BROCKLOCH RIG III

Windy Standard III

November 2015
Environmental Statement
Volume 2

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Contents

PREFACE

An Environmental Statement (ES) has been prepared in support of an application submitted by Natural Power Consultants Limited (Natural Power) on behalf of the applicant Brockloch Rig III Ltd (herein referred to as BR3). The application seeks consent under Section 36 of the Electricity Act 1989 and the ES has been prepared in accordance with the Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2000 as amended. The application also seeks a direction under Section 57(2) of the Town and Country Planning (Scotland) Act 1997 as amended that planning permission for the development be deemed to be granted.

This ES contains the information carried out for the Environmental Impact Assessment to develop a wind farm comprising of up to twenty turbines and associated infrastructure (the proposed Development). The proposed Development is located in Carsphairn Forest in Dumfries and Galloway.

The Environmental Statement and application may be viewed at the following addresses:

Environmental Statement Viewing Locations

Dumfries and Galloway Council English Street, Dumfries, DG1 2DD	Carricks Tea Room and Village Shop, Mainstreet, Carsphairn, DG7 3TQ	Dalmellington Area Centre 33 Main Street, Dalmellington, Ayr, KA6 7QL

This is Volume 2, Volume 2 of 4, of the ES. This volume contains the written statement on the findings of the Environmental Impact Assessment.

Volume 1 of the ES presents a Non-Technical Summary (NTS) of the proposed Development.

Volume 3 of the ES contains all figures and visualisations.

Volume 4 of the ES presents the technical appendices of the ES Chapters.

The ES is also supplemented by accompanying documents including a Design Statement, Planning Statement, and Pre-Application Consultation (PAC) Report.

Copies of the full Environmental Statement and Non-Technical Summary can be obtained from Natural Power, The Green House, Forrest Estate, Dalry, Castle Douglas, DG7 3XS. Tel: 01644 430 008.

Non-Technical Summary in printed form	Free
Environmental Statement in printed form (Volumes 1-4)	£822
Environmental Statement in PDF file format on CD (Volumes 1-4)	£10

A copy of the Environmental Statement can also be found on the Fred. Olsen Renewables website: http://www.fredolsen-renewables.no/brockloch-rig-overview.

Document history

Author	Marie Scaife	10/01/2015
Checked	Emily Peaston	20/01/2015
Approved	Euan Hutchison	09/02/2016

Client Details	
Contact	Gareth Swales
Client Name	Brockloch Rig III Ltd
Address	c/o Fred. Olsen Renewables Ltd

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1	10/01/2015	First Draft
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3	16/11/2015	Third Draft

Chapter 1

Introduction

Contents

Glossary

Term	Definition
Environmental Impact Assessment	Environmental Impact Assessment (EIA) is a means of drawing together, in a systematic way, an assessment of the likely significant environmental effects arising from a proposed development.
Environmental Statement	A document reporting the findings of the EIA and produced in accordance with the EIA Regulations.
Present Windy Standard Developments	The ‘present Windy Standard Developments’ refers collectively to the existing Windy Standard and the under construction Windy Standard II Wind Farms.
The proposed Development	The proposed Windy Standard III Wind Farm.
The proposed Development Area	The project development area within the site boundary which is subdivided into the Meaul Hill Cluster and Waterhead Hill Cluster.

List of Abbreviations

Abbreviation	Description
Brockloch Rig	Brockloch Rig Wind Ltd
BR3	Brockloch Rig III Ltd
EIA	Environmental Impact Assessment
ES	Environmental Statement
FORL	Fred. Olsen Renewables Ltd
LVIA	Landscape and Visual Impacts Assessment
NTS	Non-Technical Summary
PAC	Pre-Application Consultation

1.1 INTRODUCTION

1.1.1 This Environmental Statement (ES) has been prepared in support of an application under Section 36 of the Electricity Act 1989 to construct and operate the proposed Windy Standard III Wind Farm (the proposed Development) comprising of up to 20 wind turbines consisting of 8 turbines of an overall height from base to tip not exceeding 125 m and a capacity of approximately 3 MW and 12 turbines of an overall height from base to tip not exceeding 177.5 m each with a capacity of approximately 3.6 MW, forestry felling, external transformer housing, widening of existing public road junction, site tracks, crane pads, foundations, underground electricity cables, 2no. permanent anemometer masts, extension of use of consented operations and control building and temporary construction and storage compounds, 4 borrow pits, on-site concrete batching plant and associated works/infrastructure and Health and Safety sign posting (see Chapter 4: Description of Development, of the ES).

1.1.2 The application has been submitted by Natural Power Consultants Ltd (Natural Power) on behalf of the Applicant, Brockloch Rig III Ltd (herein referred to as BR3). This ES accompanies an application for consent (the 'application') to develop a wind farm comprising of up to 20 wind turbines and associated infrastructure (the 'proposed Development).

1.1.3 The proposed Development is located within Carsphairn Forest, near Carsphairn in Dumfries and Galloway and will act as an extension to the existing Windy Standard Wind Farm and Windy Standard II (the present Windy Standard Developments). At the time of writing Windy Standard II is under construction but for the purpose of assessment has been assumed to be operational by the time that Windy Standard III is developed.

1.1.4 ES Figure 1.1 in Volume 3 of the ES shows the regional context of the proposed Development including the present Windy Standard Developments and ES Figure 1.2 in Volume 3 of the ES shows the layout of the proposed Development alongside the present Windy Standard Developments.

1.1.5 ES Figure 1.1 in Volume 3 of the ES shows the location and extent of the proposed Development. The application site is located within Carsphairn Forest in Dumfries and Galloway and is currently used as commercial forestry plantation. The proposed Development Area consists of two clusters, the Meaul Hill Cluster and the Waterhead Hill Cluster. Each cluster is centred on British National Grid Coordinates of NS 579 028 and NS 578 003 respectively.

1.1.6 The existing Windy Standard Wind Farm is located on Gallow Rig and Polwhat Rig above Carsphairn Forest and commenced operation in November 1996, consisting of 36 turbines with a maximum height of 53.5 m to tip and a rated output if 21.6 MW. The existing Windy Standard Wind Farm was developed jointly by the then RWE npower renewables (now known as RWE Innogy UK and Fred. Olsen Ltd) and is currently owned by ZephIR, which RWE Innogy UK are a part of and is operated by RWE Innogy UK.

1.1.7 Windy Standard II is owned by Brockloch Rig Wind Ltd (Brockloch Rig) (a sister company to BR3 and subsidiary company of Fred. Olsen Renewables Ltd) and is currently in the construction phase and will consist of 30 turbines with a total output of up to 75 MW.

1.1.8 The proposed Development will act as an extension to the present Windy Standard Developments and will utilise infrastructure relating to Windy Standard II where practical and possible.

1.1.9 This document describes the natural and human environment of the area within which the proposed Development would be situated. It describes details of the construction, operation and decommissioning phases, and assesses the potential effects that the development would have on the natural environment and on human interests. It also describes the policy context for renewable energy within Scotland and the UK, and the overall policy context as set out by international agreements to reduce emissions of climate change gases, and targets set for the growth of renewable energy generation.

1.2 APPLICATION DETAILS

1.2.1 The application is submitted in accordance with:

- The Electricity Act 1989; and
- The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2000 and Amendment Regulations 2008.

1.2.2 The application seeks consent under Section 36 of the Electricity Act 1989. The application also seeks a direction under Section 57(2) of the Town and Country Planning (Scotland) Act 1997 as amended that planning permission be deemed to be granted.

1.3 APPLICANT

1.3.1 BR3 is a subsidiary company of Fred. Olsen Renewables Ltd (FORL). FORL have been developing and operating wind farms since the mid 1990's and is fully committed to the Scottish and UK renewable energy generation market, with an operational portfolio generating a capacity of over 432.2 MW. In the UK FORL have a total of six operational wind farms including the Windy Standard II development currently under construction.

1.4 PROJECT TEAM

1.4.1 The project has been designed and assessed by the Applicant in association with their lead consultants, Natural Power. Natural Power has been appointed to coordinate and produce this ES and associated Environmental Impact Assessment (EIA) documentation.

1.4.2 Natural Power has been providing expertise to the renewable energy industry since the company was formed in 1995 and is one of the UK's leading wind farm consultants. As well as development and EIA services, Natural Power also provide expert advice and due diligence consultancy, site construction management, site operation and maintenance.

1.4.3 Natural Power currently employs over 300 people working full time on providing renewable wind energy services internationally. Natural Power's headquarters, 'The Green House' - an award winning, environment-friendly office building is located on Forrest Estate near Dalry, approximately 17 km from the proposed Development. There are currently approximately 100 employees located at The Green House.

Table 1.1: Details of the Applicant

APPLICANT		
Brockloch Rig III Ltd	Registered Address: C/o Harper Macleod LLP, The Ca'd'oro, Glasgow, G1 3PE	
	Contact Address: c/o Fred. Olsen Renewables Ltd, 2nd Floor 64-65 Vincent Square, London, SW1P 2NU	Tel: 0207 963 8904 *Contact: Gareth Swales*

Table 1.2: Details of agent and lead consultancy

AGENT, LEAD WIND ENERGY AND PLANNING CONSULTANCY		
Natural Power Consultants	The Green House Forrest Estate, Dalry, Castle Douglas, DG7 3XS *Contact: Emily Peaston*	Tel: 01644 430 008

Table 1.3: Consultants involved in the production of this Environmental Statement

CONSULTANTS		
LANDSCAPE AND VISUAL CONSULTANCY		
Ramboll-Environ	5th Floor, 7 Castle Street, Edinburgh, EH2 3AH United Kingdom *Contact: Robert Bainsfair*	Tel: 0131 297 2678
CULTURAL HERITAGE CONSULTANCY		
CgMs	Ocean Point One, 4th Floor, 94 Ocean Drive, Edinburgh, EH6 6JH *Contact: Richard Conolly*	Tel: 0131 561 1880
SOCIO-ECONOMIC CONSULTANCY		
MKA Economics	Scion House Stirling University Innovation Park Stirling FK9 4NF *Contact: Mark Kummerer*	Tel: 07867 976665
NOISE CONSULTANCY		
TNEI Services Ltd	Milburn House, Dean Street, Newcastle Upon Tyne, NE1 1LE *Contact: Matthew Lambert*	Tel: 0191 2111404
FORESTRY CONSULTANCY		
DGA Forestry	Lochanhead Wood, Lochanhead, Dumfries, DG2 8JB. *Contact: Sandy Anderson*	Tel: 01387 730 634

1.5 STRUCTURE OF THE ENVIRONMENTAL STATEMENT

1.5.1 The ES reports the findings of the assessment of the likely environmental effects of the proposed wind farm and comprises the following volumes:

- Volume 1: A Non-Technical Summary (NTS) of the proposed Development.
- Volume 2: Written statement on the findings of the Environmental Impact Assessment.
- Volume 3: All ES Figures and Visualisations.
- Volume 4: Technical Appendices of the ES chapters.

1.5.2 Separate documents, have also been produced in support of the application including a:

- Planning Statement;
- Design & Access Statement; and a
- Pre-Application Consultation (PAC) Report

1.5.3 An outline of Volume 2 is presented below:

- Chapter 1: Introduction, of the ES, this chapter provides a brief introduction to this document and the application.
- Chapter 2: Planning and Policy Context, of the ES identifies the energy and land use policy and outlines the need for the proposed Development and its benefits within the context of international climate change agreements and European, UK and Scottish renewable energy policy.
- Chapter 3: Design Evolution and Alternatives, of the ES provides a detailed description of the site selection process for the proposed site. This chapter also discusses the design evolution process and mitigation measures that were introduced at the site selection and design stage to reduce environmental impacts.
- Chapter 4: Description of Development, of the ES provides a detailed description of the proposed Development including details of the construction, operational and decommissioning arrangements.
- Chapter 5: EIA Process, of the ES presents a methodology for environmental design and assessment of the proposed Development through gathering of baseline environmental data, mitigation of impacts during site design and final assessment of the significance of residual environmental and human effects of the proposal.
- Chapter 6: Landscape and Visual Assessment, of the ES provides an assessment of the Landscape and Visual Impacts (LVIA) of the proposed Development and cumulative LVIA.

- Chapter 7: Ecology, of the ES provides an overview of the baseline ecological conditions relating to the habitats and (non-avian) fauna present within the proposed Development Area and immediate surrounding environment.
- Chapter 8: Ornithology, of the ES describes the ornithological interest at the proposed Development and assesses the predicted effects on these interests.
- Chapter 9: Cultural Heritage and Archaeology, of the ES considers the potential impacts of the proposed Development upon cultural heritage assets.
- Chapter 10: Hydrology, Geology and Hydrogeology, of the ES assesses the impacts on the hydrological, geological and hydrogeological environment at the proposed Development.
- Chapter 11: Noise, of the ES summarises the findings of the construction and operational noise assessments that were carried out to assess the noise impact of the proposed Development.
- Chapter 12: Forestry, of the ES describes the forestry aspects of the proposed Development.
- Chapter 13: Aviation, EMI, Existing Infrastructure and Shadow Flicker, of the ES assesses the potential for impact upon aviation, Ministry of Defence (MoD) interests, communication operations and existing site infrastructure and demonstrates the consulting process undertaken and outlines mitigation where it is deemed necessary.
- Chapter 14: Traffic and Transport, of the ES assesses the effects due to transport and access resulting from the construction, operation and decommissioning of the proposed Development.
- Chapter 15: Socio-economic and Tourism Assessment, of the ES assesses the predicted socio-economic and tourism impacts of the proposed Development.
- Chapter 16: Summary, of the ES summarises the findings of the Environmental Impact Assessment (EIA) presented in the ES chapters described above.

Document history

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Contact	Gareth Swales
Client Name	Brockloch Rig III Ltd
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Chapter 2

Planning and Policy Context

Contents

Glossary

Term	Definition
Environmental Statement	A document reporting the findings of the EIA and produced in accordance with the EIA Regulations.
The proposed Development	The proposed Windy Standard III Wind Farm.
The proposed Development Area	The project development area within the site boundary which is subdivided into the Meaul Hill Cluster and Waterhead Hill Cluster.

List of Abbreviations

Abbreviation	Description
AR5	Fifth Assessment Report
CfD	Contracts for Difference
CM	Capacity Market
CO_2	Carbon Dioxide
DECC	Department of Energy and Climate Change
DGC	Dumfries & Galloway Council
DGWLCS	Dumfries and Galloway Wind Farm Landscape Capacity Study
ECCP	European Climate Change Programme
EAC	East Ayrshire Council
EALDP	East Ayrshire Local Development Plan
ES	Environmental Statement
FCFS	First Come, First Served
gCO_2	Carbon Dioxide Equivalent
kWh	Kilowatt-hour
IPCC	Intergovernmental Panel on Climate Change
IPP	Interim Planning Policy
LCF	Levy Control Framework
LCoE	Levelised Cost of Electricity
LDP	Local Development Plan
NPF	National Planning Framework
OBR	Office of Budgetary Responsibility
PAN	Planning Advice Notes
RES	The UK Renewable Energy Strategy
RO	Renewable Obligation
ROS	Renewables Obligation (Scotland)
RPP2	Second Report on Proposals and Policies
RSA	Regional Scenic Areas
SG	Supplementary Guidance
SHEP	Scottish Historic Environment Policy
SPP	Scottish Planning Policy
SYR	Synthesis Report
UNFCCC	United Nations Framework Convention on Climate Change

2.1 INTRODUCTION

2.1.1 This Chapter of the Environmental Statement (ES) identifies and contextualises the policy and legislative framework relevant to the development of renewable energy. It is recognised that current drivers to these policies have emerged from the pressing concerns regarding climate change and the resulting aims of reducing greenhouse gas emissions. Renewable energies are acknowledged within these as a means to reduce greenhouse gas emissions through a reduced reliance upon fossil fuels.

2.1.2 This Chapter also recognises the relevant development plan policies against which the application for the proposed Development is likely to be assessed.

2.1.3 It is not the purpose of this Chapter to analyse the proposed Development against the policy. Detailed analysis of the proposed Development is contained within a separate Planning Statement, which supports the application.

2.1.4 The Planning Statement contains a brief description of the proposed Development, the rationale for the proposal, a summary of the findings of the Environmental Statement (ES) and consideration of the application against key legislative requirements. It also contains consideration of the proposed Development against UK and Scottish Government policy requirements, assessment of the application against the relevant development plan policies, assessment of the effects of other material considerations, and the conclusions reached on the planning issues raised by the proposed Development. It does not form part of the assessment within the ES.

2.2 CLIMATE CHANGE (CONTEXT, POLICY DRIVERS AND LEGISLATION)

Climate Change Background

2.2.1 It is widely accepted that climate change is a pressing and real phenomenon. The Intergovernmental Panel on Climate Change (IPCC) has, to date, published three Working Group (WG) reports which have been collated into a Synthesis Report (SYR)[1] and all taken together, make up the Fifth Assessment Report (AR5). Headline statements from the report include:

2.2.2 *"Human influence on the climate system is clear, and recent anthropogenic emissions of greenhouse gases are the highest in history. Recent climate changes have had widespread impacts on human and natural systems.*

2.2.3 *Continued emission of greenhouse gases will cause further warming and long-lasting changes in all components of the climate system, increasing the likelihood of severe, pervasive and irreversible impacts for people and ecosystems. Limiting climate change would require substantial and sustained reductions in greenhouse gas emissions which, together with adaptation, can limit climate change risks.*

2.2.4 *Adaptation and mitigation are complementary strategies for reducing and managing the risks of climate change. Substantial emissions reductions over the next few decades can reduce climate risks in the 21st century and beyond, increase prospects for effective adaptation, reduce the costs and challenges of mitigation in the longer term, and contribute to climate-resilient pathways for sustainable development.*

2.2.5 *Many adaptation and mitigation options can help address climate change, but no single option is sufficient by itself. Effective implementation depends on policies and cooperation at all scales, and can be enhanced through integrated responses that link adaptation and mitigation with other societal objectives."*

[1] SYR, available at: http://www.ipcc.ch/news_and_events/docs/ar5/ar5_syr_headlines_en.pdf (accessed 01/12/2015)

International Policy Framework on Climate Change

2.2.6 The United Nations Framework Convention on Climate Change (UNFCCC) has had a strong role in establishing international policy on climate change. In particular, its principal review mechanism 'The Kyoto Protocol' was adopted by the Annex 1 participating countries in 1997 and commits the industrialised countries to legally binding targets to limit or reduce their greenhouse gas emissions.

2.2.7 Since coming into force on 16 February 2005, and following the requisite number of parties ratifying the Protocol, member countries have been implementing domestic policies and provisions in order that they work towards commitments in the treaty.

European Union Climate Change Policy

2.2.8 Under the Kyoto agreement, the EU-27 target was to achieve a reduction of 8 % in emissions by 2008-2012. The EU burden-sharing agreement (i.e. the 'EU-bubble') stipulated that some countries would reduce emissions whilst others could increase them, as long as the EU-27as a whole achieves its Kyoto Protocol target of -8 % percent, compared with 1990 emission levels. The new EU Member States have their own targets, as agreed in the Kyoto Protocol.

2.2.9 The first phase of the European Climate Change Programme (ECCP) was launched in June 2000. It was tasked with identifying and developing the relevant mechanisms to achieve this action in the form of a range of additional policies and measures as well as an emissions trading scheme[2]. This trading scheme emerged into operation in January 2005 as the EU Emissions Trading Scheme (further details in paragraphs below).

2.2.10 The most recent reinforcement of the EU's commitment to increase the amount of energy from renewable sources is set out in Directive 2009/28/EC[3] amending and repealing previous Directives from 2001 and 2003. This Directive establishes a framework for the promotion of energy from renewable sources setting mandatory national targets for member states. These national targets are such that the European Community as a whole will meet its overall target of at least 20 % of energy consumption from renewable sources by 2020. Against this EU target, the Directive establishes a requirement for the UK to achieve an equivalent target of 15 % by 2020. A press release (37/2014)[4] issued by Eurostat on 10th March 2014, notes that in 2012 the UK was only achieving 4.2 %. Against this same background, only Luxembourg and Malta recorded lower percentage levels than the UK in 2012. By comparison, Sweden, Latvia and Finland were achieving 51 %, 35.8 % and 34.3 % respectively in 2012. As of 2012, Estonia, Bulgaria and Sweden have achieved their 2020 targets.

UK Climate Change Policy & Legislation

2.2.11 Under the Kyoto Protocol and European policy, each member state is required to enact policy to deliver their emissions reduction targets. The UK Government published several policy papers from 2000 onward culminating in the enactment of climate change legislation at a UK and Scottish level in 2008 and 2009 respectively:

- Emerging policy papers
- UK Climate Change Programme (2000), (2006)
- Renewables Obligation (2002)

[2] European Climate Change Programme Report. European Commission (2001)

[3] Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources.

[4] Eurostat press release, available at: http://epp.eurostat.ec.europa.eu/cache/ITY_PUBLIC/8-10032014-AP/EN/8-10032014-AP-EN.PDF (accessed 16/10/2015)

- White Papers (2003) & (2007)[5] and (2011)[6] and the Energy Review[7]
- Legislation
- Energy Act (2008)
- Energy Act (2011)
- Energy Act (2013)
- Climate Change Act (2008)
- Climate Change (Scotland) Act (2009)

Climate Change Act 2008 and Climate Change (Scotland) Act 2009

2.2.12 The Climate Change Act 2008 received Royal Assent on 26 November 2008. Heralded as a ground breaking piece of legislation, the Act introduced legally binding targets on the Secretary of State to reduce the UK's net greenhouse gas emissions by at least 80 % below 1990 levels by 2050 and updated in 2009 to achieve CO_2 reductions of at least 34 % from electricity below 1990 levels by 2020.

2.2.13 The Climate Change Act 2008 established a series of measures to achieve these targets including the introduction of carbon budgeting, a carbon trading scheme and the creation of a new Committee on Climate Change.

2.2.14 The Climate Change (Scotland) Act 2009 is seen as a key commitment of the Scottish Government, and contains environmental legislation that is the most far-reaching considered by the Scottish Parliament during its first ten years of devolution. The aim of the Act was to establish a framework to drive greater efforts at reducing Kyoto Protocol greenhouse gas emissions in Scotland. The Act created mandatory climate change targets to achieve a reduction in Scotland's greenhouse emissions by at least 80 % below 1990 levels by 2050 and an interim target of 42 % by 2020.

2.2.15 Section 44 of the Climate Change (Scotland) Act 2009 placed a duty on every "public body" to act:

- In the best way calculated to contribute to the delivery of the emissions targets in the Act;
- In the best way calculated to help deliver the Scottish Government's climate change adaptation programme; and
- In a way that it considers is most sustainable.

Energy Act 2008, Energy Act 2011, and Energy Act 2013

2.2.16 The Energy Act 2008 updated the Renewables Obligation setting out different levels of banding for each technology.

2.2.17 The Energy Act 2011 extends and amends existing powers in the Energy Act 2008. It received Royal Assent on 18 October 2011 and aims to help increase investment in energy efficiency via the Green Deal, improve energy security and enable investment in low carbon energy supplies in the UK. The regulatory bodies and regulatory mechanisms will be restructured slightly, conferring more powers on Ofgem. The Act also imposes duties on the market to report future needs as much as possible.

2.2.18 The Energy Act 2013 received Royal Assent on 18 December 2013. This series brings together all of the department's documentation for the Energy Act. These provisions enable the Secretary of State to set a 2030 decarbonisation target range for the electricity sector in secondary legislation.[8]

2.3 UK SECURITY OF SUPPLY AND MARKETS (CONTEXT, POLICY AND DRIVERS)

Security of Supply

2.3.1 The UK Government has sought to ensure the security and diversity of the UK electricity supply amidst increasing global competition for scarce fossil fuel resources, dependency on imported supplies and the anticipated lack of availability of fossil fuel resources from indigenous sources. In May 2007, the Department of Trade and Industry released A White Paper on Energy[9], which set out the baseline for the UK's energy demand and a framework reaching European targets.

2.3.2 The UK's vulnerability to potential disruptions in energy supply was increasing. The White Paper stated that;

"By 2010, imports of gas could be meeting up to a third or more of the UK's total gas demand, potentially rising to 80% by 2020. While the UK has benefited from indigenous reserves of oil and gas for many years, as the North Sea matures, we will become increasingly dependent on imported energy. By 2010, gas imports could be meeting up to a third or more of the UK's total annual gas demand, potentially rising to around 80% by 2020 on the basis of existing policies. The UK is also already a net importer of oil, and by 2020 imports could be meeting up to around 75% of the UK's coal demand."

2.3.3 The UK Government recognised the importance of maintaining the reliability of UK energy supplies and this aim was one of the four key goals outlined in the 2007 White Paper. These goals have further been reinforced by the UK Government's 2050 Pathway Analysis document and 2050 Pathways Analysis Calculator[10]. Together, these provided a tool for policymakers, the public and the energy industry to use to help understand that choices that were required to move towards a secure, low carbon economy by the year 2050. Since then, the government has stated its commitment to a reliable energy infrastructure through publishing of the National Infrastructure Plan in 2010 and yearly thereafter[11]. This document lays out the ambitious energy programme that will support investment in energy efficiency, in low carbon energy, and in security of supply through a mixture of committed funds from public and private sector investment, using public money, regulatory change and new incentives.

Market Considerations

2.3.4 In addition to the issue of security and reliability of the electricity supply, there is a considerable school of thought that suggests the market value (and price) of energy and electricity is likely to increase, in real terms, in the future. Regarding global energy consumption, world energy demand will be 37 % higher in 2040 than in 2014 on planned policies, an average rate of growth of 1.1 %. Global investment in the power sector amounts to $21 trillion through to 2040, with over 40 % in transmission and distribution networks[12].

[5] Available at: http://webarchive.nationalarchives.gov.uk/20121205174605/http:/www.decc.gov.uk/assets/decc/publications/white_paper_07/file39387.pdf (accessed 06/08/2015)

[6] Available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/48129/2176-emr-white-paper.pdf (accessed 01/12/2015)

[7] Our Energy Challenge: Securing clean, affordable energy for the long term. Department of Trade and Industry (January 2006)

[8] Available at: https://www.gov.uk/government/collections/energy-bill (accessed 01/12/2015)

[9] Meeting the Energy Challenge: A White Paper on Energy. Department of Trade and Industry (2007)

[10] Available at: https://www.gov.uk/2050-pathways-analysis (accessed 01/12/2015)

[11] Available at: https://www.gov.uk/government/collections/national-infrastructure-plan (accessed 01/12/2015)

[12] World Energy Outlook. International Energy Agency (2014)

2.3.5 In the UK, investment in grid infrastructure remains a priority for the electricity sector. In June 2009, The European Commission issued a Directive on the promotion of the use of energy from renewable sources[13]. Article 16 of the Directive includes the following:

"Member States shall ensure that transmission system operators and distribution system operators in their territory guarantee the transmission and distribution of electricity produced from renewable energy sources."

"Member States shall also provide for either priority access or guaranteed access to the grid-system of electricity produced from renewable energy sources."

"Member States shall ensure that when dispatching electricity generating installations, transmission system operators shall give priority to generating installations using renewable energy sources in so far as the secure operation of the national electricity system permits and based on transparent and non-discriminatory criteria. Member States shall ensure that appropriate grid and market-related operational measures are taken in order to minimise the curtailment of electricity produced from renewable energy sources. If significant measures are taken to curtail the renewable energy sources in order to guarantee the security of the national electricity system and security of energy supply, Members States shall ensure that the responsible system operators report to the competent regulatory authority on those measures and indicate which corrective measures they intend to take in order to prevent inappropriate curtailments."

2.3.6 Much of the new transmission investment is driven by European policy and the needs of the generation companies that use (or plan in the future to use) the network. The plans for additional investment in the transmission system, including interconnection between member states, recognise that there is a large volume, primarily of wind electricity generation, that will connect to the system over the coming years. Ofgem, which regulates the gas and electricity markets, has recognised the importance of providing appropriate funding for asset renewal and has agreed that transmission funding arrangements provide an appropriate balance of risk and reward for the transmission companies whilst offering good value to the consumer[14]. Development of the transmission infrastructure is also a key element of the National Planning Framework in Scotland.

Electricity Market Reform (EMR)

2.3.7 EMR seeks to reform the UK electricity market to attract the necessary investment for replacing the UK's ageing energy infrastructure and meet the projected increases in demand for electricity in the future.

2.3.8 Part of the EMR will see the introduction of Contracts for Difference (CfD). CfD are intended to provide stimulus for the continued investment in low carbon technologies, including renewable energy generation, by introducing predictable revenue streams that reduce the risk to investors and increase the likelihood of receiving finance.

2.3.9 Contracts will be initially allocated on a 'First Come, First Served' (FCFS) basis, whilst there is sufficient headroom in the CfD Budget. When 50 % of the CfD Budget has been allocated through FCFS allocation the Delivery Body will check whether Government has room within Levy Control Framework (LCF) to allow FCFS allocation to continue. If there is insufficient LCF budget available, the Delivery Body will begin to allocate CfDs through Allocation Rounds. The results of the first allocation for CfD were announced on the 26th February 2015.

2.3.10 EMR will also introduce a Capacity Market (CM). This will help secure the UK's energy supply by giving capacity providers financial incentives to provide a reliable stream of electricity.

[13] Available at: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32009L0028:EN:NOT (accessed 01/12/2015)

[14] Meeting the Energy Challenge: A White Paper on Energy. Department of Trade and Industry (2007)

2.4 RELEVANT UK RENEWABLE ENERGY POLICIES

The UK Renewable Energy Strategy (RES)

2.4.1 The UK Renewable Energy Strategy (RES)[15] issued in July 2009, set out the path for the UK to meet its legally-binding target to ensure that 15 % of UK energy comes from renewable sources by 2020.

UK Renewable Energy Roadmap Update 2013

2.4.2 The UK Renewable Energy Roadmap Update 2013[16] reiterates the statutory target and provides an update of the UK's progress towards achieving 15 % of renewable sourced energy by 2020. The document notes that between January 2010 and September 2013; the Department of Energy and Climate Change (DECC) collated renewable industry announcements totalling around £31bn confirmed and planned investments, with the potential to support 35,000 jobs.

2.4.3 Renewable energy accounted for 4.1 % of energy consumption in 2012 and just fell short of the interim targets set. The shortcoming is largely due to the fall in contribution from the renewable transport sector and continued support for renewable energy technology is required to achieve the 2020 target.

The Carbon Plan

2.4.4 The Carbon Plan[17] was published in March 2011 and outlines the UK Government's plan on climate change over the next 5 years. It sets out the main renewable energy targets and what changes need to take place in order to achieve these e.g. electricity market reform.

The Utilities Act 2000 and The Renewables Obligation

2.4.5 The Utilities Act 2000 is an Act of Parliament that deals with the gas and electrical markets in the UK. In the main, it modified the Gas Act 1995 and Electricity Act 1989. One of the greatest changes was that integrated electricity companies are required to have separate licences for each of their businesses, such as supply or distribution. It enabled the Renewable Obligation (RO).

2.4.6 The RO is the principal market-based tool by which the UK Government seeks to achieve its renewable energy targets. The primary enabling legislation for the RO was the UK Utilities Act 2000.

2.4.7 Since early 2002 progress towards achieving renewable energy targets has been supported by the Renewables Obligation in England and Wales and the Renewables Obligation (Scotland) in Scotland. These set national targets for renewable energy electricity to be supplied by electricity supply companies with penalties for those companies unable to meet the obligation. The targets which have increased year on year from 2002 to 2010 were intended to collectively achieve the UK target of 10 % electricity to come from renewables by 2010. In 2003, the UK Government made further commitments to the Renewable Obligation stating that they would increase the obligation level to 15.4 % by 2015 and 20 % by 2020.

2.4.8 The 2011 *'Planning our Electric Future: a White Paper for Secure, Affordable and Low-Carbon Electricity Energy'* reiterated and built upon the commitment to low carbon energy supply, thereby strengthening the EU ETS scheme and the RO. Recommendations made in this consultation response were enacted in the Energy

[15] Available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/228866/7686.pdf (accessed 01/12/2015)

[16] Available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/255182/UK_Renewable_Energy_Roadmap_-_5_November_-_FINAL_DOCUMENT_FOR_PUBLICATIO___.pdf (accessed 01/12/2015)

[17] Available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/47613/3702-the-carbon-plan-delivering-our-low-carbon-future.pdf (accessed 01/12/2015)

Act 2008 and The Renewables Obligation Order 2009, which came into force for England and Wales on 26 November 2008 and 01 April 2009 respectively.

2.4.9 In Scotland, The UK Renewables Obligation was brought into legal force by a statutory instrument of the Scottish Executive which, since first published in 2002, has been updated annually each April. As of 13th April 2015, onshore wind was banded at 0.9 ROCS/MWh[18]. The scheme is known as the Renewables Obligation (Scotland) or ROS and aims to help meet the Scottish Government's own targets as well as to contribute to meeting the European renewable energy target of 20 %, by providing more support for emerging renewable technologies[19] [20]. The ROS is a key measure in terms of increasing the amount of renewable electricity generating capacity in Scotland. The UK Renewables Obligation is being phased out by 2017.

Levy Control Framework

2.4.10 A package of reforms have been introduced in 2015 by the DECC Secretary of State to take control of the costs of renewable electricity subsidies under the Levy Control Framework (LCF).

2.4.11 DECC's latest forecasts under the Levy Control Framework to 2020/21, confirmed in the Office of Budgetary Responsibility's (OBR) report 'Economic and Fiscal Outlook' – July 2015[21] , have shown that forecast spend on renewable energy subsidy schemes is set to be higher than expected when the schemes under the LCF were established. The Government has set a limit of £7.6bn in 2020-2021 (in 2011/12 prices), so the current forecast is £1.5bn above that limit. This is due to accelerated developments in technological efficiency, higher than expected uptake of demand-led schemes and changes in wholesale prices. This means that the forecast of future spend under the LCF is now estimated at around £11.4bn (in nominal prices) or £9.1bn (in 2011/12 prices) in 2020/21. The Government is determined to bring these costs under control to protect consumers and provide a basis for investment in clean electricity in future.

2.4.12 As part of this the Government has recently announced its intention to end new subsidies for onshore wind and to close the Renewables Obligation to new onshore wind in Great Britain.

2.4.13 A written Ministerial Statement, issued by the DECC Secretary of State on the 18th of June 2015 announced the early closure of the RO at the end of March 2016 for onshore wind. Alongside this announcement a one year grace period (April 2016-March 2017) is proposed for those projects that are able to meet the following eligibility criteria, as of the 18th June 2015:

- Planning consent
- Land agreement
- Grid connection agreement

2.4.14 A further statement by the Secretary of State was issued on 7th July 2015, providing more information on the proposed eligibility criteria, length of grace periods and DECC's intention to retain proposed 'delay' grace periods for projects that may be delayed due to aviation or grid delays that are outside of the control of the developer. For those projects that qualify for this grace period (based on the above criteria) this is proposed to run for a further year - April 2017-March 2018. In this statement, DECC announced a period of engagement with the industry and invited feedback on these proposals.

2.4.15 On the 14th July, this statement was updated, inviting stakeholders to register to attend an industry-wide event, to be held on 23rd July.

2.4.16 The Energy Bill, which includes provisions for early closure of the RO to onshore wind, was introduced on 10th July. It is proposed that details of the Government's proposed grace periods will be set out in full, on the face of the Bill, through Government amendment to be tabled at the Lords Committee stage.

2.4.17 The Lords Committee stage took place between the 7th to the 14th of September 2015. Members of the Lords discussed a proposal to remove a section of the bill that would end subsidies for onshore wind from 31 March 2016, this went to a vote with 242 for and 190 against, and therefore the change was made. DECC has yet to table new Energy Bill amendments to close the RO early to onshore wind.

2.4.18 The DECC Secretary of State has also indicated that onshore wind would not be included in the next CfD allocation round.

2.4.19 Such recent and forth coming changes to funding mechanisms now require wind energy to compete in a Levelised Cost of Electricity market. The Levelised Cost of Electricity (LCoE) is a measure of a power source which attempts to compare different methods of electricity generation on a comparable basis. As such, the capacity of onshore wind developments need to be optimised to maximise the chances of the development being realised if planning can be secured.

2.4.20 On the 11th of November 2015, a letter from the Scottish Government Planning and Architecture Division to all Heads of Planning entitled *'Energy Targets and Scottish Planning Policy'* was issued[22].

2.4.21 This letter states that despite some recent changes to UK policy, the Scottish Government's policy remains unchanged and that it *"supports new onshore renewable energy developments, including onshore wind farms and particularly community owned and shared ownership schemes".*

2.4.22 In the letter, the Chief Planner also re-emphasises that *"the Scottish Government's target is to generate at least the equivalent of 100 % of gross electricity consumption from renewables by 2020. The Electricity Generation Policy Statement is clear that this target is a statement of intent and that it is known Scotland has the potential resource to deliver and exceed it.*

2.4.23 *Scottish Planning Policy on delivering heat and electricity is clear that the planning system should support the transformational change to a low carbon economy, consistent with national objectives and targets, including the 100 % target mentioned above. This does not place a cap on the support for renewable energy developments, including on-shore wind once the target has been reached.*

2.4.24 *We expect development plans to continue to provide spatial frameworks for onshore wind in accordance with the approach in Scottish Planning Policy and that individual decisions be informed by the relevant development plan policies, themselves informed by the considerations set out in paragraph 169 of Scottish Planning Policy".*

2.5 RELEVANT SCOTTISH RENEWABLE ENERGY POLICIES

Scottish Renewable Energy Targets

2.5.1 In Scotland, energy policy is not a devolved matter. However under its environmental remit the Scottish Government set a number of targets for renewable energy development. In November 2007 the Scottish Energy Minister, announced a Scottish Government Commitment to a 50 % renewable target for electricity consumption by 2020, with an interim target of 31 % by 2011. In 2011 the Scottish Government changed its target to 100 %

[18] Renewables Obligation: Guidance for Generators., available at: https://www.ofgem.gov.uk/sites/default/files/docs/2015/04/renewables_obligation_-_guidance_for_generators_13_april_2015_v2.pdf (accessed 10/11/2015)

[19] Scottish Statutory Instrument 2009 No. 140 (SSI/2009/140) – The renewables Obligation (Scotland) Order 2009, available at: http://www.opsi.gov.uk/legislation/scotland/ssi2009/ssi_20090140_en_1 (accessed 01/12/2015)

[20] The Renewables Obligation (Scotland) Amendment Order 2011, available at: http://www.legislation.gov.uk/sdsi/2011/9780111012352/contents (accessed 06/08/2015)

[21] Economic and Fiscal Outlook, available at: http://cdn.budgetresponsibility.independent.gov.uk/July-2015-EFO-234224.pdf (accessed 28/08/2015)

[22] Available at: http://www.gov.scot/Resource/0048/00488945.pdf (last accessed 16/12/2015)

electricity to come from renewables by 2020. The Renewables Action Plan[23] which was published in 2009 sets out the main changes that need to be made within Scotland in order to meet renewable energy targets. This has been updated each year in order to provide an indication as to the progress being made towards implementing these changes.

Renewables Action Plan

2.5.2 The Renewables Action Plan (2009) set key targets that are to be achieved to enable longer term carbon reduction targets to be met.

2.5.3 Scotland is currently committed to achieving a headline target of 20 % of total Scottish energy use coming from renewable sources by 2020, from the electricity, transport and heat sectors.

2020 Route Map for Renewable Energy in Scotland

2.5.4 The 2020 Route Map is an update and extension to the Renewables Action Plan[24]. This policy reflects the newly established target to generate the equivalent of 100 % of Scotland's electricity demand from renewable energy by 2020 with an interim target of 50 % by 2015. This target is based on the fact that in recent decades Scotland has significantly increased the amount of electricity consumption which is generated by renewables however is dependent on steady growth within the onshore wind sector. The Route Map should be viewed alongside the Electricity Generation Policy Statement 2013[25] which explains the energy mix that will be required in Scotland and renewables' role within this.

2.5.5 The Route Map aims to encourage local planning authorities to support renewables and in particular in relation to onshore wind, to look for solutions in technical challenges around aviation, noise, proximity to communities, cumulative impacts in the landscape and to encourage best practice. It demonstrates the Scottish Government's continued support for the development of renewable energy development. There has been momentum gathered towards meeting interim targets, which must be maintained to reach the 2020 target. This is particularly important as the Scottish and UK positions are clear. The renewable energy sector is to be supported as it can provide electricity generation consistent with the aims of combating climate change, whilst also contributing to national security of supply and helping develop the manufacturing industry.

Scottish Government Economic Strategy

2.5.6 The Scottish Government Economic Strategy was first introduced in 2007 to drive sustainable economic growth in the areas which require it most. The strategy was updated in 2011 to take account of changing economic conditions and again in March 2015[26]. One of the strategic priorities is 'Transition to a Low Carbon Economy' which sought to establish a National Renewables Infrastructure Fund. It is considered that one of the key growth sectors is energy (including renewables) which is predicted to create a large number of jobs in Scotland in the years ahead.

Scottish Government Low Carbon Economic Strategy

2.5.7 The Scottish Government published the Low Carbon Economic Strategy in 2010[27]; a document which illustrates the importance of change to a low carbon economy and demonstrates the Scottish Government's support for developments that will facilitate the desired paradigm shift in the production and use of energy. Page 49 of the document states that:

"it is important to recognise that onshore wind is still the technology that can make the most immediate positive impact on our low carbon economy, and therefore the Scottish Government will continue to encourage large, medium and small scale developments that are sited appropriately".

2.5.8 The Scottish Government produced the report *'Low Carbon Scotland: Meeting our Emissions Reduction Targets 2013-2017: The Second Report on Proposals and Policies[28] (RPP2)'.* This report sets out how Scotland can meet its statutory targets set in the Climate Change (Scotland) Act 2009 for reducing greenhouse gas emissions between 2013 and 2027. The report states on page 1 that:

"Climate change is one of the greatest global threats we face. The transition to a low carbon society is an essential investment for the people of Scotland, our environment and our future generations."

2.5.9 The Scottish Government's vision is for a largely decarbonised electricity generation sector by 2030 using renewable sources for electricity generation. At the date of writing carbon intensity of electricity generation has fallen from 347 gCO_2/kWh in 2010 to 289 gCO_2/kWh in 2011. In 2011, Scotland topped the European league table for emissions reductions among the EU-15 Member States. This success can be attributed to:

"Scotland's abundant natural resources (which) are a basis for a revolution in renewable energy supported by energy infrastructure and skills in our oil and gas industries".

2.5.10 RPP2 notes that excellent progress is being made towards Scotland's energy targets, citing that in 2012, 39 % of Scotland's electricity came from renewables.

2.6 LEGISLATION

The Electricity Act 1989

2.6.1 As the generating capacity of the proposed Development is in excess of 50 MW, the scheme requires consent from the Scottish Government under Section 36 of The Electricity Act 1989. The application also seeks deemed planning permission granted by the Scottish Government under Section 57 (2) of the Town and Country Planning (Scotland) Act 1997. Although the determining authority in this instance is therefore the Scottish Government, Schedule 8 of the Act requires the relevant local planning authorities are consulted on planning matters.

2.6.2 The requirements of Schedule 9 of the Act, which is concerned with the preservation of amenity and fisheries, are applied to applications for consent under Section 36 of the Electricity Act 1989. Pursuant to Schedule 9 of the Act, regard is given to the desirability of preserving natural beauty, conserving flora and fauna and geological or physiographical features of special interest and of protecting sites, buildings and objects of architectural, historical or archaeological interest and the Scottish Government will consider the extent to which the Applicant has done, within reason, what they reasonably can to mitigate any effect the proposal might have on these features. There is also a requirement when exercising relevant functions related to the generation or supply of electricity to seek to avoid, so far as reasonably practicable, causing injury to fisheries or fish stocks.

2.6.3 These matters have been addressed in this ES and assessments of these features have been undertaken and are described along with a summary of the proposed mitigation measures in the relevant chapters of the ES to mitigate potential environmental effects upon these assets.

[23] Available at: http://www.gov.scot/Publications/2009/07/06095830/0 (accessed 06/08/2015)

[24] Available at: http://www.gov.scot/Topics/Business-Industry/Energy/RoutemapUpdate2013 (accessed 06/08/2015)

[25] Available at:: http://www.gov.scot/Publications/2013/06/5757 (accessed 06/08/2015)

[26] Available at: http://www.gov.scot/Topics/Economy/EconomicStrategy (accessed 06/08/2015)

[27] Available at: http://www.gov.scot/Publications/2010/11/15085756/0 (accessed 06/08/2015)

[28] Available at:: http://www.gov.scot/Publications/2013/06/6387 (accessed 06/08/2015)

The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2000 and Amendment Regulations 2008

2.6.4 Regulation 3 states that a Section 36 consent application which requires an EIA shall not be granted unless the requirements of the regulations have been satisfied. This in turn requires the Applicant to submit an ES that the proper publicity procedures have been followed and the secretary of state has taken the findings of the ES and other environmental information into account.

The Planning Acts

2.6.5 The request that planning permission be deemed granted is governed by Section 57(2) of the Town and Country Planning (Scotland) Act 1997, which provides that:

"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 Secretary of State may direct that planning permission for that development and any ancillary development shall be deemed to be granted, subject to such conditions (if any) as may be specified in the direction."

2.7 NATIONAL PLANNING POLICY AND ADVICE

The National Planning Framework (NPF)

2.7.1 The Planning etc. (Scotland) Act 2006 amended the 1997 Act to put the NPF on a statutory footing. The third edition of the National Planning Framework (NPF) was published in June 2014. It sets out a strategy for Scotland's development over the next 20 to 30 years, providing a national context for development plans and planning decisions, to inform wider programmes of government, public agencies and local authorities.

2.7.2 The NPF confirms the importance of renewable energy to Scotland's energy mix and highlights upgrades to the electricity transmission system that are needed to facilitate development. The vision for Scotland portrayed in NPF is that of a successful, sustainable place, a low carbon place, a natural, resilient place and a connected place. These visions put emphasis on the development of low carbon energy generation both onshore and offshore.

2.7.3 The NPF states in paragraph 3.6 that the renewables industry currently supports around 11,000 jobs in Scotland and paragraph 3.9 states the Government's intention to maintain:

"security of supplies and addressing fuel poverty remain key objectives. We want to continue to capitalise on our wind resource, and for Scotland to be a world leader in offshore renewable energy. In time, we expect the pace of onshore wind energy development to be overtaken by a growing focus on our significant marine energy opportunities, including wind, wave and tidal energy".

2.7.4 The third NPF takes a stronger, more prescriptive stance regarding spatial development of onshore wind, stating in paragraph 3.23 that:

"Onshore wind will continue to make a significant contribution to diversification of energy supplies. We do not wish to see wind farm development in our National Parks and National Scenic Areas. Scottish Planning Policy sets out the required approach to spatial frameworks which will guide new wind energy development to appropriate locations, taking into account important features including wild land."

2.7.5 The NPF is a material consideration and assessment of the proposed Development against NPF is provided in the Planning Statement.

Scottish Planning Policy (SPP) 2014

2.7.6 The new SPP[29] was published on the 23rd June 2014 and is a statement of Scottish Minister's priorities and will be a material consideration for determining this application.

2.7.7 The SPP highlights that the planning system is essential to achieving the Scottish government's central purposes of increasing sustainable economic growth, with regard to principles of sustainable development as outlined in the Planning etc. (Scotland) Act 2006. Decisions made through the planning system should, amongst other things, contribute to the reduction of greenhouse gas emissions in line with the commitment to reduce emissions by 42 % by 2020 and 80 % by 2050, contribute to reducing consumption and to the development of renewable energy generation opportunities. The need to tackle climate change is recognised as a principle challenge of sustainable economic growth.

2.7.8 The new SPP also introduces a presumption in favour of development that contributes to sustainable development, however to achieve the "*right development in the right place"* development plans, policies and decisions that consider onshore wind should:

- Give due weight to net economic benefit and respond to economic issues, challenges and opportunities, as outlined in local economic strategies;
- Support the delivery of energy infrastructure;
- Support climate change mitigation and adaptation;
- Have regard to the principles for sustainable land use set out in the Land Use Strategy[30]; and
- Avoid over-development and protect the amenity of new and existing development.

2.7.9 Other principles affecting the determination of applications include the protection and enhancement of the cultural and natural environment, including biodiversity and landscape; maintain, enhance and promote access to open space and recreation opportunities; and to take into account the implications of development for water, air and soil quality.

2.7.10 The new SPP states that the planning system should "*take every opportunity to create high quality places by taking a design-led approach*". The SPP aims to achieve this through the use of a "*holistic approach that responds to and enhances the existing place while balancing the costs and benefits of potential opportunities over the long term*". This holistic approach considers the relationships between the four outcomes of the new SPP:

- A successful, sustainable place;
- A natural, resilient place;
- A connected place; and
- A low carbon place.

2.7.11 Those subject policies that are relevant to this application are outlined below.

A Successful, Sustainable Place

2.7.12 The SPP recognises the importance of supporting sustainable economic growth and regeneration, setting out the role that the Scottish Government expects the planning system to play in the sustainable economic growth of Scotland.

[29] Scottish Planning Policy, available at: http://www.scotland.gov.uk/Publications/2014/06/5823 (accessed 01/12/2015)

[30] Land Use Strategy, available at: http://www.scotland.gov.uk/Topics/Environment/Countryside/Landusestrategy (accessed 01/12/2015).

Rural Development

2.7.13 The overall approach advocated in the new SPP is that of a proactive stance to development in rural areas. The Planning System should:

- *"In all rural and island areas promote a pattern of development that is appropriate to the character of the particular rural area and the challenges it faces"*; and
- *"Encourage rural development that supports prosperous and sustainable communities and businesses whilst protecting and enhancing environmental quality".*

2.7.14 These themes are also to be found in 'A Forward Strategy for Scottish Agriculture' published in 2001 and in the subsequently published *'Forward Strategy for Scottish Agriculture: Next Steps'* published in March 2006.

Valuing the Historic Environment

2.7.15 The SPP supports the recognition of the contribution made by cultural heritage to our economy, cultural identity and quality of life and describes the historic environment as a "*key cultural and economic asset and a source of inspiration that should be seen as integral to creating successful places*". As such the planning system should:

- Promote the care and protection of designated and non-designated historic environments and their contribution to sense of place, cultural identify, social well-being, economic growth, and education;
- Change should be sensitively managed to avoid or minimise adverse impacts on the fabric and setting of designated and non-designated historic environments and ensure their character is protected, conserved or enhanced; and
- Those non-designated historic assets and areas of historic interest (historic landscapes, other gardens and designated landscapes, woodlands, etc.) should also be protected and preserved as far as possible, in situ wherever feasible.

A Low Carbon Place

2.7.16 Scottish Renewable Energy Targets outline the national targets set for Scotland's electricity to be generated from renewable sources. It makes clear that Planning Authorities should support the development of renewable energy technologies, guide development to appropriate locations and provide clarity on the issues that will be taken into account when specific proposals are assessed. The targets require development plans to support all scales of energy development to ensure that an area's renewable energy potential is realised and to make clear factors that will be taken into account in decision making.

2.7.17 The energy and climate change policies referred to above are discussed within the SPP as part of the planning system. The SPP states that the planning system should:

"Support the transformational change to a low carbon economy, consistent with national objectives and targets" and

"Support the development of a diverse range of electricity generation from renewable energy technologies – including the expansion of renewable energy generation capacity"

2.7.18 Within A Low Carbon Place', a sub-section relating to onshore wind specifies that:

"Planning authorities should set out in the development plan a spatial framework identifying those areas that are likely to be most appropriate for onshore wind farms as a guide for developers and communities".

2.7.19 An approach to spatial framework is provided within the SPP which should be followed "*in order to deliver consistency nationally*". The SPP spatial framework is made up of three groups.

2.7.20 Group 1 are areas where wind farms will not be acceptable, these areas are made up of National Parks and National Scenic Areas.

2.7.21 Group 2 are areas of significant protection where wind farms may be appropriate in some circumstances. Consideration will be required where proposed developments are to be located within these areas to "*demonstrate that any significant effects on the qualities of these areas can be substantially overcome by siting, design or other mitigation*". Group 2 areas include National and International designations such as National Nature Reserves and Sites of Special Scientific Interest, Other nationally important mapped environment interest areas such as areas of wild land are included in this group and those areas not exceeding 2 km around cities, towns and villages identified on the local development plan with an identified settlement envelope or edge.

2.7.22 Group 3 are areas with potential for wind farm development which includes all areas beyond Groups 1 and 2. Within these areas "*wind farms are likely to be acceptable, subject to detailed consideration against identified policy criteria*". The proposed Development therefore lies within a Group 3 area.

2.7.23 The 2014 SPP differs in the weighting of landscape capacity studies as it was recognised in the draft SPP that planning authorities had prepared landscape assessments which also include local designations on top of the national designations and the relative weight being applied to the numerous landscape designations had become confused[31]. As such the 2014 SPP has included locally designated sites as potential areas for wind energy.

Circulars

2.7.24 Circulars contain guidance on policy implementation through legislative or procedural change which may be material considerations to be taken into account in development management decisions. Relevant Circulars which may be considered in regard to wind farm developments include:

- Circular 3/2013 – Development Management Procedures[32].
- Circular 3/2009 – Notification of Planning Applications[33].

Planning Advice Notes (PAN)

2.7.25 A number of Planning Advice Notes (PAN) have been considered during the evolution of the project.

2.7.26 Consideration of PAN 1/2013: Environmental Impact Assessment[34] which replaces PAN 58 has been made to ensure the ES produced for the proposed Development is proportionate and fit for purpose. It must be noted that this does not apply under the Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2000 and Amendment Regulations 2008.

2.7.27 Specific Advice Sheet: Onshore Wind Turbines[35] has replaced PAN 45 – Renewable Energy. It acts as a web-based, and regularly updated, source of specific advice for the development of onshore wind farms. It recognises substantial growth and increasing diversity in project scale. It also considers how wind farm development may have landscape impacts. This considers how a wind farm development may affect the landscape character. It pays particular attention to a landscape's ability to absorb development. It provides guidance for what to consider when proposing developments. The document recognises the potential impact wind farm development may pose to radar and civil and military aviation flight paths. It provides advice that consultation should be made, where constraints have been identified.

2.7.28 The Onshore Wind Turbines advice sheet discusses the potential noise issues deriving from wind turbine operation. The document refers to several guidance documents including ETSU-R-97. The specific advice sheet acknowledges the advancements in noise reduction related to wind turbine operation and refers to the criteria outlined in ETSU-R-97 as the means to assess proposals. Table 2.1 presents other relevant PANs.

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[31] Draft SPP, available at: http://www.scotland.gov.uk/Publications/2013/04/1027 (accessed 01/12/2015)

[32] Available at: http://www.scotland.gov.uk/Publications/2013/12/9882 (accessed 01/12/2015)

[33] Available at: http://www.gov.scot/Publications/2009/03/27112705/0 (accessed 06/08/2015)

[34] Available at: http://www.scotland.gov.uk/Publications/2013/08/6471/downloads#res432581 (accessed 01/12/2015)

[35] Onshore wind turbines, available at: http://www.scotland.gov.uk/Resource/0044/00440315.pdf (accessed 01/12/2015)

Table 2.1: Other Relevant PANs

Other Relevant PANs	Details
PAN 51 – Planning and Environmental Protection[36]	Published in October 2006 and supports existing policy on the role of the planning system in relation to the environmental protection regimes.
PAN 60 – Planning for Natural Heritage[37]	Provides advice on how development and the planning system can contribute to the conservation, enhancement, enjoyment and understanding of Scotland's natural environment and encourage developers and planning authorities to be positive and creative in addressing natural heritage issues.
PAN 68 – Design Statements[38]	Published in August 2003 and explains the design statement process.
PAN 73 – Rural Diversification[39]	Defines diversification as helping to broaden the economic activity of rural areas, providing opportunity and creating a more balanced and stable economy. It is suggested that one of the means by which planners can support rural diversification is by addressing issues of accessibility, infrastructure, scale and design.
PAN 75 – Planning for Transport[40]	Published in August 2005 and aims to provide guidance for improving transport integration with new developments.
PAN 3/2010 – Community Engagement[41]	Published in August 2010. It provides guidance for interacting with the public appropriately and early in the planning process.
PAN 1/2011 – Planning and Noise[42]	Published in March 2011. It includes information about noise from wind turbines and links to web based planning advice specifically for Onshore Wind Turbines. This document provides advice on *'The Assessment and Rating of Noise from Wind Farms'* (ETSU-R-97) published by the former Department of Trade and Industry and the findings of the Salford University report into Aerodynamic Modulation of Wind Turbine Noise.
PAN 2/2011 – Planning and Archaeology[43]	Replaces PAN 42 and sits alongside SPP, Scottish Historic Environment Policy (SHEP) and the Managing Change in the Historic Environment Guidance Notes. PAN 2/2011 includes advice on the handling of archaeological matters within the planning process. For monuments scheduled under the Ancient Monuments and Archaeological Areas Act 1979 there are specific controls for works set out by SHEP and managed by Historic Scotland.

[36] Available at: http://www.gov.scot/Publications/2006/10/20095106/0 (accessed 06/08/2015)

[37] Available at: http://www.gov.scot/Publications/2000/08/pan60-root/pan60 (accessed 06/08/2015)

[38] Available at: http://www.gov.scot/Publications/2003/08/18013/25389 (accessed 06/08/2015)

[39] Available at: http://www.gov.scot/Publications/2005/02/20638/51727 (accessed 06/08/2015)

[40] Available at: http://www.gov.scot/Publications/2005/08/16154453/44538 (accessed 06/08/2015)

[41] Available at: http://www.gov.scot/Publications/2010/08/30094454/0 (accessed 06/08/2015)

[42] Available at: http://www.gov.scot/Publications/2011/02/28153945/0 (accessed 06/08/2015)

[43] Available at: http://www.gov.scot/Resource/Doc/355385/0120020.pdf (accessed 06/08/2015)

2.8 DEVELOPMENT PLANS

2.8.1 The development plan for this area comprises:

- Dumfries and Galloway Local Development Plan (2014)[44] (replaces the 1999 Dumfries and Galloway Structure Plan, the 2006 Local Plans for the, Stewartry and Nithsdale areas).

2.8.2 As the statutory presumption in terms of the Development Plan under the Planning Acts does not apply either to the Section 36 determination nor the grant of any deemed planning permission, which differentiates the determination of an application under Section 36 from the determination of a planning application made under the Planning Acts, there is no requirement for the determination to be made in accordance with the Development Plan unless material considerations indicate otherwise. Notwithstanding, it is acknowledged that as the application seeks approval for a form of development, the relevant provisions of the Development Plan are relevant considerations in relation to the Section 36 determination process but it is for the decision maker to determine the weight to be attached to each of the relevant considerations, which would inevitably include the relevant provisions of the Development Plan.

2.8.3 The key policy requirements of the Dumfries and Galloway Local Development Plan (LDP) are discussed in the following paragraphs. Further consideration of the assessments contained in this report against this policy is set out in the Planning Statement which accompanies the application. Whilst the proposed Development is located entirely within Dumfries and Galloway, it sits immediately adjacent to the boundary of East Ayrshire. As such, while the Dumfries and Galloway LDP will be of primary relevance, the East Ayrshire existing development plan and emerging LDP will also be of some relevance to the assessment of the scheme's suitability and will also be discussed in the following paragraphs.

Dumfries and Galloway Local Development Plan (LDP)

2.8.4 The Dumfries and Galloway Local Development Plan was adopted on the 29th of September 2014 with the aim of guiding the future use and development of land in towns, villages and the rural area, as well as indicating where development should and where it should not happen.

2.8.5 The LDP provides a planning framework for the future use and development of land within Dumfries and Galloway, creating a backdrop to guide the location of development over the next 5 years alongside setting out development opportunities and ways to enhance the urban and rural environment. The LDP will be kept under review and will be replaced at least every five years. The overarching principle of the LDP is that:

"all development proposals should support sustainable development, including the reduction of carbon and other greenhouse gas emissions".

2.8.6 The LDP contains policies specific to renewable energy developments. There are two policies directly relevant to the proposed wind farm development.

2.8.7 **Policy IN1 – '*Renewable Energy*'** , the policy states:

""the Council will support development proposals for all renewable energy provided they do not individually or in combination have unacceptable significant adverse impact on:

- *Landscape;*
- *The cultural and natural heritage areas and routes important for tourism or recreational use in the countryside;*
- *Water and fishing interests;*
- *Air quality; and*

[44] Dumfries and Galloway Local Development Plan (2014), available at: http://www.dumgal.gov.uk/index.aspx?articleid=11907 (accessed 01/12/2015)

- *The amenity of the surrounding area"*

2.8.8 All proposals will be required to provide sufficient detail to aid this assessment, including:

- *"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 extent to which the proposal helps to meet the current government targets for energy generation and consumption".*

2.8.9 The acceptability of a development proposal 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".

2.8.10 **Policy IN2 – *Wind Energy***, the policy is split into two parts. Part 1 states that the acceptability of any proposed wind energy development will be assessed against the following considerations:

Landscape and Visual Impact

- *"The extent to which the proposal addresses the Dumfries and Galloway Windfarm Landscape Capacity Study.*
- *The extent to which the landscape is capable of accommodating the development without significant detrimental impact on landscape character or visual amenity.*
- *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 fully addresses the potential for mitigation."*

Cumulative Impact

"The extent of any detrimental landscape and visual impact from two or more energy developments and the potential for mitigation".

Impact on Local Communities

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

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

"The extent to which the proposal avoids or adequately resolves any other significant adverse impact including:- on the natural and historic environment, cultural heritage, biodiversity; forest and woodlands; and tourism and recreational interests.

The extent to which the proposal addresses any physical site constraints and appropriate provision for decommissioning and restoration."

2.8.11 The acceptability of a development proposal 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".

2.8.12 Part 2 of IN2 – Wind Energy highlights the Spatial Framework which is made up of four groups, these areas are shown within maps 9-10 of the LDP and include:

Table 2.2: Policy IN2 Spatial Framework

Areas	
Areas of Greatest Potential	Areas free from significant constraint where proposals for large and medium turbine typologies will be supported subject to detailed assessment
Areas of significant protection	Areas where a presumption against development applies due to significant constraints. These include: Sites designated for their national or international landscape or natural heritage value where Policies NE1, NE3, NE4 and NE5 (see Other Strategic Policies) also apply. Areas where the cumulative impact of existing and consented windfarms limit further development.
Cumulative Sensitivity Zones	Areas where cumulative impact is a potential constraint. In these areas proposals should: address potential future cumulative impact and avoid unacceptable coalescence between clusters of windfarms to retain an acceptable and coherent pattern of windfarm development.
All other areas	Areas where potential constraints apply but with potential for mitigation. Wind energy proposals will be assessed against all the considerations set out above in part 1. For Regional Scenic Areas the proposal should assess the potential impact on the objectives of the designation and demonstrate the extent to which these can be addressed.

2.8.13 It must however be noted that some refinement of the Spatial Framework and associated mapping is required to meet the new SPP Spatial Framework approach which is detailed above. The Spatial Framework is referred to as "Interim Spatial Framework Guidance" within the LDP and as such should not be given precedence over the new SPP Spatial Framework approach (please see paragraphs 2.9.6 – 2.9.17 below which discuss this further).

Other Strategic Policies

2.8.14 There are a number of other strategic policies relevant to the proposed Development:

- OP1 – Development Considerations
- OP2 – Design Quality of New Development
- OP3 – Developer Contributions
- ED10 – Tourism
- ED12 – Dark Sky Park
- ED16 – Protection and Restoration of Peat Deposits and Carbon Sinks
- HE4 – Archaeologically Sensitive Areas
- HE6 – Gardens and Designated Landscapes
- NE2 - Regional Scenic Areas
- NE6 - Forestry and Woodland
- NE7 – Trees and Development
- IN11 - Telecommunications
- T1 – Transport Infrastructure

East Ayrshire Local Plan 2010

2.8.15 The existing development plan for East Ayrshire comprises:

- The East Ayrshire Local Plan, 2010[45].

2.8.16 Work is being carried out on a new East Ayrshire Local Development Plan (EALDP), which will be detailed in Section 2.8.21 to 2.8.25 below.

2.8.17 The East Ayrshire Local Plan 2010 was adopted by the Council on 26 October 2010. The Plan provides a base for future development throughout East Ayrshire to the year 2017.

2.8.18 Paragraph 5.71 in Volume 1 of the East Ayrshire Local Plan states the council's support for the provisions of the Renewables Obligation (Scotland) in increasing the amount of energy produced from renewable sources. It also recognises that wind energy is the renewable energy type most relevant to East Ayrshire.

2.8.19 While the council offers support to renewable technologies as a means of reducing carbon emissions, they also consider it imperative that the more sensitive parts of the rural area in terms of landscape quality, nature conservation, and heritage interest are adequately protected.

2.8.20 In Volume 2 Policy CS12 declares the council's support for sympathetic renewable energy development including associated infrastructure, following demonstration that it causes no significant, unacceptable adverse effect upon:

- Any recognised statutory or non-statutory sites of nature conservation interest;
- The amenity of nearby communities or sensitive establishments, including individual or small groups of rural houses adversely affected by noise, visual dominance and other nuisance;
- Recognised built heritage resources, including Scheduled Ancient Monuments, Listed Buildings, Conservation Areas, Archaeological Sites and Landscapes, Historic Gardens, Designed Landscapes, and their individual settings;
- The visual amenity and natural landscape, particularly within Sensitive Landscape Character Areas identified on the Local Plan rural area map; and
- On existing infrastructure.

Proposed East Ayrshire Local Development Plan (EALDP)

2.8.21 The proposed East Ayrshire Local Development Plan (EALDP) sets out how East Ayrshire Council (EAC) wants to see East Ayrshire develop over the next 10 to 20 years. In addition, the proposed EALDP indicates where development should and should not occur.

Energy and Infrastructure

2.8.22 The proposed EALDP provides a:

"Spatial framework for wind energy developments of over 50 m to tip in height, identifying areas that are likely to be more appropriate for onshore wind development in order to provide guidance to developers and communities. The LDP does not use the term wind farm. Instead, the spatial strategy applies to all proposals for wind energy development which include turbines of 50 m and above, irrespective of the number of turbines".

2.8.23 The spatial framework is made up of three groups based on SPP methodology and is shown within Map 12 of the proposed plan. The spatial framework includes:

[45] East Ayrshire Local Plan 2010, available at: https://www.east-ayrshire.gov.uk/PlanningAndTheEnvironment/Development-plans/LocalAndStatutoryDevelopmentPlans/LocalPlan2010.aspx (accessed 20/01/2016)

Table 2.3: Spatial Framework for Wind Energy Development over 50 m in height

Grouping	Description	Constraints to be considered
Group 1	Areas where wind energy (over 50 m) will not be acceptable	National Parks National Scenic Areas
Group 2	Areas of significant protection Wind energy developments (over 50 m) will only be appropriate where it can be demonstrated that any significant effects on the qualities for which the area is identified can be substantially overcome by siting, design or mitigation	World Heritage sites Natural 2000 and Ramsar sites Sites of Special Scientific Interest National Nature Reserves Sites identified in the Inventory of Gardens and Designated Landscapes Sites identified in the Inventory of Historic Battlefields Areas of wild land Carbon rich soils, deep peat and priority peatland habitat An area not exceeding 2 km around cities, towns and villages
Group 3	Areas with potential for wind energy development (over 50 m)	No recognised constraints. Applications will however be assessed against identified policy criteria which are set out in the LDP and discussed below.

2.8.24 The proposed EALDP states that *"According to SPP, land falling within group 3 should be defined as areas of Strategic Capacity for wind energy. However, on reviewing the group 3 areas, the Council is of the view that none of these areas have adequate capacity on a strategic level to be defined as strategic capacity areas. The group 3 areas largely comprise of land forms and land uses, parts of which are clearly unsuitable for wind energy development".*

2.8.25 The EAC website reports that adoption of the EALDP is anticipated in August 2016.

2.9 OTHER MATERIAL CONSIDERATIONS

2.9.1 In addition to all of the relevant national plans and policies as outlined in Sections 2.2 to 2.8 above, this section presents the existing and emerging guidance which are also material considerations.

Existing Guidance

Dumfries & Galloway Regional Economic Strategy 2014-2020[46]

2.9.2 This strategy was introduced to devise solutions to the increasing prosperity gap existing between Dumfries & Galloway and the rest of Scotland and the UK. This has been mainly due to the lack of employment in many areas of Dumfries & Galloway.

[46] Dumfries and Galloway Regional Economic Strategy 2014-2020, available at: http://www.crichtoninstitute.co.uk/index.php/publications (accessed 01/12/2015)

2.9.3 This strategy particularly supports equity by emphasising sustainable communities and maintaining and improving the quality of life. It also emphasises the importance of opportunities for economic improvement arising from the environment.

Technical Paper: Regional Scenic Areas (2013)

2.9.4 *Technical Paper: Regional Scenic Areas,* provides background advice on how the Regional Scenic Areas (RSA) were identified and provides guidance on how to interpret whether proposals being considered under Policy NE2 may or may not affect the underlying basis of these locally designated areas. Technical Paper: Regional Scenic Areas identifies the area in which the proposed Development is located within landscape character type 19: Southern Uplands and landscape character type 19a: Southern Uplands with Forest.

Land Use Consultants 1998, Dumfries and Galloway Landscape Assessment, Scottish Natural Heritage Review No. 94

2.9.5 The *Dumfries and Galloway Landscape Assessment* outlines the landscape types across Dumfries and Galloway. The document identifies the proposed Development as within the Southern Uplands and Southern Uplands with Forest landscape character type. The assessment has subsequently been used to inform the above mentioned *Technical Paper: Regional Scenic Area.*

Emerging Guidance

DGC LDP Supplementary Guidance (SG): Wind Energy Development

2.9.6 Dumfries & Galloway Council (DGC) published its draft SG: Wind Energy Development alongside the LDP in 2013. The SG was approved in September 2014 at the Economic, Environment and Infrastructure Committee. The aforementioned guidance intends to formally replace the Wind Energy Diagram and Technical Paper Number 5: Preparation of Wind Energy Diagram (which were part of the previous Structure Plan) as well as the relevant parts of the Interim Planning Policy (IPP) (which was produced as interim guidance pending the adoption of the LDP). The SG to the Dumfries and Galloway LDP provides additional information on the issues that will be considered when specific proposals are assessed. In addition, the SG identifies areas where there is a spatial framework available for the classified turbine typologies within the guidance, based only on 'Areas of Greatest Potential' and 'Areas Requiring Significant Protection'.

2.9.7 The draft SG identified the Meaul Hill Cluster of the proposed Development as within an *"Area of Greatest Potential for large typologies (over 80m to blade tip)" and the Waterhead Hill Cluster as within an "Area Requiring Significant Protection for Large Typologies (over 80m to blade tip)"* However, the Spatial Framework was not based on the 2014 SPP approach and has instead gone further than national advice by conferring additional weight upon the consideration of locally designated areas in wind energy development proposals. Following the guidance on Spatial Frameworks in the SPP, the entire proposed Development Area would lie within an Area of Greatest Potential.

2.9.8 A letter from the Scottish Government Chief Planner dated the 15th January 2015 to All Heads of Planning[47] states that: *"it has become increasingly apparent that planning authorities are taking different approaches to the use of supplementary guidance and their consideration of the legislative context"*. This approach can result in:

- An insufficient express statement regarding the guidance within the plan itself;
- Lack of compliance with national policy; and
- Inappropriate subject matter being covered by the guidance.

2.9.9 As a result, the Scottish Government have stated that:

2.9.10 *"If guidance is submitted which requires major modifications (involving more substantive changes that would trigger additional consultation or environmental assessment), Ministers will direct that it cannot be adopted without significant change".*

2.9.11 *"If there is no, or an insufficient, express statement regarding the supplementary guidance within the plan, it cannot be adopted as statutory supplementary guidance".*

2.9.12 On the 24th of February 2015, the Scottish Government gave notice to the Dumfries and Galloway Council stating that SG, Part 1 Wind Energy Development: Development Management Considerations may not be adopted until modifications have been made. The Scottish Government state that:

2.9.13 "*these modifications are required to improve alignment with Scottish Planning Policy (SPP) June 2014, subject to the policy adopted in the Dumfries and Galloway Council Local Development Plan, adopted 29 September 2014*".

2.9.14 On the 6th March 2015 SG Part 1: Wind Energy Development: Development Management Considerations[48] was adopted by DGC as statutory supplementary guidance to the LDP. Part 1 of the SG provides additional guidance to Part 1 of policy IN2 of the LDP and applies to development management considerations. Part 1 of the SG provides all interested parties with a statement of the main factors that will be taken into account in reaching planning decisions.

2.9.15 Part 2 of the SG provides additional guidance to Part 2 of policy IN2 of the LDP and applies to the Spatial Framework. The elements included within the review of the Spatial Framework included in Part 2 of policy IN2 of the LDP and Part 2 of the SG however do not meet the requirements of the content of Spatial Frameworks that are outlined in the current SPP and as such DGC are unable to produce SG for Part 2 of policy IN2 that would be compliant with the current SPP. DGC will review the Spatial Framework as part of the Main Issues Report of the next LDP.

2.9.16 Part 2 of the SPG was not adopted but has now been published as a technical paper on the DGC website. Given the history of this document its status is not clear. In addition, the limited weight of the Interim Spatial Framework Guidance has recently been acknowledged by DGC in the Shennanton Wind Farm Planning Applications Committee Report[49]. Paragraphs 4.9 to 4.10 of that report state that:

"Part 2 of the Dumfries & Galloway LDP Policy IN2 contains an Interim Spatial Framework for both Large (over 80m) and Medium (50-80m) typologies of turbine. The 'interim' status of this spatial framework is explained within paragraphs 4.94 and 4.95 of the LDP. This is as a result of the LDP examination which has meant a requirement to refine the framework to address compliance with SPP in relation to Areas of Greatest Potential, Areas of Significant Protection and Cumulative Sensitivity Zones (in order to meet the SPP requirements).

Further mapping to address the non-compliance with the SPP requirements will be carried out as part of the LDP2 process. In the meantime, weight given to the current spatial strategy mapping ***should reflect its interim status****."*

As such, it has been deemed to have little weight in the assessment of this application.

2.9.17 Until such time as this policy gap has been addressed, the SG generally and the Spatial Framework mapping in particular should be given limited weight in the determination of this application. In the meantime reference must be given to more up to date National Policy as a material consideration when seeking to interpret LDP policies.

[48] Supplementary Guidance, Part 1 Wind Energy Development: Development Management Considerations, available at http://www.dumgal.gov.uk/CHttpHandler.ashx?id=11890&p=0 (accessed 06/08/2015)

[49] Planning Applications Committee Report: Shennanton Wind Farm. Available online from: http://egenda.dumgal.gov.uk/aksdumgal/images/att39859.pdf (last accessed 01/03/2016).

Dumfries and Galloway Wind Farm Landscape Capacity Study (DGWLCS)

2.9.18 This is a background document which seeks to further inform the characteristics and sensitivities of Dumfries & Galloway landscape. This document was used to inform the previous IPP and is referred to in the LDP as an appendix to the SPG. The DGWLCS was adopted by DGC as an appendix to SG Part 1 Wind Energy Development: Development Management Considerations; however there are concerns over the compliance of DGWLCS with the 2014 SPP and as such should be interpreted alongside the 2014 SPP. The DGWLCS assesses the:

2.9.19 *"Landscape sensitivity, the capacity of individual landscape units to accommodate change and provides advice on how the scale, siting and design of development should be informed by local landscape character".*

2.9.20 The DGWLCS identifies the Waterhead Hill Cluster of the proposed Development as being within landscape character type 19: Southern Uplands (Tarras, North/East Moffat, North/West Langholm, Lowther and Carsphairn and Beneraird Units) and the Meaul Hill Cluster as being within landscape character type 19a: Southern Uplands and Forest (Eskdalemuir, Carsphairn and West Langholm Units).

2.9.21 Landscape character type 19: Southern Uplands *"could relate to larger typologies, the distinctive landform of these uplands, where hills are pronounced and often form steep, rugged edges to adjacent dales and upland glens, is a key constraint to development. The sparsely settled nature and simple land cover pattern reduces sensitivity although, conversely, these uplands are particularly valuable because of their openness and absence of built development and large-scale forestry. These units of the Southern Uplands Type have an overall High sensitivity to the large and medium typologies of wind farm development".* It is noted that the there is significant large scale commercial forestry within the proposed Development Area.

2.9.22 High sensitivity is defined within this guidance as *"the majority or all of the key landscape characteristics are vulnerable to change. Development would conflict with key aspects of landscape character with widespread and significant adverse impacts likely arise".*

2.9.23 Landscape character type 19a: Southern Uplands and Forests are *"of a predominantly expansive, gently undulating landform and simple extensive commercially managed forest cover reduces sensitivity wind farm development. Landscape sensitivity would be low for both the large and medium typologies".*

2.9.24 In addition the DGWLCS states that *"this landscape is very sparsely populated and not readily visible from the wider landscape being sited away from settled areas and public roads. Visual sensitivity would be Medium in relation to the large typology and Medium-low in relation to the medium typology".*

2.9.25 Overall the sensitivity in respect of landscape values is regarded as Low. Low sensitivity is defined within the guidance as *"the development typology relates well to key landscape characteristics and change is able to be accommodated without significant adverse impact".*

2.9.26 The document also states in relation to cumulative effects that within Landscape Character Type 19a :

2.9.27 *"Cumulative effects would be more likely to arise within the 'Ken' and 'Carsphairn' units and associated with the existing wind farms of Wether Hill, Windy Standard and Hare Hill and the consented wind farm of Whiteside. A number of wind farms are also proposed in the adjacent 'Stroan' unit of the Foothills with Forest character type (18a) and cumulatively, development in the 'Ken' unit of the Southern Uplands Type with Forest could 'bridge the gap' between developments in the Foothills and Southern Uplands, potentially forming a concentrated band of wind farm development. The sparsely populated nature of the Southern Uplands, Southern Uplands with Forest and Foothills with Forest (18a) in a broad area between Upper Nithsdale and Stroan Hill would result in cumulative visual impacts being primarily experienced by walkers accessing hills such as Cairnsmore of Carsphairn. There would be likely to be more distant views from elevated parts of the Glenkens and Rhinns of Kells.".*

2.9.28 As with the SG mentioned previously there are concerns over the DGWLCS compliance with the 2014 SPP and there is some uncertainty over the status of this study since only Part 1 of the SG has been adopted and the DGWLCS document itself has not been subject to public consultation. As such, until the policy gap detailed above is addressed, the DGWLCS generally as an appendix to the SG, Part 1 Wind Energy Development: Development Management Considerations should be given limited weight in the determination of this application.

Other Supplementary Guidance adopted as part of the DGC LDP

2.9.29 Dumfries and Galloway Forestry and Woodland Strategy (2014) (DGFWS) – This strategy provides a framework for guiding forestry and woodland practice within Dumfries and Galloway over the next ten years. It will guide both woodland creation and the restructuring and management of existing forests and woodlands, to maximise the benefits for the local economy, communities and environment. The strategy will also inform the development of associated processing and infrastructure and the best use of all products from forests and woods (please refer to Chapter 12: Forestry, of the ES).

Draft Supplementary Guidance proposed as part of the DGC LDP

2.9.30 DGC LDP Consultation Draft Supplementary Guidance: Trees and Development (2015) - This Supplementary Guidance applies to all forms and scales of development which may affect areas of forestry and woodland cover.

EALDP Draft Supplementary Guidance – Planning for Wind Energy

2.9.31 The East Ayrshire Draft Supplementary Guidance – Planning for Wind Energy states that *"decisions on wind energy proposals should take account of the spatial framework, but should also be assessed against identified policy criteria".* The policy criteria identified in the draft supplementary guidance which are to be considered in the determination of planning applications are grouped under the headings: Environment; Local Economy and Communities; and Infrastructure and are made up of the following criteria to be used to assess proposed developments in spatial strategy Group 3:

Table 2.4: Planning Application Assessment Criteria

Environmental	Local Economy and Communities	Infrastructure
• Landscape and visual amenity; • Cumulative impact; • Carbon rich soils; • Natural heritage, biodiversity and wild land; • Historic environment; • Effects on hydrology, the water environment and flood risk; • Forestry and Woodlands; and • Effect on greenhouse gas emissions.	• Residential Amenity; • Tourism and recreation, including public access; and • Economic impact of proposal.	• Aviation and Defence; • Road and traffic implications • Broadcasting installations; • Efficient operation of technology • Siting and design of turbines and ancillary works • Decommissioning, restoration and aftercare • Contribution to renewable energy generation targets

Other Strategic Policies within the proposed EALDP

- Policy Tour 1: Tourism Development;
- Policy Tour 4: The Dark Sky Park;
- Policy RE1: Renewable Energy Developments;
- Policy RE3: Wind Energy Proposals over 50 m in Height;
- Policy RE4: The Cumulative Impact of Wind Energy Proposals;
- Policy RE5: Wind Energy and the Landscape;

- Policy RE7: Removal of Wind Turbines;
- Policy RE8: Community Benefits;
- Policy RE9: Financial Guarantees;
- Policy T4: Development and Protection of Core Paths and Natural Routes;
- Policy ENV2: Scheduled Monuments and Archaeological Resources;
- Policy ENV3: Conservation Areas;
- Policy ENV4: Gardens and Designated Landscapes;
- Policy ENV6: Nature Conservation;
- Policy ENV7: Wild Land and Sensitive Landscape Areas;
- Policy ENV9: Trees, Woodland and Forestry; and
- Policy ENV10: Carbon Rich Soils.

2.10 SUMMARY

2.10.1 This Chapter highlights the key policies at international, national and local level, encouraging renewable energy and development of sustainable communities in the area.

2.10.2 In designing the proposed Development, these policies have been considered in so far as it has been possible and relevant to do so. This recognises that some local planning policies are currently in a transitional stage and may be subject to further change before the application for the proposed Development is determined. In this uncertain situation, weight must instead be given to the 2014 Scottish Planning Policy as a relevant material consideration.

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Author	Marie Scaife	10/01/2015
Checked	Emily Peaston	26/02/2015
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Client Details	
Contact	Gareth Swales
Client Name	Brockloch Rig III Ltd
Address	c/o Fred. Olsen Renewables Ltd

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Chapter 3

Design Evolution and Alternatives

Contents

Glossary

Term	Definition
Above Ordnance Datum	Height relative to the average sea level at Newlyn, Cornwall UK
Environmental Impact Assessment	Environmental Impact Assessment (EIA) is a means of drawing together, in a systematic way, an assessment of the likely significant environmental effects arising from a proposed development.
Environmental Statement	A document reporting the findings of the EIA and produced in accordance with the EIA Regulations.
Landscape and Visual Impact Assessment	A separate but closely linked process that operates within the overall framework of the EIA. It specifically aims to ensure that all possible effects of change and development both on the landscape itself and on views and visual amenity are taken into account in decision-making.
Present Windy Standard Developments	The 'present Windy Standard Developments' refers collectively to the existing Windy Standard and the under construction Windy Standard II Wind Farms
Scheduled Ancient Monument	A scheduled monument is a monument of national importance given legal protection under the Ancient Monuments and Archaeological Areas Act 1979.
The proposed Development	The proposed Windy Standard III Wind Farm.
The proposed Development Area	The project development area within the site boundary which is subdivided into the Meaul Hill Cluster and Waterhead Hill Cluster.
Zone of Theoretical Visibility	The area predicted to have views of a proposed development on the basis of a digital terrain model or digital surface model, which may/may not take account of landcover features.

List of Abbreviations

Abbreviation	Description
AOD	Above Ordnance Datum
ANO	Air Navigation Order
ASAs	Archaeologically Sensitive Areas
BAA	British Airports Authority
BR3	Brockloch Rig III Ltd
BT	British Telecom
CAA	Civil Aviation Authority
CFD	Computational Fluid Dynamics
CMS	Construction Management Statement
DGC	Dumfries and Galloway Council
DGWLCS	Dumfries and Galloway Wind Farm Landscape Capacity Study
DSP	Dark Sky Park
EAC	East Ayrshire Council
EIA	Environmental Impact Assessment
ES	Environmental Statement
GIS	Geographic Information System
GPA	Glasgow Prestwick Airport
IEA	Institute of Environmental Assessment
IPP	Interim Planning Policy
JRC	Joint Radio Company
LCoE	Levelised Cost of Electricity
LVIA	Landscape and Visual Impact Assessment
LDP	Local Development Plan
MCoS	Mountaineering Council of Scotland
MoD	Ministry of Defence
MW	Mega Watt
NATS	National Air Traffic Services
NERL	Nats En Route
NOABL	Numerical Objective Analysis Boundary Layer
Ofcom	Office of Communications
PAC	Pre-Application Consultation
PAN	Planning Advice Note
PSR	Primary Surveillance Radar
RSPB	Royal Society for the Protection of Birds
SAMs	Scheduled Ancient Monuments
SEPA	Scottish Environment Protection Agency
SDSO	Dark Sky Park the observatory
SG	Supplementary Guidance
SLA	Sensitive Landscape Areas
SNH	Scottish Natural Heritage
SPA	Special Protection Area
SPP	Scottish Planning Policy
SSSI	Special Scientific Interest
UKFS	The UK Forestry Standard
WAsP	Wind Atlas Analysis and Application Program
ZTV	Zone of Theoretical Visibility

3.1 INTRODUCTION

3.1.1 The purpose of this Chapter is to identify the steps that have been considered in the design evolution of the proposed Windy Standard III Wind Farm (the proposed Development). This Chapter demonstrates how the site design and the layout of the turbines evolved through the initial site selection process, identification of various constraints and site specific factors, and highlights the key design criteria applied.

3.1.2 Planning Advice Note (PAN) 68: Design Statements explains the design statement process. Design and Access Statements are a statutory requirement for all Major Developments under the terms of the Planning etc. (Scotland) Act 2006. Although not a statutory requirement for a Section 36 application, this Chapter nevertheless explains the design process which has been gone through in arriving at the final layout.

3.2 THE SITE SELECTION PROCESS

3.2.1 Natural Power were approached by the Applicant, Brockloch Rig III Ltd (BR3), with a proposal for an extension to the existing Windy Standard Wind Farm and the under construction Windy Standard II (the present Windy Standard Developments). The Applicant's connections with this site over 20 years and knowledge gained during this period of the sites social, environmental and commercial suitability all pointed towards this being a viable place to develop further.

3.2.2 Initial layouts for Windy Standard III were informed by the studies for the under construction Windy Standard II. The proposed Development Area was identified as a potentially developable and consentable site that met a number of key criteria including:

- Good estimated wind speeds;
- Good separation distance from dwellings;
- Close proximity to viable grid connection;
- Willing landowner;
- Suitable land area to accommodate generating capacity; and
- No national designations.

3.2.3 Initial feasibility assessments indicated that there was opportunity for further wind energy development in Carsphairn Forest. Within the land under the Applicants control at Windy Standard III, three development areas (Waterhead Hill, Meaul Hill and Dodd Hill) were initially identified by Natural Power as having potential for wind farm development. ES Figure 1.1 in Volume 3 of the ES highlights strategic level constraints.

3.3 INITIAL SITE FEASIBILITY ASSESSMENT

3.3.1 Following site selection, a feasibility assessment was carried out against the potential constraints detailed below. The initial site feasibility assessment demonstrated the suitability of the site for wind farm development. Following the results of the initial feasibility assessments, the proposed Development was scoped and then a full Environmental Impact Assessment (EIA) undertaken, with the results presented in the relevant chapters of this Environmental Statement (ES).

Wind Resource

3.3.2 Initial long term wind speed estimates were derived from multiple sources, including site measurements collected on the existing Windy Standard Wind Farm at Brockloch Rig. Early estimates used within an initial site feasibility assessment of the long term winds speed across the proposed Development Area are as follows:

- 7.2 m/s to 9.8 m/s at 70 m above ground level (WAsP flow model); and
- 7 m/s to 9 m/s at 45 m above ground level (NOABL).

3.3.3 Although these values should be taken as indicative, they imply that the wind speed at the proposed Development has the potential to deliver an economically viable wind energy development.

3.3.4 Detailed assessments have been undertaken using state of the art VENTOS Computational Fluid Dynamics (CFD) modelling in order to better understand the local wind regime. This has led to an improved understanding of the specific complex flow regime that results from the terrain and forestry surrounding the proposed Development. The turbulence intensity, wind shear, inflow angle and veer across the site were assessed in order to inform the design process (along with all relevant physical, environmental and technical constraints). The process was undertaken iteratively in order to arrive at the appropriate number, size and location of turbines for the proposed Development to minimise project risks (turbine performance / operational issues) and maximise project efficiency and energy yield output. A full meteorological monitoring campaign has been commenced, using industry best practice monitoring techniques (combination of anemometer mast and LiDAR remote sensing), in order to capture detailed wind profiles and further refine the wind resource on site.

Proximity to Dwellings

3.3.5 During feasibility and throughout a buffer of 1 km was given to residential dwellings near the proposed Development Area. Potential noise, shadow flicker and visual amenity impacts were given consideration during the site design iterations to ensure minimum effects on nearby residents. The Pre-Feasibility 31 Turbine Layout (ES Figure 3.2 in Volume 3 of the ES) and the Initial Feasibility 23 Turbine Layout (ES Figure 3.3 in Volume 3 of the ES) show that turbines were located more than 1 km away from surrounding residential dwellings, this remains true for the final layout (please refer to ES Figure 3.1: Constraints to Site Design and ES Figure 3.6: Final Layout (20 Turbines) in Volume 3 of the ES). Noise and shadow flicker impacts were later fully assessed in the EIA and the results are presented in Chapter 11: Noise and Chapter 13: Aviation, EMI, Existing Infrastructure and Shadow Flicker, of the ES. The residential visual amenity is considered fully in Chapter 6: Landscape and Visual Assessment, of the ES.

Ecology and Ornithology

3.3.6 Pre-planning ecology assessments were conducted to assess the site connectivity with local statutory designated sites and to uncover existing records of raptor activity around the proposed Development. A desk study of the proposed Development was conducted the results of which state that there are no designated ecological or ornithological constraints, such as Sites of Special Scientific Interest (SSSI), Special Protection Area's (SPA) or RAMSAR, within the site boundary, or in the immediate vicinity. As a result of the pre-planning ecology assessments the proposed Development was considered as unlikely to impact on designations and target species and as such was considered suitable for a wind energy development subject to further assessment. Potential effects upon ecology and ornithology were fully assessed in the EIA and the findings presented in Chapter 7: Ecology and Chapter 8: Ornithology, of the ES.

Hydrology, Geology & Hydrogeology and Peat

3.3.7 A desk study of the proposed Development Area was conducted within the feasibility assessment. A number of watercourses were identified within the proposed Development Area from the 1:10,000 Ordnance Survey maps; a 50 m buffer from these watercourses was applied which excludes development within these areas.

3.3.8 A desk study and site reconnaissance survey identified potential geological and environmental conditions that may involve long-term or short-term geological processes. Potential effects upon Hydrology, Geology and Hydrogeology including private water supplies and on peat were fully assessed in the EIA and the results presented in Chapter 10: Hydrology, Geology and Hydrogeology, of the ES and the accompanying Peat Stability Assessment.

Grid Connection

3.3.9 It was proposed during the initial site feasibility that Windy Standard III would utilise the same grid connection as Windy Standard II, connecting into the electricity grid at the new Dun Hill Substation. The initial feasibility assessment indicated that there was sufficient capacity on the grid for the proposed Development's connection

subject to further assessment. Given that the proposed Development is using the Windy Standard II grid connection route, no effects above and beyond that are expected.

Access

3.3.10 An access study was carried out in February 2009 to determine the feasibility of the proposed public access route from Ayr to the entrance of Windy Standard II based on a Siemens 2.3 MW wind turbine. The study assessed the delivery of wind turbine components and general construction traffic and consisted of a site visit by an experienced Natural Power Engineer and a 'trial run' by a wind turbine haulage contractor. This access study was used within the initial feasibility study of the proposed Development and as a result deemed that the site had good access given the proximity to the A713, which allows connection to Ayr, ports along the west coast and the M77. The potential effects on transport and access were fully assessed in the EIA and the results are presented in Chapter 14: Traffic and Transport, of the ES.

Military and Civil Aviation

3.3.11 The potential for the proposed Development to interfere with Military and Civil Aviation assets was considered during the feasibility phase. An assessment of Dumfries and Galloway Council (DGC) Interim Planning Policy (IPP) maps indicated that the proposed Development is located near to potential areas of aviation constraint. Further assessment found that an Ministry of Defence (MoD) Tactical Training Area is located near to the proposed Development and that there was the potential for conflict with the Glasgow Prestwick Airport (GPA) radar. This was considered during the feasibility stage of the proposed Development and it was considered that such aviation constraints may impact on the proposed Development subject to further assessment. As such, MoD, National Air Traffic Services (NATS), British Airports Authority (BAA), Civil Aviation Authority (CAA) and Glasgow Prestwick Airport (GPA) were consulted and assessments were undertaken to confirm any risk of interference. The potential effects on Military and Civil Aviation are presented in Chapter 13: Aviation, EMI, Existing Infrastructure and Shadow Flicker, of the ES.

Landscape and Visual

3.3.12 Landscape and visual issues were considered in detail at an early stage of the project. A number of sources of information were used, at the time to inform the design albeit noting that some of these have been replaced in the meantime. These include:

- Dumfries and Galloway Structure Plan which contained policies specific to renewable energy developments (now replaced by the Dumfries and Galloway Local Development Plan (LDP)[1]);
- Technical Paper No 5: Preparation of a Wind Energy Diagram which provided guidance that was used to compile the Dumfries and Galloway Structure plan (now intended to be formally replaced by the Dumfries and Galloway Supplementary Guidance (SG)[2]);
- Dumfries and Galloway Interim Planning Policy (IPP): Wind Energy Development (relevant parts of which are intended to be replaced by the SG); and
- Dumfries and Galloway Wind Farm Landscape Capacity Study (DGWLCS) which was used to inform the previous IPP and was adopted by DGC as statutory Supplementary Guidance alongside Supplementary Guidance, Part 1 Wind Energy Development: Development Management Considerations; however there are concerns over the compliance of DGWLCS with the 2014 SPP and as such should be interpreted alongside the 2014 SPP.

3.3.13 The initial feasibility assessment of landscape and visual impacts concluded that the proposed Development would meet policies set out within the Dumfries and Galloway Structure Plan by fully assessing the landscape and visual impact of the proposed Development within the ES, in addition the majority of the proposed Development is not subject to any constraining statutory designations; however the proposed Development is located approximately 2 km at the nearest from a Regional Scenic Area and further assessments would be required to assess the impact on this area.

3.3.14 An initial desktop assessment of the visual influence of the proposal was undertaken which consisted of the production of a Zone of Theoretical Visibility (ZTV) map to a radius of 35 km from the Initial Feasibility 23 Turbine Layout (ES Figure 3.3 in Volume 3 of the ES). The ZTV indicated that there was potential for visibility to the west of the proposed Development; however only a limited number of turbines would be visible and visibility beyond 10 km would be small. It was concluded that whilst further assessment would be required, it would be possible with careful site design to minimise any additional landscape and visual impacts to the present Windy Standard Developments. A professional Landscape Architect worked closely with the project team from the outset, reviewing the siting and design of the wind farm in order to minimise the potential landscape and visual and the cumulative effects of the proposed Development. The findings of the landscape and visual impact assessment are set out in Chapter 6: Landscape and Visual Assessment, of this ES.

Archaeology and Cultural Heritage

3.3.15 During the initial feasibility study the presence of Scheduled Ancient Monuments (SAM) and Listed Buildings was investigated inside and out with the site boundary. There are no Scheduled Ancient Monuments or listed buildings recorded within the proposed Development Area. Four SAM's were found within 5 km of the proposed Development and the nearest listed buildings were located in Carsphairn village, which lies approximately 6.5 km South of the proposed Development. The initial feasibility assessment indicated that there should be no direct impacts on archaeological and cultural heritage features from the proposed Development subject to further assessment. The potential impacts upon archaeology and cultural heritage were fully assessed in the EIA and the results are provided in Chapter 9: Cultural Heritage and Archaeology, of the ES.

Land Use

3.3.16 The proposed Development is located in an area of commercial forestry which is owned by a single landowner, the commercial forestry is located within Carsphairn Forest. There are currently forestry operations ongoing within the forestry as well as deer management activities and deer stalking.

3.3.17 The proposed Development is located to the west and south of the present Windy Standard Developments. The existing Windy Standard Wind Farm commenced operation in November 1996 and consists of 36 turbines with a maximum ground to blade tip height of 53.5 m and a total installed capacity of 21.6 MW. Windy Standard II is currently in the construction phase and will consist of up to 30 turbines, 18 of the turbines with a maximum ground to blade tip height of 120 m and 12 at 100 m and a total installed capacity of up to 75 MW. In addition, there are two core paths within the adjacent area to the proposed Development, one is out with the Planning Application Boundary and the other crosses the Planning Application Boundary where it is crossed as a result of the existing Windy Standard Wind Farm, Windy Standard II and ongoing forestry operations.

Existing Infrastructure

3.3.18 The presence of existing infrastructure such as service pipelines including the Scottish Water mains water supply pipe and cables, television transmission, mobile telephone networks and electromagnetic paths were considered in the initial feasibility study. Geographic Information System (GIS) data used within the initial feasibility study indicated that there were no existing infrastructure within the proposed Development Area that would be impacted by the proposed Development subject to further assessment. In order to confirm this it was recommended during the initial feasibility assessment that consultation with Scottish Water, Office of Communications (Ofcom), British Telecom (BT), and Joint Radio Company (JRC) be conducted to confirm that the proposed Development would not interfere with any known existing infrastructure or microwave links. The potential impacts upon existing infrastructure were fully assessed in the EIA and the results are provided in Chapter 13: Aviation, EMI, Existing Infrastructure and Shadow Flicker, of the ES.

[1] Available online from: http://www.dumgal.gov.uk/CHttpHandler.ashx?id=11287&p=0 (Last accessed 01/12/2015)

[2] Available online from: http://www.dumgal.gov.uk/index.aspx?articleid=11943 (Last accessed 01/12/2015)

Initial Site Feasibility Assessment Conclusion

3.3.19 The initial site feasibility assessment concluded that the site offers a maximum potential for a 23 turbine development. The initial feasibility assessment indicated that the site had:

- A good wind resource across the site;
- The proposed Development was unlikely to impact on any ecological designations and target species;
- Sufficient grid capacity;
- Visibility beyond 10 km would be limited;
- No direct and limited indirect impacts on archaeological and cultural heritage features; and
- The proposed Development would not be expected to interfere with any known existing infrastructure.

3.3.20 However, further assessments would be required to optimise the design and layout of the proposed Development, these included:

- In-depth assessment of the wind regime;
- Detail ground investigation surveys;
- Onsite background noise monitoring campaign;
- Full Landscape and Visual Impact Assessment and Cumulative assessment;
- Review and confirmation of existing public access and a thorough construction infrastructure study and site investigation to establish the presence and extent of anticipated constraints to construction site access and gain better understanding of the ground conditions;
- Consultation with GPA and MoD regarding potential aviation constraints; and
- Further archaeological studies.

3.4 THE CONSULTATION PROCESS

3.4.1 The consultation process was carried out to:

- Identify any further key considerations;
- Clarify the key points raised during the initial feasibility assessment;
- Promote dialogue with both statutory and non-statutory consultees and other stakeholders concerning key issues; and
- To confirm and agree the proposed methods for survey, evaluation and assessment.

3.4.2 A summary of the consultation responses is set out in Table 3.1 below. The full Scoping Opinion Request submitted to and Final Scoping Opinion Response received back from the Scottish Government is presented within Technical Appendix 3.1 and 3.2 in Volume 4 of the ES.

Table 3.1: Summary of responses from scoping consultations

CONSULTEE	SCOPING RESPONSE	ADDRESSED IN
Dumfries and Galloway Council	<u>Archaeology and Cultural Heritage</u> Survey and assessment work should follow relevant institute for Archaeology standards and practice Direct and indirect effects should be assessed in the EIA Dumfries and Galloway Wind Farm Landscape Capacity Study (DGWLCS) must be considered in the ES Advised that the Council Historic Environment does not record any features in the vicinity of the turbines on the highest ground where the turbines are located, but the Ordinance Survey identifies a modern cairn on Waterhead Hill Due to the high level of afforestation on the proposal site and the elevation, the archaeological potential is assessed as low Agree that the EIA should focus on assessing features already recorded within the site boundary Cumulative effects will need to be fully assessed Indirect effects on significant sites, and the Archaeologically Sensitive Areas (ASAs) within D&G should be assessed and illustrated appropriately with wirelines/photomontages, these should include the King's Cairn and Lamford Burn Cairn, Holm of Daltallochan stone circle, standing stone and cross slabs designated as scheduled monuments, selection of sites featuring in the Heritage Trails if there is inter visibility with the proposal and key listed buildings falling within the ZTV Key Gardens and designated landscapes falling within the ZTV Above list not exhaustive and further analysis of the historic environment features, in relation to the ZTV should be undertaken, before finalized list of wirelines/photomontages is agreed with Council Archaeologist	The design iterations have taken account of the potential impacts to cultural heritage assets and avoided any significant adverse impacts where reasonably possible. A full cultural and built heritage impact assessment has been conducted, presented in Chapter 9: Cultural Heritage and Archaeology, of the ES.
	<u>Environmental Standards</u> Site specific assessment should be carried out following ETSU-R-97 and the proposal should be designed to meet the lower noise limits as specified in ETSU-R-97. A method statement for construction phase should be provided within the EIA	The design iterations have taken account of the potential noise impacts and avoided any significant adverse impacts where reasonably possible. A construction and operational noise assessment following ETSU-R-97 has been conducted by the projects noise acousticians and is presented in Chapter 11: Noise, of the ES.
	<u>Council Roads Officer</u> No comments received	Addressed in Chapter 14: Traffic and Transport, of the ES.
	<u>Council Landscape Architect</u> Key landscape and visual considerations are anticipated to be the setting of and views to the Cairnsmore of Carsphairn and potential cumulative effects Scheme would be required to be assessed as a whole and in terms of its two component parts DGWLCS should be referred to as the key reference for landscape sensitivity, capacity and guidance Wireline, with turbine numbers labelled, cumulative wirelines, with windfarms labelled, photomontage and cumulative photomontage for most significant effects should be included for key landscape and visual receptors Proposal should be assessed for cumulative effects as an extension to the Windy Standard (Phase I & II), and also in the wider pattern in the upper Glen Kens, over the watershed to Nithsdale, and over the DGC border The LVIA must thoroughly test how the various schemes (Windy Standard (Phase I, II and III)) appear in combination, reference should be made to SNH Siting and Design of Windfarms in the Landscape (2009), Section 5	The design iterations have taken account of the potential landscape and visual impacts and avoided any significant adverse impacts where reasonably possible. A full Landscape and Visual Impact Assessment (LVIA) has been carried out by the Project Landscape Architect and will be presented in Chapter 6: Landscape and Visual Assessment, of the ES.
Scottish Natural Heritage (SNH)	<u>Landscape:</u> Broadly happy with proposals in Scoping Report. Viewpoints were suggested to check the type of visibility from the SAWL, including:	A full LVIA has been presented in Chapter 6: Landscape and Visual Assessment, of the ES. Viewpoints of the Shalloch of Minnoch and Merrick have been included within

CONSULTEE	SCOPING RESPONSE	ADDRESSED IN
	• Shalloch of Minnoch • Merrick Request both photomontages and wirelines from the above areas Also like a viewpoint representative of the Rhinns of Kells Request that a wild land assessment is considered – up to the applicant to demonstrate a reason if they decide to omit this study Glenmount and Quantans Hill Wind Farms should be included within the assessment Compatibility of design between the proposed scheme and Windy Standard (Phase I & II) will need to be considered <u>Ecology</u> Assume that assessments in relation to watercourses are considered and if so this should be explained in the ES Should be an assessment of impacts on any rare and scarce associated species <u>Ornithology</u> Satisfied with surveys carried out and methodology used <u>Hydrology, Hydrogeology and Geology</u> Peat Depth Surveys and Peat Slide Risk Assessments should be as extensive as necessary to capture and assess all relevant areas Recommend early engagement with SEPA	the proposed viewpoints as a photomontage and wireline. A viewpoint representative of the Rhinns of Kells has also been included. Glenmount and Quantans Hill Wind Farm have been included within the cumulative scope of the LVIA. Landscape Architects have considered the compatibility of the design between the proposed Development and the existing and under construction Windy Standard I and II developments. The proposed Development has undergone numerous design iterations which will be detailed in Chapter 3: Design Evolution and Alternatives, of the ES. A full ecological impact assessment has been conducted by Natural Power Ecologists in consultation with relevant bodies, and will be presented in Chapter 7: Ecology, of the ES. The design iterations have taken account of the potential impacts to ornithological interests and avoided any significant adverse impacts where reasonably possible. A full ornithological impact assessment has been conducted by Natural Power Ecologists, in consultation with relevant bodies, presented in Chapter 8: Ornithology, of the ES. The design iterations have taken account of the potential impacts to hydrological, hydro-geological and ground conditions and avoided any significant adverse impacts where reasonably possible. A full hydrological impact assessment has been conducted by Natural Power, in consultation with relevant bodies, presented in Chapter 10: Geology, Hydrology and Hydrogeology, of the ES.
Scottish Environment Protection Agency (SEPA)	<u>Carbon Balance</u> Request that the ES contains a section systematically assessing carbon balance Refer to the Scottish Government guidance Calculating carbon savings from windfarms on Scottish peat lands – A New Approach <u>Disruption to wetlands including peatlands</u> ES should demonstrate how the layout and design of the proposal avoid impact on wetlands or peatlands A phase 1 habitat survey should be conducted, guidance A Functional Wetland Typology for Scotland followed and National Vegetation Classification completed for any wetlands identified The results of the National Vegetation Classification survey and Appendix 2 of SEPA Planning guidance on windfarm developments used to identify if wetlands are groundwater dependent terrestrial ecosystems The route of roads, track or trenches within 100 m and the location of borrow pits or foundations within 250 m of groundwater dependent terrestrial ecosystems should be reconsidered, if not the likely impact will need assessment Where avoidance is impossible, details of how Impacts upon wetlands including peatlands are minimized or mitigated should be provided in the ES <u>Disturbance and re-use of excavated peat</u> Best practice for developers to produce a Peat Management Plan Expect all proposals to be in accordance with Guidance on the Assessment of Peat Volumes, Reuse of Excavated Peat and Minimisation of Waste and SEPA Regulatory Position Statement – Developments on Peat <u>Other issues</u> Developments should be designed to avoid engineering activities in the water environment If water abstraction is proposed, scope of information required	The design iterations have taken account of the potential carbon balance impacts and avoided any significant adverse impacts where reasonably possible. A full Carbon Balance Assessment was conducted by Natural Power, presented in Technical Appendix 10.5: Carbon Balance Report in Volume 4 of the ES. The design iterations have taken account of the potential impacts to hydrological, hydro-geological and ground conditions and avoided any significant adverse impacts where reasonably possible. A full hydrological impact assessment has been conducted by Natural Power, in consultation with relevant bodies, presented in Chapter 10: Hydrology, Geology and Hydrogeology, of the ES. A Peat Stability Assessment was undertaken at the proposed Development, the results of which are reported in Technical Appendix 10.3: Peat Stability Assessment in Volume 4 of the ES. Addressed in Chapter 4: Description of Development, of the ES. This Chapter outlines the details of the proposed Development as specified in the application

CONSULTEE	SCOPING RESPONSE	ADDRESSED IN
	Throughout the EIA process all aspects of site work that might impact upon the environment should be systematically identified Potential pollution risks and principles of preventable measures and mitigation identified Recommend that the principles of the Construction Environmental Management Plan (CEMP) are set out in the ES outlining how the draft Schedule of Mitigation will be implemented. Refer to SNH and SEPA Good Practice During Windfarm Construction and the Highland Council CEMP Process for Large Scale Projects Site should be assessed for flood risk from all sources in line with Scottish Planning Policy	and Chapter 1: Introduction, of the ES, including specifications of turbines, access tracks and electrical infrastructure. Addressed in Chapter 3: Design Evolution and Alternatives, of the ES. This Chapter provides a detailed description of the site selection process for the proposed site. This Chapter also discusses the design evolution process and mitigation measures that were introduced at the site selection and design stage to reduce environmental impacts. Technical Appendix 4.1: Draft Construction Environmental Management Plan in Volume 4 of the ES sets out the principles of the CEMP and outlines how the schedule of mitigation proposed within the ES will be implemented. This document is intended to act as a basis for a more detailed site specific CEMP.
East Ayrshire Council (EAC)	<u>Land Use Planning/Policy</u> Consideration should be given to the Ayrshire Joint Structure Plan, the adopted East Ayrshire Local Plan and the Addendum to the Ayrshire Joint Structure Plan Technical Report TR03/2006: Guidance on the Location of windfarms within Ayrshire, where appropriate. The Council's emerging Local Development plan and the East Ayrshire Landscape Wind Capacity Study should also be considered where relevant. <u>Design, Landscape and Visual Impact</u> Landscape and visual impact assessment should take account of landscape and visual impacts experienced over parts of southern East Ayrshire. Impacts from the proposed Development on Sensitive Landscape Areas (SLA) within East Ayrshire and the integrity of these designations should be fully considered and impacts minimized through good design and layout of the wind farm. The baseline appraisal of landscape capacity should also incorporate indirect impacts on East Ayrshire landscapes. <u>Cumulative Impacts</u> The relationship of the proposed Development to operational, consented and undetermined s36 and planning applications and current scoping stage wind farms must be assessed carefully and the design should take account of this relationship. Cumulative assessments should address the consequences of travelling through the landscape and sequential views. Consideration should be given to whether the landscape has reached capacity for further large scale wind farm development in the area. Consideration should also be given to landscape and visual cumulation with other types of development. <u>Zones of Theoretical Visibility (ZTVs)</u> Recommend a minimum 35 km ZTV including a list of views, an indication of distance and the evaluation and justification for their inclusion or omission. Built and Cultural Heritage Resources The ES should assess the direct and indirect impacts of the proposed Development upon heritage resources and their settings within the zone of visual influence of the development, including scheduled ancient monuments, unscheduled archaeological sites, listed buildings, conservation areas and gardens and designated landscapes. <u>Tourism/Recreation and Public Access Resources</u> The ES should address the consequences of the development for users of the countryside and its direct and indirect impacts on tourism and recreational interests and resources in the vicinity. Impacts on vital tourism resources should be fully considered including the potential for lighting (visible and infra-red) impacts on the Dark Sky Park (DSP) and Dark Sky Park the observatory (SDSO). Popular recreational walking routes and core paths should be considered by the ES where there is potential intervisibility with the proposed Development.	The design iterations have taken account of the East Ayrshire Council planning guidance. East Ayrshire Council planning guidance is addressed in Chapter 2: Planning and Policy Context, of the ES and also within the Planning Statement. A full LVIA and cumulative assessment was carried out by the Project Landscape Architects, presented in Chapter 6: Landscape and Visual Assessment, of the ES. The proposed Development has undergone numerous design iterations to address environmental and technical constraints raised during the consultation process. The iterations of site design are presented in Chapter 3: Design Evolution and Alternatives, of the ES. The design iterations have taken account of the potential impacts to cultural heritage assets and avoided any significant adverse impacts where reasonably possible. A full cultural and built heritage impact assessment has been conducted, presented in Chapter 9: Cultural Heritage and Archaeology, of the ES. An assessment on socio-economics and tourism has been carried out by MKA Economics, presented in Chapter 15: Socio-economic and Tourism

CONSULTEE	SCOPING RESPONSE	ADDRESSED IN
	Amenity Issues The consequences of the proposed Development for occupiers of properties within the vicinity of the proposed development, as well as countryside users, should be assessed. Traffic and Transportation Issues The ES should assess the impact of the proposed Development on the public road network in terms of the effects of additional vehicular traffic on traffic management, road safety, road layout and road condition.	Assessment, of the ES. The design iterations have taken account of the potential traffic and transport impacts and avoided any significant adverse impacts where reasonably possible. An assessment of the operation and construction transportation on traffic climate has been carried out and is presented in Chapter 14: Traffic and Transport, of the ES.
Existing Infrastructure		
Scottish Water	Scottish Water has no objections to the proposal, there are no Scottish Water, water abstractions sources, designated as Drinking Water Protected Areas under the Water Framework Directive, in the area	The design iterations have taken account of the potential impacts on water abstraction sources. Addressed in Chapter 10: Hydrology, Geology and Hydrogeology, of the ES. This Chapter assesses the impacts on the hydrological, geological and hydrogeological environment at the proposed Development.
The Scottish Rights of Way and Access Society	Scottish Rights of Way and Access Society recommend that Core Paths Plans are consulted. The ES should consider any direct and indirect impacts of the proposed Development on core paths and access rights under the Land reform (Scotland) Act 2003, as well as rights of way, and suggest that it pays particular attention to the maintenance of these during construction, operation and decommissioning of the proposed Development.	The direct and indirect impacts of the proposed Development on surrounding core paths were considered. There are only two core paths within the adjacent area to the proposed Development, one is out with the Planning Application Boundary and the other crosses the Planning Application Boundary however this path is also crossed as a result of the existing Windy Standard Wind Farm, Windy Standard II and forestry operations as such the additional impact from Windy Standard III is expected to be negligible. This is addressed in Chapter 15: Socio-economic and Tourism Assessment, of the ES.
BT	BT concludes that the proposed Development should not cause interference to BT's current and presently planned radio networks.	The design iterations have taken account of the potential impacts on BT's current and presently planned radio networks and is addressed in Chapter 13: Aviation, EMI, Existing Infrastructure and Shadow Flicker, of the ES.
OFCOM	OFCOM provide information on who to contact to provide an assessment of microwave links located near or within the proposed Development Area.	Natural Power contacted OFCOM, Atkins Global, JRC and BT informing them of coordinates following design freeze. A fixed link report was produced by Ofcom which showed that there are no fixed links at a search radius of 1050 m from the centre of Meaul Hill and no fixed links at a search radius of 1200 m from Waterhead Hill. Atkins global had no objection to the design freeze coordinates. JRC cleared the proposed Development with respect to radio link infrastructure and BT concluded that the proposed development should not cause interference to BT's current and presently planned radio networks. This is addressed in Chapter 13: Aviation, EMI, Existing Infrastructure and Shadow Flicker.
Joint Radio Company (JRC)	Cleared with respect to radio link infrastructure operated by Scottish Power and Scotia Gas Networks. JRC does not foresee any potential problems based on known interference scenarios and data provided. Developers advised to seek re-coordination prior to considering any design changes.	Natural Power contacted JRC informing them of coordinates following design freeze JRC responded stating that the proposed Development was cleared with respect to radio link infrastructure Addressed in Chapter 13: Aviation, EMI, Existing Infrastructure and Shadow Flicker, of the ES.
Transport		**Please see response from Dumfries and Galloway Roads Officer above**
Transport Scotland	Site Access Transport Scotland advice that an abnormal loads assessment should be carried out on the proposed route for any abnormal loads as part of the EIA process, identifying any accommodation measures required including the temporary removal of street furniture, junction widening, traffic management, etc. Assessment of Impacts	An assessment of access, traffic and transport has been carried out by Natural Power, presented in Chapter 14: Traffic and Transport, of the ES.

CONSULTEE	SCOPING RESPONSE	ADDRESSED IN
	The ES should provide information with regard to the construction stage including the preferred route options for the movement of any heavy loads along with an estimate of vehicle trip generation from the site and an indication of distribution/assignment of these trips. The ES should also identify potential environmental impacts on the trunk road once the development is operational. The assessment of environmental effects of road traffic should be undertaken in accordance with the guidance set out within the Institute of Environmental Assessment (IEA) publication 'Guidelines on the Environmental Assessment of Road Traffic (Guidance Note 1')', 1993. Potential trunk road related environmental impacts such as driver delay, severance, pedestrian amenity, safety, etc. should be considered and assessed where appropriate Methods adopted to assess the likely traffic and transportation impacts on traffic flows and transportation infrastructure should comprise: Determination of the baseline traffic and transportation conditions, and the sensitivity of the site and existence of any receptors likely to be affected in proximity of the trunk road network; Review of the development proposals to determine the predicted construction and operational requirements; and Assessment of the significance of predicted impacts from these transport requirements taking into account impact magnitude and baseline environmental sensitivity. <u>Noise and Vibration</u> Impacts to sensitive receptors associated with noise and vibration arising from the proposed Development during construction and operational phases should be considered. Operational traffic noise and construction traffic noise should be assessed by considering the increase in traffic flows. The ES should consider potential impacts to identified trunk road receptors in terms of predicted noise levels from construction traffic and any increases to road traffic attributed to the proposed Development. <u>Air Quality</u> If air quality is to be scoped out, the reasons for this should be clearly stated in the ES. AQ should be assessed based on guidelines found within the Environmental Protection UK 'Development Control: planning for Air Quality' publication.	A full noise assessment has been carried out and is presented in Chapter 11: Noise, of the ES. A Dust Management Plan will be produced in accordance with Technical Appendix 4.1: Draft Construction Environmental Management Plan in Volume 4 of the ES. The purpose of this Dust Management Plan is to describe the procedures by which potential sources of fugitive dust shall be managed during construction activities associated with the proposed Development.
Cultural Heritage		**Please see response from Dumfries and Galloway Council on Archaeology and Cultural Heritage**
Historic Scotland	Historic Scotland confirms that there are no nationally important heritage assets within the boundary of the proposed Development. Suggest that any initial assessments focus on the following assets and requested visualisations illustrating the impact of the proposed Development upon views from specific locations, based on the relationship between the asset's significance and the surrounding landscape: King's Cairn, Chambered Cairn and Cairn to W of Water of Deugh. Two wireframe visualisations were requested. One from the King's Cairn, looking towards the smaller cairn, and one from the King's Cairn, looking towards the proposed Development Area, and particularly towards Big Meaul and Upper Hill. Lamford Burn, cairn 800 m NE of Lamford Bridge. A visualisation was requested using a viewpoint on the cairn looking towards the proposed Development. Loch Doon Castle. A visualisation was requested looking towards the proposed Development from the castle. Craigengillan House and Graigengillan Garden and Designated Landscape. A visualisation was requested from a viewpoint as close as possible to the house (and preferably from the driveway immediately outside the private garden of the dwelling), looking towards the proposed Development. Historic Scotland would encourage that the cumulative impact of the proposed Development together	Heritage assets including those suggested and the cumulative impact of the proposed Development together with others in the vicinity has been addressed within Chapter 9: Cultural Heritage and Archaeology, of the ES. Further consultation was undertaken with Historic Scotland as the project progressed and it was agreed (e-mail dated 31st October 2014) that, of the requested visualisations, only that for King's Cairn would be necessary, as the other requested viewpoints lie outside the Zone of Theoretical Visibility (ZTV). This is presented as ES Figure 9.3a to d in Volume 3 of the ES.

CONSULTEE	SCOPING RESPONSE	ADDRESSED IN
	with others in the vicinity should be thoroughly assessed as part of the ES.	
Ecological		**Please see SNH response above**
Royal Society for the Protection of Birds (RSPB)	The RSPB generally feel that the level of vantage point surveys has been sufficient to record the level of ornithological interest at this site. Although have concerns that the vantage point survey data is now four years out of date. The RSPB acknowledge that more recent survey work has been carried out following advice from SNH (2012/13), in order to more fully assess the raptor interest at this site. However, the RSPB also note that during these surveys on two occasions (23/04 and 26/04/2013) the walk-over raptor survey work coincided with the raptor vantage point surveys, which may have compromised survey results as surveyors on foot could have influenced flight behaviour across the site. The RSPB therefore, advise that full detail of vantage point watches including clear view-shed maps is provided as part of the Environmental Statement (ES). Raptors Ask that full consideration is given to potential impact on peregrine and merlin through collision risk and that the assessment is clearly summarised in the ES. Collision risk assessment RSPB have some concerns that the turbine layout changed between vantage point survey years (2009/10 to 2012/13), particularly since there has been an increase in the number of turbines proposed from 18 to 22. The RSPB would therefore like to highlight the need to fully address this issue through CRA stage of the EIA process to ensure that the results of the ornithological survey work are fully assessed in relation to the final project design. The RSPB ask that full details of the collision risk model and analysis, including flight line maps for all species is provided as part of the ES to enable full verification of assessment of impact made. The RSPB would also like to highlight the potential issue with regard to assessing CR at this site based on a design which has two areas of development (turbine location) more than 2 km apart. Again, we ask that this factor is fully considered through the EIA process. Peat/bog Habitat Mitigation should include measures undertaken as part of the design process to avoid construction and operations impact on deep peat soils. The ES should include carbon calculations to ensure that there is no net loss to carbon through this development proposal as a result of impact to peat deposits. Habitat Management Plan The RSPB would expect the relevant proposals for habitat management as part of any enhancement or mitigation measures to be included within the ES.	Full detail of vantage point watches, collision risk assessments and habitat management will be provided as part of the ES and addressed within Chapter 7: Ecology and Chapter 8: Ornithology, of the ES. In addition, a Carbon Balance Assessment has been provided as part of the ES in Technical Appendix 10.5: Carbon Balance Assessment and Technical Appendix 10.6: Carbon Balance Calculation Sheets in Volume 4 of the ES.
John Muir Trust	Visual, Landscape and Cumulative Impacts The ES must address the combined visibility and sequential impact of the proposed Development. Peatland Refer to the Scottish Government's Carbon Calculator which states *that "construction of wind farms on non-degraded peats should always be avoided"* and recommends that construction on peatland should be fully addressed in the ES.	The design iterations have taken account of the potential landscape and visual impacts and avoided any significant adverse impacts where reasonably possible. A full LVIA has been carried out by the Project landscape Architect and is presented in Chapter 6: Landscape and Visual Assessment, of the ES. The design iterations have taken account of the potential impact on peatland and avoided any significant adverse impacts where reasonably possible. Addressed within Chapter 10: Hydrology, Geology and Hydrogeology, of the ES. This Chapter assesses the impacts on the hydrological, geological and hydrogeological environment at the proposed Development. A full Carbon Balance Assessment was conducted by Natural Power, presented in Technical Appendix 10.5: Carbon Balance Report in Volume 4 of the ES. Chapter 4: Description of Development, of the ES. This Chapter outlines the details of the proposed Development as specified in the application and Chapter 1: Introduction, of the ES, including specifications of turbines, access tracks and

CONSULTEE	SCOPING RESPONSE	ADDRESSED IN
		electrical infrastructure.
Forestry Commission Scotland	Forestry and Woodlands The policy on Control of Woodland Removal 2009 and the Scottish Government's determination to decrease the loss of existing woodland and aspiration for further expansion, reiterated in the National Planning Framework 2 should be taken into account when preparing the development plans for the proposed Development. Climate Change The ES should consider the consequences of woodland removal on carbon sequestration and appropriate mitigation measures. The ES should describe the proposed mitigation in terms of its social, economic and environmental value, so that an assessment can be made as to whether the proposed mitigation is appropriate and compensates for the negative impacts of woodland removal. An assessment of the implications of the proposed Development on water. Soil and air resources, and an appreciation of the potential consequences of the loss of woodland cover with regards climate change. Adherence to the UKFS Forests & Water Guidelines and adherence to pollution regulations is required to safeguard water quality. Felling and retention The ES should clearly state that the project will be developed and implemented in accordance with the UKFS and associated guidelines. The ES should recognize the social, economic and environmental values of the forest and the woodland habitat and take into account the fact that, once mature, the forest would have been managed into a subsequent rotation, often through a restructuring proposal that would have increased the diversity of tree species and the landscape design of the forest. The ES should clearly indicate proposed areas of woodland for felling to accommodate turbines and associated infrastructure. The ES should consider design approaches that reduce the scale of felling required to facilitate the development. Where there is a change in land use (e.g. to non-woodland habitats) the woodland should be described in sufficient detail to enable its intrinsic public benefit value to be assessed. The ES should also detail any trees or woodland areas likely to be indirectly affected by the proposed Development and provide full details of alternatives and/or protection and mitigation measures. Where turbines are to be installed within a forest, a full description of the topography of the site is necessary. Landscape and Visual Assessment A full assessment of the landscape and visual impacts should be carried out, including a full description of the general landscape character and a statement of the landscape and visual sensitivities that may be potentially affected by the proposed Development. An assessment of the cumulative landscape and visual impacts as a consequence of the proposed Development should be carried out. Biodiversity and Priority Habitats The wildlife implications of any tree felling should be considered in relevant sections of the ES. The ES should also consider any impacts of forestry activities on the water environment, with particular attention paid to acidification and nutrient leaching. The ES should contain a detailed assessment of the implications of the proposed Development on biodiversity. Compensatory Planting Plan	Assessments have been carried and are presented in Chapter 12: Forestry, of the ES. In addition the Project Landscape Architect has a comprehensive knowledge of forestry and is addressed within Chapter 6: Landscape and Visual Assessment, of the ES. Changes in land use are detailed within Chapter 12: Forestry, of the ES. This Chapter also describes the plans for felling, restocking and forest management practices, and the process by which these were derived. The effects of forest felling and restocking are assessed in the relevant chapters of this ES such as Chapter 6: Landscape and Visual Assessment, Chapter 7: Ecology and Chapter 10: Hydrology, Geology and Hydrogeology, of the ES. Addressed within Chapter 7: Ecology, of the ES. This Chapter provides an overview of the baseline ecological conditions relating to the habitats and (non-avian) fauna present within the proposed Development Area and immediate

CONSULTEE	SCOPING RESPONSE	ADDRESSED IN
	A compensatory Planting Plan should be appropriately described within the ES.	surrounding environment.
Marine Scotland	Careful consideration should be given within the ES to the following activities during construction, operation and decommissioning which can have an impact on fish and fisheries: • Construction of turbine foundations; • Excavation of borrow pits; • Road construction/upgrading; • Cable laying; • Water abstraction and discharge. A buffer zone of at least 50 m should be established near water bodies and watercourses. All construction should avoid areas of deep peat and where this is not possible appropriate mitigation measures should be put in place. The propensity of the development site to flooding, prior to any construction activities, should be considered. Any activity that is liable to cause water pollution is required by the Water Framework Directive to be authorized by SEPA. Potential impacts of tree felling on the aquatic environment should be addressed in the ES. Information on all species and abundance of fish within the proposed Development Area and on fisheries which depend on these should be addressed. Site specific mitigation measures and/or enhancement programmes to protect and/or compensate freshwater habitats should always be included in the ES. The combined effect on water quality and fisheries from all existing and proposed construction developments in the area should be addressed in the ES in addition to angling, as a recreation interest, and the impact that the proposed Development may have on it. Where the development can be clearly demonstrated to be low risk to fish populations a site specific mitigation plan to minimise any impact to fish and inhabiting waters should still be drawn up. If it is anticipated that the proposed Development will have no significant impact this should be clearly presented within the ES.	Addressed within Chapter 7: Ecology, of the ES. This Chapter provides an overview of the baseline ecological conditions relating to the habitats and (non-avian) fauna present within the proposed Development Area and immediate surrounding environment and in Chapter 10: Geology, Hydrology and Hydrogeology, of the ES. This Chapter assesses the impacts on the hydrological, geological and hydrogeological environment at the proposed Development.
Galloway Fisheries Trust	Suggest that fish and fish habitat information are considered within the ES and that baseline surveys are carried out in the field as opposed to assessing these receptors via a desk study. The CEMP, along with a Pollution Prevention Plan, should be strongly adhered to during construction, operation and decommissioning of the proposed Development. Adequate buffer zones should be established between the proposed Development and watercourses within and surrounding the proposed Development. Buffer zones should surround watercourses and construction areas, roads (where possible) and laybys.	Addressed within Chapter 7: Ecology, of the ES. This Chapter provides an overview of the baseline ecological conditions relating to the habitats and (non-avian) fauna present within the proposed Development Area and immediate surrounding environment and in Chapter 10: Geology, Hydrology and Hydrogeology, of the ES. This Chapter assesses the impacts on the hydrological, geological and hydrogeological environment at the proposed Development. Technical Appendix 4.1: Draft Construction Environmental Management Plan outlines how the schedule of mitigation proposed within the ES will be implemented. This document will form the basis of the more detailed site specific CEMP.
Scottish Wildlife Trust	Scottish Wildlife Trust were contacted by telephone and responded by stating that they had no comments at the scoping state, but will comment once the application is submitted.	Further updates have been provided to the Scottish Wildlife Trust.
Aviation		
CAA Airspace	The CAA confirms that the appropriate statutory aviation consultees have been identified and suggests consultation with these bodies and states the need for turbines to be charted on aviation maps following consent.	Further to scoping, Natural Power contacted CAA, MOD and NATs with an update on the design freeze layout. Discussions are also underway with the CAA with regards to aviation lighting requirements. BR3 will work with the CAA and other relevant consultees to agree a suitable lighting pattern where required. In addition to this it must be

CONSULTEE	SCOPING RESPONSE	ADDRESSED IN
		noted that RenewableUK (RUK) has been requested by the CAA to provide a Briefing Note on Onshore Aviation Lighting[3] which takes into consideration the likelihood that onshore wind turbines with a tip height in excess of 150 m will be greater in the future as a result of the need to reduce costs through turbine optimisation and site selection, via larger rotors on taller hub heights. As a part of the Briefing Note, RUK has reviewed the current plethora of aviation lighting references for onshore and offshore projects in the UK and UK Continental Shelf (UKCS), including CAA, Ministry of Defence (MOD), Maritime and Coastguard Agency (MCA) and RUK documents. The Briefing Note provides recommendations with regards to aviation lighting for turbines with a tip height in excess of 150 m and provides suggested next steps. Natural Power on behalf of BR3 has responded to the draft Briefing Note and will continue to work with RUK on this matter in the future.
Crown Estate	State that the interests of The Crown Estate are not affected by the proposal and confirm that The Crown Estate have no comment to make.	As there are no interests of The Crown Estate impacted by the proposed Development, The Crown Estate interests have not been addressed in the ES.
Ministry of Defence (MoD) / Defence Estates	The MoD has no objection to the proposal. In the interests of air safety, the MOD requests that all Cardinal turbines are fitted with 25 candela omni-directional red lighting and infrared aviation lighting with an optimized flash pattern of 60 flashes per minute of 200ms to 500ms duration at the highest practicable point. Each other alternate perimeter turbine should be fitted with 25 candela omni-directional red lighting or infrared aviation lighting with an optimised flash pattern of 60 flashes per minute of 200ms to 500m duration at the highest practicable point.	Addressed within Chapter 13: Aviation, EMI, Existing Infrastructure and Shadow Flicker, of the ES. This Chapter assesses the potential for impact upon aviation, Ministry of Defence (MoD) interests, communication operations and existing site infrastructure and demonstrates the consulting process undertaken and outlines mitigation where it is deemed necessary.
NATS	No objection from NATS. General guidance was provided by NATS. Advice that developers engage with NATS should they anticipate any issues	NATS were commissioned to carry out a Pre-Planning Assessment of the proposed Development. The NATS Pre-Planning Report confirmed they expected no impact anticipated on NATS's radar, no impact anticipated on NATS's navigation aids, no impact anticipated on NATS's radio communications infrastructure and no impact anticipated on any airport to which NATS provides a safeguarding service. The proposed Development has been examined by technical and operational safeguarding teams and no impact is anticipated. This is addressed in Chapter 13: Aviation and Existing Infrastructure.
British Airports Authority (BAA)	No response received	The design iterations have taken account of the potential impact on aviation and avoided any significant adverse impacts where reasonably possible. This is addressed in Chapter 13: Aviation, EMI, Existing Infrastructure and Shadow Flicker, of the ES.
Glasgow Prestwick Airport (GPA)	GPA was concerned that some of the turbines within the scoping layout would be detectable by their primary surveillance radar. Given the critical location of the development (on the approach to runway 30) and the existing clutter that is already detected by GPA radar in this area GPA reported that it would be extremely likely that Glasgow Prestwick Airport would object to the proposal. Encourage the developer to engage with GPA regarding a possible solution at the earliest opportunity.	A meeting was held between Natural Power and GPA to discuss the impact of the proposed Development on the operations of GPA and potential mitigation measures. It was concluded that while there would be a significant impact on the GPA radar and the proposed Development is just on the extremities of the 30 km critical impact zone, there is a proposed mitigation solution which is very nearly finalised which would be a suitable remedy for the impacts of the proposed Development. GPA are therefore confident that a mitigation solution will be available for the proposed Development. GPA sent a cooperation letter to the client on the 11th August 2015 addressing this (see Technical Appendix 13.1 in Volume 4 of the ES).

[3] RenewableUK, Briefing Note to the Civil Aviation Authority re Configurations for Onshore Aviation Lighting to Meet the Requirements of the Air Navigation Order Article 219, January 2016.

CONSULTEE	SCOPING RESPONSE	ADDRESSED IN
		Addressed in Chapter 13: Aviation, EMI, Existing Infrastructure and Shadow Flicker, of the ES.
Recreation		
Mountaineering Council of Scotland	Have few issues regarding the proposal for Meaul, but regard the proposal for Waterhead Hill as potentially of concern and proposed assessment deficient in providing the information required to evaluate its impact on mountain resource. Viewpoints The Mountaineering Council of Scotland feels that the proposed viewpoints do not capture the potential impact on the mountain resource. In particular the MCoS feel that a viewpoint of the Corbett summit should be included within the Environmental Statement and suggest that a single viewpoint at the summit of Coran of Portmark be included within the Environmental Statement. Socio-economic Impacts MCoS would expect the socio-economic assessment to highlight the impact of wind farms on local members and visitors enjoyment of mountaineering and other activities in the area	The project Landscape Architects are experienced and have addressed all receptors, having conducted a number of site visits even if not captured through the presentation of viewpoint locations at every possible location. This is addressed in Chapter 6: Landscape and Visual Assessment, of the ES. Addressed within Chapter 15: Socio-economic and Tourism Assessment, of the ES.
Visit Scotland	Suggest that full consideration is given to the Scottish Government's 2007 research on the impact of wind farms on tourism and also recommend that any potential detrimental impact of the proposed Development on tourism, whether visually, environmentally and economically, be identified and considered in full.	Addressed within Chapter 15: Socio-economic and Tourism Assessment, of the ES. This Chapter assesses the predicted socio-economic and tourism impacts of the proposed Development. Also addressed within Chapter 6: Landscape and Visual Assessment, of the ES. This Chapter presents the full LVIA which has been carried out by the Project landscape Architect for the proposed Development.

Key Considerations identified through the Consultation Process

3.4.3 The consultation process has confirmed our findings of the Initial Feasibility Studies and has shown that whilst the findings to date demonstrate the site is suitable for wind energy development, the following areas would require particular consideration during final design and assessment:

- It was identified that landscape, visual and amenity considerations were deemed a priority for the site, as such the proposed Development has been assessed as a whole and in terms of its constituent parts in order to develop a final design that minimises the visual extent of the proposed Development when viewed from key viewpoints such as Loch Doon (see Section 3.5 below);
- Cumulative effects are a key consideration; as such the proposed Development has also been assessed for cumulative effects as an extension to the present Windy Standard Developments and also within the wider surrounding area in order to develop a final design (see Section 3.5 below);
- Glasgow Prestwick Airport (GPA) responded to the scoping report by stating that they were concerned that some of the turbines within the scoping layout would be detectable by their primary surveillance radar, however a meeting was held between GPA and Natural Power to discuss mitigation measures and it was concluded that there would be a mitigation solution available that would remedy the impacts of the proposed Development (please refer to Technical Appendix 13.4 in Volume 4 of the ES); and
- Further consultation with CAA identified that visible red aviation lighting would be required on the 177.5m turbines under the Air Navigation Order (ANO) Article 219 lighting requirements. Discussions are currently underway with the CAA to agree suitable lighting requirements. BR3 will work with the CAA and other relevant consultees on this. In addition to this it must be noted that RenewableUK (RUK) has been requested by the CAA to provide a Briefing Note on Onshore Aviation Lighting[4] which takes into consideration the likelihood that onshore wind turbines with a tip height in excess of 150 m will be greater in the future as a result of the need to reduce costs through turbine optimisation and site selection, via larger rotors on taller hub heights. As a part of the Briefing Note, RUK has reviewed the current plethora of aviation lighting references for onshore and offshore projects in the UK and UK Continental Shelf (UKCS), including CAA, Ministry of Defence (MOD), Maritime and Coastguard Agency (MCA) and RUK documents. The Briefing Note provides recommendations with regards to aviation lighting for turbines with a tip height in excess of 150 m and provides suggested next steps. Natural Power on behalf of BR3 has responded to the draft Briefing Note and will continue to work with RUK on this matter in the future.

3.5 DETAILED DESIGN OF ALTERNATIVE WINDY STANDARD III LAYOUTS

3.5.1 This subsection describes the alternative layouts considered for the proposed Development, and discusses how the evolution of the site design and layout continued throughout the EIA process. The layout of the proposed Development was designed under the guidance, requirements and considerations of BR3, Natural Power and other contributing specialist consultants. The site design process was guided by the findings of the baseline surveys, by the opinions of the specialist consultants and by issues raised through consultation with statutory and non-statutory consultees. Consideration has also been given to issues raised by the community before, during and after the public exhibition events in line with Scottish Planning Policy (please refer to PAC Report).

3.5.2 The aim of the siting and design process was to arrive at a design that would be acceptable in environmental, landscape and visual terms, technically feasible and economically viable. The design process included the selection in number and size of turbines, placement of turbines, tracks and other associated infrastructure, whilst taking account of landscape and visual concerns, ecology, hydrology and peat.

3.5.3 The location of individual turbines was guided by the technical requirements for the turbine including the potential manufacturer's warranty requirements, slope angles and the nature of the topography in which the turbine was to be located. Siting was also guided by the results of the baseline studies scoping exercise and community consultation with particular attention given to the likely landscape and visual assessment effects, residential amenity and the hydrology and peat resource at the site identified by investigations by specialist staff at Natural Power.

3.5.4 Computer modelling was used as a tool to aid the development of the designed layout. Wireframes were generated for views from key locations around the site and used to 'test' the design in views from the surrounding area.

3.5.5 The remainder of this Chapter highlights the site design considerations and the key stages in the site design evolution, illustrating the iterative process that has resulted in the final proposed Development. Through each of the design iterations considered, key technical and environmental constraints and design criteria have been applied, which are described in more detail below.

Influence of the Policy Context

3.5.6 With regard to the full range of impacts, the eventual design of the proposed Development was mindful of advice detailed in the following documents:

- Dumfries and Galloway Local Development Plan and interim supplementary guidance;
- Dumfries and Galloway Wind Farm Landscape Capacity Study (DGWLCS);
- PAN 1/2013: Environmental Impact Assessment;
- Land Use consultants, 1998, Dumfries and Galloway Landscape Assessment. Scottish Natural Heritage Review. No.94;
- The Dumfries and Galloway Wind Farm Landscape Character Assessment 2011;
- SNH guidance on *'Siting and Designing Windfarms in the Landscape'* (December 2009);
- Guidelines for Landscape and Visual Impact Assessment, 3rd Edition; and
- PAN 68: Design Statements.

3.5.7 The above list is not an exhaustive list of relevant documents. A full review of legislation and planning policy has been provided in Chapter 2: Planning and Policy Context, of the ES and an assessment of such material is provided in the accompanying Planning, Design and Access Statements, as well as in individual ES chapters. A review was undertaken of design guidance documents and other standard texts on wind farm development such as the SNH guidance on *'Siting and Designing Windfarms in the Landscape'* (December 2009). These are considered further in Chapter 6: Landscape and Visual Assessment, of the ES.

3.5.8 The iterative design process was brought to a conclusion, and the final design fixed, when it was considered that an acceptable balance had been struck in the context of the policies in the local Dumfries and Galloway Council area and the various other considerations identified in this Chapter.

Design Strategy Principles

3.5.9 The design strategy for the key elements of the proposed Development has taken into account the following objectives:

- To provide a turbine layout with simple form, which relates to the landscape character of the site and its surroundings;
- To create a turbine layout which reflects the scale of the landscape in which it is located;
- To avoid an overly complex and visually confusing layout;
- To achieve a balanced composition of the turbines against the landscape and skyline from key view point locations;

[4] RenewableUK, Briefing Note to the Civil Aviation Authority re Configurations for Onshore Aviation Lighting to Meet the Requirements of the Air Navigation Order Article 219, January 2016.

- To reflect the pattern of nearby existing and proposed wind farms; and
- To maximise site efficiency in order to compete in a Levelised Cost of Electricity (LCoE) market.

3.5.10 In addition, the following principles have been taken into account in order to ensure that the proposed Development best meets the objectives detailed above whilst maximising the efficiency of the proposed Development:

- Larger turbines have only been used selectively in areas of lower ground levels and contained visibility meaning larger turbines can be accommodated more easily;
- The tip heights of turbines have been considered from an above ordnance datum (AOD) point of view and found that the AOD tip heights of the present Windy Standard Developments are greater than that of the proposed Development thus balancing out the overall tip heights of the surrounding developments.
- There is a fairly mixed baseline with extensive commercial forestry, varied topography, and wind farms already demonstrating significant variations in size with everything from the existing Windy Standard Wind Farm to potentially that of South Kyle and other surrounding sites such as Windy Standard II and Afton and this has been considered within the final design.
- Noting the CfD/LCoE climate which is pushing for greater efficiency in electrical generation within a very competitive market, turbines of 177.5 m to tip height are considered within the design of the proposed Development and are proposed within the final design. Higher tip height turbines are capable of significantly increasing the total output therefore maximising the chances of the development being realised if planning can be secured. In addition, the land take of the proposed Development is reduced as fewer turbines are required to generate a greater total output than turbines with lower tip heights; this also reduces the environmental impacts and the carbon footprint of the proposed Development; and
- Noting that the site is within a search for large typology wind turbines area (as defined in the adopted LPD as turbines greater than 80 m), the principle of turbines within the proposed Development Area is already accepted. Larger turbines therefore allow the potential of this search area to be maximised.

3.5.11 Key objectives specific to the LVIA were also adopted for the proposed Development and will be discussed within Chapter 6: Landscape and Visual Assessment, of the ES.

Constraints to Development

3.5.12 The main considerations on site which influenced the final design of the proposed Development (as shown in ES Figure 3.1 in Volume 3 of the ES) were:

- Watercourses;
- Wind flow;
- Ground conditions and topography;
- Protected species and habitat;
- Landscape and visual;
- Residential Amenity and Noise;
- Cultural heritage;
- Aviation; and
- Constraints associated with LCoE.

Watercourses

3.5.13 All mapped natural watercourses were marked as a constraint and a 50 m buffer was applied to protect watercourses from disturbance and potential effects on water quality during construction. Their locations were confirmed during site visits and the on-site track design aimed to minimise watercourse crossings.

Wind Flow

3.5.14 Site design and layout were tailored to ensure optimal turbine performance bearing in mind the local topography. This also included consideration of forestry felling and re-designs and suitable spacing adhered to so as to not induce wake effect.

Ground conditions and topography

3.5.15 The peat resource on-site was considered to be pertinent to the siting of the turbines and areas of slope greater than 10 degrees were avoided. Detailed desk top investigations and a hydrological and peat survey of the area was undertaken to reveal any sensitive areas to wind farm construction activities, this investigation directly informed the design day and led to detailed consideration of siting to avoid areas of potential sensitivity to peat. The finalised layout has also been subject to a full peat stability assessment, which is included in Technical Appendix 10.3 in Volume 4 of the ES.

Protected species and habitat

3.5.16 No international, national or regional ecological designations are located within the proposed Development Area. A phase one habitat survey was carried out to identify areas potentially sensitive to wind farm infrastructure. Full details are provided in Chapter 7: Ecology, of the ES.

3.5.17 Ornithological surveys were undertaken over the site to identify any areas of potential constraint. Full details are provided in Chapter 8: Ornithology, of the ES.

Landscape and visual

3.5.18 The design process took account of the potential landscape and visual effects that the proposed Development may create. The design iterations that considered such effects are described below and further details are also provided in Chapter 6: Landscape and Visual Assessment, of the ES.

Noise

3.5.19 Detailed modelling and background noise monitoring at key residential properties helped inform the layout process. Further details are provided in Chapter 11: Noise, of the ES.

Cultural heritage

3.5.20 Assessments of potential impacts upon cultural heritage made during the EIA process helped inform the final layout of the proposed Development. Significant impacts were thus avoided and further details are provided in Chapter 9: Cultural Heritage and Archaeology, of the ES.

Public Consultation

3.5.21 Having regard to the Town and Country Planning (Development Management Procedure) (Scotland) Regulations 2013, regulation 13(4)(c) states that a design statement should include details of consultations undertaken and the outcome of that consultation. The main aim for the community engagement process is to ensure effective engagement between the Applicant and the local authority, local community, consultees etc. to help make sure that the proposal will;

- Reflect more accurately an understanding and appreciation of local interests and concerns;
- Provide a higher quality and more active and well-timed consideration of evidence of the potential benefits and impacts of the proposal (enabling better and prompt decision-making in the planning process, focused on the material issues); and
- Ensure that, if the proposal does go ahead, local communities, the local authority and other consultees have had opportunities to shape how the development is actually realised and the continuing relationship they may have with it.

3.5.22 The principles of effective public engagement as described in PAN 3/2010: Community Engagement to provide:

- Access to information.
- The opportunity to contribute ideas.
- The opportunity to take an active part in developing proposals and options.
- The opportunity to be consulted and make representations on formal proposals and policies.
- The opportunity to receive feedback and be informed about progress and outcomes.

3.5.23 Building upon the relationships developed with the local community throughout the lifetime of the present Windy Standard Developments, since conception of the proposed Development, BR3 and their agents, Natural Power, have worked closely with the local communities in order to understand the attitudes and opinions of the local community towards renewable energy and the proposed Development.

3.5.24 Natural Power, on behalf of BR3, have liaised with the local community during the pre and post scoping period, ensuring that communities were given additional information if required and ensuring that all queries from community councils, community groups and members of the community were answered and followed up where required.

3.5.25 A public exhibition was held on the 13th of August at Lagwyne Village Hall, Carsphairn, where 19 members of the public attended, the majority of which were supportive of the development. Prior to the public exhibition, letters were sent out to local community councils and other community groups informing them of the forthcoming public exhibition, providing an indication of what would be discussed at the public exhibition and providing details of where and when the event would be held. An A3 poster for the public exhibition was enclosed with the letter and community councils and community groups asked if they could display this poster somewhere within the community to inform as many people about the event as possible. A link to the proposed Development website was provided within the letter in order to provide community councils and community groups with further information if required. In addition, a mail drop was carried out by Cumbria Mailing Services to all properties within 10 km of the proposed Development and all properties within Carsphairn and Dalmellington. A public exhibition notice was also advertised within the Galloway News on the 7th August 2014 informing readers of the forthcoming public exhibition, providing an indication of what would be discussed at the public exhibition and providing details of where and when the event would be held.

3.5.26 Follow up consultation with key members of the community and community council have been carried out to give the community an opportunity to learn more about the proposal and share their views on specific aspects of the project. Ongoing consultation and communication has been held with the community as the design of the proposed Development has evolved to keep them informed and seek their input. This includes an update on the design of the proposed Development provided to the Carphairn Community Council on the 23rd of February 2015 at Lagwyne Village Hall.

Iterative Design Process – Description of Initial Layout Designs

Pre-Feasibility 31 Turbine Layout

3.5.27 An initial study was undertaken which accounted for broad known desk based constraints at the site. This process identified a maximum capacity for the site of up to 31 turbines of approximately 3 MW class. This layout however did not take into account the wind availability on site, detailed landscape and visual considerations, detailed onsite hydrology and potential noise impacts. The 31 turbine layout included six turbines on Meaul Hill, eight turbines on Waterhead Hill, ten turbines on Dodd Hill and seven turbines located to the north and east of the existing Windy Standard Wind Farm. See ES Figure 3.2 in Volume 3 of the ES for illustration of the Pre-Feasibility 31 Turbine Layout that was initially presented for the proposed Development.

Initial Feasibility 23 Turbine Layout

3.5.28 An Initial Feasibility Assessment was conducted that concluded that the proposed Development offered a maximum potential for a 23 turbine layout. As such, in 2012 a 23 turbine layout had been designed which considered detailed landscape and visual considerations and found that the proposed Development is not subject to any constraining statutory designations and an initial desktop assessment of the visual influence of this layout was undertaken which consisted of the production of a Zone of Theoretical Visibility (ZTV) map to a radius of 35 km from the Initial Feasibility 23 Turbine Layout. The ZTV indicated that there was potential for visibility to the west of the proposed Development; however only a limited number of turbines would be visible and visibility beyond 10 km would be small. The landscape and visual assessment also considered the visual impact on Loch Doon in order to minimise impact. It was therefore concluded that whilst further assessment would be required, it would be possible, with careful site design, to minimise any additional landscape and visual impacts to the present Windy Standard Developments.

3.5.29 An assessment of wind availability on site was also conducted which indicated that the wind speed at the proposed Development had the potential to deliver an economically viable wind energy development. Hydrological conditions on site were considered and the potential noise impacts on surrounding residential dwellings were given consideration during the site design iterations to ensure minimum effects on nearby residents.

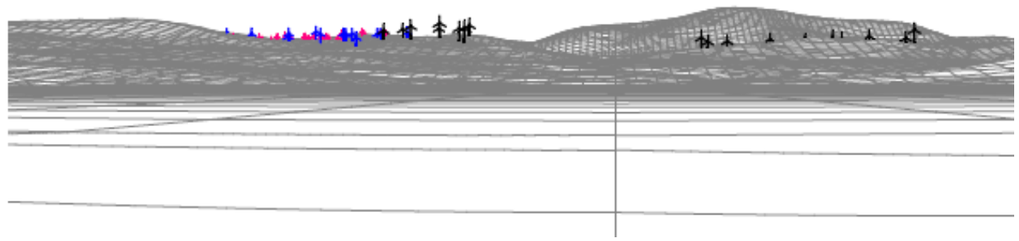
3.5.30 The 23 turbine revised layout was also designed and desktop assessed for line of sight from Prestwick airport Primary Surveillance Radar (PSR), NATS Lowther Hill and NATS Great Dun Fell and any other constraints on site such as ecological and ornithological constraints, hydrological and geological constraints, archaeological and cultural heritage constraints and potential grid connection. The 23 turbine layout consisted of eleven turbines on Meaul Hill, seven turbines on Waterhead Hill and five turbines on Dodd Hill. See ES Figure 3.3 in Volume 3 of the ES for illustration of the Initial Feasibility 23 Turbine Layout.

22 Turbine Scoping Layout

3.5.31 Following a more detailed technical based review of the site layout, exploring the available wind resource on site and noise modelling to consider potential noise impacts, it was concluded that a development of a scale of 22 turbines would be a more technically feasible scale of development. The 22 turbine layout consists of eleven turbines on Meaul Hill with a maximum ground to blade tip height of up to 150 m and eleven turbines on Waterhead Hill, three of which had a maximum ground to blade tip height of up to 100 m and eight of which had a maximum ground to blade tip height of up to 120 m. ES Figure 3.4 in Volume 3 of the ES illustrates the proposed layout presented at Scoping.

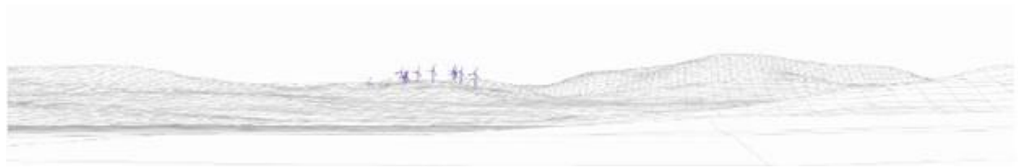
3.5.32 The wirelines which are shown below of the Pre-Feasibility 31 Turbine Layout and the 22 Turbine Scoping Layout for illustrative purposes shows the reduction in visual impact from Loch Doon as a result of the design changes. The wind turbines on Dodd Hill that were proposed in the Pre-Feasibility 31 Turbine Layout and the Initial Feasibility 23 Turbine Layout have been dropped in the 22 Turbine Scoping Layout which has greatly reduced the visual extent of the proposed Development farm from Loch Doon.

Pre-Feasibility 31 Turbine Layout: View Point from Loch Doon



The Pre-Feasibility 31 Turbine Layout above is a cumulative wireline showing the proposed Development in black, the existing Windy Standard Wind Farm in pink and Windy Standard II in blue.

22 Turbine Scoping Layout: View Point from Loch Doon



The view from Loch Doon is significantly reduced from the 22 Turbine Layout above as all turbines on Dodd Hill have been removed.

3.5.33 ES Figures 6.35a and 6.35e and ES Figures 6.36a, 6.36e and 6.36f in Volume 3 of the ES show Dodd Hill in the background and show some of the Waterhead Hill turbines behind Dodd Hill. These ES Figures however can also be used to illustrate how the visual impact could have been significant if the Dodd Hill turbines had not been removed.

20 Turbine Design Day Layout

3.5.34 Following the formal scoping process and the public exhibition, it was identified that landscape and visual considerations were deemed a priority consideration for this site, particularly with regards to the Waterhead Hill Cluster of turbines.

3.5.35 This, along with baseline studies and further site investigations were discussed during a detailed design day which included representatives from BR3, the project landscape architect, the project acoustic consultant and the Natural Power technical, ecology and hydrology teams involved in the baseline surveys. The aim of this design day was to ensure these identified constraints were accommodated while maintaining a coherent site design. The key considerations affecting the detailed layout were slope, peat, hydrology, and landscape and visual constraints.

3.5.36 As with the scoping layout, iterative changes were reviewed by the project landscape architect from the key viewpoints to assess any changes in the layout as it evolved. This process allowed an optimum design, which accommodated for technical constraints and minimised landscape and visual impacts.

3.5.37 As a result of this process, two turbines on Waterhead Hill were removed and one other re-located, in order to reduce the lateral extent of the proposed Development and minimise blade overlap and stacking of turbines behind one another, when seen from the key viewpoints.

3.5.38 A site design of 20 turbines was considered consisting of twelve turbines on Meaul Hill with a maximum ground to blade tip height of up to 150 m and eight turbines on Waterhead Hill with a maximum ground to blade tip height of up to 125 m, which led to the completion of more detailed on site investigations and the development of a detailed baseline description.

3.5.39 In addition, more extensive peat sampling and assessment was undertaken to confirm the locations with regards to their suitability at a finer scale. See ES Figure 3.5 in Volume 3 of the ES for illustration of the 20 Turbine Design Day Layout.

3.5.40

20 Turbine Design Day Layout: View Point from Loch Doon

The 20 Turbine Design Day Layout View Point from Loch Doon which is shown above for illustrative purposes highlights the 125 m turbines on Waterhead Hill in blue and highlights the reduction in lateral extent and blade overlap at the Waterhead Hill cluster as a result of the changes made during Design Day. The above wireline is also a cumulative wireline and shows the proposed South Kyle Wind Farm in red, the existing Windy Standard Wind Farm in green and Windy Standard II in orange.

3.6 FINAL AND PROPOSED LAYOUT (20 TURBINE)

3.6.1 Following a final review of the layout and reflecting back to the design strategy (as outlined in para 3.5.9 to 3.5.11 above), the decision was made to assess the opportunity to accommodate increasing the tip height from 150 m to a maximum ground to blade tip height of up to 177.5 m at Meaul Hill, maximising the capacity and efficiency of the site whilst not significantly increasing the impact on the local environment (see the design strategy outlined in para 3.5.9 to 3.5.11 above). This would help ensure the proposed Development would be as competitive a site as possible under the CfD regime and maximise the potential output of the DGC Search Area for wind farm development.

3.6.2 Site investigations were carried out to assess the feasibility of locating turbines with a ground to blade tip height of up to 177.5 m on the Meaul Hill area of the proposed Development. In addition, an assessment of the landscape and visual impact of turbines of this size was conducted by the project landscape architect. The assessment concluded that the additional visibility from increasing the tip height from 150 m to 177.5 m would be minimal and mainly within areas that are offshore or areas that are remote, unsettled and not generally accessed for recreational purposes.

3.6.3 As a result of the investigations it was considered that turbines of a maximum ground to blade tip height of up to 177.5 m would be acceptable on the lower hill of Meaul Hill and a final layout was agreed with relevant specialists within the project team.

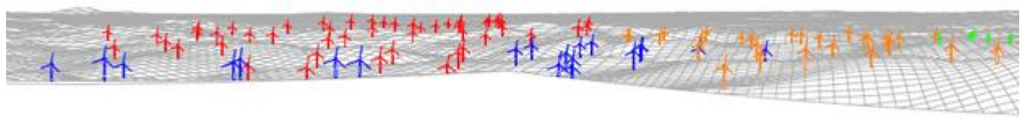
3.6.4 The resultant hub heights for the proposed Development are up to 84 m at the Waterhead Hill Cluster and 121 m at the Meaul Hill Cluster. The proposed deployment of higher hubs at the lower altitude Meaul Hill Cluster will allow the wind resource to be optimised by capturing the more energetic and less turbulent flow above the forest canopy, while also creating a less cluttered visual appearance. Based on Computational Fluid Dynamics (CFD) modelling and local measurements hub height wind speeds at the proposed turbine locations are predicted to range between approximately 7 to 9 m/s, with the mean hub height wind speed exceeding 8 m/s**.**

3.6.5 The final and therefore proposed layout is a technically acceptable and economically favourable 20 turbine layout consisting of eight turbines at Waterhead Hill each with an installed capacity of approximately 3 MW and ground to tip height of up to 125 m and twelve turbines on Meaul Hill each with an installed capacity of

approximately 3.6 MW and ground to tip height of up to 177.5 m. See ES Figure 1.2 and 3.6 in Volume 3 of the ES for illustration of the Final Site Layout.

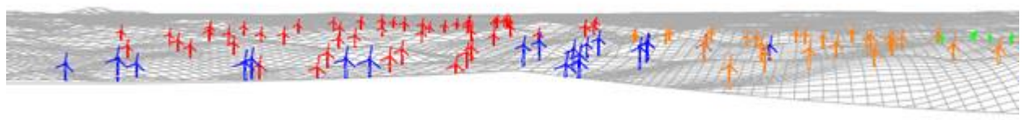
3.6.6 The wirelines below provide an illustration of the lack of additional visual impact as a result of accommodating turbines of a ground to blade tip height of up to 177.5 m at Meaul Hill.

125 m/150 m turbines: View Point from Cairnsmore of Carsphairm



The view point from Cairnsmore of Carsphiarn which is shown above for illustrative purposes highlights the 125 m turbines on Waterhead Hill and 150 m turbines on Meaul in blue. The above wireline is also a cumulative wireline and shows the proposed South Kyle Wind Farm in red, the existing Windy Standard Wind Farm in green and Windy Standard II in orange.

177.5 m turbines: View Point from Cairnsmore of Carsphairn



The view point from Cairnsmore of Carsphiarn which is shown above for illustrative purposes highlights the 125 m turbines on Waterhead Hill and the 177.5 m turbines on Meaul in blue and show that the increase in tip height does not increase the visual impact of the proposed Development. The above wireline also shows the proposed South Kyle Wind Farm in red, the existing Windy Standard Wind Farm in green and Windy Standard II in orange.

3.6.7 As a result of the investigations it was considered that turbines of up to 177.5 m from ground to blade tip height would be acceptable on the Meaul Hill Development Area and a final layout was agreed with the relevant specialists, allowing the project team to fully consider final associated infrastructure.

Operations and Control Building

3.6.8 It is anticipated that the consented onsite control building at Dun Hill (shown in ES Figure 1.2: Site Layout in Volume 3 of the ES) that is used in conjunction with Windy Standard II will also be used for management at the proposed Development. Although the timescale for the use of this building will need to be extended to reflect the operational timescale of the proposed Development, there will be limited additional impact from using this control building for the proposed Development and therefore is not predicted to cause any additional significant impact. Full details of the control building are presented within Chapter 4: Description of Development, of the ES.

Access Track

3.6.9 Access to the site from the public road network would follow the same route as used for the present Windy Standard Developments, and is discussed in greater detail within Chapter 4: Description of Development and Chapter 14: Traffic and Transport, of the ES.

3.6.10 In order to reduce the need for the construction of new tracks, thus reducing the degree of disturbance to the local environment, the proposed Development would be accessed using a combination of the existing access track to site and the consented forestry and Windy Standard II track and new sections of track branching off the consented tracks. However, due to the time difference from the construction of Windy Standard II and the proposed Development, consent for use of all tracks within the application boundary is being sought in this application. ES Figure 1.2 in Volume 3 of the ES shows the proposed turbine layout and the existing and proposed new access tracks. There may be some requirement to upgrade some of the existing tracks and details of the nature of the upgrades will be agreed during the development of the Construction Management Statement (CMS) once turbine manufacturer requirements are known. The use of these will allow access to extend and build the new tracks, to allow plant to dig any new cable trenches and thereafter to access the site for operational and eventual decommissioning purposes. This is discussed in greater detail within Chapter 4: Description of Development and Chapter 14: Traffic and Transport, of the ES.

Construction Compound

3.6.11 During the construction phase of the proposed Development, a temporary compound and laydown site will be required. If a compound and laydown area consented for Windy Standard II cannot be re-used, the construction compound will be built by carefully considering the landscape and visual impact of the compound and hydrological and geological impacts from its construction and use. The construction compound is discussed in greater detail in Chapter 4: Description of Development, of the ES.

3.7 CONCLUSION

3.7.1 In line with the good practice advice from the Scottish Government and procedures normally required for Major Developments under the Town and Country Planning (Development Management Procedure) (Scotland) Regulations 2013 the proposed Development has been subject to a detailed and iterative design process. The final design has sought to balance the technical requirements of the Applicant with the environmental considerations highlighted by consultees and the public during early consultation. The residual impacts of the design process are considered in the following ES chapters.

BROCKLOCH RIG III

Chapter 4

Description of Development

Document history

Author	Emily Peaston	19/01/2015
Checked	Marie Scaife	25/01/2015
Approved	Euan Hutchison	25/03/2016

Client Details	
Contact	Gareth Swales
Client Name	Brockloch Rig III Ltd
Address	c/o Fred. Olsen Renewables Ltd

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1	19/01/2015	First Draft
2	05/03/2015	Second Draft
3	23/02/2016	Third Draft

Contents

Glossary

Term	Definition
Ecological Clerk of Works	The Ecological Clerk of Works (ECoW) will carry out pre-construction surveys during the construction of the proposed Development.
Environmental Statement	A document reporting the findings of the EIA and produced in accordance with the EIA Regulations.
Present Windy Standard Developments	The 'present Windy Standard Developments' refers collectively to the existing Windy Standard and the under construction Windy Standard II Wind Farms.
The proposed Development	The proposed Windy Standard III Wind Farm.
The proposed Development Area	The project development area within the site boundary which is subdivided into the Meaul Hill Cluster and Waterhead Hill Cluster.

List of Abbreviations

Abbreviation	Description
CEMP	Construction Environmental Management Plan
CDM	Construction Design Management
COSHH	Control of Substances Hazardous to Health
CMS	Construction Method Statement
DGC	Dumfries and Galloway Council
ECoW	Ecological Clerk of Works
ES	Environmental Statement
HCoW	Hydrological Clerk of Works
HSE	Health and Safety Executive
kV	Kilovolt
O&M	Operations and Maintenance
PPG5	Pollution Prevention Guidelines 5
PPG6	Pollution Prevention Guidelines 6
PMO	Planning Monitoring Officer
SCADA	System Control and Data Acquisitions
SEPA	Scottish Environment Protection Agency
SNH	Scottish Natural Heritage
SuDS	Sustainable Drainage System
UKFS	UK Forestry Standard

4.1 INTRODUCTION

4.1.1 This Chapter outlines the details of Windy Standard III wind farm (the proposed Development) as specified in the application and Chapter 1: Introduction, of the ES, including specifications of turbines, access tracks and electrical infrastructure. It also describes the general construction methodology, timescales and typical construction equipment likely to be used. Operational and decommissioning phases are also described within this Chapter.

4.1.2 The construction methods detailed below build on best practice methodologies developed at other wind farms to comply with Health and Safety requirements for construction operations and follow relevant guidelines including the Scottish Environmental Protection Agency's (SEPA) Pollution Prevention Guidelines, SNH's Good Practice During Wind Farm Construction and SNH's/Forestry Commission Scotland's Floating Roads on Peat guidance.

4.2 SITE LOCATION

4.2.1 ES Figure 1.1 in Volume 3 of this ES shows the location and extent of the proposed Development. The Development Area is located within Carsphairn Forest in Dumfries and Galloway and is primarily used as commercial forestry plantation. As outlined in Chapter 1: Introduction, of the ES, the proposed Development consists of two development areas, the Meaul Hill Cluster and the Waterhead Hill Cluster. Each cluster is centred on British National Grid Coordinates of NS 579 028 and NS 578 003 respectively.

4.2.2 The application is for a wind farm comprising of up to 20 wind turbines. There will be a mixture of turbine sizes; 8 turbines of an overall height from base to tip not exceeding 125 m and a capacity of approximately 3 MW on Waterhead Hill and 12 turbines of an overall height from base to tip not exceeding 177.5 m each with a capacity of approximately 3.6 MW on Meaul Hill. After community consultations, scoping consultations and detailed design discussions it was agreed that the proposed turbine sizes allow maximum efficiency and exploitation of wind resource without significantly increasing environmental impacts. See Chapter 3: Design Evolution and Alternatives, of the ES for further details of the design process that resulted in this layout. The application also includes forestry felling, external transformer housing, widening of existing public road junction, site tracks, crane pads, foundations, underground electricity cables, 2no. permanent anemometer masts, extension of use of consented operations and control building and temporary construction and storage compounds, 4 borrow pits, on-site concrete batching plant, associated works/infrastructure and Health and Safety sign posting. Infrastructure relating to the under construction Windy Standard II (e.g. existing borrow pits) will be utilised where practical and possible. Where this is the case this application will seek to extend the consented life of that infrastructure for the duration of the life of the proposed Development. Any requirements relating to the reinstatement of such infrastructure will also therefore be deferred until the end of the operation period of the proposed Development.

4.2.3 Included within this will be the under construction substation and control building at Dunhill which will be used by Windy Standard II and will be utilised by the proposed Development. Details of these will require to be addressed and agreed with the relevant authorities as part of the Construction Method Statement (CMS) for the proposed Development and afterwards when the earlier phases are decommissioned.

4.2.4 It is intended that the proposed Development will make use of available capacity on the local transmission network with connection to the under construction on-site Dunhill substation.

4.2.5 As shown in ES Figure 1.1 in Volume 3 of the ES, the proposed Development is located within the Dumfries and Galloway Council (DGC) area. As mentioned above, it is also proposed to use some of the Windy Standard II infrastructure and which is also entirely located in the DGC area. Some additional underground cabling within the proposed Development Area may also be required in order to connect the proposed turbines to the under construction substation.

4.3 SITE LAYOUT

4.3.1 The turbine layout and associated infrastructure is presented in ES Figure 1.2 in Volume 3 of this ES. This ES Figure illustrates the relevant elements, including locations for the 20 turbines, site tracks, crane pads, batching plant, onsite electrical substation and control building, temporary construction and storage compound areas, anemometer mast and potential borrow pit search areas (local temporary sources of construction aggregate which are solely for the purpose of wind farm construction).

4.3.2 Micro-siting allows the exact turbine location and infrastructure to be modified post-consent, following detailed ground investigation and ground clearance. Through industry experience a micro-siting allowance of 50 m is considered appropriate for turbines and infrastructure. Table 4.1 below gives the centre point co-ordinates and proposed maximum tip height for each of the proposed turbines.

Table 4.1: Turbine Locations

Turbine Number	Easting	Northing	Maximum Tip Height (m)	AOD (m)
1	257914	603241	177.5	420
2	258242	603181	177.5	400
3	257506	602943	177.5	410
4	257969	602832	177.5	450
5	258361	602734	177.5	435
6	257582	602518	177.5	405
7	258836	602706	177.5	425
8	258855	602384	177.5	450
9	258005	602391	177.5	400
10	258478	602316	177.5	430
11	258122	601993	177.5	390
12	258299	601578	177.5	400
13	257773	600495	125	510
14	257370	600398	125	490
15	256887	600219	125	460
16	256780	599933	125	460
17	257214	599860	125	510
18	257538	600175	125	500
19	257964	600322	125	520
20	258500	600764	125	490

4.3.3 The layout was developed taking into account the ecological, geological, hydrological, archaeological, topographical, landscape, noise and visual constraints whilst ensuring optimal wind resource use (see Chapter 3: Design Evolution and Alternatives, of the ES for further details).

4.3.4 Concerning layout alternatives, the layouts were tested from a series of 'design viewpoints' and the iterative process continued until a series of key design objectives had been met to an appropriate degree. These are set out in Chapter 3: Design Evolution and Alternatives and Chapter 6: Landscape and Visual Assessment, of the ES.

4.3.5 In simple terms, it was considered turbines with a ground to blade tip height of around 177 m at Meaul Hill, maximised the capacity and efficiency of the proposed Development whilst not significantly increasing the impact on the local environment (Meaul Hill has a summit that lies around 50-80 m lower than the immediate surrounding hills) whilst maintaining turbines of a maximum tip height of 125 m at Waterhead Hill in a structured simple layout from key viewpoints, presented an optimal layout balancing output with impacts.

4.3.6 Each layout, although constrained to some extent by on-site considerations was considered in landscape and visual terms until it was felt that it broadly met the design strategy principles set out in Chapter 3: Design Evolution and Alternatives and Chapter 6: Landscape and Visual Assessment, of the ES as judged from a selection of key representative viewpoints. It was accepted that not all of the design strategy objectives set out in Chapter 3: Design Evolution and Alternatives and Chapter 6: Landscape and Visual Assessment, of the ES could be met fully from every viewpoint but it was felt that this was so from the great majority of the assessment locations.

4.3.7 Once this 20 turbine layout was re-confirmed as being acceptable with respect to other on-site interests (including ecology, hydrology, archaeology, existing land use/holdings), the layout was fixed, final turbine height testing took place and detailed assessment was continued and completed.

4.3.8 The total land take of the proposed Development, after completion of reinstatement measures, including foundations, crane pads, site tracks and new sections of access track has been assessed to be approximately 123,299 m². The operational land use required from the existing developments and access track which is required to operate the proposed Development is approximately 78319 m², which includes tracks indicated in ES Figure 1.2 in Volume 3 of the ES and the use of the electrical and control buildings, and the substation. Indicative drawings for currently available technologies that suit site conditions are presented in ES Figure 4.1 – 4.11 in Volume 3 of this ES. Drawings include indicative turbines, turbine foundations, site track cross sections, crane pads, turbine transformer housing, cable ducts, and the temporary construction compounds and signage.

4.4 USE OF EXISTING INFRASTRUCTURE AT WINDY STANDARD

4.4.1 The following indicates the extent of infrastructure from the existing Windy Standard Wind Farm and Windy Standard II (the present Windy Standard Developments) that is required to construct and operate the proposed Development (please see ES Figure 3.6 in Volume 3 of the ES). For each, a brief description is provided on the extent of use and evaluation.

Access and Site Tracks

4.4.2 Access to the site from the public road network would follow the same route as used for the present Windy Standard Developments, and is discussed in greater detail within this Chapter and in Chapter 14: Traffic and Tourism, of the ES.

4.4.3 In order to reduce the need for the construction of new tracks, thus reducing the degree of disturbance to the local environment, the proposed Development would be accessed using a combination of the existing access track to site and the consented forestry and Windy Standard II track and new sections of track branching off the consented tracks. However, due to the time difference from the construction of Windy Standard II and the proposed Development, consent for use of all tracks within the application boundary is being sought in this application. ES Figure 1.2 in Volume 3 of this ES shows the proposed turbine layout and the existing and proposed new access tracks. There may be some requirement to upgrade some of the existing tracks and details of the nature of the upgrades will be agreed during the development of the CMS once the turbine manufacturer requirements are known. The use of these will allow access to extend and build the new tracks, to allow plant to dig any new cable trenches and thereafter to access the site for operational and eventual decommissioning purposes.

4.4.4 During the construction of the proposed Development, pre-construction surveys will be carried out by an Ecological Clerk of Works (ECoW) to ensure that the use of these existing tracks will have minimal environmental impact. Likewise all environmental considerations and controls discussed within the ES apply to the use of all existing tracks and infrastructure. This further reduces potential impacts during the construction and operation of the proposed Development.

4.4.5 By following the measures described, the use of the tracks during the construction and operational stages of the proposed Development are not expected to have any significant impacts.

Control Building

4.4.6 The under construction control building at Dun Hill (see ES Figure 3.6 in Volume 3 of this ES) that will be used in conjunction with Windy Standard II will be used for the management of the proposed Development also. There will be no further impact from using this control building for the proposed Development and therefore will not cause any significant impact.

Substation

4.4.7 The underground 33 kiloVolt (kV) cables routed from the proposed turbines would be brought together via underground cables to the under construction substation at Dun Hill, which will be used for Windy Standard III. The electricity will be stepped up from 33 kV to 132 kV at the substation before being connected to the grid. There will be no further environmental impact during the operation of the substation for the proposed Development. See below for the construction impacts during the construction of the cabling required for proposed Development.

Grid Connection

4.4.8 The grid connection will be made at the under construction substation at Dun Hill, which is a 132 kV substation, to be used by Windy Standard II. It connects to the overhead power line that travels through to the infrastructure at Coylton. It is the transmission line that provides the grid connection for Windy Standard II and has available capacity secured for the proposed Development.

4.4.9 As noted from the previous developments, because there is potential for wind farm infrastructure to interact with transmission lines, care has been taken to ensure that no turbine would be installed to within 1.5 times the maximum height to tip of the turbine and this exclusion buffer.

4.4.10 Taking into account the Health and Safety Executive's (HSE) Agricultural Information Sheet Number 8; *Working Safely near Overhead Electricity Power Lines* and the present Windy Standard Developments Construction Method Statements (CMS), impact to the overhead power lines will be minimised. Therefore, there would be no additional impacts arising in respect of the proposed Development in respect of electrical infrastructure.

Cabling

4.4.11 The wind turbines envisaged for use on the proposed Development will require external transformers linked to the substation through underground cable ducts (see Section 4.14 below for more information). These would generally follow the existing tracks where possible and will take into account due consideration for way leaving of existing infrastructure and environmental considerations. Along existing and consented tracks, where cabling is required pre-commencement surveys will be undertaken to give an up to date assessment of any ecological and any other environmental sensitivities and will inform the CMS. Pre-construction surveys, as per the rest of the development will be carried out by the onsite Ecological Clerk of Works (ECoW) to ensure construction is not having an unacceptable impact on any species of concern. Cabling will also be carried out in a staged process, with vegetation and topsoil temporarily removed to be back filled as soon as the cables are laid. This method ensures vegetation is replaced as soon as possible and the temporary nature of the disturbance during the works is kept to an absolute minimum.

4.4.12 Following the pre-commencement and pre-construction surveys and the staged nature of the cabling process the impact on habitats, the wider environment and any species of concern will be reduced to a minimum, and will be a short-lived disturbance where it exists

4.5 PUBLIC ROAD ACCESS

4.5.1 Chapter 14: Traffic and Transport, of the ES details the public road network proposed for the transportation of turbine components. The proposed route is the same as that used for the existing Windy Standard Wind Farm and potentially South Kyle Wind Farm and other proposed developments, a summary of which is detailed below.

4.5.2 Access to the site from the public road network would follow the same route as used for the present Windy Standard Developments. The route leaves the A713 north of Carsphairn and continues on an existing private track into Carsphairn Forest.

4.5.3 The condition of the public road along the access route of the A713 would be surveyed and recorded prior to it being used by the heavy traffic required for wind farm construction and/or the commencement of any road modifications. Repair and maintenance work will be carried out on these roads during and following the construction period to rectify any damage caused by the passing of heavy vehicles associated with the proposed Development. All works would be carried out to Dumfries and Galloway and East Ayrshire Council's typical specifications.

4.5.4 The impact of proposed Development construction and operation traffic on the pubic road system in Dumfries and Galloway is assessed in Chapter 14: Traffic and Transport, of the ES.

4.6 PREPARATORY FELLING

4.6.1 The windfarm felling programme was largely driven by technical constraints. Areas of forestry would require to be felled to accommodate the construction and operation of the proposed Development. Typically a minimum area of about 1.54 ha (equivalent to a 70 metre radius circle) would be required to be felled for each turbine; a 10 m buffer around each item of infrastructure, in addition to the area required for the infrastructure; and a 50 m corridor for access roads.

4.6.2 Much of the felled areas can be replanted upon completion of the construction, only leaving felled areas to allow the safe operation and maintenance of the proposed Development for its life time. The replanting requirements are discussed below in Section 4.23 of this Chapter.

4.6.3 Full details of the forestry felling, restocking and forest management practices are provided in Chapter 12: Forestry, of the ES.

4.7 CONSTRUCTION PHASE

Construction Method Statement (CMS)

4.7.1 Prior to the commencement of construction, a CMS would be produced setting out in detail the individual items of works associated with the construction of the proposed Development. It would consider relevant planning conditions and ensure that each activity is carried out safely, in accordance with best practice and the relevant guidelines[1], and to minimise environmental impact, and in accordance with SEPA's pollution prevention guidance.

4.7.2 Typically the document would cover the following topics:

- Site Health and Safety Plan;
- Method Statements and Risk Assessments to include for environmental considerations e.g. sympathetic construction methodology with regard to weather and ground conditions;
- Location and Description of Project;
- Consent and Regulation Approvals e.g. discharge of planning conditions;
- Pre-construction Survey Work Undertaken;
- Turbine Description/Specification;
- Construction Schedule;
- Public Highway Works;
- Site Tracks;
- Temporary Construction Compound;
- Crane Pads;
- Cable Trenches;
- Foundation Works;
- On-site Substation and Control Building;
- Borrow Pits;
- Monitoring - Ecological, Hydrological and Geotechnical and Archaeology;
- Emergency Procedures; and
- Pollution Control and Waste Management – potential waste material, materials that can be reused onsite or elsewhere and mitigation measures.

4.7.3 A Site Pollution Control and Waste Management Plan will be drawn up as part of the CMS. The Site Pollution Control and Waste Management Plan takes into account the types and quantities of waste arising from the proposed Development during the construction, operation and decommissioning stages, offers options to avoid and manage the levels of waste and plans for disposal and details any necessary mitigation measures. This is discussed in more detail in Section 4.26 of this Chapter.

4.7.4 The Site Pollution Control and Waste Management Plan will be written in accordance with relevant guidance including *SEPA Land Use Planning System Guidance Note 4*[2] and *Pollution Prevention Guidelines 5: Works and Maintenance in or Near Water: PPG5*[3]. The Site Pollution and Waste Management Plan will outline the mitigation measures that are proposed to prevent or reduce the likelihood of pollutant leaks at the proposed Development. Waste management measures used to reduce the amount of waste produced as a result of the proposed Development will be detailed as well as the methods used to ensure that such small amounts of waste are safely stored (see Section 4.26 below for more information on Waste Management). The potential to reuse waste on site as a method of waste reduction will be discussed in the Site Pollution and Waste Management Plan and discussed in detail within the Peat/Soil Excavation and Preparatory Felling Section of the CMS. In addition, measures put in place to ensure that waste generated from the construction phase of the proposed Development does not have a significant cumulative effect on local waste management infrastructure will also be detailed.

4.7.5 Previous experience of agreeing the construction methodology during the post-consent/pre-construction stage has proved effective in securing accurate and realistic method statements. At this stage in the project, additional data is available for consultation in the form of detailed site investigations. Furthermore, the civil engineering contractor and the turbine supply contractor would have been chosen by this stage, enabling more detailed preparation of individual method statements. During the preparation of the CMS, correspondence and meetings with SNH, SEPA, the planning authority and other relevant consultees would be undertaken to review the working methods proposed and if necessary, incorporate changes. This iterative process of preparing the CMS ensures that when construction commences there is a documented procedure and risk assessment. This makes

[1] Good Practice during Wind Farm Construction, 2nd Edition. (2013) Scottish Renewables, SNH, SEPA, FCS and Historic Scotland. Available online from: http://www.snh.gov.uk/planning-and-development/renewable-energy/onshore-wind/good-practice-during-windfarm-const/(last accessed 04/12/2015)

[2] SEPA, (2014) Land Use Planning System SEPA Guidance Note 4.

[3] Pollution Prevention Guidelines 5: Works and maintenance in or Near Water PPG5. Available online from: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/290145/pmho1107bnkg-e-e.pdf (Accessed 04/12/2015)

monitoring of the construction activities, either by the appointed site representative or by the various bodies associated with the preparation of the document, more straightforward.

4.7.6 Each Section of the CMS will provide a detailed description of the task to be completed along with risk assessments, where necessary, covering items such as waste management and reuse, pollution prevention, control of waters, nuisance and material use.

4.7.7 The revised EU Waste Framework Directive 2008[4] introduced an exclusion from waste controls (see Section 4.26 below for more information on Waste Management) which applies to *"natural non-hazardous agricultural or forestry material"* that is deemed suitable for use in habitat creation/restoration or soil protection. As such, waste materials such as peat will be re-used on site where those materials are deemed suitable for reuse. Such materials will be reused on site during reinstatement works and habitat restoration.

4.7.8 A Section of the CMS regarding the handling and storage of peat would be prepared which details the techniques used to maximise the potential for excavated material to be reused on-site during reinstatement works (see Section 4.22 below for more details) in accordance with recommended guidance such as *SEPA Guidance on the Assessment of Peat Volumes, Reuse of Excavated Peat and Minimisation of Waste*[5]*, Developments on Peatland: Site Surveys and Best Practice*[6] and in accordance with recommendations from a suitably qualified geotechnical designer, ecologist and hydrologist following a detailed site investigation. Peat slide risk (see Chapter 10: Hydrology, Geology and Hydrogeology, of the ES and Technical Appendix 10.3: Peat Slide Risk Assessment in Volume 4 of the ES) assessment works have been carried out to provide input to the layout design and the results show that through geotechnical risk management, strict construction management and implementation of relevant control measures, the risk of peat failure across the site shall be reduced to residual levels. Additional detailed ground investigation would be conducted prior to construction. In respect of matters regarding construction methodology and peat stability at the site, the following general recommendations would be adhered to and would form part of the overall CMS documentation:

4.7.9 Environmental awareness to be provided to all staff entering on to site; this will include a basic environmental site induction:

- Avoid placing excavated material and local concentrated loads on peat slopes.
- Avoid uncontrolled concentrated water discharge onto peat slopes identified as being unsuitable for such discharge.
- Avoid unstable excavations. All excavations would be suitably supported to prevent collapse and development of tension cracks.
- Avoid placing fill and excavations in the vicinity of steeper slopes.
- During construction install and regularly monitor geotechnical instrumentation as appropriate, in areas of possible poor ground such as deeper peat deposits.
- Implement site reporting procedures to ensure that working practices are suitable for the encountered ground conditions. Ground conditions are to be assessed by a suitably experienced geotechnical engineer.
- Form a contingency plan to detail the level of response to observed poor ground conditions.
- Routinely inspect the Development Area by maintenance personnel including an assessment of ground stability conditions.
- Carry out an annual inspection of the site following completion of works by suitably experienced and qualified geotechnical personnel.
- Maintain stored peat in a suitable condition to minimise the peat drying out.
- Minimise the need to handle stored peat so as to reduce any drying or changes to the peat.

4.7.10 The layout of the site infrastructure has predominantly been sited on peat less than 0.5 m deep to minimise the impacts on the peat habitat sites. However all procedures will follow best practice guidelines (see Technical Appendix 10.3: Peat Slide Risk Assessment in Volume 4 of the ES for further information regarding peat stability at the proposed Development).

4.7.11 The proposed Development is located within commercial forestry. As such, a Section of the CMS regarding the handling, storage and disposal of Forestry Waste would be prepared in accordance with recommended guidance such as SEPA Guidance Notes 'WST-G-027 Management of Forestry Waste' (2013) and SEPA Guidance Notes 'LOPS-GU27 Use of Trees Cleared to Facilitate Development of Afforested land' (2014) and in accordance with recommendations from our forestry consultants DGA Forestry.

4.7.12 Other Sections relating to site-specific items including landslide hazard and geotechnical risk register, identified during the pre-construction phase could also form part of the CMS. It is intended that the CMS will be an evolving document and staged completion of the document would be undertaken in line with the progression of construction. Updating of the document to reflect changes in the methods to be used would also be carried out, as and when necessary.

4.8 WIND FARM CONSTRUCTION AND REINSTATEMENT TECHNIQUES

4.8.1 Construction of the proposed Development would begin following granted consent from the Scottish Government for the development. It is expected that the commissioning of the turbines will take place in two phases ultimately determined by the CMS.

4.8.2 Section 4.7 above describes the construction phase in detail, however, the general order of on-site activities is summarised in Table 4.2. These items generally follow chronologically but some items will run concurrently.

4.8.3 Any construction works required at the on-site substation and the grid connection can be lengthy processes which will commence early in the construction programme to allow a live grid connection to coincide with the commissioning of the first phase of turbines.

Table 4.2: Construction Elements

Construction Elements
Site investigation
Mobilisation of civil and electrical contractor
Construction and upgrades to access and site tracks
On-site temporary construction compound
Preparatory Felling
Track reinstatement
Excavation and construction of turbine foundations
On-site cabling
Works on the existing substation
Preparation of crane pads
Installation of turbine transformers

[4] Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives. Available online from: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/218586/l_31220081122en00030030.pdf (last accessed 04/12/2015)

[5] Guidance on the assessment of peat volumes, reuse of excavated peat and minimisation of waste, SEPA. Available online from: http://www.scottishrenewables.com/publications/guidance-assessment-peat-volumes-reuse-excavated/ (last accessed 04/12/2015)

[6] Developments on Peatland: Site Surveys and Best Practice. Available online from: http://www.scotland.gov.uk/Resource/Doc/917/0120462.pdf (last accessed 04/12/2015)

Construction Elements
Mobilisation of turbine supply contractor
Anemometer delivery and erection
Turbine delivery
Turbine erection
Reinstatement around turbines
Turbine fit-out
Connection to substation and grid connection
Commissioning of wind farm
Reliability testing
Demobilisation

4.8.4 Table 4.2 represents a simplistic process of the different construction elements given in chronological order. It should be noted that there will be a degree of overlap between individual elements. It should also be noted that these elements relate to permanent infrastructure. Some temporary works are required during the construction phase, which are not included in this description due to their minor nature and duration. These might include construction of temporary hardstanding areas for crane components, pads for supporting the rotors during construction or drainage measures in turbine excavations.

Construction Environmental Management Plan (CEMP)

4.8.5 As part of the CMS, a CEMP will be produced and finalised setting out the means by which each element of the proposed Development will be constructed on site. A draft CEMP is set out in Technical Appendix 4.1: Draft Construction Environmental Management Plan in Volume 4 of the ES.

Construction Timetable

4.8.6 The construction period for the whole of the proposed Development is envisaged to last for approximately 15 months, from commencement of construction through to installation and commissioning of the turbines, ending with site reinstatement (as shown on the construction programmes). Construction would consist of the following phases which, although presented in a typical sequence, may overlap or occur concurrently:

- Public highway improvements.
- Construction of a site storage compound for off-loading materials and components and to accommodate site offices and mess facilities. Depending on where the site storage compound is, normally some tracks would be required.
- Construction of site tracks and excavation of cable trenches.
- Construction of turbine and crane pads.
- Delivery and erection of turbine towers, and installation of nacelles and blades.
- Delivery and erection of on-site anemometer mast.
- Laying of on-site cabling.
- Installation of turbine transformers.
- Works to the on-site substation and control building.
- Testing and commissioning of the turbines and the wind farm electrical system.
- Site reinstatement (on-going during works).

4.8.7 A typical 15 month construction programme is presented in Table 4.3 below.

Table 4.3: Indicative 15 month construction programme

TASK NAME	MONTH 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
MOBILISATION															
ACCESS AND SITE TRACKS															
SWITCHGEAR BUILDING	The existing substation will be utilised														
FOUNDATIONS															
CABLING															
HARD-STANDINGS															
TURBINE ERECTION															
COMMISSIONING OF WIND FARM															
RELIABILITY TESTING															
RESTORATION WORKS*															
DEMOBILISATION															

***** Restoration work around track edges, turbine bases and other areas of infrastructure will be on-going to ensure reinstatement of any peat substrate occurs as soon as possible.

Typical Equipment Used at the Site

4.8.8 The following is an indicative list of equipment that would be required to construct the proposed Development. The equipment would be in use on the site or stored on site within the construction compound. Where appropriate, vehicles such as cranes, trucks, excavators and bulldozers may be secured and left on the track at appropriate working areas overnight.

4.8.9 *One 800/1000 tonne capacity crane and two 400/500 (or less) tonne capacity cranes.* The 400/500 tonne cranes would be used for general construction duties such as the preparation of the reinforcement cages at the turbine bases and as tailing cranes for steerage during the turbine erection. The larger crane would be used for the turbine erection to lift the heavy components into place.

4.8.10 *Two 30/40 tonne 360 degree excavators.* These would be used at borrow pits for excavating stone and for excavation of turbine foundations. Ripper buckets or hydraulic breakers may be used for the excavators winning stone from the borrow pits.

4.8.11 *Three smaller excavators in the range of 10 to 20 tonnes.* These would be used for road construction and profiling and restoration of verges, turbine foundations and for excavation of cable trenches.

4.8.12 *One tracked bulldozer.* This would be used for a number of tasks such as stockpiling material from turbine excavations, management of stockpiles within the borrow pits, road construction, crane pad preparation and re-grading of the track running surface.

4.8.13 *Approximately four dump trucks.* These would be used for moving material around the site, e.g. for moving excavated peat or soils from cut site tracks to any stretches of floating track over deeper peat, and stone from the borrow pits for track construction.

4.8.14 *One or two heavy duty vibrating rollers.* The rollers are used to compact new roads, turbine foundation formations and are essential in compacting the crane pads and turbine backfill to the appropriate densities.

4.8.15 *On-site concrete batching plant.* If it is considered more feasible to batch concrete on site rather than import concrete batched offsite an onsite batching plant would be used (see Section 4.19 below). Concrete would be delivered from the batching plant to the relevant construction area by cement trucks. The temporary location of the batching plant would be agreed with the Local Planning Authority as part of the CMS.

4.8.16 *Approximately six cement trucks with revolving drums.* These would only be necessary if an on-site concrete batching plant was used. The trucks would be used to carry the concrete from the batching plant in the construction compound or borrow pit to the turbine foundation being formed. Where concrete is batched off-site and brought to the site in cement lorries, these would enter the site and pour concrete directly where required, therefore removing the need for on-site cement trucks.

4.8.17 *One mobile concrete pump*. The concrete pump would be used on-site during the concrete works for the turbine foundations and the metering building. The pump would be lorry mounted and have a large boom to enable placement of the concrete within the turbine base excavations. The concrete wagons would reverse up to the rear of the pump and deliver the concrete into a hopper which would be connected to the pump. Using the pump allows a controlled and highly flexible method of pouring foundations.

4.8.18 *Two cable laying vehicles.* This would comprise a lorry or tractor with a revolving drum attachment for laying of cables in trenches alongside site tracks and a tracked excavator with drum attachment for the offsite cabling on stretches where it is not routed alongside a new or existing track.

4.8.19 *Two small trucks or four wheel drive vehicles with trailers*. This would be used for transporting of small loads around the site i.e. ducting pipes for cables in turbine foundations.

4.8.20 *Two minibuses and six four wheel drive vehicles.* These would be used for transporting construction workers and site managers around the site. These would be likely to leave the site on a regular basis transporting workers to and from their billets off-site.

4.8.21 A number of other vehicles would bring loads to the site, but would not be stored at the site. These would include lorries with flatbed extendable trailers carrying all turbine components including transformers, lorries carrying cabling, steel rods for concrete reinforcement and concrete lorries with revolving drums in the case that concrete is batched off-site, or lorries carrying water, cement and aggregate to be mixed in an on-site batching plant (if used).

4.8.22 To prevent mud entering the public road system, if necessary, the wheels of all lorries leaving the site would be washed either using a manual spray or a wheel washing drive through unit.

4.8.23 *Cabins/Welfare Facilities.* Due to the requirement under Health & Safety Legislation and the CDM Regulations for welfare facilities on site and the exposed nature of the site, a number of cabins would be needed in the construction compound(s). These would have offices, canteens, drying-rooms, toilets and washing facilities. The units would be self-contained and no discharge of drainage would be made to the surrounding land unless otherwise agreed with SEPA and the local authority. Smaller, mobile self-contained units are likely to be required as work progresses throughout the site. These would be placed at suitable locations to tie in with the work interfaces as required. A typical layout of the construction compound area is presented in ES Figure 4.1 in Volume 3 of this ES.

4.8.24 *Fuel & Chemical Storage*. Fuel would be required for the vehicles, generators and other equipment on site. The storage facilities would typically comprise of a bunded concrete pit containing a lockable, bunded fuel tank and a separate lockable housing for the storage of construction chemicals. In addition there would typically be a wheeled, double skinned bowser for transport of fuel to tracked vehicles. Drip trays would be used when refuelling vehicles on the site. Emergency spill kits would be kept on site adjacent to the fuel storage area and with the mobile bowser. A Principal Contractor (please see Section 4.21 below which details site representatives and support staff) would have a 24 hour emergency response company on standby in the event of a spillage incident. Vehicles would be refuelled at their working location to prevent loss of time and use of fuel returning to any designated refuelling areas. All previous stated measures would be used when refuelling vehicles, taking into account all guidance and pollution prevention measures, and the bowser operator would be suitably trained to deal with any spillage.

4.8.25 *Construction Materials.* A variety of materials would be utilised during the construction of the proposed Development including, but not limited to; concrete, reinforcing steel, timber for joinery work and shuttering, stone and sand for road construction, general construction sundries, electricity cables. Wherever possible, the re-use of materials would be carried out, i.e. formwork to be re-used, excavated material from foundations to be reused in the preparation of crane pads and roads, topsoil for re-instatement and landscaping, etc. An indication of the materials used and the amount of resources (plant and labour) is generally included in the preparation of the CMS. Handling of potentially hazardous materials would be carried out in accordance with SEPA Pollution Prevention Guidelines, but particularly; Pollution Prevention Guidelines 6; *Working at Construction and Demolition Sites: PPG6*[7] concerning the delivery, handling and storage of materials. For example, the preparation of contingency plans, and briefing operatives on the procedure to follow if a spillage occurs would be covered by the appointed civil engineering contractor, displayed on site and contained within the CMS document prior to construction commencing.

[7] Working at Construction and Demolition Sites: PPG6. Available online from: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/290139/pmho0412bwfe-e-e.pdf (last accessed 10/12/2015).

4.9 SPECIFICATION OF TURBINES

Description

4.9.1 The selected turbines would be of a modern design with three blades mounted on a horizontal axis, attached to a nacelle, housing the generator, gearbox and other operating equipment. The nacelles would be mounted on a tubular tower which allows access to the nacelle. There are 2 different blade tip heights of turbines proposed; 8 turbines of an overall height from base to tip not exceeding 125 m on Waterhead Hill and 12 turbines of an overall height from base to tip not exceeding 177.5 m on Meaul Hill – see Table 4.1 for further details. It is expected that the turbine cut in wind speed will be 3m/s and will rotate clockwise.

4.9.2 Wind turbine towers will likely be constructed from steel and the blades from fibreglass.

4.9.3 It is proposed that the turbine tower, nacelle and blades will be finished in a semi-matt, off-white/pale grey colour. Typical turbine specifications, of the type being considered for use on the site, are presented in ES Figures 4.2a and b in Volume 3 of the ES indicating the different turbines heights proposed. In order to comply with Health and Safety requirements for the site, the Applicant would propose to apply identification numbers to the sides of the turbines. Numbers would be up to1000 mm tall by 900 mm wide and would be positioned between 1.5 m and 3 m from ground level in order to be visible from the approaching access track. Details of these would be agreed as part of the CMS.

4.9.4 There may be a need for transformer housings to be situated adjacent to each of the turbine towers. The requirement for such structures, along with their dimensions, will vary based on the final turbine choice (some turbine types require two stacked transformer housings). Indicative design for typical transformer housing is shown in ES Figure 4.3 in Volume 3 of the ES.

Erection of Turbines

4.9.5 Two types of cranes are required for the erection of the turbines; 500/600-tonne capacity cranes and 100/200-tonne capacity tailing cranes. The cranes would use the crane hard standing area as indicated in ES Figure 4.4 in Volume 3 of the ES.

4.9.6 Where possible, the delivery of the turbine components would be scheduled, weather dependent, to allow for direct lift off the transport trailers. Otherwise, turbine components would be stored on, or adjacent to, the crane pad areas. Alternatively, components may be delivered to the construction compound for internal distribution by a separate tractor unit. The tower sections would be erected, followed by the nacelle and hub. Following erection of the tower sections and the nacelle, the blades would either, be lifted and attached individually to the hub in position, or the hub and blades would be raised together, as a unit, and attached to the nacelle. The cranes would then move to the next turbine location.

Operation

4.9.7 Once installed and fully commissioned, the wind turbines would operate automatically and can be controlled remotely or from the on-site metering building. Regular visits will be made by technicians to infrastructure and turbines in four-wheel drive (4WD) vehicles or similar. In addition, longer servicing visits would be required, typically every six months, along with irregular unscheduled maintenance, as may be necessary. Occasional use of larger vehicles, such as cranes or lorries similar to those used during construction may be necessary, should there be a requirement for replacement of major turbine components.

4.9.8 Additional anemometer masts will be required and the wind farm performance would be remotely monitored using these permanent anemometer masts, together with a Supervisory Control and Data Acquisition system (SCADA) that would monitor the individual turbines and the grid connection.

Environmental Considerations

4.9.9 All turbine transformers would be sited on bunded foundations that are able to contain 110 % of the oil contained within it. Any leaks from equipment within the nacelle would be contained within the turbine.

4.10 TURBINE FOUNDATIONS

Construction

4.10.1 Reinforced concrete gravity foundations are envisaged for use for the proposed turbines, as for the consented Windy Standard II turbines. This foundation type is typically an inverted T shape consisting of a large pad with protruding upstand left approximately 200 mm proud of the finished ground level. The pad is back filled with selected as-excavated material or stone material placed and compacted over the foundation. The base tower section of the turbine is subsequently connected to the foundation either via an embedded end can (short tower section) which is cast into the foundation or alternatively by using holding down bolts that are cast into the upstand section of the foundation. Stability of the turbine is provided through the weight of the foundation and the material replaced and compacted over it.

4.10.2 A typical turbine foundation specification is presented in ES Figure 4.5 in Volume 3 of this ES. Detailed design specifications for each foundation would depend on the site specific factors such as ground conditions, the specific turbine used and various other engineering considerations. Typically a square concrete base plate of approximately 18 m x 18 m usually suffices for turbines with the dimensions identified in ES Figure 4.2a and 4.2b in Volume 3 of the ES. Combined with the protruding upstand, the overall depth of the foundation would be around 3-3.5 m. Following construction of the foundations, a layer of peat, peat turfs and/or mineral soils that was excavated from the turbine foundation area would be reinstated. Transformers would be located within housings, as shown in ES Figures 4.2a, 4.2b and 4.3 in Volume 3 of the ES, adjacent to the turbines with power cables from the turbines passing through ducts cast into the foundation.

Environmental Considerations

4.10.3 Depending on the height of the water table at the foundation location, a drainage system may be installed around the foundation to prevent the build-up of water pressure under the foundation. Alternatively, in locations that were particularly sensitive to hydrological disturbance, a submerged foundation design could be employed which would not require a drainage system around the foundation.

4.10.4 Cement entering a watercourse can have a detrimental effect by drawing oxygen from the water and increasing its alkalinity. If an on-site batching plant is required it would be situated away from water courses, either within a borrow pit or at another secure location which will be agreed in advance with Scottish Environmental Protection Agency (SEPA). Although the site has been designed to avoid sensitive areas as far as possible, particular care would be taken pouring concrete at turbine foundations in the vicinity of watercourses and in areas of deeper peat. SEPA Pollution Prevention Guidelines 5*: Works and Maintenance in or Near Water: PPG5* as well as Pollution Prevention Guidelines 6; *Working at Construction and Demolition Sites: PPG6* would be adhered to and in addition SEPA would be consulted during the preparation of the CMS to ensure that the appropriate measures are put in place. This may include construction of a settlement pit within the construction compound or elsewhere for treating rinse water from concrete lorries and measures to prevent water from entering excavations in the vicinity of watercourses.

4.11 SPECIFICATION OF PERMANENT ANEMOMETER MAST(S)

4.11.1 Wind farm performance would be remotely monitored using two new permanent anemometer masts, one located at each turbine cluster each up to the hub height of their respective turbines. A System Control and Data Acquisitions (SCADA) unit would monitor the individual turbines and allow remote technical control. The location of the new permanent anemometry masts is shown on ES Figure 1.2 in Volume 3 of the ES, and would consist of a lattice tower mast of up to 84 m in height at the Waterhead Hill Cluster and up to 121 m in height at the Meaul Cluster as shown in ES Figure 4.6a and b in Volume 3 of the ES.

4.11.2 In terms of additional anemometer requirements, each of the turbines would have an anemometer located on the nacelle in order to operate the turbines. Furthermore, it is proposed that several ground based laser anemometer devices of approximately 2.5 m in height and requiring a ground area of up to 25 m^2 of relatively level ground per unit are installed. These would be secured by means of a 2 m high palisade type fence for each unit and would have a mains power supply taken from the wind farm electrical network. The location and number of these devices to be installed would be agreed with the relevant planning authorities as part of the CMS at the time of construction.

4.12 CRANE PADS

Construction

4.12.1 Cranes would be required during the erection of each turbine at the turbine site, typically a 800/1000-tonne crane and a smaller 100/200-tonne crane. To provide stable, firm ground for safe operation of the cranes during the installation of turbines, areas of hardstanding would be laid down on one side of each turbine foundation. These would need to be suitable for the outriggers of the respective cranes; leading to an area of approximately 55 m x 35 m for simultaneous use of both cranes (see ES Figure 4.4 in Volume 3 of this ES). Their locations will be finalised following further site investigation, but will maximise use of the access tracks, where possible, to minimise the carbon footprint of the proposed Development. Typically, construction of the hardstanding areas would be similar to construction of the site tracks (on shallow soils) with 100-150 mm of topsoil removed and stored adjacent to the sites and remaining soil removed down to a suitable bearing stratum. Geotextile material would be laid down with crushed stone on top, to a depth of around 700 mm. The crushed stone would be sourced from the borrow pit locations identified indicatively in ES Figure 1.2 in Volume 3 of the ES.

4.12.2 Additional temporary hardstandings may be required at various stages during turbine construction and erection. This may include temporary hardstanding to facilitate the erection of crane components, lattice boom or turbine components e.g. rotor assembly.

Environmental Considerations

4.12.3 Prior to excavation for the crane pad, the vegetation layer would be carefully removed followed by any underlying peat. The crane pad will be excavated to form a level, solid platform with suitable graded stone excavated from borrow pits and turbine foundation excavations. The removed peat will either be relocated to the nearest restoration area or re-used to sympathetically reinstate around the turbine foundations or temporarily stored for relocation as soon as is practical (see Section 4.22 below). Stored peat would be prevented from drying out by storing the turfs close together to prevent drying of the edges. They will be monitored during storage and irrigated if required. On completion of erection and installation works, it is proposed that the areas of hardstanding will remain as it may be required during the operational phase of the proposed Development. It is envisaged that the surrounding grassland vegetation will re-colonise the area. A diagram of a typical crane hardstanding can be found in ES Figure 4.4 in Volume 3 of the ES, although the final detail may vary depending on the exact make and model of turbine procured.

4.12.4 Reuse and storage of peat will be fully discussed within the CMS and will follow best practice contained within SEPA Guidance on the Assessment of Peat Volumes, Reuse of Excavated Peat and the Minimisation of Waste and SEPA Land Use Planning System Guidance Note 4.

4.13 SITE TRACKS AND BORROW PITS

Description

4.13.1 It is expected that new stone for upgrades to tracks and new tracks will be won from borrow pit locations identified onsite. Existing quarries and consented borrow pits for forestry activities and Windy Standard II will be

used or re-opened where there is sufficient rock and where practicable. From initial site assessments the indicative locations of these are shown on ES Figure 1.2 in Volume 3 of this ES; however final locations would be agreed as part of the CMS for the scheme and subject to detailed ground investigations to confirm suitability of material. Additional borrow pit potential search areas have been identified should further stone be required (see ES Figure 1.2 and ES Figure 3.6 in Volume 3 of the ES), however these additional borrow pit potential search areas have not been assessed as part of the EIA and therefore do not currently form part of the planning application. Should we need these additional borrow pit potential search areas a non-material variation will be sought and any further borrow pit locations will be subject to the successful outcome of a relevant Mineral Extraction Licence application which would be made to the relevant authority. The final reinstatement of these borrow pits would be agreed with the local authority in consultation with SNH prior to reinstatement works commencing.

Construction

4.13.2 Approximately 9 km of new on-site tracks and 6.6 km of upgraded tracks would link the proposed turbines and infrastructure to the road network. The design philosophy behind the track layout has taken into account a number of factors including topography, hydrology, watercourse crossing, ground conditions and construction parameters and has been based on best practice methodology developed at other wind farm sites. It is proposed that existing and previously consented tracks are used where possible in order to reduce the need for construction of further tracks. Using existing tracks will also further reduce the degree of disturbance to the local environment. The proposed track layout has been designed following an onsite review and minimised the number of water crossings necessary and used as far as possible the existing infrastructure in place to minimise impacts on the environment.

4.13.3 The initial stripping of top soil for the tracks and placement of stone material for construction of tracks has the biggest potential to release sediment into watercourses. Therefore, using methods consistent with industry best practice sediment measures would be put in place ahead of the track construction activities. Sediment would be transported the furthest by existing surface water channels and manmade drainage systems, therefore proactive mitigation measures would require these to be identified prior to the track construction. Within the channels and drains and any necessary settlement ponds, silt traps would be constructed prior to track construction. The silt traps would likely be constructed using straw/hay bales or specialized siltation fencing, pinned into place, allowing water to either percolate through the bale or flow over. Where machinery is required for any of these up-front activities they would have low pressure bearing tracks. Sediment transport mitigation drainage systems would be subject to regular maintenance during the lifetime of the proposed Development.

4.13.4 For construction of new sections of track, alternative methods would be utilised for different areas of the site, depending on site specific conditions. For each method, the track running width (excluding drainage channels and cable trenches) would generally be approximately 5 m wide, with the exact width depending on the local ground conditions. Track widths may be wider for short sections such as lengths with passing places and at sharp bends and track junctions. Excavated roads would be used for on-site track construction and for access tracks, where overlying soil or peat material would be removed with a foundation formed on the underlying glacial till or the weathered rock horizon, as shown in ES Figure 4.7 in Volume 3 of the ES. Where a localised area of peat averaging over 1 m depth for over 100 m in length occurs or for any other area where it is thought to be necessary following detailed design, floating roads could be used. As detailed in ES Figure 4.7 in Volume 3 of the ES, floating tracks would be constructed by placing layers of geogrid directly on top of the vegetation with as-dug or imported stone placed on top. Where more strength is required, due to ground conditions, additional geogrid layers or timber rafts would be used. Excess peat from excavated or cut track sections would be used to dress the batters of floating road sections.

4.13.5 In addition there would be a requirement for drainage channels along one or both sides of each section of track depending on the ground conditions along each track segment (see ES Figure 4.8 in Volume 3 of the ES) to prevent the track itself acting as a watercourse. Tracks would be designed with a crossfall, towards the drainage ditches, to prevent build up of water on the running surface. It is important that the water flowing along the drainage ditch is not able to build up enough volume and velocity to act as a major sediment transport route. To prevent this happening, cross drainage pipes would be placed under the road at regular intervals. This also helps minimise the effect the road construction would have on the hydrology in the adjacent area and prevent concentration of water flow higher in the catchments' area than would necessarily occur. The drainage ditch would also be blocked just above the cross drainage inlet, thus preventing water from simply flowing past the inlet. Using stone available onsite, a head wall would be constructed to prevent erosion around the inlet. A silt trap would also be constructed at the inlet to the cross drainage, to minimise sediment entering the pipes. The outlet of the cross drainage would allow the water to filter through the adjacent vegetation.

4.13.6 For safety reasons, marker posts may be placed in the ground by the edge of the track in order to guide on-site vehicles during times of poor visibility or at night to turbines and site infrastructure. In addition, safety and/or directional signs would be placed at strategic points across the site area to inform members of the public that they are entering a wind farm area, make them aware of potential hazards and provide directions to emergency services should the need arise. Any signage would be agreed with the relevant authorities as part of the CMS.

4.13.7 Tracks between turbines and the anemometry equipment are required during the operational period of the proposed Development to allow for routine maintenance operations and the replacement of larger turbine/electrical components.

4.14 ON-SITE CABLING

Description of On-Site Cabling and External Turbine Transformers

4.14.1 The wind turbines envisaged for use on the proposed Development will initially generate electricity at 690-1000 Volts. This needs to be converted to 33,000 Volts (33 kV) via a transformer located within the turbine or immediately adjacent to the tower of each turbine. Typical specifications for possible external transformer housings currently available are given in ES Figure 4.3 in Volume 3 of the ES. The indicative dimensions of the external transformer housing shown within ES Figure 4.3 in Volume 3 of the ES are 4 m (length) x 2 m (width) x 3 m (height). It is proposed that the external transformer housing will be dark green in colour; however this is subject to confirmation with the DGC. Any external transformer would be linked to the turbines through cable ducts in the turbine foundations. Underground cable routes between turbines and the substation compound would generally follow track routes. These would be placed up to 2 m from the track verge and drainage ditches.

Construction

4.14.2 The transformers would be linked to the on-site electrical substation and metering/control building via 33 kV underground cables placed in trenches. The route within the site would generally run adjacent to the route of on-site tracks where possible. The underground cables from the proposed Development to the on-site substation will likely be routed across open ground away from site tracks. The route would be marked above ground with clearly identified posts, spaced at suitable intervals along the length. This would be agreed as part of the CMS.

4.14.3 Cables would be laid from a drum attached to a suitable vehicle. Each 33 kV cable would arrive as three insulated cores. These would be gathered in the trench and bound together along the entire length of the trench in a trefoil arrangement. Communication cables and earth tapes would also be laid in the same trench. The cables would be protected from mechanical damage by a sand bed and surround. Two layers of marker tape and/or tiles would be buried above the cables to prevent accidental excavation, and concrete marker posts would be placed at regular intervals to enable the cables to be located in the future.

4.14.4 Silt, scour and run-off could pose a problem as the cable trench can act as a preferential drainage channel. Backfilling of the trench should be carried out as soon as is practicable and the road drainage installed should be set up with suitable silt traps as the construction proceeds. In steep sections, impermeable plugs should be used in the cable trench to prevent the channel becoming a preferential drainage run, ideally using locally won clay material.

Environmental Considerations

4.14.5 In areas where the surrounding soils are very coarse gravel or peat, the cable trench footprint shall have a geo-textile wrap placed within it to prohibit fines migrating from the backfill into the surrounding sub-soils. These areas shall be identified on site during the commencement of the works. Where surplus mineral soil material is present, this shall be transported back to the borrow pit for use in the reinstatement and final profiling.

4.14.6 On-site cable trenches would be located to minimise the area of disturbance, up to 5 m beyond the edge of the site track in case of multiple circuits. Trench excavation, cable laying and backfill would be carried out in a continuous operation (minimising the length of trench open at any one time) and may occur subsequent to the construction of on-site tracks or after the erection of turbines. Prior to excavation, the topsoil/turfs would be stripped and placed to the side in a temporary stockpile. A trench would then be dug with a small excavator or backhoe to approximately 1 m in depth and up to 1.5 m in width.

4.14.7 Where cables cross contours on steeper areas of ground, clay plugs would be placed at intervals within the trench to prevent the trench acting as a water conduit. ES Figure 4.8 in Volume 3 of the ES gives an indicative outline of the cable trench. The final cable positions would be surveyed and supplied in 'as built' drawings for the Operations and Maintenance team.

4.14.8 Alternatively, cable ploughing may be adopted if ground conditions permit. The final choice of method will depend on the appointed contractor and the results of further site investigation.

4.14.9 Indicative details of the cable/service trenches are shown in ES Figure 4.9 in Volume 3 of the ES. Cables would be laid in sand for protection with warning tapes/boards placed above to mitigate the risk of unintentional excavation. Impermeable barriers (plugs) would be placed in the sand layer at regular intervals to prevent the trench acting as a water conduit with more frequent spacing between plugs on steeper gradients.

4.14.10 In all cases, the cables would be buried to a depth of approximately 1 m. Reinstatement would be carried out to relay the previously stripped top layer of peat turfs containing the seed bank, over the top of the cable trench. This reinstatement would be conducted following the backfilling of each cable trench section.

4.14.11 At track crossings and within concrete foundations, the cables would be laid within plastic ducts.

4.14.12 Existing watercourses should be monitored during the works, both to prevent water entering the excavation, and also for runoff and silt escaping and entering these. These may need temporary diversions/piping until the track is complete and the watercourses can be reinstated.

4.14.13 On decommissioning of the wind farm, on-site cabling can be removed, if required. Most modern cables are aluminium and are relatively benign and inert; over time these will break down to clay. These can be electrically isolated and left in-situ or cut and pulled from the cable trench depending on the planning requirement.

4.15 CONTROL BUILDING

4.15.1 It is anticipated that the under construction control building at Dun Hill (shown in ES Figure 3.6 in Volume 3 of the ES) that will be used in conjunction with the under construction Windy Standard II will also be used for management of the proposed Development.

4.16 SUBSTATION

4.16.1 The underground 33 kV cables routed from the proposed turbines would be brought together via underground cables to the onsite substation at Dun Hill. The electricity will be stepped up from 33 kV to 132 kV at the substation before being connected to the grid.

4.17 GRID CONNECTION

4.17.1 The grid connection will be made at the consented 132 kV Dun Hill substation on site, to be used by Windy Standard II. It connects to the overhead power line to Coylton.

4.18 CONSTRUCTION COMPOUND AND FACILITIES

Description

4.18.1 During the construction phase of the proposed Development, a temporary compound and laydown site will be required. If a compound and laydown area consented for Windy Standard II cannot be re-used, the construction compound will be built by carefully removing topsoil or peat turfs down to a firm substrate, laying down geotextile material and then constructing a working surface of stone extracted from the borrow pits. The topsoil/peat would be stored adjacent to the site for reinstatement or used elsewhere on the site. Final details of the compound and laydown area will be agreed as part of the CMS.

Construction

4.18.2 The dimensions of the compound would be up to 100 m x 100 m and would be surrounded by a security fence. Due to the requirement under health and safety legislation, the Construction Design Management (CDM) Regulations for welfare facilities on site, and the exposed nature of the site, a number of cabins would be needed in the construction compound. These would have offices, canteens, drying-rooms, toilets and washing facilities. Smaller mobile, self-contained units are likely to be required as work progresses throughout the site. These would be placed at suitable locations to tie in with the work interfaces as required. A typical layout of the construction compound area is presented in ES Figure 4.1 in Volume 3 of the ES.

4.18.3 The compound would be used, where necessary, for temporary storage of the various components and materials which are required for construction.

4.18.4 A settling pit/concrete washout bay and wheel wash may be included near the construction compound. When concrete lorries have deposited their loads, there is a requirement to wash out the inside of the concrete drum. This requires a few gallons of water that would then be washed out from the drum into a settlement pit. The size of this pit would depend upon the flow of concrete lorries up to the site (or within the site, if an on-site batching plant is employed) but would be lined with an impermeable sheet and granular fill to assist in the settling process. The construction compound will be reinstated at the end of the construction period. The stored subsoil and the stored topsoil would be laid over the geomembrane separating it from the underlying stone surface and then reseeded using a seed mix selected or where possible, turfs would be reinstated.

Environmental Considerations

4.18.5 Fuel would be required for the vehicles, generators and other equipment on site. The storage facilities would typically be comprised of a bunded concrete area containing a lockable, bunded fuel tank and a lockable housing unit for the storage of construction chemicals. In addition, there would typically be a wheeled, double-skinned bowser for transport of fuel to tracked vehicles. All construction equipment would be inspected on a daily basis to check for spillages. Drip trays would be used when refuelling vehicles on the site. Emergency spill kits would be kept on site adjacent to the fuel storage area and with the mobile bowser. Site operatives would be briefed on the emergency procedures to be undertaken in the event of a large spillage. The principal contractor would have a 24-hour emergency response company on standby in the event of a spillage incident. Vehicles would be refuelled at their working location to prevent loss of time and use of fuel returning to any designated refuelling areas. All previous stated measures would be used when refuelling vehicles and the bowser operator would be suitably trained to deal with any spillage.

4.18.6 Cement entering a watercourse can have a detrimental effect by drawing oxygen from the water and increasing its alkalinity. If an on-site batching plant is required, it is envisaged the batching plant consented for Windy Standard II would be re-used; however a proposed batching plant is also included as a part of the proposed Development (see ES Figure 1.2 in Volume 3 of the ES).

4.18.7 Turfs would be regularly monitored to prevent excessive desiccation. The subsoil would be removed and stored separately from the topsoil (or peat turfs). Geotextile and stone would be laid down to an approximate depth of 300-500 mm.

4.18.8 The units would be self-contained and no discharge of drainage would be made to the surrounding land unless otherwise agreed with SEPA and the local authority.

4.18.9 The settlement pit would be located away from watercourses with details included as part of the CMS following consultation with SEPA. Any drainage from these facilities would be collected and treated prior to discharge via the Sustainable Drainage System (SuDS). The washout bay would be maintained as necessary by replacing the granular fill with clean stone. At close of construction, all material within the washout bay would be removed from site and the area reinstated.

4.18.10 Diesel fuel would be stored on site for all construction vehicles. The storage tank would be placed within the construction compound and measures would be taken to mitigate the risk of leakage using either a double skinned tank, or the tank placed within a bund capable of containing 110 % of the maximum stored volume as required by the SEPA guidelines.

4.18.11 In line with SEPA guidance, appropriately competent operatives would be used for handling, storing and arranging for the disposal of potentially polluting substances. Licensed waste disposal companies would be used to dispose of potentially polluting wastes (see Section 4.26 below for more information on Waste Management). This will be discussed in greater detail within the Pollution Control and Waste Management Plan contained within the CMS.

4.19 BATCHING PLANT

4.19.1 During the construction of the proposed Development, if it is considered more feasible to batch concrete on site rather than import concrete batched offsite an onsite batching plant would be used. If an on-site batching plant is required, it is envisaged the batching plant consented for Windy Standard II would be re-used; however a proposed batching plant is also included as a part of the proposed Development (see ES Figure 1.2 in Volume 3 of the ES). The location of the batching plant would be agreed with the Local Planning Authority as part of the CMS and would be agreed in advance with SEPA.

4.19.2 The onsite batching plant would consist of aggregate bays and cement hoppers, water storage tanks, mixing hoppers and silos. Aggregates and sand would be stockpiled and contained adjacent to the plant (indicative diagram shown in ES Figure 4.10 in Volume 3 of the ES). If an on-site batching plant is required it would be situated away from water courses, either within a borrow pit or at another secure location such as a construction compound. The proposed batching plant shown in ES figure 1.2 in Volume 3 of the ES is contained within the construction compound and an existing borrow pit location.

4.20 SIGNAGE

4.20.1 There may be the need for signage at the proposed Development as Windy Standard III presents an industrial type operation in an isolated environment, in combination with safe day-to-day navigation, for emergency vehicles to navigate to emergencies, should they arise as well as aid the development of comprehensive risk assessment for those visiting and using the site. To improve recognised Health and Safety concerns on site, signage would consist of non-illuminated post and panel sign locations and non-illuminated turbine identification signs with a maximum of 3 signs per post facing at the proposed Development.

4.20.2 The signage would comprise of two elements; directional signs and roundels displaying the site speed limit. The directional and speed roundel sign measure 300 mm x 400 mm x 3 mm respectively, which will be mounted on a 2500 mm x 76 mm grey aluminium pole as shown on ES Figure 4.11 in Volume 3 of the ES. The poles will be set within 600 mm deep concrete foundation as indicated in ES Figure 4.11 in Volume 3 of the ES. This will ensure the stability of the signs, in line with current guidance for such installations.

4.20.3 ES Figure 4.11 in Volume 3 of the ES illustrates the typical appearance and dimensions of the proposed signs. The sign fixtures allow back-to-back mounting and are used on sign locations where more than two signs are specified. The signs will be hard wearing using tamperproof fixtures, securing the signs in place. A high quality typeface is used to maximise readability. The signage is uncluttered and designed to be legible from vehicle or from foot.

4.20.4 The exact number of signs required at any of the post locations will be decided post consent, following a full review of the health and safety requirements.

4.21 EMPLOYMENT DURING CONSTRUCTION

Site Representatives and Support Staff

4.21.1 It is envisaged that the proposed Development would be constructed employing a number of main contractors; probably one for the civil infrastructure works, one for the electrical works, and one for the supply, erection and commissioning of the wind turbines - all of whom would be coordinated and overseen by a project manager. A Principal Contractor will be appointed who will be responsible for the construction of the laydown areas, tracks, turbine bases and any modification required to the under construction substation and control building at Dun Hill. The Principal Contractor will formally appoint a Site Manager prior to construction who will be responsible for the day-to-day management of the site, including environmental responsibilities. In order to monitor the progression, a number of site representatives would be employed full time to ensure the Quality and Health and Safety aspects of the construction, and to ensure the development is carried out in accordance with the CMS methodologies. The site representatives would be individuals with previous experience of wind farm construction and would, as required, be supported on site by a suitably qualified Planning Monitoring Officer (PMO), Ecological Clerk of Works (ECoW) and a Hydrological Clerk of Works (HCoW). The site representatives would carry out daily checks on the site to monitor on-going activities, particularly when subcontractors are being used on site. In addition to this, and in conjunction with the ecologist, and hydrologist, environmental audits of the site operations would be undertaken on a regular basis accompanied by representatives of the relevant contractors. Where necessary, additional specialists may attend the site including geotechnical representatives and PMO's.

4.21.2 In line with guidance, appropriately competent operatives would be employed for handling, storing and arranging for the disposal of potentially polluting substances. Licensed waste disposal companies would be used to dispose of potentially polluting wastes.

4.21.3 During the construction period there could be approximately 30 - 40 construction operatives carrying out the works on site that have been described. There would be indirect local benefits arising from the construction phase, including use of hotels, B&Bs and other accommodation, hire of local equipment and plant, temporary employment of local work force and potential contracting of local subcontractors. The construction mobilisation would likely be spread over a 15 month period. See Chapter 15: Socio-economic and Tourism Assessment, of the ES for more information on the Socio-Economic Impacts of the proposed Development.

4.22 SITE REINSTATEMENT

4.22.1 Site reinstatement works will include the targeted re-use of peat. Prior to construction excavation works, consideration will be given to methods for handling and holding any excavated materials, particularly peat or peaty soils as peat has the potential to lose structural integrity upon excavation particularly when double handled or moved around the site (see Section 4 of Technical Appendix 10.1: Peat Management Plan in Volume 4 of the ES).

Access Tracks

4.22.2 During track excavation works, where possible the vegetated top layer of material, which holds the seedbank, will be stripped and carefully set to the side of the worked area for re-use in the re-profiling and track verge reinstatement works. Where practical, if storage is required, the layers will be correctly stored in their respective soil/peat horizons, i.e. in the layers that they were stripped in, so when reinstated they can be put back in the correct order. If temporary storage of excavated materials is required, then such material will be stored safely and the method of storage will not lead to any areas of additional disturbance (see Section 4 of Technical Appendix 10.1: Peat Management Plan in Volume 4 of the ES).

Cable Trenches

4.22.3 The reinstatement and storage of any excavated materials for the cable trenches will involve replacement of previously stripped soils, vegetated layers or turves. Timing of trench reinstatement works will also take into account adjacent construction activities which may disturb any reinstatement works already carried out. The amount of time between the excavation of the trench and subsequent reinstatement following cable laying will be minimised as much as practically possible. The reason for this is that the longer the stripped turves are stored for the more they will degrade and become unsuitable for successful reinstatement. The optimum scenario for the cable trench works will be to ensure that no cable trenches are excavated until the electrical contractor has their cables ready for installation on site.

Turbine Foundations

4.22.4 Reinstatement methods associated with turbine foundations will include where practical the storage of peat turves and topsoil around the perimeter of the foundation excavation. A plan showing where the material is to be stored will be created prior to the works commencing. In areas where storage of the peat turves or excavated material adjacent to the works is not possible, then the material will be taken to the nearest agreed storage areas as soon as possible (see Section 4 of Technical Appendix 10.1: Peat Management in Volume 4 of the ES).

Crane Hardstandings

4.22.5 Due to the requirement for crane hardstandings to remain in place, reinstatement of the crane pad will not take place. There will however be reinstatement of the area around the crane pad and any exposed batters using the stripping, storage and reinstatement methods described above (see Section 4 of Technical Appendix 10.1: Peat Management Plan in Volume 4 of the ES).

Construction Compound

4.22.6 All temporary construction areas will be removed and reinstated as quickly as possible following construction. Following removal of temporary site accommodation, storage, equipment and materials, all areas will then be reinstated. The reinstatement will involve reprofiling/landscaping to ensure that the reinstated area blends in with the surrounding area. Suitable materials i.e. topsoil and peat will then be replaced over the area in appropriate horizons i.e. in the correct order. The material used for the reinstatement works (often that which was excavated for the temporary construction area), will be stored and managed adjacent to the temporary construction areas but away from watercourses and other sensitive receptors. It is highly probable that the temporary construction areas, such as the site compound will only be required for the duration of the construction period. Therefore it is unlikely that any stripped turves would be suitable for reinstatement, as the vegetation would have decomposed if stored for any length of time. Vegetation will therefore be allowed to regenerate naturally (see Section 4 of Technical Appendix 10.1: Peat Management Plan in Volume 4 of the ES).

Monitoring

4.22.7 Any re-use of peat across the proposed Development Area will be monitored to ensure that effects on the peat land environment are appropriately understood and subsequently reduced via any remedial works that can be undertaken. The details of any required monitoring would be discussed and agreed with SEPA, SNH and DGC prior to commencement. For further details see Section 6 of Technical Appendix 10.1: Peat Management Plan in Volume 4 of the ES).

4.23 FORESTRY REPLANTING

4.23.1 The majority of the areas to be felled for the proposed Development would be restocked in accordance with current standards, practices and guidelines contained within the UK Forestry Standard (UKFS) and its associated guidelines as a minimum[8]. Details of the replanting are presented in Chapter 12: Forestry, of the ES.

4.23.2 Much of the felled areas can be replanted upon completion of the construction, only leaving felled areas to allow the safe operation and maintenance of the proposed Development for its life time. It is envisaged that replanting will be carried out leaving 30 m open corridor around access tracks and 70 m radius open areas around turbines and crane pads. This replanting accounts for flight lines for bats and other ecological considerations as set out Chapter 7: Ecology, of the ES, whilst ensuring compliance Forestry Commission requirements with regards to forestry management. The replanting requirements are discussed further detail in Chapter 12: Forestry, of the ES.

4.24 OPERATIONAL PHASE

OPERATIONAL PHASE

4.24.1 The majority of the operation of the proposed Development would be automated. Each individual turbine would operate independently of the other turbines. Turbine operation would be managed by control and monitoring systems. These systems control the rotational speed of each individual turbine and ensure its continued safe operation. Should any malfunction in operation occur or should wind speeds exceed safe limits, then the braking system of the wind turbine would automatically be applied and each turbine would shut down to a safe condition.

4.24.2 The lifetime of the project is envisaged to be up to 25 years from completion of commissioning to commencement of decommissioning. Turbines are generally designed for a projected life of 20 to 25 years. However, to ensure that turbines continue to operate with acceptable reliability (i.e. with each turbine capable of operating on average, between 95 % and 98 % of the time), regular pre-planned maintenance and servicing programmes are performed on each turbine. A typical maintenance programme is outlined below. Additionally, there may be a need to conduct irregular, ad hoc maintenance in the event of mechanical breakdowns.

4.24.3 Tracks and cranes pads giving access to turbines and the anemometer masts will be required during the operational period of the proposed Development to allow for routine maintenance operations and occasional replacement of larger components.

Maintenance Programme

4.24.4 Maintenance regimes commonly begin shortly after commissioning with a 'post-construction' check on the torque levels of all bolts within the structure. This is normally performed 10 days after commissioning and again, 3 months after commissioning.

4.24.5 After this, minor and major service regimes continue on a six-monthly basis with both services being performed annually throughout the lifetime of the turbine.

4.24.6 Routine oil sampling and testing of lubricant maintains awareness of the integrity and condition of these lubricants. This allows cost-effective oil changes to be performed as the oil quality degrades. Routine oil sampling and testing of transformer oils is also performed in order to maintain awareness of the integrity of the electrical properties of these oils.

4.24.7 Maintenance of the high-voltage switchgear will also be conducted routinely and annual checks will be performed.

[8] UK Forestry Standard Guidelines. Available at; http://www.forestry.gov.uk/ukfs (last accessed 17/12/2015)

4.24.8 In the case of major component maintenance being required, such as generator or blade replacement, large vehicles similar to those used during construction may need to return to site. These would be subject to similar conditions of planning as agreed for the initial construction period. From time to time, when such maintenance is being undertaken, it may be necessary to restrict access to areas close to the replacement turbine components in order to maintain the health and safety of visitors. In such cases, the areas affected would be clearly marked and fenced and alternative routes would be provided for any visitors seeking passage through the proposed Development Area, where necessary.

4.24.9 All maintenance of any equipment item would be performed according to the Original Equipment Manufacturer's stated schedules, Health and Safety and Construction, Design and Management procedures.

4.24.10 All maintenance would also occur according to the environmental procedures aforementioned in this Chapter.

Storage and Use of Polluting Substances

4.24.11 Storage of polluting substances at the site during the operational period of the proposed Development would only take place where agreed with the relevant authorities in accordance with Control of Substances Hazardous to Health (COSHH) regulations. Generally, substances of this nature are transported in minimum quantities on an 'as required' basis.

Employment during the Operational Phase

4.24.12 It is envisaged that the turbines at the proposed Development would be included within a wider portfolio of operational wind turbines and that persons and/or technicians would be on site as required. For the first few years of operation the turbines would be under warranty and maintenance would be performed by the turbine manufacturer. During these years there would be approximately 4-6 technicians dedicated to the site. During annual servicing this would increase temporarily with up to 8 technicians on site. The site would also support a site manager to be based in the local area. Other contract personnel would attend the site as required to maintain the civil and electrical infrastructure as well as carrying out duties in relation to ecological monitoring and reporting. Site personnel would make use of the onsite control building, which has been designed to include office space and welfare facilities.

4.25 DECOMMISSIONING

4.25.1 At the expiry of the consent or the end of the wind farm's useful life, it is proposed that the turbines, transformers and the on-site substation would be removed. The upper section of the turbine foundations, to a depth of at least 1 m, would be removed and backfilled with appropriate material. Peat or topsoil would be replaced and the area reseeded (see Section 4.22 above for information on site reinstatement and 4.26 below for more information on Waste Management). This process will be discussed in greater detail within the Pollution Control and Waste Management Plan contained within the CMS. Tracks will be left and allowed to grass over, or would be covered with soil and reseeded. At least six months prior to the decommissioning of the site, a Decommissioning Method Statement would be prepared, for agreement with the local authorities and relevant consultees.

4.26 WASTE MANAGEMENT

4.26.1 The proposed Development will produce small amounts of general, municipal and hazardous waste during its construction, operation and decommissioning.

4.26.2 Waste materials generated during the construction phase include excavation waste such as vegetation, forestry residues, soil, stone, rock and similar materials. Excavated materials can be reused on site or elsewhere if it is deemed suitable for reuse. Excavated peat associated with development on peatland is not classed as waste if it is deemed suitable for a required and predetermined end use as part of construction works and reinstatement on a site. Other construction waste streams include municipal waste from welfare facilities, including food waste, paper, plastics, glass, cardboard, paper, and other typically domestic refuse. Industrial waste chemicals, fuel, oil and polluted water from plant, vehicle and wheel washes may also be generated as a result of the proposed Development. There will also be forestry waste as a result of forestry felling activities at the proposed Development.

4.26.3 The operational phase of a development is unlikely to generate significant amounts of waste except for minor quantities of material collected during routine maintenance inspections. Waste streams during this phase include municipal waste, waste chemicals, fuel and oil, sewage and polluted water from vehicle and wheel washes.

4.26.4 During the decommissioning phase of a development wastes include demolition waste, turbine components, electrical cabling as well as municipal waste, waste chemicals, fuel and oil, sewage and polluted water. Wind turbines and electrical cables can be re-used subject to potential ready markets for the material.

4.26.5 Measures will be put in place to ensure waste generated from the proposed Development is kept to a minimum and does not have a significant cumulative effect on local waste management infrastructure. Such measures will be detailed fully within the CMS.

4.26.6 Embedded mitigation to reduce the quantity of waste from the proposed Development will include the design of the proposed Development in such a way that new turbines can be accessed by existing access tracks wherever possible, minimising the need to construct additional access tracks and reducing the potential for waste. All construction and decommissioning activities will be planned effectively to ensure that any materials associated with these activities are predicted well in advance, reducing the chance of over-ordering of materials which would result in waste.

4.26.7 Materials will be reused on site or elsewhere and materials will be sent for recycling where recycling facilities are available. Other measures to ensure that waste materials sent to local waste management facilities sent to landfill are kept to a minimum include the nomination of an approved person(s) to be responsible for waste management on site; this will include the coordination of waste collection to suitable disposal and/or recycling facilities. In addition, a system to record and monitor waste will be implemented, keeping a record of re-use, recycling and disposal. It may also be possible to schedule certain activities that generate large volumes of waste to avoid overloading local infrastructure if other construction projects in the area are also producing large volumes.

4.26.8 Pollution prevention measures will also be put in place and these will be detailed fully within individual chapters of the ES and within the CMS. Pollution prevention measures include:

- Storage of waste materials within the construction compound only. If waste materials are generated outside the construction compound they will be taken to the compound on a daily basis.
- All waste products will be removed from site by registered waste carriers and taken to a waste management facility permitted to receive each specific waste type.
- Bonfires and the burning of waste products will be prohibited on site.
- Labelled, double skinned waste tanks will be utilised for the storage of waste oils onsite.
- The waste storage area will be isolated from surface drains and bunded to contain any spillages
- A wastewater collection system will be used to prevent contamination of local water courses.

4.27 HEALTH AND SAFETY

Health and Safety of Construction Workers

4.27.1 The construction site will be managed and operated in accordance with Health and Safety at Work etc. Act 1974 and comply with relevant Health and Safety Regulations, including:

- The Management of Health and Safety at Work Regulations 1999
- Construction (Design and Management) Regulations 2015
- Electricity Safety, Quality and Continuity Regulations 2002

4.27.2 In awarding any civil, electrical or other contracts for the construction of the proposed Development the appointed contractor is obligated by law to follow the CDM Regulations implemented by the Health and Safety Executive (HSE). These are based on standard procedures that are adapted to take account of all site specific requirements. The Regulations require due consideration is given to construction workers and the public, with risk assessments and method statements created to cover all risks identified including access rights across the site.

4.27.3 A CDM Coordinator would be contracted by the developer to make sure all the regulations are correctly implemented, and to compile a health and safety file, which would be used in the operation and maintenance phase of the proposed Development. The developer remains ultimately responsible and would be required to provide a timescale and start date for the project, to allow the CDM coordinator to review the adequacy of the contractor involved against the description of the required works. Additionally, a developer representative would be on site during the construction period. This person would be empowered to halt any or all construction works if they believe correct health and safety procedures are not being adhered to. Similar procedures for site workers, visitors and civilians must be drawn up for the operational phase of any wind farm. The HSE can question any aspect of the project and visit site at any time if they have any concerns.

Safety of the Public

4.27.4 Throughout the construction phase of the proposed Development the relevant statutory requirements would be adhered to. All potentially hazardous areas would be fenced off and all unattended machinery would be stored in the site compound or immobilised to prevent unauthorised use. In addition, temporary construction safety signs would be placed at each possible entrance to the site and in areas where there may be further danger, e.g. around settling lagoons and borrow pits.

4.27.5 Throughout construction, measures to manage diversion routes would be put in place. The diversion routes would be clearly marked and for safety reasons would direct the user away from any areas of construction.

Operational Phase

4.27.6 Wind farms have a proven track record for safety. A very small number of wind turbines have been known to suffer mechanical damage through lightning strikes or mechanical failure. Experience on existing sites has shown that allowing the public to access an operating wind farm does not lead to a compromise with respect to safety issues.

4.27.7 Companies supplying products and services to the wind energy industry operate to a series of international, European and British standards. A set of product standards for wind energy equipment has been developed by the International Electrotechnical Commission - IEC 16400. There are a number of British Standards that correspond to it, for example; BS EN 61400-1 ed3.0: 2005 “Wind turbines – Part 1: Design requirements”.

4.27.8 The developer would commit to installing wind turbines and components that meet BS EN 61400-1 ed3.0.

4.27.9 Public access to the proposed Development Area after construction has been completed would remain the same as the current situation. Appropriate warning, directional and identification signs would be installed directing to and on the turbines, transformers and onsite electrical control building, and access to these would be restricted to wind farm personnel. At all times these facilities would be locked. Additionally, safety and/or directional signs would be placed at strategic points across the site area to make people aware of potential hazards and provide direction for emergency services should the need arise. Any signage would be agreed with the relevant authorities as part of the CMS (see Section 4.20 above).

4.27.10 No resulting safety risks are expected as a result of public access to the proposed Development Area. Turbine models being considered for the site would operate automatically and have sensors to detect any instabilities or unsafe operation during high wind speeds. Should sensors placed within the nacelle and tower of the turbine detect any other malfunction in operation or should wind speeds increase over maximum operational thresholds, the brakes would be automatically applied in order to rapidly shut the turbine down.

4.27.11 If the cause of the shut down was high wind speeds then the turbine would automatically begin operation once the average wind speed reduced to within operational levels. Under other causes of shutdown, e.g. through malfunction, the turbine would remain shut down and in a safe condition (i.e. commonly with the blades orientated 90° to the wind direction) until manually restarted by a member of the Operations and Maintenance (O&M) team following satisfactory inspection and/or repair. This procedure ensures safe operation of turbines to protect members of the public walking, cycling or riding past turbines during the operational phase. In addition, the vibrometers in the nacelles would detect rotor imbalance in blades caused by icing and the wind turbine’s control and monitoring system would shut the turbines down under these conditions. The turbines are also equipped with lightning protection equipment so that strikes will be conducted from the nacelle down the tower into the earth.

4.27.12 The safety features and record of wind turbines are identified above, and it is concluded that the proposed Development would not present a significant safety risk to the public.

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Author	Marie Scaife	09/12/2014
Checked	Emily Peaston	16/01/2015
Approved	Euan Hutchison	25/03/2016

Client Details	
Contact	Gareth Swales
Client Name	Brockloch Rig III Ltd
Address	c/o Fred. Olsen Renewables Ltd

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Chapter 5

EIA Process

Contents

Glossary

Term	Definition
Baseline	The existing conditions that prevail against which the effects of the proposed Development are compared.
Environmental Impact Assessment	Environmental Impact Assessment (EIA) is a means of drawing together, in a systematic way, an assessment of the likely significant environmental effects arising from a proposed development.
Environmental Statement	A document reporting the findings of the EIA and produced in accordance with the EIA Regulations.
The proposed Development	The proposed Windy Standard III Wind Farm.
The proposed Development Area	The project development area within the site boundary which is subdivided into the Meaul Hill Cluster and Waterhead Hill Cluster.

List of Abbreviations

Abbreviation	Description
EIA	Environmental Impact Assessment
ES	Environmental Statement

5.1 ENVIRONMENTAL IMPACT ASSESSMENT (EIA) METHODOLOGY

Overview of the EIA Process

5.1.1 This Chapter of the Environmental Statement (ES) aims to outline the process and methodology regarding the application of Environmental Impact Assessment (EIA) used during the preparation of this ES to guide the specific elements of site assessment and design.

5.1.2 The EIA is based on various legislation, in particular, the Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2000 as amended by the Electricity Works (Environmental Impact Assessment) (Scotland) Amendment Regulations 2008 (herein referred to as the EIA Regulations). The EIA Regulations outline the process of an EIA and the criteria that would determine if an EIA is necessary or not, the relevant environmental studies and statements, how the information is evaluated by the Scottish Ministers, Planning Authority and consultative bodies and how this is implemented through the consent under Section 36 of the Electricity Act 1989. Under the EIA Regulations, the proposed Development is classed as Schedule 2 development, requiring the project to be screened for EIA. The Applicant determined following an internal screening process that an EIA was required.

5.1.3 The key stages of the EIA process and methodology, following site selection and definition of the development characteristics have been explained in more detail in the following Chapters.

5.2 SCOPE OF THE ENVIRONMENTAL STATEMENT

5.2.1 The nature of environmental and social effects can be divided into a number of different categories. Firstly, there are categories of environmental and human receptors (e.g. breeding birds, migrating birds, ecological habitats, cultural and archaeological sites and artefacts, human settlements, noise sensitive properties) that may be affected. Secondly, there are the various stages and components of the proposed Development which may have differing characteristics with relation to the environment (e.g. the construction, operation and decommissioning stages and the turbines, tracks, power cables and substation), as separate components of the proposed Development.

5.2.2 Scoping exercises were undertaken to identify the environmental effects that might result from a development with the characteristics defined during the early stages of the development process, with reference to the environmental receptors specific to the area in the vicinity of the proposed Development. An essential part of this involved identifying the sensitive environmental receptors of the proposed Development and its surroundings.

5.2.3 In defining types of environmental effects, the lead consultant, Natural Power and its technical associates, have made use of its long experience in carrying out EIA for onshore wind farm proposals. A list of the consultants involved and the topics assessed is set out in Chapter 1: Introduction, of the ES. In addition, reference was made to guidance documents issued by government agencies and non-governmental organisations. Specific guidance documents which have been referred to for individual elements of the EIA are detailed in the relevant chapters within this ES. A scoping report providing the proposed scope of the EIA was drawn up and submitted to The Energy Consents and Deployment Unit of the Scottish Government. The responses have been detailed in Chapter 3: Design Evolution and Alternatives, of the ES and the full Scoping Opinion Request submitted to and Final Scoping Opinion Response received back from the Scottish Government is presented within Technical Appendix 3.1: Windy Standard III Scoping Opinion Request and Technical Appendix 3.2: Scottish Government Final Scoping Opinion in Volume 4 of the ES.

5.3 IDENTIFICATION OF THE BASELINE ENVIRONMENT

Data Collection

5.3.1 A number of existing data sources were collected and reviewed prior to the initiation of survey work targeted directly on gathering data for the EIA of the proposal. This included information and understanding of the site

and the surrounding area from previous phases of development in and around Windy Standard. It was understood that existing data sources would, in most cases, be unlikely to provide sufficient data alone to use in the EIA but would provide a valuable initial stage with which to form methodologies for further survey.

5.3.2 Details of existing data sources and coverage are presented within the relevant chapters of this ES.

Baseline Surveys

5.3.3 Baseline surveys were carried out by specialist consultants in a number of different study areas. These were aimed at gathering sufficient data to form a picture of the current status of environmental and human elements in the vicinity of the proposed Development, and filling in any gaps in existing historical data. The ultimate aim was to allow the prediction of the potential effects of a subsequent detailed development proposal upon these elements. Baseline survey methodologies and coverage are described in detail in the relevant assessments in chapters of this ES.

5.4 SITE DESIGN, ASSESSMENT OF POTENTIAL IMPACTS AND MITIGATION

Site Design and Identification of Effects

5.4.1 The consultation process, baseline studies and surveys identified technical constraints and any potentially more sensitive environmental receptors within the proposed Development Area. The goal was to design a wind farm within the boundaries of technical and economic constraints that would avoid any unacceptable environmental impacts.

5.4.2 In order to minimise unacceptable significant adverse environmental effects, the assessment and design of the proposed Development followed an iterative approach. With this type of approach, potentially significant adverse effects are identified during the assessment process and the design of the proposed Development is modified in order to avoid, reduce or mitigate these effects as far as reasonably practicable.

5.4.3 Further details of the site design process are discussed in detail within Chapter 3: Design Evolution and Alternatives, of the ES.

Determining Significant Impacts

5.4.4 The basic outline methodology for assessing significance was developed after consideration of relevant guidance/regulations including:-

- Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2000 as amended by the Electricity Works (Environmental Impact Assessment) (Scotland) Amendment Regulations 2008;
- Guidelines for Landscape and Visual Impact Assessment 3nd Edition: E & FN Spon, (2013), published by the Institute of Environmental Management and Assessment and the Landscape Institute; and
- Guidelines for Environmental Impact Assessment (2004) Institute of Environmental Management and Assessment (IEMA).

5.4.5 Impact assessments undertaken as part of the proposed Development EIA have employed the principles outlined within this Chapter. In the case of some specific assessments, an adapted methodology has been used in order to reflect the environmental and social receptors being assessed. In particular assessments for the following topic areas have been subject to these adaptations:

- Forestry; and
- Operational Noise.

5.4.6 In determining the significance of a potential residual effect, the magnitude of change arising from the proposed Development is correlated with the 'sensitivity' of the particular environmental attribute under consideration. Magnitude of change is evaluated in accordance with the definitions set out in Table 5.1 below.

Table 5.1: Example Definitions of 'magnitude' of change

Definitions of 'magnitude' of change	
High	Total loss or major alteration to key elements/features of the baseline (i.e. pre-development) conditions.
Medium	Partial loss or alteration to one or more key elements/features of the baseline (i.e. pre-development) conditions.
Low	Minor shift away from baseline (i.e. pre-development) conditions.
Negligible	Very slight change from baseline (i.e. pre-development) conditions.

5.4.7 Where applicable, in carrying out individual assessments, a scale of increasing 'sensitivity' of the environmental or social receptor is defined. This may be defined in terms of quality, value, rarity or importance to other elements, and be classed as low, medium, or high. Table 5.2 provides an example table to illustrate this concept.

Table 5.2: Example of Sensitivity

Examples of Sensitivity	
High	Elements of international / national importance generally designated for protection through national legislation / policy
Medium	Elements of regional / local importance that are not designated but are generally protected by local policy
Low	Elements of local value that can generally tolerate change

5.4.8 For certain assessment areas, guidance can be taken from the value attributed to elements through designation or protection under law, i.e. landscapes or ecological resources given various levels of protection under planning law. Where assessment of this nature has taken place, the correlation of magnitude against 'sensitivity' determines a qualitative expression for the significance of the effect. This is demonstrated in Table 5.3.

Table 5.3: Example Significance Matrix

SIGNIFICANCE MATRIX			
MAGNITUDE OF CHANGE			
High	Moderate	Moderate/Major	Major
Medium	Minor/Moderate	Moderate	Moderate/Major
Low	Minor	Minor/Moderate	Moderate
Negligible	Negligible/Minor	Minor	Minor/Moderate
	Low	Medium	High
			SENSITIVITY OF RECEIVING ELEMENT

5.4.9 Although significance is usually assessed in terms of varying degrees, those effects indicated as 'major' and 'moderate/major' are likely to be regarded as being equivalent to 'significant effects' when discussed in terms of the EIA Regulations[1]. Following the iterative design process adopted during the design of the proposed Development, the significance of each effect would be confirmed or reassessed.

[1] EIA Quality Mark Article, EIA and the Search for Significance in EIA, IEMA.

5.4.10 The significance of an effect may also be affected by its duration (e.g. the length of the construction period) and by its reversibility, i.e. the degree to which a site could be returned to its baseline conditions following decommissioning.

5.4.11 Each of the impact assessments detailed in the relevant chapters of this ES have been generally formulated in a similar way, giving an evaluation of baseline conditions, the magnitude, sensitivity and significance of impacts and then the residual impacts following the implementation of stated mitigation measures and resultant beneficial effects.

5.4.12 A view on the acceptability of the proposed Development in policy terms is provided in the Planning Statement. With regards to this, it must be noted that a significant impact does not necessarily mean an unacceptable impact in policy terms. In addition, significant impacts can also be positive as well as negative.

Cumulative Assessment

5.4.13 The EIA Regulations require the likely cumulative impacts of the proposed Development to be assessed as part of an EIA. These can be broadly defined as impacts that result from incremental changes caused by other developments, plans or projects together with the proposed Development. The EIA Regulations, state that all likely significant cumulative effects resulting from the existence of the development, use of natural resources and the emission of pollutants, the creation of nuisances and the elimination of waste should be considered within the EIA.

5.4.14 The proposed methodology for assessing cumulative impact throughout the EIA follows the guiding principles outlined in the European Commission guidance[2] for the assessment of Indirect and Cumulative Impacts. The detailed approaches to cumulative assessment are varied according to each specific ES chapter. Appropriate spatial scales are defined within these chapters and are defined following their particular methodologies, which follow current available guidance.

Mitigation

5.4.15 The purpose of mitigation is to, where applicable, design out or reduce the significance of unacceptable adverse effects to an environmentally (or otherwise) acceptable level; where acceptability is deemed with respect to regulatory, policy and/or other considerations.

5.4.16 For the purposes of this EIA, mitigation has been approached in two levels through design mitigation in the first instance and impact mitigation where required, which are described in the following passages.

Design Mitigation

5.4.17 Measures envisaged to prevent or reduce any significant adverse effects were identified and incorporated into the design as environmental and visual assessments were developed. Those impacts that presented potentially higher magnitude impacts were also identified. The design process continued until it was considered by the Applicant and consultants involved in the production of the ES that the most appropriate wind farm design had been developed. In this way, the proposal presented here can be seen to have embedded measures, to prevent or reduce significant adverse effects directly into the design process (design mitigation), and the findings and conclusions of the environmental assessments reflect the incorporation of those measures.

Impact Mitigation

5.4.18 Measures which are envisaged to prevent, reduce or offset significant adverse effects unavoidable through design, were also identified through the EIA process. The process of assessment has considered the potential effects of the proposed Development and those effects, where applicable, will have measures proposed which apply best practice and guidance recognised within the industry to attain environmentally acceptable levels, or those which are deemed acceptable through determination.

5.4.19 In some cases, individual effects have not been considered to require automatic impact mitigation. However, as a means of best practice and to take into account the views and comments expressed via specialist consultants and consultees, impact mitigation was applied.

[2] European Commission (1999) Guidelines for the assessment of Indirect and Cumulative Impacts as well as Impact Interactions, available at: http://ec.europa.eu/environment/archives/eia/eia-studies-and-reports/pdf/guidel.pdf (accessed on 10/12/2015)

BROCKLOCH RIG III

Document history

Author	Robert Bainsfair	18/08/2015
Checked	Marie Scaife	10/09/2015
Approved	Emily Peaston	14/09/2015

Client Details	
Contact	Gareth Swales
Client Name	Brockloch Rig III Ltd
Address	c/o Fred. Olsen Renewables Ltd

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Chapter 6

Landscape and Visual Assessment

Contents

Glossary

Please see Technical Appendix 6.1 in Volume 4 of the ES for a Landscape and Visual Assessment Glossary

List of Abbreviations

Abbreviation	Description
ANO	Air Navigation Order
AOD	Above Ordnance Datum
CMS	Construction Method Statement
DGC	Dumfries and Galloway Council
DGWLCS	Dumfries and Galloway Wind Farm Landscape Capacity Study
EAC	East Ayrshire Council
EASLA	East Ayrshire Sensitive Landscape Area
ECDU	Energy Consents and Deployment Unit
ES	Environmental Statement
GDL	Gardens and Designed Landscapes
LCT	Landscape Character Type
LDP	Local Development Plan
LVIA	Landscape and Visual Impact Assessment
NSA	National Scenic Areas
OS	Ordnance Survey
RSA	Regional Scenic Area
SASA	South Ayrshire Scenic Area
SAWL	Search Areas for Wild Land
SLA	Sensitive Landscape Areas
SLR	Single Lens Reflex
SLSLA	South Lanarkshire Special Landscape Area
SNH	Scottish Natural Heritage
SPP	Scottish Planning Policy
WLA	Wild Land Areas
ZTV	Zones of Theoretical Visibility

6.1 LANDSCAPE AND VISUAL ASSESSMENT

6.2 INTRODUCTION

6.2.1 The following Landscape and Visual Impact Assessment (LVIA) describes the potential landscape and visual effect of the proposed Windy Standard III wind farm (hereafter referred to as the proposed Development).

6.2.2 The LVIA takes account of the effect of the proposed Development on the landscape both within and beyond the site since, in common with most wind farms, the proposals are likely to affect the landscape character and visual amenity of locations outwith the site boundary. In consultation with Dumfries & Galloway Council (DGC) and Scottish Natural Heritage (SNH) a study area of 35 km radius was selected, from the outer turbines of the proposed Development. This was agreed in consultation with statutory and non-statutory agencies during an initial Scoping exercise held in March 2014.

6.2.3 The assessment considers the entire period of the development, including site preparations and construction, operation of the wind farm and final decommissioning and reinstatement of the site.

6.2.4 The assessment is described in the following Sections:

- Assessment Methodology - A brief explanation of the assessment criteria is provided together with the means by which the assessment has been carried out with reference to consultations undertaken and standard methodologies and guidelines. The assessment is accompanied by a series of illustrative figures comprising plans, wirelines and photomontages;
- Project Description and Embedded Mitigation - This Section comprises a description of the key aspects of the proposed Development which have potential to cause landscape and/or visual effect, as well as measures that have been incorporated into the project design to mitigate these effects;
- Planning and Landscape and Visual Context - This Section makes reference to legal and planning policy and strategic guidance information provided in the Environmental Statement (ES);
- Assessment of Residual Landscape and Visual Effects - This Section comprises a description of the remaining effect of the development after the incorporation of mitigation measures, and an assessment of their magnitude and significance; and
- Summary of Significant Residual Landscape and Visual Effects - The final Section comprises a summary of the assessment results and is accompanied by conclusions on the effect of the proposed Development in landscape and visual terms.

6.2.5 This Chapter is supported by Technical Appendix:

- Technical Appendix 6.1: Landscape and Visual – Glossary in Volume 4 of the ES (a glossary of key terms utilised in this chapter);
- Technical Appendix 6.2: Residual Effects on Landscape Character Types in Volume 4 of the ES (an assessment of the residual effects on different landscape character types as mapped in ES Figure 6.2 in Volume 3 of the ES);
- Technical Appendix 6.3: Viewpoint Analysis in Volume 4 of the ES (providing an assessment of the residual effects on landscape character and visual amenity at a series of representative viewpoint locations as mapped in ES Figure 6.4 in Volume 3 of the ES and as illustrated in ES Figures 6.31a - 6.48j in Volume 3 of the ES); and
- Technical Appendix 6.4: Route Analysis in Volume 4 of the ES (providing detailed statistical information regarding the cumulative visibility of the proposed Development and existing/consented and proposed wind farms in the study area in respect of receptors on the routes shown in ES Figure 6.30 in Volume 3 of the ES).

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6.3 ASSESSMENT METHODOLOGY

Methodology

6.3.1 The landscape and visual assessment has been based on guidelines provided in:

- Landscape Institute and Institute of Environmental Management and Assessment (2013) Guidance for Landscape and Visual Impact Assessment – Third Edition;
- The Countryside Agency and Scottish Natural Heritage (2002) Landscape Character Assessment;
- Scottish Natural Heritage (SNH) and the Countryside Agency (2002) Topic Paper 6: Techniques and Criteria for Judging Capacity and Sensitivity;
- SNH (December 2014) Siting and Design of Wind Farms in the landscape – Version 2;
- SNH (2007) Assessing the Impacts on Wild Land – Interim Guidance Note;
- SNH (2012) Assessing the Cumulative Impact of Onshore Wind Energy Developments
- SNH (2014) Visual Representation of Windfarms, Good Practice Guidance;
- The Landscape Institute Advice Note 01/2011;
- SNH (2012) Strategic Locational Guidance for Onshore Wind Farms – Natural Heritage Considerations; and
- SNH (2015) Spatial Planning for Onshore Wind Turbines – Natural Heritage Considerations.

6.3.2 The landscape and visual assessment has involved a desk study, field work, data processing and analysis, as well as interpretation using professional judgement.

Consultations

6.3.3 An initial Scoping request was submitted to the Energy Consents and Deployment Unit (ECDU) Dumfries and Galloway Council (DGC) and Scottish Natural Heritage (SNH) in March 2014. Responses relevant to the LVIA are listed below in Table 6.1 along with details of how these have been addressed.

6.3.4 Following initial scoping responses, further detailed consultations were undertaken with DGC in respect of the detailed methodology and representative viewpoints that were to be utilised. DGC set out their response in a Delegated Report (undated).

Table 6.1: Consultation Responses

Consultee	Comment	LVIA Response
ECDU	The Scoping Report should promote a full assessment by the applicant of all the landscape and visual issues. This should include a full description of the general landscape character within which the applicant proposes to introduce the wind farm and a statement of the landscape and visual sensitivities that may be potentially affected by that development.	The LVIA comprises a baseline and assessment of residual effects in respect of the character of the landscape within a 35 km radius of the proposed Development as well as other landscape and visual receptors.
	It should also include an assessment of the cumulative landscape and visual impacts as a consequence of the wind farm proposal, and identify relevant criteria that may have a bearing on that assessment.	Section 6.3 of the LVIA describes the methodology and criteria utilised in the cumulative assessment of the proposed Development, and Table 6.2 identifies the existing, consented and proposed wind farms context that formed the basis of the cumulative assessment.
	The Scottish Forestry Strategy specifically advocates the use of Scottish Natural Heritage's suite of Landscape Character Assessments, which provide valuable descriptive information about the landscape of Scotland. The potential removal of all or some of the existing woodlands within the wind farm proposal area may create significant areas of open ground (that is, ground without woodland cover) and thereby have a significant effect on the recognised character of the local landscape.	SNH's published landscape character assessments were referenced in describing the character of the landscape within the study area. It is intended to replant felled areas following construction of the proposed Development. Consequently, there should not be large scale open areas established as a result of the proposed Development. The LVIA and Chapter 2: Planning and Policy Context, of the ES describes this in more detail.
	We would also advise that when forest landscape design is being considered as part of the forest management associated with such a development, a chartered Landscape Architect with a comprehensive knowledge of forestry should be commissioned.	The forest design and management associated with the proposed Development is described in detail in Chapter 13: Forestry, of the ES. The proposals were developed by DGA forestry in conjunction with the project Landscape Architect and the forestry operator.
DGC	The key landscape and visual considerations with respect to Windy Standard III from the Dumfries and Galloway Region are anticipated to be: the setting of and views to the Cairnsmore of Carsphairn, as an iconic summit and landmark hill in the Upper Glen Kens; and the summit experience and views from the hill.	Consideration is given in Section 6.6 of the LVIA to the effect of the proposed Development upon views from the summit of Cairnsmore of Carsphairn. The effects on the setting of this summit is considered in the assessment of residual effect on landscape character in Technical Appendix 6.2: Residual Effects on Landscape Character Types in Volume 4 of the ES and Section 6.6, below.
	The proposed Development has potential for considerable cumulative effects. As a western extension to Windy Standard One and Windy Standard Two, it would add considerably to the scale of the development with regard to both turbine height and the spread of the footprint. In addition there are further undetermined applications at South Kyle lying immediately northwest of Windy Standard, and at Quantans to the South of Cairnsmore of Carsphairn. There are numerous other in-planning and scoping schemes within 10 km of Windy Standard across the Southern Uplands and Rugged Granite Uplands.	The LVIA assesses the cumulative effect attributable to the proposed Development and also considers its part on the emerging pattern of wind energy development in the area.
	The proposed Development would be required to be assessed as a whole, but also in terms of its two component parts, to ensure potential impacts are fully understood, and that design solutions are optimized in terms of the mitigation measures they can provide.	The LVIA, and more specifically the visual assessment, addresses the effect of the overall development whilst also identifying where effects are primarily derived from either the Meaul Hill or Waterhead Hill clusters of turbines of the proposed

Consultee	Comment	LVIA Response
		Development.
SNH	Viewpoints were suggested to check the type of visibility from the Search Areas for Wild Land (SAWL), including: • Shalloch of Minnoch; and • Merrick Request both photomontages and wirelines from the above areas.	Further detailed consultations were undertaken with SNH, DGC and, East Ayrshire Council (EAC) post scoping and it was agreed that viewpoints from the Shalloch of Minnoch were to be omitted as there was no visibility from the main vantage point. Viewpoints of Merrick have been included within the proposed viewpoints as photomontages and wirelines (see ES Figure 6.45a - 6.45j in Volume 3 of the ES).
	Request a viewpoint representative of the Rhinns of Kells.	A viewpoint representative of the Rhinns of Kells has been included (see ES Figure 6.43a - 6.43h in Volume 3 of the ES).
	Request that a wild land assessment is considered – up to the applicant to demonstrate a reason if they decide to omit this study	No detailed Wild Land Impact Assessment has been undertaken in respect of Merrick as the proposed Development is situated over 15 km from the WLA (key receptor locations being over 17 km from turbines) and would be seen in the context of the existing Windy Standard Developments and Afton development. As demonstrated in the analysis for Viewpoint 15 (see Appendix 6.3: Viewpoint Analysis in Volume 4 of the ES) no significant effects are anticipated within the Merrick Wild Land Area.
	Glenmount and Quantans Hill Wind Farms should be included within the assessment.	Glenmount and Quantans Hill Wind Farm have been included within the cumulative scope of the LVIA (see ES Figure 6.6 in Volume 3 of the ES).
	Compatibility of design between the proposed scheme and Windy Standard (Phase I & II) will need to be considered	Landscape Architects have considered the compatibility of the design between the proposed Development and the existing and under construction Windy Standard I and II developments. The proposed Development has undergone numerous design iterations which will be detailed in Chapter 3: Design Evolution and Alternatives, of the ES.
East Ayrshire Council (EAC)	Landscape and visual impact assessment should take account of landscape and visual impacts experienced over parts of southern East Ayrshire. Impacts from the proposed Development on Sensitive Landscape Areas (SLA) within East Ayrshire and the integrity of these designations should be fully considered and impacts minimized through good design and layout of the wind farm. The baseline appraisal of landscape capacity should also incorporate indirect impacts on East Ayrshire landscapes. The relationship of the proposed Development to operational, consented and undetermined Section 36 and planning applications and current scoping stage wind farms must be assessed carefully and the design should take account of this relationship. Cumulative assessments should address the consequences of travelling through the landscape and sequential views. Consideration should be given to whether the landscape has reached capacity for further large scale wind farm development in the area. Consideration should also be given to landscape and visual cumulation with other types of development.	A full LVIA and cumulative assessment was carried out and presented in this chapter, including assessment of potential cumulative effects in respect of existing, consented and proposed wind farms. The principal consideration has been the additional effect of the proposed Development in respect of existing/consented and existing/consented and proposed wind farm scenarios, although consideration of the in combination effect of the proposed Development (i.e. the combined effect of the proposed Development and both of the wind farm scenarios) has been addressed throughout the Chapter. In respect of the non-wind farm context, this has been considered in respect of the baseline context of the study and has therefore been a fundamental consideration in determining the residual landscape and visual effects of the proposed Development. The proposed Development has undergone numerous design iterations to address environmental and technical constraints raised during the consultation process. The iterations of site design are presented in Chapter 3: Design Evolution and Alternatives, of the ES.
	Recommend a minimum 35 km ZTV including a list of views, an indication of distance and the evaluation and justification for their inclusion or omission.	Included within ES Figure 6.4 – 6.29 in Volume 3 of the ES and discussed within the LVIA.

Assessment Process: Landscape and Visual Baseline

6.3.5 Initially, the existing landscape and visual context of the study area was assessed in order to establish a baseline against which to judge the effect of the proposed Development (see Section 6.5 below). This baseline was based on an analysis of available geographical and topographical information, Ordnance Survey data/aerial photography, and existing landscape character studies (see ES Figure 6.2a and 6.2b in Volume 3 of the ES), and the findings verified by field reconnaissance. Designated landscapes in the study area were also identified, including those of international, national, regional and local status (see ES Figure 6.3a and 6.3b in Volume 3 of the ES). A summary of relevant landscape planning policies and designations is also provided.

Assessment Process: Evaluation of Landscape and Visual Effect

Visibility Analysis

6.3.6 In order to assist in evaluating the potential landscape and visual effects arising from the introduction of the proposed Development, Zones of Theoretical Visibility (ZTVs) were generated to identify the potential extent of visibility of the proposed Development over the study area (see ES Figures 6.2b, 6.3b, 6.4 - 6.5 and 6.7 - 6.29 in Volume 3 of the ES). The findings of the ZTVs were verified by field reconnaissance. The visibility assessment has concentrated on publicly accessible areas including outdoor recreational areas, road and the public footpath network.

Receptors

6.3.7 Within the study area, there is a range of landscape and visual receptors. A baseline survey was carried out to identify these receptors, involving desk study and field work.

6.3.8 In addition to the fabric of the existing landscape at the application site (i.e. its constituent elements such as topography and ground cover) the landscape character types or areas from where the proposed Development may be visible were included in the assessment.

6.3.9 Designated landscapes listed in Historic Scotland's Inventory of Gardens and Designed Landscapes as well as Wild Land Areas within the study area from where the proposed Development may be seen are also included as landscape receptors and are shown on ES Figure 6.3a and 6.3b in Volume 3 of the ES.

6.3.10 Visual receptors (i.e. individuals or groups of people who may have views of the proposed Development) have also been identified. The main groups of visual receptors considered are as follows:

- Residents;
- Walkers;
- Cyclists;
- Tourists, visitors or users of recreational facilities; and
- Road and rail users.

6.3.11 It is acknowledged that these groups may be sub-divided and that there may be more categories of receptors, but for the purposes of the assessment, it is considered that the above categories cover the main groups of landscape and visual receptors.

6.3.12 The LVIA addresses the effect of the proposed Development on each of the above receptors.

Viewpoint Assessment

6.3.13 A definitive list of viewpoints, based on the preceding list of receptors was chosen in consultation with DGC in respect of the proposed Development. 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 and existing views are described fully in the detailed assessment in Technical Appendix 6.3: Viewpoint Analysis in Volume 4 of the ES.

6.3.14 An analysis of the potential effects on landscape and visual amenity at each of these viewpoints arising from the introduction of the proposed Development to the baseline context (including existing wind farms) was carried out. This analysis involved the production of computer generated wirelines and/or photomontages to predict the operational views of the proposed turbines from each of the agreed viewpoints. The existing and predicted views from each of these viewpoints were analysed to identify the magnitude of change and the residual impacts on landscape character and visual amenity. It should be noted that consented wind farms that were not constructed at the time of the assessment were omitted from the assessment of residual effects on the baseline context of viewpoints.

Cumulative Assessment

6.3.15 An assessment of potential cumulative landscape and visual effect of the proposed Development in conjunction with operational, consented and/or proposed wind farms within 35 km has also been undertaken. The cumulative wind farms included were established in consultation with DGC and SNH prior to commencement of the assessment. Turbine numbers and dimensions for each scheme are summarised in Table 6.2, below.

6.3.16 Where possible, the location, layout and turbine size of each cumulative wind farms has been sourced from the relevant developers. However, some of the information concerning operational turbine coordinates may not take into account micro siting that may have occurred during construction. Where information from developers has not been forthcoming, information from other sources such as local planning authorities, SNH or planning documents has been used.

6.3.17 It is considered important to distinguish the status of the different wind farm projects included in the cumulative assessment in relation to the degree of certainty about their contribution to any cumulative scenario. The locations of each of the cumulative sites included in the assessment are shown in ES Figure 6.6 in Volume 3 of the ES.

6.3.18 In assessing the potential cumulative landscape and visual effect, consideration has been given to cumulative effect arising from Combined and/ or Consecutive Visibility (where the observer is able to see two or more developments from one Viewpoint location), and Sequential Effect (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).

Table 6.2: Cumulative Wind Farms (see ES Figure 6.6 in Volume 3 of the ES)

Wind Farm	Number of Turbines	Height of Turbines to Blade Tip (m)	Approximate distance from the proposed Development
The proposed Development			
Windy Standard III	20	125 m and 177.5 m	-
Existing/ Consented Developments			
Afton	27	120 m	4 km
Andershaw Forest	14	125 m	34 km
Bankend Rigg	11	76 m	30 km
Blackcraig	23	110 m	23 km
Dersalloch	23	115 -125 m	15 km
Galawhistle	22	121.2 m and 110.2 m	26 km
Hadyard Hill	52	100 m	30 km
Hagshaw Hill	26	55 m	34 km
Hagshaw Hill Extension.	20	80 m	34 km
Hare Hill	20	62 m	9 km
Hare Hill Ext.	39	70 -91 m	11 km
Kennoxhead	19	145 m	29 km
Knockman Hill	5	81 m	21 km
Knockshinnoch	2	126.5 m	17 km
Mark Hill	28	110 m	35 km
Sanquhar	12	130 m	13 km
Sunnyside	2	62 m	23 km
Torrs Hill	2	100 m	15 km
Tralorg	8	100 m	34 km
Twentyshilling Hill	9	125 m	19 km
Upper Ingleston Farm	1	34.2 m	23 km
Wether Hill	14	90 m	14 km
Whiteside Hill	11	121.2 m	13 km
Windy Standard I	36	53.5 m	2 km
Windy Standard II	30	100 m and 120 m	1.5 km
Proposed Wind Farms			
Benbrack	18	130 m	6 km
Fowler Farm	1	67 m	26 km
Garleffan	6	135 m	15 km
Glenmount	19	130 m	13 km

Wind Farm	Number of Turbines	Height of Turbines to Blade Tip (m)	Approximate distance from the proposed Development
Glentaggart	5	132 m	33 km
Hadyard Hill Extension	31	126.5 m	30 km
High Cumnock	8	132 m	15 km
Keirs Hill	17	149 m	16 km
Leadhills	14	137.5 m	31 km
Lethans Hill	26	136 – 152 m	160 km
Linfairn	17	126.5 m	19 km
Loch Urr	26	127.5 m	21 km
Longburn	20	135 m	11 km
Margree Forest	17	120 m	17 km
Mochrum Fell	8	116.5 -126.5 m	28 km
Penbreck & Carmacoup	9	125 m	30 km
Pencloe	21	125 m	4 km
Polquhairn	9	100 m	15 km
Quantans Hill	19	130 m	7.5 km
Sanquhar Six	6	130 m	14 km
South Kyle	50	149.5 m	4 km
Spango	14	145 m	25 km
Ulzieside	10	125 m	19 km
Windy Rig	16	125 m	5 km

Evaluation Criteria

6.3.19 An assessment of the significance of the residual effects was carried out to determine the effect of the proposed Development on the landscape and visual amenity of the study area.

6.3.20 The significance of a landscape or visual effect is a function of the sensitivity of the affected landscape or visual receptor, and the magnitude of change that would occur as a result of the proposed Development. The evaluation criteria used in the assessment in respect of sensitivity and magnitude of change are described below.

6.3.21 The aim of the landscape and visual impact assessment is to identify, predict and evaluate potential effect arising from the proposed Development, and in particular, in accordance with the Environmental Impact Assessment Regulations to identify any likely significant effect. Wherever possible, identified effects are quantified, but the nature of landscape and visual impact assessment requires interpretation by professional judgment.

6.3.22 The purpose of the cumulative assessment component of the LVIA is to describe, visually represent and assess the ways in which the proposed Development would have additional impacts when considered together with other operational, under construction, consented and, where required, proposed (i.e. those for which applications have been submitted to the relevant authority) developments of a similar nature.

6.3.23 In order to provide a level of consistency to the assessment, the magnitude of change (and cumulative change) and assessment of significance have been based on pre-defined criteria as described below.

Landscape Sensitivity

6.3.24 The sensitivity of the landscape is defined in Section 6.5 below as a combination of judgements regarding the landscape resources susceptibility to change and its value. Change is defined as high, medium, low based on professional interpretation of a combination of parameters including:

- The value placed on the landscape based upon formal designation or classification;
- Landscape quality and condition;
- Existing land-use;
- The pattern and scale of the landscape;
- Visual enclosure/openness of views, scale of views, and the 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.

Viewpoint Sensitivity

6.3.25 Viewpoint sensitivity is defined as high, medium, low based on an interpretation of a combination of parameters, as follows:

- Location and land use at the Viewpoint;
- Landscape character and quality in the immediate vicinity of the Viewpoint;
- Landscape character and quality of the intervening landscape and backdrop to the proposed Development;
- Frequency of use; and
- Whether the receptor is static or transitory.

6.3.26 In relation to land use at the viewpoint, visual sensitivity is defined as follows:

- High: Users of outdoor recreational facilities including strategic recreational footpaths and locations/vantage points, cycle routes and rights of way, whose attention may be focused on the landscape; important landscape features with physical, cultural or historic attributes; principal views from residential buildings ; beauty spots or picnic areas;
- Medium: Other footpaths; people travelling through the landscape on roads, trains or other transport routes; and
- Low: People engaged in outdoor sports or recreation (other than appreciation of the landscape), commercial buildings, and other locations where people's attention may be focused on their work or activity.

Magnitude of Change

6.3.27 The magnitude of change to landscape and visual amenity was determined by a combination of largely quantifiable parameters, as follows:

- The distance of the viewpoint from the development;
- The duration of predicted effects;
- In the case of character areas and/or designated areas, the extent of the landscape affected;
- In the case of roads, cycleways and footpaths, the length of the route affected by the development;
- The extent of the view affected by the proposed Development (i.e. the horizontal angle subtended by the proposed Development);
- The elevation of the proposed Development in relation to the receptor; and
- The extent of other built development visible, particularly vertical elements.

Table 6.3: Magnitude of Change

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 fundamental change to baseline conditions.
Moderate	Partial loss or modest alteration to one or more key features or characteristics of the baseline, resulting in localised change within a broader unaltered context.
Slight	Slight loss or small alteration to one or more key elements, features or characteristics of the baseline conditions. Change arising from the loss/alteration will be discernible but underlying landscape character or view composition will be similar to baseline.
Negligible	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 development would be discernible. The development would result in no appreciable change to the landscape resource or view.

6.3.28 The parameters evaluated in relation to the magnitude of cumulative change include:

- The number of existing, consented and/or proposed wind farms visible;
- The distance to each of the existing, consented, and/or proposed wind farms from receptor locations;
- The direction of each wind farm in relation to other wind farm developments and the viewpoint;
- The horizontal subtended angle occupied by each wind farm (i.e. The angle between the left hand visible turbine and right hand visible turbine in each wind farm);
- The frequency and duration of cumulative visibility; and
- In the case of landscape character areas, landscape designations and transportation/recreational routes, the proportion of the area or route subject to cumulative views.

6.3.29 The criteria utilised in ascribing magnitude of cumulative change throughout this assessment is defined in Table 6.4 below:

Table 6.4: Magnitude of Cumulative Change

Magnitude of Cumulative Change	Definition
Substantial	The proposed Development would represent a considerable increase in the proportion of the landscape or view affected by wind farm development.
Moderate	The proposed Development would represent a notable increase in the proportion of the landscape or view affected by wind farm development. Moderate cumulative change equates to a localised change within an otherwise unaltered context.
Slight	The proposed Development would represent a minor addition to the proportion of the landscape or view affected by wind farm development. The change would be discernible, but the original baseline conditions would be largely unaltered.
Negligible	The proposed Development would represent a very limited or barely discernible addition to the proportion of the landscape or view affected by wind farm development. The baseline condition of the landscape or view would, for all intents and purposes, be unaffected.

Landscape and Visual Effects

6.3.30 Landscape and visual effects have been assessed as major, moderate, minor or none. These categories have been based on comparison of viewpoint or landscape sensitivity and predicted magnitude of change, as indicated in Table 6.5. **Major** and **major/moderate** effects are considered to represent significant effects in terms of the EIA Regulations.

6.3.31 The matrices are not used in an arithmetic way or as a prescriptive tool. The methodology and analysis of potential effect at any particular location must allow for the exercise of professional judgement.

6.3.32 Whilst landscape effect can be negative (adverse), positive (beneficial) or neutral (neither adverse nor beneficial overall) it has been assumed, for the purposes of this assessment, that effects are adverse unless stated otherwise.

Table 6.5: Landscape and Visual Effect

	Magnitude of Change				
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
Negligible	Moderate/Minor	Minor	Minor/None	None	None

6.3.33 A summary of significant effects is provided in the final Section of this Chapter.

Illustrative Tools

6.3.34 Volume 3: Figures of the ES, contains all of the drawings to accompany the LVIA. These figures include landscape character and designation plans, zones of theoretical visibility (ZTVs) and cumulative visibility plans and visualisations.

6.3.35 The ZTV figures were prepared to assist in the identification of areas from where there is potential visibility of the proposed Development. The ZTVs present the maximum potential visibility insofar as they are based on Ordnance Survey (OS) digital terrain data at 5 m horizontal interval resolution and therefore do not take account of local landforms and vegetation (e.g. trees, hedges and forestry), nor any built forms in the landscape. This means that the visibility shown on the ZTVs is predicted to be more extensive than actual visibility on the ground. Where the ZTVs show no visibility, it is generally predicted that no turbines would be seen. A series of cumulative ZTVs were prepared to ascertain the potential cumulative visibility of the proposed Development in conjunction with the other wind farms considered in the cumulative assessment as listed in Table 6.2.

6.3.36 The viewpoint analysis is illustrated by a range of images including photographs, wirelines and photomontages. The photographs used to construct the photomontages were taken by a professional photographer using a digital Single Lens Reflex (SLR) camera with a 50 mm lens. Wirelines were generated using the same OS digital data used to generate the ZTVs and therefore take no account of the screening effect of man-made structures, local micro-topography or vegetation. For ease of reference, and in accordance with current SNH guidance, the wirelines show the proposed Development in red, existing/operational wind turbines in black, consented turbines in green and schemes subject to a formal application or appeal in blue.

6.3.37 The photomontage images were generated by combining a wireline of the proposed Development with the photograph of the existing view and rendering the image using a model of the proposed wind turbines, also generated electronically.

6.3.38 It should be noted that photography is a tool to assist in the visualisation process, and cannot be expected to precisely replicate the actual view or predicted view which would be attained on the ground. Moreover, weather and light conditions will vary greatly throughout each day, month and year, with consequent effect upon general visibility and the potential visibility of the proposed Development.

6.4 PROJECT DESCRIPTION AND EMBEDDED MITIGATION

Project Description

6.4.1 The site selection rational and description of the proposed Development is given in Chapter 4: Description of Development, of this ES. This Chapter also details the design optimisation process undertaken in order to achieve a satisfactory layout in respect of landscape and visual amenity within key site environmental and technical constraints.

- The wind farm development would comprise three distinct phases:
- Construction phase;
- Operational phase; and
- Decommissioning phase.

6.4.2 From the point of view of the landscape and visual assessment, there are two aspects of a wind farm development that have the potential to cause an effect on landscape quality and visual amenity. These comprise:

- Activities and elements of the proposed Development that would affect the fabric of the physical landscape of the site; and
- Activities and characteristics of the proposed Development visible from the surrounding locality, would affect the landscape character and visual amenity nearby.

Construction Phase

6.4.3 The construction phase of the proposed Development is likely to last for approximately 15 months. During this phase the following activities and elements have the potential to cause an effect on the landscape and visual amenity of the study area:

- Site preparations, including felling, soil stripping and excavation of borrow pits (and soil stockpiles);
- Upgrading of existing site access tracks and formation of new tracks;
- Excavation and construction of turbine and anemometry mast foundations;
- Excavations for underground cables;
- Formation of temporary site compound;
- Site office and car parking;
- Formation of temporary crane pads adjoining each turbine location;
- HGV deliveries to site and movement of vehicles on site;
- Site cranes and erection of turbines; and
- Reinstatement works, including removal of temporary construction compound and restoration of borrow pits.

6.4.4 The turbines themselves would be erected over a short period, typically 1-2 days per turbine, and the appearance of the construction cranes in views of the site would therefore be of short duration.

Operational Phase

6.4.5 The operational phase would last approximately 25 years, during which time potential sources of landscape and visual effect would include:

- Wind turbine generators and anemometer masts;
- Access tracks; and
- Grid connection compound and site control building/switch room (however, it must be noted that the grid connection compound and site control building/switch room are part of the baseline for Windy Standard II).

6.4.6 The effect of the above elements on the landscape and visual amenity of the study area are considered in detail in the sections which follow.

Decommissioning

6.4.7 Key aspects of decommissioning works that have potential landscape and visual implications include:

- Removal of access tracks and reinstatement of the underlying disturbed ground;
- Dismantling and removal of wind turbines and anemometer masts, trimming of foundations to a depth of 1 m below ground surface levels, and restoration of turbine locations to match the character and appearance of the adjoining forested moorland landscape; and
- Deplanting of grid infrastructure, removal of the grid connection compound, and reinstatement of the compound location to match the character and condition of the adjoining forested moorland where required.

Post Decommissioning

6.4.8 Following the decommissioning of the proposed Development, removal of all above ground structures and reinstatement works the remaining effects would largely relate to retained site entrance and site tracks, and the restored borrow pits.

Embedded Mitigation Measures

6.4.9 It is accepted that wind farms, by their nature and scale, generally result in some significant landscape and visual effects. The role of any mitigation or design approach should therefore be to minimise such significant effects through careful siting and design of developments. Whilst the element with greatest potential for significant effects will generally be wind turbines it is also important to provide careful consideration of the associated infrastructure such as tracks, power-lines, substations and control buildings. SNH's current guidance on the siting and design of wind farms in the landscape states that:

"Wind farms should be sited and designed so that adverse effects on landscape and visual amenity are minimised and so that areas which are highly valued for their landscapes and scenery are given due protection. If wind farms are sited and designed well the capacity of our landscape to incorporate this type of development is maximised."

6.4.10 Paragraph 3.2 of SNH's guidance goes on to state that *"it is important to site and design a wind farm so that it relates directly to the qualities of a specific site. The main design elements are likely to include:*

- *Layout and number of wind turbines;*
- *Size, design, and proportion of wind turbines;*
- *Type, route and design of access tracks, including the amount of cut and fill required and the junctions with public roads;*
- *Location, design and restoration of hardstandings;*
- *Location, design and restoration of borrow pits;*
- *Location, design and restoration of temporary construction compounds;*
- *Location and size of wind monitoring masts;*
- *Positioning and mitigation of turbine lighting (if required);*
- *Visitor facilities, including paths, signs, parking and visitor centre (if proposed); and*
- *Land management changes, such as muirburn, woodland management or felling, fences, and stock grazing."*

6.4.11 Based on SNH's guidance, an analysis of the baseline context of the proposed Development and advice received from DGC and ECDU, the embedded mitigation would include considerations of the following matters:

- Site location and layout relative to the landscape and cumulative context;

- Turbine design;
- Forest felling and replanting;
- Aviation lighting;
- Off-site highway improvements;
- Access tracks;
- Laydown areas and crane pads;
- Cabling, substation control building and substation;
- Construction compound;
- Concrete batching plant;
- Borrow pits;
- Construction methods and landscape reinstatement; and
- Decommissioning operations.

6.4.12 The siting and layout of the proposed Development was based on an iterative design process aimed at reducing environmental impacts whilst achieving suitable technical and commercial objectives bearing in mind the recent and emerging changes to funding mechanisms and the requirement for wind energy to compete in a levelised cost of electricity market (as discussed further in Chapter 2: Planning and Policy Context, of the ES). The design development and design strategy is described in Chapter 3: Design Evolution and Alternatives, of the ES. Key objectives specific to the LVIA were also adopted for the proposed Development that include:

- Use of the enclosure provided by the topography of the adjoining uplands to contain the extent of the potential viewshed of the proposed Development;
- The selective use of Larger turbines in areas of set back from prominent skylines where visibility from sensitive low lying positions would be restricted;
- Minimisation of effects on key visual receptors including residential receptors, road users and walkers, including those within Glen Afton, Doon Valley and at settlements and road corridors to the north;
- Avoidance of significant effects on areas designated for their landscape value (e.g. Dumfries and Galloway Regional Scenic Area and South Ayrshire Regional Scenic Area);
- Focusing of the proposed Development in an area already subject to extensive wind farm development to concentrate development rather than dispersing it throughout the locale, and within a search area where there is an expectation of large typology wind turbines, as defined in the adopted Local Development Plan (LPD);
- Use of a layout that reflects the development pattern of nearby existing and proposed wind farms with that of the present Windy Standard Developments;
- The avoidance, wherever possible of prominent hills/summits and ridges or steep gradients that mark a transition to smaller scale landscapes or along the edge of the uplands;
- The placement of the largest turbines of the proposed Development in locations which ensure that they do not exceed the maximum tip height (in terms of metres above ordnance datum (AOD)) of the present Windy Standard Developments; and
- The use of large turbines to maximise energy outputs whilst minimising landtake and effects on landscape fabric. Wherever possible, ensuring that the proposed Development would be seen in the same part of the view as other wind farm developments, and overlapping with them.

Turbine Design

6.4.13 A number of standard and site specific environmental mitigation measures were incorporated into the design of the wind farm. These include use of modern turbine design features.

6.4.14 The proposed Development would make use of three bladed horizontal axis turbines with tubular steel towers. Research (Stevenson and Griffiths, 1995) has confirmed that tubular turbine towers reduce visual clutter and are simpler in appearance. Consequently, the use of such turbines for the proposed Development would be consistent with the simplicity of the surrounding landscape. Care was also taken to achieve a balanced ratio between tower height and blade length.

6.4.15 With regard to the colour of the proposed turbines, Siting and Designing Windfarms in the Landscape (Version 2) SNH, December 2014 states that:

"Selecting the most appropriate colour for a turbine(s) is an important part of detailed windfarm design and mitigation. It has previously been assumed that wind turbines could be painted a colour that would camouflage them against their background. However, experience has shown that no single colour of wind turbine will consistently blend with its background and it is more important to choose a colour that will relate positively to a range of backdrops seen within different views and in different weather conditions."

6.4.16 The publication goes on to state that as a rule for most rural areas of Scotland:

- *"A single colour of turbine is generally preferable;*
- *A light grey colour generally achieves the best balance between minimising visibility and visual impacts when seen against the sky;*
- *The use of coloured turbines (such as greens, browns or ochres) in an attempt to disguise wind turbines against a backcloth is usually unsuccessful; and*
- *Paint reflection should be minimised."*

6.4.17 In cognisance of the preceding guidance a simple pale grey colour and non reflective render is therefore proposed for turbines.

Forest Felling and Replanting

6.4.18 The extent of preparatory felling at the site is indicated in ES Figure 12.6 in Volume 3 of the ES, and described in Chapter 12: Forestry, of the ES. The amount of felling required has been minimised, ensuring that important forested edges are retained which provide mitigation of views from locations such as the A713 corridor, Carsphairn and New Cumnock. Moreover, it is envisaged that, following completion of construction works that replanting will be carried out utilizing appropriate forest species, leaving 30 m open corridor around access tracks and 70 m radius open areas around turbines and crane pads. Clear felling of forest compartments and replanting is a characteristic element if the landscape within which the proposed Development is located and would therefore not be anomalous.

Aviation Lighting Requirements

6.4.19 In order to mitigate night time visual impacts infra-red lighting would be employed on the Waterhead Hill Cluster to meet the requirements of the aviation authorities and negate any potential associated visual impacts as infrared lighting is not visible to the naked eye.

6.4.20 CAA confirmed in post scoping consultation that visible red aviation lighting would be required on the 177.5m turbines in the Meaul Hill Cluster under the Air Navigation Order (ANO) Article 219 lighting requirements. Discussions are underway with the CAA with regards to the ANO Article 219 lighting requirements. In the absence of any certainty regarding the lighting requirements for the proposed Development, no assessment of this aspect has been included in the LVIA.

Off-Site Highway Improvements

6.4.21 No offsite highway improvements are anticipated. Consequently, no assessment was required in this respect.

Access Tracks

6.4.22 As far as possible existing forest tracks and the access tracks for the present Windy Standard Developments would be used to minimise the amount of ground disturbance and loss of characteristic vegetative cover. Notwithstanding this, 8.8 km of new tracks would be required, including sections linking to proposed turbine

locations. New tracks would be constructed to match the appearance of existing forestry tracks and have been designed to avoid prominent slopes and summits.

6.4.23 During the construction phase of the proposed Development all access tracks would be constructed/widened to a nominal width of 5 m to accommodate construction vehicles and abnormal load deliveries.

6.4.24 The proposed tracks would be aligned so as to take advantage of the screening effect of intervening topography and/or vegetation. Consequently, the tracks are likely to be screened from the majority of external viewpoints.

Crane Pads

6.4.25 These would be surfaced to match the proposed track construction. Whilst crane pads would be retained for the duration of the proposed Development they are likely to be screened from the majority of external viewpoints by a combination of topography and/or forest cover.

Cabling, Substation Control Building and Substation

6.4.26 In order to avoid potential visibility of the grid connection cables these would be undergrounded within the site from each turbine to the substation and onsite grid connection. Undergrounded sections of cable would, wherever practicable, be placed beside proposed access tracks to reduce disturbance of the landscape and to ease future maintenance.

6.4.27 The proposed Development would utilise the on-site substation and control building which will be used by Windy Standard II. Consequently, this aspect of the proposed Development would require no additional land take. It is also the case that these aspects of the proposed Development, once constructed, will be screened from the majority of external receptors by a combination of intervening topography and vegetation.

Construction Compound

6.4.28 During the construction phase of the proposed Development, a temporary compound and laydown site will be required. Upon completion of construction works at the proposed Development the compound would be removed and the ground reinstated. In order to ensure that the compound and laydown area can be returned to a condition consistent with the adjacent moorland suitable construction methods and soil husbandry methods would be adopted. These would be specified in the Construction Method Statement (CMS) and agreed with DGC, SNH and SEPA prior to works commencing at the site.

Concrete Batching Plant

6.4.29 The concrete batching plant would be positioned within an existing borrow pit excavation east of Brockloch Rig and would therefore be enclosed and screened from the vast majority of views.

Borrow Pits

6.4.30 The aggregate required for the construction of the turbine bases and construction and upgrading of tracks would be won from a series of up to four borrow pits distributed along the length of the proposed access track, as shown in ES Figure 1.2 in Volume 3 of the ES. These excavations are based upon existing borrow pit excavations and would avoid prominent slopes and summits. Each borrow pit would be restored during the construction phase of the proposed Development. Each restored borrow pit would be subject to suitable aftercare provisions.

6.4.31 Detailed restoration design proposals and outline aftercare proposals would be agreed with DGC prior to commencement of construction activities at the site as part of the Construction Method Statement (CMS) (see Chapter 4: Description of Development, of the ES) and could be covered by a suitable suspensive condition.

Construction Methods and Landscape Reinstatement

6.4.32 Throughout all phases of the proposed Development, ground disturbance on site would be confined, as far as practicable, to access tracks, turbine base areas, lay-down areas, crane pads and underground sections of the grid connection cables. The proposed location of these elements is described in Chapter 4: Description of Development, of the ES. Moreover, working widths would be restricted and carefully monitored and any existing landscape feature or materials arising from site operations that are to be retained would be safeguarded.

6.4.33 No stockpiles of aggregate would be retained on site during construction. Any aggregate arising from the proposed borrow pits would be placed directly.

6.4.34 All soils stripped from construction areas and borrow pits would be retained in clearly demarcated stockpiles of no greater than 3 m height in locations immediately around the edges of borrow pit excavations and/or directly placed to reinstate track sides.

6.4.35 On completion of the construction phase, all areas subject to ground disturbance adjacent to built elements would be reinstated to match adjoining undisturbed ground. Additionally, the surface of the temporary compound would be ripped to relieve any compaction of the aggregate base and underlying substrate, and the surface soiled and seeded.

6.4.36 A detailed construction and reinstatement method statement would be agreed with DGC and SEPA prior to commencement of construction activities.

Decommissioning

6.4.37 During decommissioning of the proposed Development, all above ground structures would be removed and the ground reinstated. Subject to further assessment of site hydrology and soil cover depths, below ground structures and foundations would be left in place to avoid further disturbance.

6.5 BASELINE CONDITIONS

6.5.1 The following section describes the key aspects of the landscape and visual context of the study area. The sensitivity of receptors is commented upon as a basis for the subsequent assessment of residual effects.

Landscape Planning and Legislative Context

6.5.2 Details of the national, regional and local planning policy and strategic spatial guidance of relevance to the proposed Development is contained in Chapter 2: Planning and Policy Context, of the ES.

Landscape and Visual Context

Topography and Hydrology

6.5.3 The topography of the study area, which is illustrated in ES Figures 6.1 in Volume 3 of the ES, comprises three main valleys which divide the area, extending south-east from the River Ayr valley. These include the Nithsdale between Cumnock and Dumfries, Doon Valley between Patna and Loch Doon, and The Glenkens to the south. The coastal edge of the Ayr Bay forms the western most extent of the study area and is orientated in a north to south direction. The mountain ranges within the study area are collectively known as the Southern Uplands with the site situated in the hill range of Carsphairn Forest, the Lowther Hills located to the east and the Merrick range situated within Glentrool Forest to the south. The landform to the west is typically comprised of lowland hills.

6.5.4 The nature of the study area's hydrology is largely defined by the river systems which drain through the upper hill ranges located to the east, collecting to form wider river systems such as the River Ayr to the north, the River Nith to the southeast and the River Doon to the north; the River Ayr and the River Doon draining to the Firth of Clyde at Ayr, whilst the River Nith drains to the Solway Firth at Dumfries. The Afton Reservoir and Loch Doon are located in the vicinity of the application site, to the north-east and south-west respectively. Inland water bodies are frequently found in the south of the study area, situated in upland areas and the lower valley landscapes of The Glenkens; the most notable of which include Loch Doon, Loch Bradan Reservoir, Clatteringshaws Loch and Loch Ken.

6.5.5 In the immediate vicinity of the proposed Development the landscape comprises the western slopes of Windy Standard Hill where elevations within the site area typically range between 400 m AOD and 550 m AOD. The upland landscape of the Carsphairn Hills surrounds the site area to the north, south and east, with the summit of Windy Standard (698 m AOD) located to the east and the summit of Cairnsmore of Carsphairn (797m AOD) situated to the south. The landform generally slopes downwards to the west towards the A713 and Loch Doon

beyond, both of which are located in the wider valley form of The Glenkens. The overall form of the topography is largely derived from Carsphairn Hills and the erosion channels of the numerous burns that run down off them.

Landcover and Landuse

6.5.6 To the north, the upland basin of the River Nith and adjoining areas in the Foothills and Plateau Moorland have been heavily influenced by quarrying and mining activities, with both active and restored sites present. Many of these sites have been restored characteristically to grazing moorland with few field boundaries and/ or woodland planting and including occasional water bodies. However, the operational Greenburn surface mine is clearly evident west of New Cumnock. Other land-uses in this area include agricultural grasslands and forestry.

6.5.7 To the east of the proposed Development, the Carsphairn Hills are mostly comprised of upland moorland and the plantation woodland of Carsphairn Forest. The existing Windy Standard Wind Farm is situated within this forested area. To the west and south-west plantation woodland and moorland extends across the Merrick range of hills.

6.5.8 The broad pattern of landcover and landuse within the study area is heavily influenced by topography. It can be roughly divided into accessible areas and inaccessible areas. Accessible areas are made up of those which have been settled, cultivated or cleared for agricultural land, those which are used for quarrying/ mining landuses or are afforested with coniferous plantation. The inaccessible areas are made up of topographically challenging areas which remain as broadleaf woodland (predominantly oak and birch), moorland or peat bog.

6.5.9 The more accessible lowland areas tend to be used as pastoral and arable agricultural land with areas of riparian woodland while upper slopes are often characteristic of restored moorland. The policy woodland contained within Dumfries House Garden and Designed Landscape represents a key feature within the lowlands landscape west of Cumnock.

6.5.10 Settlement is concentrated along the coastal regions and along major transport routes located at the base of valleys, increasing in size at crossroads where major communication links meet.

6.5.11 Table 6.2, above, and ES Figure 6.6 in Volume 3 of the ES indicate the extent of existing wind farm development within the study area. The principal context currently is that of the existing Hare Hill and the present Windy Standard Developments. It is apparent from an analysis of the layout, position and turbine geometry established at each site that there is a divergent pattern of development, the relatively smaller scale turbines of the Hare Hill scheme occupying a prominent domed hill, whilst the existing Windy Standard Wind Farm occupies a linear rigg landform oriented northwest to southeast, west of Glen Afton in an area of extensive coniferous forestry. Windy Standard II, once constructed, will follow a similar layout to this, but will utilise larger turbines, reflecting the lesser sensitivity and visibility of their position set back from Glen Afton. The recently consented Afton Wind Farm, whilst responding to the topographical form of the underlying landscape and the existing Windy Standard Wind Farm, utilises turbines of a size similar to those of Windy Standard II.

Transportation

Road Network

6.5.12 There are several main communication routes throughout the study area with a common pattern of a north-west to south-east orientation across the central part of the study area whilst to the west routes are aligned northeast/southwest reflecting the pattern of the coastal edge.

6.5.13 Some stretches of the main roads network are identified by the ZTV as having views of the proposed Development. However vegetation adjacent to the road corridor provides some visual screening, resulting in intermittent views across the landscape. The main routes with potential visibility of the proposed Development include:

- The A70, Douglas to Ayr: This route is orientated in a rough east to west direction and is located, at its closest point, approximately 16.8 km to the north of the proposed Development;
- The A76, Dumfries to Kilmarnock: There is potential visibility from sections of this route between New Cumnock and Mauchline, which, at their closest, are located approximately 12 km to the north of the proposed Development;
- The A77, Kilmarnock to Turnberry: This route is orientated in a north-east to south-west direction, extending from the Firth of Clyde coastline, and, at its closest point, is situated approximately 26.7 km to the west of the proposed Development;
- The A79, Ayr to Prestwick: Orientated in a north to south direction following the coastline of Ayr Bay, at its closest point, this route is situated approximately 27.5 km north-west of the proposed Development;
- The A702, St John's Town of Dalry to the A74(M): This route follows a south-west to north-east alignment and, at its closest point, is located approximately 19.4 km from the proposed Development;
- The A712, Newton Stewart to Crocketford: This route is follows a northward curving alignment passing through New Galloway and, at its closets point, is located approximately 22.5 km south of the proposed Development;
- The A713, Ayr to Castle Douglas: This route is orientated in a north-west to south-east direction and, at its closest point, passes within 4.1 km to the west of the proposed Development;
- The A719: Links the A77, A76 and A71, is orientated in a south-west to north-east direction and, at its closest point, is located approximately 29.6 km north-west of the proposed Development, and
- The A762, Laurieston to the A713 near St John's Town of Dalry; This route is orientated south-north and, at its closest point, is situated approximately 18.5 km south of the proposed Development.
- The B705, Catrine to Auchinleck: This is an eastern loop road off the A76, passing through Catrine and Auchinleck, and at its closest point it is located approximately 19.3 km north of the proposed Development;
- The B741, Girvan to New Cumnock: This route passes through various small settlements as well as Dalmellington and lies within 7.3 km of the proposed Development at its closest point;
- The B743, Ayr to the A70: This route is aligned west to east, between Ayr, Mauchline, Sorn and the A70. At its closest point this route is situated approximately 23.3 km north of the proposed Development, and
- The B7037, Galston to Sorn: This is aligned in a north-west to south-east direction, and at its closest point is located approximately 24.4 km north of the proposed Development.

6.5.14 Road users are generally held to have a medium sensitivity to the type of development proposed due to the transitory nature of views and the movement and disturbance/detractors associated with them.

Rail Network

6.5.15 The principal railways in the study area that would be subject to potential views of the proposed Development include:

- The eastern section of the Glasgow South Western Line, between Kilmarnock and Dumfries, which, at its closest, is situated approximately 11.5 km to the north of the proposed Development at New Cumnock;
- The western section of the Glasgow South Western Line, between Troon and Girvan, which, at its closest, is situated approximately 26 km west of the proposed Development, and
- The Prestwick to Mauchline line which, at its closest, is situated approximately 25.9 km to the north west of the proposed Development.

6.5.16 Rail passengers are generally considered to have a medium sensitivity to this type of development due to the transitory nature of the views they experience.

Recreation and Tourism

6.5.17 Overall, there are few formal recreational facilities in the study area which are generally confined to the interior of main settlements; however there are a number of marked footpaths and amenity/access woodlands (see Chapter 15: Socio-Economic and Tourism Assessment, of the ES. In addition, there are large areas of the coniferous plantation with marked footpaths open to the public including the Galloway Forest Park to the west of

Loch Doon. Loch Doon, itself, which is situated about 3 miles east of the town of Dalmellington, next to the road signed A713 to Castle Douglas & Dumfries, is a recognised tourist resource and is associated with the Scottish Dark Sky Observatory that opened in October 2012. A new Cafe by the dam that is open 7 days a week, there is also a new Touring Caravan Park and formalised camping spots. The area has a popular riverside walk and four hill ranges with hills from 1,000 ft to 2,766 ft. Five hills are above 2,500 feet, known as Corbetts.

Walking

6.5.18 The study area contains a section of the Southern Upland Way between the Galloway Forest Park in the south and the Lowther Hills to the east. This nationally important long distance route has some potential views of the proposed Development and at its closest point this route would pass within 9.8 km of the proposed Development.

6.5.19 Locally there are a number of footpaths and tracks, several of which are identified within the Dumfries and Galloway Core paths Plan, adopted 2013, and the East Ayrshire Finalised Core Path Plan, adopted 2008 (see Figure 13.1 in Volume 3 of the ES. The main routes within 5 km which have potential visibility of the proposed Development are as follows;

- Cairnsmore of Carsphairn by the Green Well Core Path;
- Carsphairn Forest Core Path;
- D17 Craigengillan / Eriff Core Path; and
- Knockgorroch Core Path.

6.5.20 No formal footpaths were identified within the application site.

6.5.21 Strategic recreational footpaths/trails are generally assumed to have a high sensitivity to the type of development proposed due to the nature of their use, the often scenic quality of their route, and their importance as a regional or national leisure/tourist resource. In contrast, short-range footpaths, including unmarked footpaths, are generally considered to have medium sensitivity.

Cycling

6.5.22 National Cycle Route (NCR) 7: This is an on-road cycle route which follows a minor road though the Galloway Forest Park and continues northwards towards Maybole before joining the A719 to Ayr and north to Troon. At its closest point it is located approximately 22 km to the west of the proposed Development.

6.5.23 Cycling opportunities also exist on the quieter roads and tracks within the study area. The A70, A77 and A76 are also popular with commuter cyclists.

6.5.24 Given that cycleways are important to national/regional tourism, cyclists using NCR7 are considered, as a worst case, to have a high sensitivity to the type of development proposed.

Settlement

6.5.25 The study area contains contrasting settlements of large scale, as well as smaller villages, hamlets and scattered farmsteads. The larger settlements with predicted visibility of the proposed Development include:

- Cumnock (approximately 15.2 km north/north-west of the proposed turbines);
- Auchinleck (approximately 18.6 km north/north-west of the proposed turbines);
- St John's Town of Dalry (approximately 19 km south of the proposed turbines);
- Mauchline (approximately 24.7 km north/north-west of the proposed turbines);
- Ayr (approximately 27.3 km north-west of the proposed turbines), and
- Maybole (approximately 27.5 km west/north-west of the proposed turbines).

6.5.26 Small scale settlements with potential visibility of the proposed Development include:

- Carsphairn (6.5 km South of the nearest proposed turbine).

6.5.27 Residential receptors are considered to have a high sensitivity to the type of development proposed.

Landscape Designations

6.5.28 There are no national landscape designations such as National Scenic Areas (NSA) within the study area. However, there are several regional and local landscape designations, those with potential views of the proposed Development are as follows:

Dumfries and Galloway Hills Regional Scenic Area (RSA)

6.5.29 There are three RSAs within the study area, each of which would experience potential visibility of the proposed Development, the closest of which is the Galloway Hills RSA. At its closest, this area is located approximately 1.8 km south of the proposed Development and was designated in order to protect the dramatic and scenic qualities of the landscape including much of the Galloway Forest Park. Technical Paper No.6: Identification of Regional Scenic Areas (Dumfries and Galloway Council in 1999) and subsequent Local Development Plan Technical Paper, published in September 2014, describes this RSA as follows:

"This is the largest Regional Scenic Area, a reflection both of the scale of the landscape of the Galloway Hills and the interesting juxtaposition of contrasting upland, valley and coastal landscapes. The relationship between the hills, in particular from the western side of Wigton Bay and certain sections of the perimeter valleys, The overall scale of the designated area results in some parts, particularly those areas included because of their contribution to the wider view, being of less internal scenic interest than others. Examples include certain of the forested foothills of the Merrick and the Rhinns of Kells. However, these areas form the setting to the dramatic summits of the Galloway Uplands, and so warrant designation as an integral part of the scenically valued landscape of the Galloway hills, to protect them from unsuitable development, and encourage sensitive management.

The uplands vary in character from massive craggy peaks of the Rugged Granite Uplands with their heather covered slopes and granite outcrops to the smoother, rounder, lower summits of the Foothills, and their extensive forested counterparts. The designated area has been extended to include the dramatic sculptural peaks of the Cairnsmore of Carsphairn Southern Uplands Landscape Unit to the east, as well as the forested eastern slopes of the Rhinns of Kells."

6.5.30 It should be noted, however, that, contrary to the Scottish Planning Policy (SPP), no citation or specification of the special qualities that are to be protected are given in the Technical Paper, making assessment of potential residual effects wrought by the proposed Development problematic. It would appear, from the preceding description that the key issues pertinent to the designation include:

- The juxtaposition of contrasting upland, valley and coastal landscapes.
- The forested foothills of the Merrick and the Rhinns of Kells which form the setting to the dramatic summits of the Galloway Uplands.
- The varied character of the uplands including massive craggy peaks of the Rugged Granite Uplands with their heather covered slopes and granite outcrops to the smoother, rounder, lower summits of the Foothills, and their extensive forested counterparts.
- The dramatic sculptural peaks of the Cairnsmore of Carsphairn Southern Uplands Landscape Unit to the east, as well as the forested eastern slopes of the Rhinns of Kells.

6.5.31 The remaining two areas are the Thornhill Uplands RSA and the Terregles Ridge RSA, both of which have limited potential visibility of the proposed Development and are therefore not described in further detail.

6.5.32 For the purposes of this Landscape and Visual Impact Assessment RSA are considered to have a high sensitivity to the type of development proposed. It is recognised however that in planning terms the SPP affords these a lower level of protection that NSA's and other designations.

East Ayrshire Sensitive Landscape Area (EASLA)

6.5.33 The EASLA within the study area is subdivided into three different areas. Those that would be subject to potential views of the proposed Development include one 1.8 km to the north of the proposed Development and which extends across the southern uplands between Littlemark and the Nith and extends north to Glenmuirshaw. The second area is located approximately 19.3 km north of the proposed Development and contains the River Ayr, and the third area is located approximately 4.6 km to the west and is centred on the River Doon valley.

6.5.34 The East Ayrshire Local Development Plan Background Paper: Sensitive Landscape Areas (2015) states that:

"The designation of the Sensitive Landscape Area is considered an appropriate means of ensuring East Ayrshire's most valuable landscapes are fully respected in preparing and assessing development proposals. The Sensitive Landscape Area designation does not prevent development. Instead, it requires development proposals to fully consider the qualities that make the landscape valuable and to seek sites and design solutions that respect these qualities and minimise adverse impacts."

6.5.35 It is noted that no specific common special qualities or rationale is given for the designation. Rather, the justification given for the designation is that the relevance of constituent landscapes. The landscape types that form constituent parts of the designation are set out below, along with the key reasons for their inclusion.

6.5.36 Lowland River Valley - *"The lowlands river valleys are interesting and scenic lowland landscapes, with significant natural and built heritage resources. Whilst East Ayrshire has several lowland river valleys, only those relating to the River Ayr and the Doon are included within the Sensitive Landscape Area. Accessible to many settlements, these attractive areas are an important feature within the lowland landscape. Attractive Estates (Sorn Castle and Auchinleck House) and designed gardens and landscapes (Skeldon Estate) are interspersed with riparian woodlands, small field parcels and winding roads. Significant tracts of natural woodland given a sense of naturalness and seclusion."*

6.5.37 Upland River Valley - *"Whilst East Ayrshire contains several upland river valleys, it is the Doon Valley, as well as a small section of the Nith Valley, that is included within the Sensitive Landscape Area. The Doon Valley is an attractive upland valley, which provides a scenic entrance into East Ayrshire. It contains a wide range of landscape features including complex knolly hill patterns in its most upland section, several water bodies and wetlands, landmarks hills and Craigengillan Estate. The east side of the Doon Valley has been affected by the coal industry, making the appropriate management of the remaining valley of significant importance. Glen Afton is the only Upland Glen within East Ayrshire, making it an important landscape feature for the area."*

6.5.38 East Ayrshire Plateau Moorland - *"The plateau moorland is intrinsically a wide open upland landscape. Its unique qualities are due to the landmark hills contained within the landscape, which form an important feature of East Ayrshire's skyline. The open expansive nature of the upland plateau contrasts dramatically to the rolling lowland landscape, and contributes significantly to the diversity of the landscape that can be experienced when travelling through East Ayrshire. The high ridgelines are visually prominent and the rugged upland landscape has a high scenic value, attractive to walkers. With only a single track road through the Glen, it provides a relatively remote and tranquil landscape."*

6.5.39 East Ayrshire Southern Uplands and East Ayrshire Southern Uplands with Forestry - *"The steep sided, rugged open hills of the Southern Uplands form a dramatic backdrop to the adjacent low-lying upland basin, and form an important part of East Ayrshire's southern skyline. The well-defined, steep-sided hills on the eastern edge of Glen Afton, Blackcraig and Craigbraneoch, are important landmark features and provide for some spectacular views. The Uplands to the east of Glen Afton is an important area for recreation / hill walking. The eastern section of the Southern Uplands with Forestry is included within the Sensitive Landscape Area. This landscape parcel forms an important buffer between Glen Afton and the non-forested section of the Southern Uplands, and helps provide a logical boundary to the Sensitive Landscape Area."*

6.5.40 Rugged Uplands with Lochs and Forestry - *"The landscape is unique in East Ayrshire terms, due to its remote and little modified nature. Loch Doon, East Ayrshire's largest water body, adds to the diversity and interest of the landscape. The sparsely settled landscape gives a strong sense of seclusion and naturalness. It has a high scenic value and for this reason is also important for recreation and tourism."*

6.5.41 Foothills West of the Doon Valley - *"The relatively constrained band of upland landscape, forms an important role in proving the backdrop and setting for the Doon Valley and the Girvan Valley in South Ayrshire. The landmark hills in the southern part of the landscape form the backdrop to Dalmellington and Craigengillan Estate, whilst the more gentle northern section contributes positively to the setting of Patna and Waterside as well as the entrance into East Ayrshire on the A713."*

South Lanarkshire Special Landscape Area (SLSLA)

There are two South Lanarkshire Special Landscape Areas located within the study area; Douglas Valley (approximately 33.2 km north-east of the Development) and Leadhills and the Lowther Hills (approximately 29 km east/north-east). The potential for visibility is limited to the Leadhills and the Lowther Hills SLSLA which are described, in the South Lanarkshire Council's publication Validating Local Landscape Designations (2010) as follows:

"the Leadhills and Lowther Hills area forms part of the more extensive Lowther Hills range which extends into Dumfries and Galloway. This landscape of remote rounded hills and isolated upland glens is characterised by a general sense of emptiness. Much of the landscape is treeless, with only a few small forestry plantations. Between the hills a number of scenic glens pass southwest from the Clyde Valley into Dumfries and Galloway, the Conservation village of Leadhills is located at the head of two glens, 400 m above sea level. With the adjacent village of Wanlockhead they represent the highest settlements in Scotland and the industrial archaeology associated with these villages, including working railways, museum, mine spoil and former mines, permeates into the adjoining landscape."

6.5.42 The specific characteristics cited in South Lanarkshire Council's report as key to the inclusion of this area in the SLA designation are as follows:

- An extensive area of high, smooth, rounded hills and varied upland glens with a sense of emptiness engendered by a lack of extensive forestry or wind farm development;
- Cultural features include the mining heritage surrounding Leadhills and remains of settlement on the sides of the glens;
- Extensive areas of rough grassland and heather moorland vegetation; and
- The Southern Upland Way and other walking routes accessible via the M74 and main roads passing through to the west; visitor attractions at Leadhills and fishing on the Daer Reservoir.
- An extensive area of high, smooth, rolling hills.

South Ayrshire Scenic Area (SASA)

6.5.43 This is an extensive designated area covering much of the south-western part of the study area, between Ayr and the Galloway Forest Park, with a second area between Ayr and Mauchline. The nearest area of this designation is situated approximately 10.7 km west of the nearest proposed turbine.

6.5.44 As with the Galloway Hills RSA, the East EASLA and SLSLA, no citation or explanation of the specific rationale or special qualities of this designation were available at the time of this assessment. South Ayrshire Council, in their current local plan, describe scenic areas as:

"Notable areas of particular landscape quality are the Heads of Ayr, the Carrick Hills, the mainly upland area of South Carrick and the coastal strip in the southern part of the Plan area. These have been afforded Scenic Area status in the Plan. It should however be noted that in general, potential impacts on the environment and landscape will be considered even if the area is not specifically identified as being within a designated scenic area."

6.5.45 For the purposes of this assessment these local designations are considered to have a high sensitivity to the type of development proposed. It is recognised; however, that in planning terms the SPP 2014 affords these a lower level of protection than NSA's and other designations.

Classified Landscapes

Gardens and Designed Landscapes (GDL)

6.5.46 The Inventory of GDL compiled by Historic Scotland identifies fourteen GDL within the study area, one of which are identified in the ZTVs as having potential visibility of the proposed Development as identified below (see ES Figure 6.3a and 6.3b in Volume 3 of the ES).

Table 6.6: GDLs with Potential Visibility of the proposed Development

GDL	Grid Reference	Distance & direction to nearest area of visibility within GDL	Description
Craigengillan	246391, 604198	9.0 km west	Craigengillan is a rare example of a complete and unfragmented estate landscape, started in the 16th century, with the layout of the gardens and the designed landscape carried out in the late 18th/early 19th century. The Japanese Gardens, rockeries and waterfalls were added in the early 20th century. The main focus of the designed landscape is along the River Doon on the eastern side of the GDL. It is noted as being of 'outstanding' quality in all categories by Historic Scotland.

6.5.47 GDL are an important part of the area's history, character and scenery and add greatly to the enjoyment of the countryside and settlements. In many cases they provide a landscape setting for important buildings, have rare plant collections or contain interesting woodland or wildlife habitats. The primary aim of the GDL designation is to identify record and protect the value of these landscapes for the enjoyment for the future generations. For the purposes of this LVIA the assessment considers the likely effect of the proposed Development upon the amenity of visitors and the character of the landscape. It does not address the specific historic reasons for the landscapes classification. This is dealt with in Chapter 9: Cultural Heritage and Archaeology, of the ES.

Wild Land Areas (WLA) (see ES Figure 6.3a and 6.3b in Volume 3 of the ES).

6.5.48 SNH's Policy Statement Wildness in Scotland's Countryside (2003) recognises the importance of wild land and considers how to identify and manage such land. Annex 1 of this Policy Statement maps search areas for wild land, although these areas have been superseded by those identified within the 'Map of Wild Land Areas 2014.

6.5.49 The key criteria in determining this classification include:

- A high degree of perceived naturalness in the setting, especially in its vegetation cover and wildlife, and in the processes affecting the land;
- The lack of any modern artefacts or structures;
- Little evidence of contemporary human uses of the land;
- Landform which is rugged, or otherwise physically challenging; and
- Remoteness and/or inaccessibility.

6.5.50 Whilst WLAs are not subject to formal designations they are attributed a high value and sensitivity in planning policy and are considered nationally important landscapes.

6.5.51 The study area contains WLA1 - Merrick, which is located approximately 14.1 km south-west of the proposed Development, encompassing parts of Glentrool Forest and Carrick Forest.

Landscape Character

6.5.52 Landscape Character Assessments relevant to the assessment include:

- Dumfries and Galloway Landscape Assessment (Review No 94), SNH (1998);
- Ayrshire Landscape Assessment (Review No 111), SNH (1998), and
- Glasgow and the Clyde Valley Landscape Assessment (Review No 116), SNH (1999).

6.5.53 In 2010, South Lanarkshire Council issued the South Lanarkshire Landscape Character Assessment prepared by Ironside Farrar (2010). The location and extent of landscape character types are mapped in ES Figure 6.2a and 6.2b in Volume 3 of the ES. For the purposes of this assessment, the Glasgow and the Clyde Valley landscape assessment identified above will not be included in the baseline study as the Ironside Farrar assessment supersedes this earlier SNH assessment.

6.5.54 Reference has also been made to the current Consultative Draft, Dumfries and Galloway, Interim Planning Policy: Wind Energy Development (2011) and the Dumfries and Galloway Wind Farm Landscape Capacity Study (DGWLCS) (Anderson Grant 2011). The DGWLCS largely adopts the landscape types within the 1998 landscape assessments mentioned in 6.5.50, above.

6.5.55 A comparison of the blade tip ZTV and landscape character areas (see ES Figures 6.4 and 6.2a and 6.2b in Volume 3 of the ES, respectively) enabled identification of the landscape types from which the proposed Development may be visible. The key characteristics of each landscape type considered, along with their sensitivity to the type of development proposed is outlined in Table 6.7, below.

Table 6.7: Landscape Character Types within 35 km with Potential Visibility of the proposed Development

Landscape Types	Key Characteristics	Distance and direction to proposed Development from nearest area of visibility within each LCT Unit	Sensitivity to Type of development proposed
LCAs within Dumfries and Galloway Landscape Assessment			
Flooded Valley (DGW9)	Generally shallow V shaped valley with narrow valley floor. Extensive waterbody with bays and wetlands Glacially shaped terrain including drumlins, roche mountonees, rocky ridges and eroded slopes. Improved pasture of medium scale with dry stone dyke enclosures. Rough grassland with heather and gorse on rocky ridges. Small broadleaf woodlands and shelterbelts. Small coniferous plantations (except at Cairn Edwards where forestry is extensive). Major road corridor. Guidance: This landscape type is very distinctive, occurring in just one area. Its attractiveness, the combination of diverse landcover pattern and dominance of the loch is appreciated by large numbers of visitors to the area. It is partially designated by Regional Scenic Area status. Overall guidance/strategy is to maintain and enhance the landscapes character and condition.	19.49 km N	High due to the incised and enclosed nature of the landscape and its small to medium scale and the prevalence of size indicators.
Upper Dale (DGW10)	Wide V shaped valley, enclosed by high peaks and moorland. Open, long range views. Improved valley pastures becoming rougher in the upper valley sides. Medium to large scale enclosures with dry stone dykes. Riparian woodlands along the main river and up tributary channels. Medium to large scale forestry plantations on the valley sides and extending over horizons from higher ground. Mining settlements and remnants of industrial activity e.g. mine ruins and bings. Guidance: The remote upland nature of this landscape and the legacy of discontinued industrial development have created quite a rough and abandoned character in places. The overall strategy should be to enhance the character. All the general considerations discussed in Part 2 of this report are relevant.	4.18 km E	Variable, low in locations subject to substantial enclosure by woodland and forestry, to medium in more open locations where views are relatively expansive and characterised by large scale open landscapes containing a number of existing vertical elements. Sensitivity increases in parts of the LCT in the vicinity of Carsphairn where the landscape is enclosed by the topography of the Southern Uplands, thereby reducing the scale of the landscape and emphasising the elevated rolling skyline.
Southern Uplands (DGW22)	The eastern section of the Lowther Hills range and the southern section of the Carsphairn Hills are designated by Dumfries and Galloway RSA; This landscape is considered to be remote in character emphasised by the limited number of field enclosures and in medium condition; The landcover is predominately comprised of coarse grassland with pockets of heather moorland on higher elevations and occasional areas of coniferous woodland situated in incised valleys. There is a legacy of mineral activity in this LCT with a number of relics visible in the landscape; Overall, this is a large scale landscape due to its elevated and open nature together with the simple land cover and areas of large scale commercial woodland. Localised confinement is provided in incised valleys; and Long distance, panoramic views are obtained from summits and elevated slopes, restricted to medium distance by intervening landform and woodland blocks on lower slopes. This LCT contains part of the present Windy Standard Developments. Guidance:	0.73 km NW 16.86 km W 19.27 km SW 30.82 km W	Medium on larger scale open upland summits, but increasing to high in lower lying, steeper slopes and in locations on the edges of valleys where the uplands form prominent skylines.

Landscape Types	Key Characteristics	Distance and direction to proposed Development from nearest area of visibility within each LCT Unit	Sensitivity to Type of development proposed
	The main forces for change are the loss or deterioration of heather moorland and large scale forestry expansion. This LCT occurs in six locations within the study area, four of which have potential visibility of the proposed Development.		
Southern Uplands with Forest (DGW23)	With the exception of a limited section in The Glenkens which is designated by Dumfries and Galloway RSA this landscape is subject to no landscape designations; The condition of the landscape is low due to the simple blanket plantation forestry; The dominant landcover is commercial forestry, predominately Sitka spruce with occasional mixes of larch introducing a change in colour, form and texture. The forestry generally extends over the summits or is concentrated on side slopes leaving domed peaks exposed. Rotational felling provides pockets of open space. Small areas of rough grassland and heather moorland exist in open areas; The balance between forestry and large scale felling forms on the whole a large scale landscape; and Views tend to be foreshortened by landform and forestry except from elevated slopes and open summits where long distance views are obtained across the surrounding landscape. This LCT contains the existing Wether Hill Wind Farm, part of the Windy Standard Wind Farm and three of the Hare Hill turbines. Guidance: To conserve the existing open agricultural areas and management of heather and semi-natural woodland areas. This LCT occurs in three locations within the study area, all of which have potential visibility of the proposed Development.	The proposed Development is located within this LCT. 5.47 km W 23.58 km N	Low on larger scale forested upland summits, but increasing to high in lower lying, steeper slopes and in locations on the edges of valleys where the uplands form prominent skylines and turbines would be clearly evident and felling would also be notable.
Rugged Granite Uplands (DWG25)	The entire hill range of Rhinns of Kells and Merrick is designated by Dumfries and Galloway RSA. Much of the Merrick range is also designated by a Wild Land search area; This is a high quality landscape in an undeveloped condition represented by the relative intact nature of this landscape fabric of this ‘wild’ highland landscape; The landcover is dominated by heather moorland with areas of rough grassland which contrast from the white granite outcrops and rugged cliffs. Small inland lochs and forest plantations are present on lower slopes; The scale of this landscape is generally large however; changes in local topography can create enclosures reducing the scale significantly. Occasional walled enclosures to lower areas; and Generally long distance, panoramic views obtained from summits, cliff tops and ridges. Localised changes in landform can restrict views too short to medium distance. Guidance: To conserve the wild, open and dramatic highland character of the landscape. This LCT occurs in two locations within the study area, all of which have potential visibility of the proposed Development.	5.58 km NE 16.95 km NE	High, due to the remote character, absence of man-made structures and rarity of this landscape.
LCTs within Ayrshire Landscape Assessment			
Lowland Coast (AYS2)	The area is not subject to landscape designation; Much of this landscape has been developed; This is a settled landscape comprised of a combination of natural and managed dune systems including a number of stands of Scots pine. The road network supports the growth of settlement from Prestwick and Ayr and growth of industrial and recreational development; The road and rail network forms strong linear patterns in the landscape. Undeveloped dune land areas do remain however they are scarce. The landscape scale is small to medium scale; and Medium distance views are obtained from this landscape enclosed by the neighbouring inland hills.	29.74 km SE 31.21 km SE	Generally medium, due to its developed character, the presence of extensive movement and presence of large scale structures at Ayr and Prestwick.

Landscape Types	Key Characteristics	Distance and direction to proposed Development from nearest area of visibility within each LCT Unit	Sensitivity to Type of development proposed
	Guidance: Conserve remaining areas of underdeveloped coast, and restore or enhance areas which are used for formal recreation. This LCT occurs in three locations within the study area, two of which have potential visibility of the proposed Development.		
Coastal Headland (AYS4)	Much of the LCT is designated by South Ayrshire Scenic Area; Medium quality landscape with an undeveloped and remote character on upper slopes and summits; The landuse on lower, sheltered slopes is pastoral which quickly gives way to rough grazing land on upper slopes. Areas of semi-natural woodland are found on sheltered slopes and there is a scattering of small to medium scale coniferous plantations. Summits are characterised by gorse and lines of overgrown field boundary trees; The pattern of field enclosure by hedgerows on lower slopes forms a small to medium scale landscape which increases to medium to large scale on upper slopes and summits; and Medium to short distance views are obtained from lower slopes with views restricted by vegetation. Medium to long distance views afforded from upper slopes. Guidance: Conserve these undeveloped coastal hill tops.	27.41 km SE	High, due to its designated value and combination of small to medium scale of the sheltered low slopes in this landscape, and the general absence of man-made elements on the more open, large scale coastal summits.
Coastal Valley with Policies (AYS5)	This landscape is designated by the South Ayrshire Scenic Area and Culzean Castle GDL; This is a high quality landscape in good condition; The landcover comprises arable farmland concentrated on lower slopes, pastures on mid slopes; all combined with broadleaf and coniferous shelterbelts and woodland. A main road route crosses the area and settlement is concentrated around Culzean Castle with a scattering of farms in sheltered locations; There is a pattern formed by field boundaries comprised of hedges and shelterbelts. Policy woodland further enforces the small scale pattern of the landscape; and The policy woodland, hedgerows and shelterbelts and moorland hills inland forms enclosure forming short distance views. Guidance: Conserve and reinforce the policy landscape of the valley.	29.81 km E	High due to its designated value and high quality and its enclosed, medium to small scale.
Ayrshire Lowlands (AYS7)	Dumfries House and Carnell registered GDLs are situated within this landscape; Overall medium to high quality landscape with a strong pattern of field enclosure in good condition; Landcover is predominately pastoral, with arable farming on lower land; The lowlands are well settled with a number of towns and villages linked by a dense network of minor roads and occasional major roads. The settlement pattern is historic in origin with farmsteads sited on low hill tops. Hedgerows and mature trees form field and road enclosure, often creating avenues along minor roads. Overall this landscape is small to medium scale; and The character of the landscape shows subtle and gradual differences reflecting the topographical differences with open pasture enclosed by dense boundary vegetation. Open medium distance views from pasture land, becoming channelled along minor roads. Guidance: Conserve the high quality, pastoral landscape and retain the areas legacy of hedges and hedgerow trees. This LCT occurs in four locations within the study area, all of which have potential visibility of the proposed Development.	12.65 km S 17.60 km S 23.94 km S 28.30 km SE	Variable, ranging from medium in areas subject to extensive surface mining (e.g. Skares and Netherton) to and high in locations adjoining river valleys and at Dumfries House.

Landscape Types	Key Characteristics	Distance and direction to proposed Development from nearest area of visibility within each LCT Unit	Sensitivity to Type of development proposed
Lowland River Valleys (AYS9)	Limited parts of the River Ayr valley are designated by the South Ayrshire Scenic Area and East Ayrshire SLA. The most eastern part of the River Irvine valley is designated by Loudoun Castle GDL; Medium quality landscape; The landcover is comprised of rich pasture land enclosed in places by hedges, amongst stands of beech and semi-natural woodland. Settlement is comparatively limited; Small scale, linear landscapes; and Visual enclosure formed by steep valley sides, narrow valley floors and frequent stands of woodland. Guidance: Conserve the distinctive and small scale pastoral and woodland landscapes of the river valleys. This LCT occurs in four locations within the study area, three of which have potential visibility of the proposed Development.	16.29 km S 27.45 km SE 29.84 km S	Ranging from high in undeveloped locations such as Dumfries House, but medium elsewhere where settlement and infrastructure and mineral workings are evident.
Upper River Valley (AYS10)	A large proportion of this landscape is designated by the East Ayrshire SLA in particular the Doon, Nith and Ayr valleys; Medium quality landscape condition; The common landuse on valley floors and lower slopes is improved pasture land giving way to rough grazing and moorland on upper slopes. There is a history of former coal mines and quarrying activities still evident in the landscape including areas of recent open cast mining. There are areas of plantation woodland and shelterbelts; The patterns in the landscape are influenced by the former quarrying and mining activities forming a medium scale landscape. Major road routes lie at the base of the valleys influencing a growth of linear settlements alongside these routes; and Largely open, medium scale landscape supporting medium distance views enclosed by the surrounding uplands; Guidance: Maintain the contrast between the valleys and the surrounding uplands and maintain each of the valleys' distinctive character. This LCT occurs in five locations within the study area, all of which have potential visibility of the proposed Development.	9.94 km E 10.60 km S 16.39 km S 12.12 km S 22.3 km S 32.29 km S	Generally medium due to prominence of surface mining/extraction industry, and infrastructure.
Upland Basin (AYS15)	The landscape is not protected by any landscape designations; Overall a moderate condition, reducing to low where surface mining is ongoing; Mineral extraction, in particular coal mining has had an important influence on the landscape with derelict or unrestored land evident in this landscape. Much of the area is farmed as pasture land or used for industrial uses. Settlement is largely comprised of a scattering of farmsteads and small linear villages developing alongside transport routes. A major road and rail route is situated to the north; The landscape is also subject to the influence of existing wind farm development which is seen on the skyline to the south and south-east; Pasture land is enclosed by a combination of drystone walls and hedges forming a simple pattern to this medium scale landscape; and Largely exposed with a series of low undulations in the topography. Views from the north are enclosed by the Southern Uplands foothills forming medium distance views across the landscape. Guidance: Enhance the semi-upland character of the basin and address the effects of past and/or present industrial activity.	10.6 km S	Generally, medium, but increasing to high at the head of Glen Afton as the scale of the landscape reduces and enclosure increases.
Lowland Hills (AYS16)	The landscape is not protected by any landscape designations; Overall a medium quality landscape. The summits contain few manmade elements;	25.24 km SE	Varied, medium in areas subject to mining or extractive operations, increasing to high in elevated

Landscape Types	Key Characteristics	Distance and direction to proposed Development from nearest area of visibility within each LCT Unit	Sensitivity to Type of development proposed
	Landcover is dominated by pastures with steeper slopes and bluffs with gorse. Past and present quarries are evident in the landscape. The area is settled with a regular pattern of main and minor roads. Settlement avoids exposed elevated parts of the hills and is concentrated within sheltered locations; Field enclosure and regular road network forms a medium scale landscape pattern; and Exposed elevated and open landscape supporting medium to long distance views. Guidance: Maintain the contrast between the hills and surrounding lowland pastures and coast and prevent development which adversely affects their skylines.		summits which form sensitive skylines.
Foothills (AYS17)	Value is placed in sections of this landscape by the designation of the South Ayrshire Scenic Area and East Ayrshire SLA; Medium quality landscape; Lower foothills typically comprised of pastoral farming land with medium sized fields giving way to rough grazing land in the upper foothills with the summits dominated by moorland and commercial plantations. Present and past areas of coal mining evident in landscape. The area is relatively sparsely settled, limited to occasional farms and villages in sheltered locations; The farmland provides a medium scale pattern on lower slopes increasing in scale on upper slopes as landcover changes; and Medium distance channelled views across lower valleys, enclosed by steep sides of the incised valleys. This LCT contains part of the existing Hadyard Hill wind farm. Guidance: Maintain the foothills transitional character formed by the product of variations in landcover and contrasts in lowlands, valleys and higher uplands. This LCT occurs in six locations within the study area, all of which have potential visibility of the proposed Development.	5.13 km E 14.40 km E 14.46 km E 14.99 km E 20.47 km SE 23.91 km E	Varied, medium in areas subject to mining and large scale dense coniferous plantations, increasing to high in elevated slopes/summits which are visually prominent or form sensitive skylines and in locations adjoining Loch Doon.
Foothills with Forest (AYS18)	Areas adjoining the Doon valley are designated by the East Ayrshire SLA with the area to the south in the Carrick Hills designated by South Ayrshire Scenic Area; Medium quality landscape in an undisturbed condition on upper slopes but with managed agricultural land on lower slopes; Dark swathes of forestry provide an almost uniform dark green cover across the slopes. Areas of open ground comprise of rough to semi-improved pasture land enclosed in lower slopes and often unenclosed on upper slopes. The fringes of this area have been and are currently subject to open cast mineral extraction of a variety of scales. Settlement is limited to a scattering of small villages and farmsteads alongside roads and on lower slopes; Medium to large scale landscape with a simple pattern of landcover; and Medium distance views from clearings in forestry decreasing to short distance in incised semi-enclosed valleys. Part of the existing Hadyard Hill wind farm is located within this LCT. Guidance: Maintain the foothills transitional character formed by the product of variations in landcover and contrasts in lowlands, valleys and higher uplands. This LCT occurs in three locations within the study area, all of which have potential visibility of the proposed Development.	7.68 km SE 9.42 km E 13.56 km E	Varied, medium in areas subject to mining and large scale dense coniferous plantations, increasing to high in elevated slopes/summits which are visually prominent or form sensitive skylines.
Plateau Moorland (AYS19)	A large proportion of this landscape is designated by East Ayrshire SLA; This is a medium quality, remote landscape with few man-made structures; The landcover consists of blanket bog, heather and grass moorland used as grazing land. The area is relatively unsettled consisting of occasional isolated farmsteads and a sparse road network;	12.93 km SW 23.67 S	Ranging from medium in locations close to settled area or areas of large scale coniferous forest and mining activity, increasing to high in more open and flatter areas devoid of forest cover and man-made

Landscape Types	Key Characteristics	Distance and direction to proposed Development from nearest area of visibility within each LCT Unit	Sensitivity to Type of development proposed
	Medium to large scale, simple landscape; and This is an open, exposed landscape with extensive long distance views across the relatively level plateau. Guidance: Conserve the open and largely undeveloped character of these moorland hills and reduce adverse effects associated with past patterns of forestry. This LCT occurs in five locations within the study area, two of which have potential visibility of the proposed Development.		elements.
Plateau Moorland with Forest (AYS20)	A limited section of this landscape north of the River Nith is designated by the East Ayrshire SLA; Overall the landscape quality is low increasing to medium in areas of undeveloped and remote moorland; The landcover is typified by areas of extensive coniferous plantations interposed with areas of open moorland; Large scale open landscape in moorland locations, reducing to small scale, enclosed spaces within woodland areas; and From open moorland locations, views are long distance however forestry provides well defined enclosure, restricting views to short distance. This LCT contains the existing Whitelee turbines. Guidance: Conserve the open and largely undeveloped character of these moorland hills and reduce adverse effects associated with past patterns of forestry. This LCT occurs in three locations within the study area, one of which has potential visibility of the Development.	13.67 km SW	Low in areas dominated by coniferous forest scale, but increasing to medium in open moorland locations where the scale and regular plateau form of the landscape is evident.
Southern Uplands (AYS23)	Designated by the East Ayrshire SLA; Medium quality landscape due to the relative intactness of its key characteristics as represented by the SLA. The landscape is largely undeveloped; The landcover is comprised of rough grazing land with higher areas often composed of heather moorland. Semi-natural woodland is scarce and limited to sheltered glens and erosion gullies. Extensive coniferous plantations exist on the fringes of higher hills. Settlement is typified by scattered dwellings and farmsteads on lower slopes; Field enclosure is limited to lower slopes. The landform is comprised of a series of steep, smooth slopes forming rounded summits; creating a medium to large scale landscape; and An exposed landscape supporting long distance views across other landscape types. Views restricted by topography in valleys and neighbouring plantation woodland on upland slopes. This LCT contains existing Hare Hill turbines. Guidance: Conserve and restore the character of the southern uplands landscape, promoting more natural patterns of landcover and reducing the impact of extensive areas of forestry. This LCT occurs in four locations within the study area, all of which have potential visibility of the proposed Development.	2.98 km SW 3.58 km S 17.97 km E	Medium on larger scale open upland summits, but increasing to high in lower lying, steeper slopes and in locations on the edges of valleys where the uplands form prominent skylines.
Southern Uplands with Forest (AYS24)	Much of the area in proximity to the proposed Development neighbouring Glen Afton is designated by the East Ayrshire SLA. The north-eastern fringe of the area to the south-west at Carrick Forest is designated by the South Ayrshire Scenic Area; The quality and condition of the landscape is variable; ranging from high quality intact upland landscapes and river valley landscapes to lower quality landscapes dominated by dense coniferous plantations. The overall quality is low due to the dominance of extensive coniferous plantations; The landcover is predominately comprised of plantation woodland managed by a pattern of rotational felling. There is little to	0.79 km SE 8.5 km E 14.35 km NE 20.29 km E	Low on larger scale forested upland summits, but increasing to high in lower lying, steeper slopes and in locations on the edges of valleys where the uplands form prominent skylines and turbines would be clearly evident and felling would also be notable.

Landscape Types	Key Characteristics	Distance and direction to proposed Development from nearest area of visibility within each LCT Unit	Sensitivity to Type of development proposed
	no settlement; The dominance of coniferous plantation woodland creates a large scale pattern of strong geometric lines in the landscape; and Medium distance views are obtained from selected summits and elevated slopes and clearings in the woodland related to the practice of felling and replanting. This contrasts with views from the majority of the forested landscape which are restricted by topography and reduced to short distance. Guidance: Conserve and restore the character of the southern uplands landscape, promoting more natural patterns of landcover and reducing the impact of extensive areas of forestry. This LCT occurs in two locations within the study area, all of which have potential visibility of the proposed Development.		
Rugged Granite Uplands (AYS25)	Designated by South Ayrshire Scenic Area, East Ayrshire SLA and contained within a Wild Land Search Area; This landscape is of medium to high quality represented by the landscape designations and the intact nature of the key characteristics; Heather moorland and rough grassland provides moorland grazing on upper slopes with little to no native woodland. Commercial conifer plantations cover the lower slopes. Largely remote and unsettled; Large scale commercial plantations on lower slopes in an overall medium to large scale landscape; and Exposed, open landscape with dramatic and extensive panoramic views from summits. The viewing distance shortens on lower slopes where plantations enclose views. Guidance: To conserve and emphasise the dramatic and remote landscape character of the granite uplands. This LCT occurs in two locations within the study area, all of which have potential visibility of the proposed Development.	8.50 km NE 11.00 km NE	High, due to the remote character and absence of man-made structures.
South Lanarkshire Landscape Character Assessment			
Southern Uplands STC21	Part of the South Lanarkshire Special Landscape Area. Large scale upland landscape with strong but smooth rolling relief and extensive panoramic views from summits and ridges. Glacially carved and smoothed landforms, including U-shaped valleys, hanging valleys and corries. Extensive mosaic of heath and rough grassland. Significant Archaeological sites, particularly from the Bronze and Iron Age. Prominent isolated coniferous plantations and old stands of Scots pine. With the exception of Clyde Wind Farm largely undeveloped, except for occasional upland farms and shielings, the M74 corridor and occasional masts and pylons. Guidance: The guidance in respect of this LCT largely relates to spatial planning requirements and the need to take account of ancillary elements of developments.	30 km SW	High, due to the remote character, and valued nature of this landscape.

6.6 ASSESSMENT OF LANDSCAPE AND VISUAL EFFECTS

Introduction

6.6.1 This section provides an assessment of the landscape and visual effects (including cumulative effects) arising from the proposed Development, taking into account the efficacy of the mitigation measures described in Section 6.4: Project Description and Embedded Mitigation, of this Chapter. The assessment addresses the following:

- An assessment of the residual effects on landscape fabric during construction, operational phases and during decommissioning of the proposed Development;
- An assessment of the effects on landscape designations within the study area;
- An assessment of the effects on classified landscapes such as GDLs and Wild Land Areas;
- An assessment of effects on the landscape character types in the study area;
- An assessment of the residual effects on the visual amenity at settlements;
- An assessment of residual effects experienced by walkers and cyclists on recreational routes;
- An assessment of residual effects experienced by road users on key roads in the study area;
- An assessment of residual effects on passengers on rail routes within the study area; and
- A Viewpoint Analysis to assess the potential landscape and visual effect at eighteen viewpoints representative of a range of different receptor types as a mean of verifying the findings of other aspects of the Assessment of Landscape and Visual Effects.

Residual Effect on Landscape Fabric

6.6.2 The effect of the proposed Development on the fabric of the landscape can be either direct or indirect. Direct effects occur where changes to the fabric of the landscape arise as a result of physical disturbance, for example the loss of landscape elements such as vegetation cover. Indirect effects are consequential changes that are separate from the source of the change in a temporal or spatial manner, for example changes in vegetation in a lower part of river catchments, as the result of modifications to surface water patterns upstream due to the development.

Construction Phase

6.6.3 Table 6.8, below, quantifies the amount of potential land-take required for the proposed Development.

Table 6.8: Summary of Effect on Landscape Fabric during Construction

Construction Element	Dimensions (m)	Area (Hectares)
Temporary site compound	100 m x 100 m	1 ha
Borrow pits	100 m x 100 m	1 ha
New access tracks	9027.8 m x 5 m	4.5139 ha
Selective widening of existing tracks	6636 m x 5 m	3.3180 ha
Excavation at turbine locations	18 m x 18 m x 20	0.648 ha
Crane pads	55 m x 35 m x 20	3.85 ha
Anemometry mast foundations	8 m x 8 m x 2	0.0.0128 ha
Cable	4465.85 x 4 m	1.7863 ha
Total Area	161290.4 m^2	16.129

6.6.4 The proposed mitigation measures outlined in Chapter 4: Description of Development, of the ES and Section 6.4: Embedded Mitigation, above, provide for the use of a number of existing pieces of infrastructure at the Windy Standard II site, thereby minimising the additional landtake and disturbance that would result from the proposed Development.

Operational Phase

6.6.5 Effects on the landscape fabric of the proposed Development would be the equivalent in extent to the non-temporary elements outlined in Table 6.8, above. It is apparent from this that a total of 16.1 hectares would be subject to long-term change, primarily relating to land-take and changes in landcover associated with new site tracks, crane pads, turbine bases. The remainder, including temporary compounds and borrow pit locations would be returned to either moorland or forestry, in keeping with its existing condition. Areas subject to preparatory felling would be replanted upon completion of construction works. This is not considered likely to constitute significant landscape effects.

Decommissioning Phase

6.6.6 Landscape and visual effects occurring during decommissioning of the proposed Development would be less than those occurring during its construction and would be of short to medium term in duration. Moreover, following removal of wind farm elements and restoration of the underlying land to a combination of moorland and forestry, no significant effects are anticipated.

Residual Effects on Landscape Designations

Dumfries and Galloway Regional Scenic Area (RSA)

6.6.7 The proposed Development would result in no direct effect on this designated area. Visibility from this designated area would be concentrated on open elevated locations such as Meikle Milyea (Rhinns of Kells), the Merrick range, and the Croignit, Cairnsgarroch and Meaul Hills, the closest such summit occurring at Cairnsmore of Carsphairn. Whilst the ZTVs show the viewshed of the proposed Development to extend across other parts of this designated area, much of these areas are covered with coniferous forest and therefore subject to no change However, the proposed Development would be visible from a small number of open summits including Merrick range and Meikle Milyea.

6.6.8 Viewed from the Merrick range and Meikle Milyea, the twenty turbines of the proposed Development would be visible at distances of between 17 and 20 km and would appear as a single group within an extensive forested upland landscape in the background of views. The proposed Development would be seen in the context and partially overlapping with the existing Windy Standard Wind Farm and the Whether Hill development. Given the distance at which the proposed Development would be seen and the modest proportion of the view it would consequently occupy, and its context of existing wind farms in the vicinity, the magnitude of change would be **slight**, equating to a limited alteration to one or more key elements, features or characteristics of the baseline conditions. Change arising from the alteration would be evident, but would be localised and the underlying landscape character or view composition will be similar to baseline. On this basis the residual effect on the character in this part of the RSA would be **moderate**. Considered in cumulative terms, the proposed Development would be consistent with the existing pattern of development and is therefore considered to represent a **slight** magnitude of cumulative change. In the event of the proposed wind farms being incorporated, the proposed Development would have a reduced relative prominence, equating to a negligible cumulative change. Consequently, the proposed Development would constitute a cumulative effect ranging from **moderate to moderate/minor**.

6.6.9 Viewed from the Croignit, Cairnsgarroch and Meaul Hills all 20 of the proposed turbines would be seen at distances of between 8 and 11 km and would be seen in conjunction with the existing Windy Standard Wind Farm array. The proposed Development's visibility, relatively distance from receptors at this location, and the relatively limited proportion of the expensive views available from these summits would represent a **moderate** change and a **major/moderate** residual effect in this part of the RSA.

6.6.10 Viewed from Cairnsmore of Carsphairn (see ES Figures 6.31a to 6.31h in Volume 3 of the ES) the proposed Development and its ancillary components would not represent a wholly new or anomalous feature in the context of the existing Windy Standard Wind Farm and Wether Hill development, and would be broadly consistent with the scale of the landscape. However, from this VP it would represent a notable extension to this cluster which would further diversify the typologies of turbines in the view and would if viewed in isolation result in a **major/moderate** residual effect on the character of the landscape at Cairnsmore of Carsphairn. Considered in conjunction with existing and consented wind farms including the under construction Windy Standard II Wind Farm, the proposed would represent still result in a **major/moderate** cumulative effect on the landscape, albeit noting that the additional magnitude of change would be less. If the numerous proposed wind farms are taken into account the residual cumulative effect experienced by hill walkers in respect of the proposed Development in this part of the RSA would reduce to **moderate** and not significant.

6.6.11 Notwithstanding the potential for the landscape character and visual amenity of locations within the RSA to be significantly affected, it is necessary to address the effect of the proposed Development on the specific rationale and special qualities of the RSA for which it was designated. However, as previously commented, DGC's Technical Paper describing the RSA doesn't provide this information. It does, however, offer a description of the RSA that provides some insights into what is valued about the constituent landscapes. These valued elements are set out below, along with an assessment of the likelihood of the occurrence of significant effects.

The juxtaposition of contrasting upland, valley and coastal landscapes

6.6.12 This element of the RSA would not be adversely affected by the proposed Development as the Southern Uplands with Forest landscape, in which the proposed Development occurs, is already characterised as containing wind farm developments.

The forested foothills of the Merrick and the Rhinns of Kells which form the setting to the dramatic summits of the Galloway Uplands

6.6.13 The proposed Development would not be located within the foothills to Merrick or Rhinns of Kells and would therefore not affect this aspect of the RSA rationale.

The varied character of the uplands

6.6.14 The proposed Development would not diminish the varied character of the uplands and would not detract from the massive craggy peaks, heather covered slopes, granite outcrops of the Granite Uplands, or the smoother, rounder, lower summits of the Foothills.

6.6.15 *The dramatic sculptural peaks of the Cairnsmore of Carsphairn Southern Uplands Landscape Unit to the east, as well as the forested eastern slopes of the Rhinns of Kells*

6.6.16 The proposed Development would be located to the northwest of the Cairnsmore of Carsphairn summit and at a comparatively lower level. Viewed from locations to the west of the proposed Development, the existing Windy Standard Wind Farm turbines and under construction Windy Standard II turbines would occupy more elevated positions and will often be seen in closer proximity to the Cairnsmore of Carsphairn summit in views from elsewhere in the RSA. Moreover, in this cumulative context the proposed Development would overlap with the present Windy Standard Developments, thereby corresponding with the established/consented development envelope as observed from the RSA.

6.6.17 Based on the preceding analysis the proposed Development is not considered to pose a significant effect on this designation.

East Ayrshire Sensitive Landscape Area (EASLA)

Southern Uplands

6.6.18 The ZTV in ES Figure 6.4 in Volume 3 of the ES indicates views of the proposed Development from this EASLA unit would be confined to a small number of hills, including Benty Cowen Hill, Auchincally Hill, Milray Hill, White Knowes, Hare Hill and Blackcraig Hill. However, Auchincally Hill is forested, and Hare Hill and White Knowes contain the existing Hare Hill wind farm and the consented Afton Wind Farm, respectively.

6.6.19 Viewed from Blackcraig Hill all 20 of the proposed turbines visible below the skyline in the middle-distance, partially overlapping with the existing Windy Standard Wind Farm array and extending development across the uplands. The difference in turbine scale between the existing Windy Standard Wind Farm and the proposed Development would be evident. In this context, and that of the existing Hare Hill and existing Windy Standard Wind Farm, the proposed Development would represent a substantial change and a major residual effect. This is due, in part to the variation in the geometry of its turbines, but also due to its proximity and prominence on an exposed ridgeline in the view from this location.

6.6.20 Given the elevated position of this viewpoint the potential for cumulative visibility is extensive. The viewpoint is enclosed on three sides by existing/consented wind farms including Afton, the present Windy Standard Developments, Hare Hill Extension, Sanquhar, Whiteside Hill, all of which would be seen relatively close to the viewpoint, and are therefore especially prominent. Beyond this, existing/consented wind farms are seen more distantly and are distributed more evenly. The proposed Development, whilst visible in the middleground would be seen beyond Afton and the existing Windy Standard Wind Farm array and entirely overlapped by them. It would also occupy modest extents of the view in comparison to these two schemes. Seen in the context of existing and consented wind farms the proposed Development would represent a **slight** magnitude of cumulative change and a **moderate** cumulative effect. In the event of the proposed wind farms in the study area being consented and constructed, the magnitude of cumulative change attributable to the proposed Development would reduce to negligible and the residual cumulative effect attributable to the proposed Development would be **moderate/minor**. The addition of the proposed wind farms would significantly complicate the cumulative context, and lead to a possible wind farm landscape in the vicinity of this receptor location. The proposed Development would not contribute significantly to the exceeding of the landscape capacity at this location within the EASLA.

River Ayr

6.6.21 All twenty of the proposed turbines would be visible from elevated locations at Airds Moss (over 20 km to the north of the proposed Development), from sections of the B743 and Meanlour Hill and Middlefield Law (between 23 and 30 km from the proposed Development).

6.6.22 The proposed Development would be partially obscured by intervening topography, the majority of turbines appearing as blade tips only and seen in the context of the existing Hare Hill and existing Windy Standard Wind Farm turbines. The proposed Development would introduce further large scale engineered features to a part of the skyline which adjoins the existing Windy Standard Wind Farm. Consequently, notwithstanding the difference in turbine geometry that may be apparent, the proposed Development would not represent a wholly new element. Moreover, given the distance at which the proposed Development would be seen and consequent limited proportion of this expansive view that it would affect, the magnitude of change would be **slight** and the residual effect on the landscape character at this viewpoint would be **moderate/minor**.

6.6.23 The proposed Development would be seen in conjunction with the majority of existing/consented wind farms in the study area. With the exception of the existing Bankend Rig, Hagshaw Hill and consented Galawhistle arrays, the existing/consented cumulative context at this viewpoint is largely concentrated to the south and southeast of this viewpoint, and would comprise turbines on the skyline of the view. In this direction, the wind farms form two large scale clusters of turbines. The proposed Development would overlap with and appear part of the Windy Standard II array which is located in front of the proposed Development. A number of the proposed schemes, including Lethans, Garleffan and South Kyle, would be close to the viewpoint and more prominent than the existing/consented developments and would serve to, significantly extending the proportion of the views affected by wind farms in this designated area. Seen in conjunction with the existing/consented wind farms the proposed Development would result in a **negligible** cumulative change and a **minor** residual effect on the landscape character of this designation. This would remain the case in the event of the proposed Development being consented and constructed.

Doon Valley

6.6.24 There are two areas within this designated landscape which would be subject to potential views of the proposed Development, one in the vicinity of the Craigengillan GDL, and west of Loch Doon.

6.6.25 The visibility in respect of locations in the vicinity of the GDL is described in 6.6.26, below. It is apparent form the assessment of the effects on the GDL that the magnitude of change would be **slight**, equating to a **moderate** residual effect (including cumulative effect) in locations in this part of the EASLA.

6.6.26 In locations west of Loch Doon a total of up to twenty of the proposed turbines would be visible on the skyline from this part of the EASLA. However, considerable variation in visibility would be evident, the greatest visibility occurring on elevated ground at the Big Hill of Glenmount, Herds Hill, and on the Forest Drive. The turbines would be seen in the same part of the view as the existing Windy Standard Wind Farm array, but proposed Development would appear closer and more prominent. The difference in rotor speeds between the existing Windy Standard Wind Farm and the proposed Development arrays may be apparent.

6.6.27 The proposed Development would be visible on the skyline to the west of the present Windy Standard Developments and the consented Afton development. Whilst substantially overlapping with the development envelope of these other schemes, the proposed Development would appear of larger scale and relatively more prominent. The proposed Windy Rig scheme would continue the lateral extension of wind turbines along the skyline to the southeast, but would be in keeping with the established pattern of development as represented by Afton, the present Windy Standard Developments and the proposed Development. In contrast, Benbrack and South Kyle would represent a considerable extension of development across the skyline to the northeast of this viewpoint and would occupy prominent skyline positions. It should be noted that the proposed Glenmount wind farm is located within this part of the EASLA.

6.6.28 In the context of the present Windy Standard Development the proposed Development would represent a **moderate** change to the baseline context and a **major/moderate** effect.

6.6.29 Seen in conjunction with the existing Windy Standard Wind Farm, Windy Standard II turbines, and those of Afton Wind Farm, the proposed Development would continue to represent a **moderate** change and **major/moderate** cumulative effect due to the relative prominence of the proposed turbines on Waterhead Hill. In the event of the proposed Windy Rig, Benbrack and South Kyle Wind Farms being constructed, the cumulative change attributable to the proposed Development would reduce to **slight** and the cumulative effect would be **moderate**, due to its distance and relatively reduced prominence and relationship to the established development pattern on the Southern Uplands and the proximity of the proposed Glenmount wind farm.

6.6.30 Whilst the existing, and consented wind farms are evident from this designated area they represent characteristics elements in the landscape rather than defining it. It is, however, conceivable that if all of the proposed wind farms were consented and constructed that the capacity of the landscape to accommodate wind turbines would be exceeded due to the enclosure of this part of the EASLA by developments. This scenario is considered to be unlikely and the proposed Development is not anticipated to contribute in any significant way to such a breach in capacity.

South Lanarkshire Special Landscape Area (SLSLA)

6.6.31 Views of up to eight turbines, predominantly blade tips, would be provided from elevated summits around the settlement of Leadhills, including Green Lowther, Dungrain Law and Dun Law. The proposed Development would be seen at distances of over 30 km and would not be readily discernible. Consequently, the magnitude of change wrought by the proposed Development within this designated area would be **none to negligible**, equating to **minor or no effect**. This would also be the case when the proposed Development is considered in conjunction with the cumulative developments listed in Table 6.2, above. On this basis, the proposed Development is not considered to pose a significant effect on the key characteristics or special qualities of this designation.

South Ayrshire Scenic Area (SASA)

6.6.32 The ZTV indicates that potential views of the proposed Development would be provided from Dersalloch Hill and a number of other small hills in the vicinity, and from the summits of Auldcraigoch Hill and Auchenroy Hill. However, Dersalloch Hill is the site of a consented wind farm, and the Auldcraigoch and Auchenroy Hills are forested. Given this context, the limited proportion of the SASA that would be affected by the proposed Development, and its location over 12 km from the nearest receptor within the SASA, the residual effect on this designation is predicted to be **minor.**

Residual Effects on Classified Landscapes

Gardens and Designed Landscapes (GDL)

6.6.33 Craigengillan is the only GDL with potential visibility of the proposed Development. The ZTV indicates up to eight turbines would be visible from elevated moorland locations east of the Auldcraigloch Hill and Auchenroy Hill. Additionally, up to sixteen turbines would be visible from the eastern slope and summit of Crawaur. The turbines would be seen on the skyline to the east-southeast at distances of between 9 km and 12.4 km and consequently would not represent an especially prominent or intrusive feature in views and would also not be evident in views from the principal features and ornamental gardens of the GDL. Given the relatively limited viewshed of the proposed Development from the GDL, and its concentration in elevated moorland locations, rather than in the vicinity of key features and visitor locations in the GDL, the magnitude of change on this GDL would be **slight**, equating to a **moderate** residual effect on the visual amenity of visitors to the GDL and in the character of the GDL.

6.6.34 According to the cumulative ZTVs the proposed Development would be seen concurrently with the existing/consented Hare Hill, Knockshinnoch, and Dersalloch, However, field reconnaissance suggests that Dersalloch would be all but entirely screened by intervening forest at Auchenroy Hill and Auldcraigoch Hill, and Knockshinnock would not be readily discernible. Consequently the principal cumulative context would be that of Hare Hill wind farm, which is visible on the skyline at a distance of around 15 km to the east-northeast of potential receptor locations in the GDL. Given the limited cumulative context and relative proportion of the view occupied by the proposed Development and Hare Hill, the cumulative magnitude of change in respect of existing and consented developments would be **slight**, equating to a **moderate cumulative effect**.

6.6.35 In the event of the proposed Benbrack, South Kyle, Lethans, Glenmount, Quantans, Windy Rigg and Pencloe, wind farms being incorporated, the cumulative context would increase in complexity. The proposed Benbrack and South Kyle turbines would be the most prominent and would significantly increase the proportion of the view occupied by wind farms. In this context, the proposed Development would be almost entirely overlapped by the Benbrack array, and would consequently constitute **negligible** additional change and a **moderate/minor residual cumulative effect**.

Wild Land Areas

6.6.36 The proposed Development would be visible from elevated summits and north and east facing slopes of the Merrick range. All twenty of the proposed turbines would be visible at distances of between 17 and 20 km and would appear as a single group within an extensive forested upland landscape in the background of views. The proposed Development would be seen in the context and partially overlapping with the existing Windy Standard Wind Farm and Whether Hill developments. Given the distance at which the proposed Development would be seen and the modest proportion of the view it would consequently occupy, and its context of existing wind farms in the vicinity, the magnitude of change would be slight, equating to a limited alteration to one or more key elements, features or characteristics of the baseline conditions. Change arising from the alteration would be evident, but would be localised and the underlying landscape character or view composition will be similar to baseline. On this basis the residual effect on the Wild Land Area would be **moderate** and not significant.

6.6.37 The proposed Development, seen in the context of the present Windy Standard Developments and Hare Hill developments would be consistent with the existing pattern of development and is therefore considered to represent a slight magnitude of cumulative change. In the event of the proposed wind farms being incorporated

the proposed Development would take on a reduced relative prominence, equating to a **negligible** cumulative change. Consequently, the proposed Development would constitute a cumulative effect ranging from **moderate** to **moderate/minor.**

6.6.38 On the basis of the preceding analysis the proposed Development, viewed individually or in a cumulative context, is considered to:

- Pose no potential significant effect on the existing perceived naturalness of the WLA;
- Would not introduce modern artefacts, structures or landuses to the WLA;
- Would have no effect on the characteristic landform of the WLA and
- Would not affect the remoteness or inaccessibility of the WLA.

6.6.39 On this basis, the proposed Development is not considered to significantly affect the WLA.

Residual Effects on Landscape Character Types

6.6.40 Technical Appendix 6.2: Residual Effects on Landscape Character Types in Volume 4 of the ES contains the detailed assessment of residual effects on LCTs within the study area. It is apparent from this that the following LCTS were predicted to be subject to potential significant effects:

- Southern Uplands (LCT DGW22), Cairnsmore of Carsphairn unit;
- Southern Uplands with Forest (LCT DGW23);
- Rugged Granite Uplands (LCT DWG25).
- The Foothills (LCT AYS17) in the vicinity of Loch Doon;
- Southern Uplands LCT AYS23) Glen Afton;
- Southern Uplands with Forest (LCT AYS24);

6.6.41 In respect of the proposed Developments effect on the Southern Uplands LCT (LCT DGW22), it is important to note that this LCT already contains a number of wind farm developments including the present Windy Standard Developments and the consented Whiteside Hill turbines. The proposed Development, whilst undoubtedly resulting in localised significant effects on the northern extents of the Carsphairn unit of the Southern Uplands, would not represent a wholly new element and would generally be perceived as part of a broader developed context and would have a geographically limited viewshed. Seen in the context of the numerous proposed wind farms identified in the study area, the proposed Development would result in significant, if localised, cumulative effects. However, its link to the established pattern of development would offer some advantages over other proposed schemes that are likely, if all consented, to exceed the capacity of the landscape in this LCT.

6.6.42 The proposed Development would be located within the Carsphairn unit of the Southern Uplands with Forest LCT (LCT DGW23), along with the present Windy Standard Developments; it is therefore the case that an established characteristic of this landscape is the presence of both forestry (and large scale felling) and wind turbines. Within this landscape turbines are positioned along the top of the pronounced ridges (or rig) landforms of the upland and within forested areas. The proposed Development would be consistent with this. Whilst the proposed Development would undoubtedly result in an extension of the impacts associated with wind energy development in this landscape, its position at the centre of the upland between Glen Afton and incised landscape of the A713 corridor and Doon Valley would result in minimal significant effects outwith the LCT. It is also the case that, whilst significant effects would be attributable to the proposed Development within this LCT, and it would contribute to a wind farm landscape between Waterhead Hill and Gallow Rig, i.e. the interior of the present Windy Standard Developments, its close association with these developments is part of a clustering of development that would have the benefit of avoiding the dispersal of turbines and consequent implications for adjoining receptors in the study area and the capacity of the wider landscape.

6.6.43 Significant effects identified within the Rugged Granite Uplands landscape (LCT DWG25) would be localised to a small number of positons at the northern end of the Rhinns of Kells unit, in the vicinity of the Black Craig and Knockower summits. Elsewhere, in the more sensitive locations of Meaul and Meikle Milyea, there would be no significant effects on the landscape character of the LCT.

6.6.44 Significant effects predicted within the Foothills landscape (LCT AYS17) in the vicinity of Loch Doon would primarily be experienced on the western side of the loch, at the Big Hill of Glenmount, Herds Hill, and at Bryan's Heights and concern effects on the baseline context as well as the cumulative context with consented wind farms taken into account. However, in the event of the proposed South Kyle and Windy Rig developments taken into account, the proposed Development would be assimilated into a wider, more complex development scenario where it would form a relatively limited contributor to the overall cumulative effect.

6.6.45 Significant effects on the Southern Uplands (LCT AYS23) would be confined to locations in the vicinity of Blackcraig Hill, in the Glen Afton unit of this landscape. It should be noted, however, that this unit contains the existing Hare Hill wind farm and the consented Hare Hill extension and Afton schemes, which will have far greater prominence than the proposed Development (as reflected in the assessment of Viewpoint 7. The addition of the other proposed wind farms in the study area would significantly complicate the cumulative context, and lead to a possible wind farm landscape in the vicinity of this receptor location. However, the proposed Development would not constitute a significant contribution this potential exceeding of the landscape capacity at this location.

6.6.46 Significant effects on the Southern Upland with Forest landscape (LCT AYS24) would be confined to Hillend Hill Strandlud Hill and Milray Hill. The wider effect of the proposed Development would be minimal. The proposals would result in no alteration to the underlying character of this landscape, which comprises extensive forest cover.

Residual Effects on Visual Amenity of Settlements

Carsphairn

6.6.47 ES Figure 6.4 in Volume 3 of the ES predicts views of up to four turbines would be provided from a small number of locations at the westernmost end of the settlement, including McAdams Way. However, field reconnaissance suggests that the proposed Development would be entirely screened by intervening topography and vegetation. This conclusion is borne out by the findings of the viewpoint analysis for Viewpoint 5 in Technical Appendix 6.3: Viewpoint Analysis in Volume 4 of the ES. Consequently, there would be no residual effect on this settlement, and therefore no residual cumulative effect.

St. John's Town of Dalry

6.6.48 Up to four turbines would be visible from locations in the vicinity of the junction of the A702 and B7000 and Underhill within this settlement. Where visible turbines would be seen at distances exceeding 19 km and would appear as a series of blade tips on the horizon. Given the distance at which the proposed Development would be seen, its restricted visibility and limited proportion of the view it would affect, the magnitude of change would be **negligible**, equating to a **moderate/minor** residual effect on the amenity of this settlement.

6.6.49 The proposed Development would be seen in conjunction with the existing/consented Blackcraig Hill, Torrs Hill and Knockman Hill wind farms, which would be seen at distances of between 4.89 km and 12 km. In this context, the proposed Development would constitute a barely discernible addition and a moderate/minor residual cumulative effect. This would remain the case with the inclusion of the proposed Benbrack, Quantans Hill and South Kyle developments.

Cumnock

6.6.50 The ZTV in ES Figure 6.4 in Volume 3 of the ES and field reconnaissance indicates that the proposed Development would be visible from a limited number of locations at the eastern edge of this settlement in the vicinity of Barhill Road and Holland Crescent, Hemmings Way and properties on Penders Wynd in Netherhird. Up to four of the proposed turbines would be visible at between 15 and 17 km, would be seen as blade tips, and often backclothed by topography. In this context, the proposed Development would represent a **negligible** change and **moderate/minor** residual effect on the amenity of residential receptors.

6.6.51 In cumulative terms, the proposed Development would be seen in conjunction with the existing/consented Bankend Rig, Hare Hill, the present Windy Standard Developments, Afton Bankend Rig, Hare Hill and extension. The wind farms would form a complex concentration of turbines on the skyline to the south and southeast, and would be seen at distances of between 10 km and 15 km. The proposed Development would be barely discernible and would represent a **negligible** addition to this cumulative context, equating to a moderate/minor residual cumulative effect. This would remain if the proposed High Cumnock, Lethans, Pencloe, Polquhairn, Sanquhar Six and South Kyle, Spango and Windy Rig developments are taken into account.

Auchinleck

6.6.52 According to the ZTV up to four of the proposed turbines would be visible from locations adjacent to Main Street (especially at junction with B7036) where a break in buildings provides open views towards the south. To the east, up to eight turbines would be seen from locations in Beechwood Ave, Boswell Drive, Knockroon Lane and Coal Drive. Where turbines are visible they would be seen at distances of over 18 km and would appear as a series of blade tips. Given the distance at which the proposed Development would be seen, its restricted visibility and the small proportion of the view that would be affected, the magnitude of change would be **negligible** and the residual effect on the amenity of the settlement would be **moderate/minor.**

6.6.53 The proposed Development would be seen in conjunction with the existing/consented Hare Hill, the present Windy Standard Developments, Afton and Knockshinnock arrays, these cumulative developments appearing on the skyline to the south of this settlement at distances of between 14 km and 19 km. The proposed Development would be barely discernible in comparison with the Windy Standard II and Afton array, and would constitute a minor residual cumulative effect. This would remain the case in the event of the proposed Garleffan, South Kyle, High Cumnock and Kennoxhead schemes being incorporated,

Mauchline

6.6.54 The ZTV indicates extensive visibility of up to four turbines from the entirety of this settlement. However, field reconnaissance suggests that the settlement occupies an undulating landscape which descends gradually in a southwestern direction and as a consequence views form the majority of the settlement interior would be restricted by intervening built forms, available views towards the site being confined to locations on the southeastern edges of the settlement, including locations in Grassmillees Way, Southfield Avenue and in newly constructed housing in Fernlea Avenue. The turbines would be seen at a distance of over 24 km and would be partially obscured by intervening topography. Consequently, the magnitude of change would be **negligible**, equating to a **moderate/minor** residual effect.

6.6.55 The proposed Development would be seen in conjunction with the existing/consented Hadyard Hill developments, Hare Hill, the present Windy Standard Developments, Afton, Dersalloch and Knockshinnoch developments which would be seen on the skyline to the southwest, south and southeast at distances of between 14 km and 26 km. In this context the proposed Development would represent a **negligible** addition and a **moderate/minor** cumulative effect. This would remain the case in the event of the proposed windfarms within the study area being incorporated.

Ayr

6.6.56 The ZTV indicates that up to four turbines would be visible from the northern extents of this settlement between Heathfield and Prestwick Airport and Dalmilling. However, this settlement is located in a gently undulating coastal plain where views towards the proposed Development from locations within the interior of the settlement are restricted by intervening buildings, vegetation and the A77 road embankment. Where views of the proposed Development do occur it would appear as a series of blade tip, seen on the skyline at a distance of over 28 km. Given the restricted visibility inland from this settlement, its distance from the proposed Development there would generally be no change apparent, but with localised **negligible** change possible in views from a small number of properties on the eastern side of the settlement. Consequently, the residual effect on the amenity of Ayr would range from **none to moderate/minor**. This would remain the case in respect of prospective cumulative visibility.

Maybole

6.6.57 The ZTV indicates potential views of up to four turbines from the northern half of the settlement between Whitefaulds and Alloway Road. This section of the settlement is located on the southern side of a low hill, and so intermittent views of up to four turbines would be provided from here. The turbines would generally be seen as a series of blade tip and would appear on the horizon at a distance of over 28 km. Given the settlements distance from the proposed Development there would generally be no change apparent, but localised **negligible** change would occur at the more open and elevated northern parts of the settlement. Consequently, the residual effect on the amenity of Ayr would range from **none to moderate/minor.**

6.6.58 Whilst cumulative visibility of the proposed Development and the existing/consented Bankend Rig, Hadyard Hill, Hare Hill, the present Windy Standard Developments, Afton and Dersalloch arrays is predicted, the proposed Development would be barely visible from this settlement and would therefore constitute a **negligible** change and a **moderate/minor** residual cumulative effect. This would remain the case in the event of the proposed wind farms in the study area being included.

Residual Effects on Transport Routes

6.6.59 The following route analysis describes the predicted visibility of the proposed Development from key transport routes within the study area. The analysis is based upon the ZTVs and Route Analysis in Technical Appendix 6.4: Route Analysis in Volume 4 of the ES, as well as field reconnaissance.

Road Network

A70

6.6.60 The A70: This route extends approximately 55 km between Ayr and Douglas: Between Ayr and Cumnock visibility of the proposed Development would be intermittent, the turbines being seen at distances of between 16.73 km and 26.13 km, often appearing primarily as blade tips on the horizon and seen in the context of the existing Hare Hill and Windy Standard Wind Farm arrays. Further east, westbound road users would experience intermittent views of the proposed Development on the approach to Cumnock. Such views would be fleeting, however, due to the extent of intervening shelter belts and forest cover, and the proposed turbines would be seen at distances exceeding 16.97 km. Given the intermittent nature of views, the distance at which the proposed Development would be seen and the presence of existing turbines nearby on the horizon, the magnitude of change would be **negligible**, equating to a **moderate/minor effect**.

6.6.61 With the exception of Mark Hill, Whether Hill and Torrs Hill turbines, the proposed Development would be seen in conjunction with all of the existing and consented wind farms in the study area. The majority of developments would be seen to the south of the route and seen on the horizon in the distance. Seen in the context of existing and consented wind farms, the proposed Development would represent **negligible** addition and a **moderate/minor residual effect**. This would remain the case in the event of the proposed wind farms being constructed.

A76

6.6.62 According to the ZTV intermittent views of the proposed Development would be experienced by southbound road users on this route between Bargowen and New Cumnock. However, field reconnaissance suggests that actual visibility would be greatly restricted by intervening vegetation between Bargowen and Mauchline and between Auchline and Cumnock. Where visible, the proposed turbines would generally be seen as blade tips on the horizon at distances of between 10.69 km and 25.55 km and would therefore be difficult to discern. On this basis the magnitude of change experienced on this route would be **negligible** and the residual effect would be **moderate/minor**.

6.6.63 The principal cumulative context for the proposed Development would be the present Windy Standard Developments, Hare Hill, Afton and Dersalloch developments, the proposed Development appearing amidst the Windy Standard II array. Seen in this context, the proposed Development would represent a **negligible** change and **moderate/minor cumulative effect** on this route. This would remain the case in the event of the proposed

wind farms being incorporated. The proposed wind farms would add considerably to this cumulative context, many of the proposed schemes, such as High Cumnock, South Kyle and Pencloe appear closer and considerably more prominent in views from this route.

A77

6.6.64 The ZTVs indicate potential intermittent views of the proposed Development between Kirkoswald and Kilmarnock. However, field reconnaissance suggests that actual visibility would be interrupted on the route between Kirkoswald and Maybole by intervening topography and vegetation, and would cease entirely within the settlement of Maybole due to intervening buildings. Between Maybole and Ayr views of the proposed Development would be obscured by intervening shelter belts and forest cover, and it would be entirely screened from the route on the eastern side of Ayr by a combination of road embankments and vegetation. Views from the remaining section of the route between Prestwick Airport and Kilmarnock would also be screened by intervening vegetation. Consequently, the proposed Development is predicted to have **no residual effect** on the amenity of road users on this route.

A79

6.6.65 The A79, Ayr to Prestwick: Whilst the ZTVs and statistical analysis for this route show potential views of the proposed Development field reconnaissance indicates that such views would be entirely screened by the intervening built form of Ayr. Consequently, the proposed Development would result in **no residual effect** on the amenity of road users on this route.

A712

6.6.66 According to the ZTVs and statistical analysis, the only section of this route subject to theoretical visibility would be a 1.45 km stretch of the route, west of New Galloway. However, field reconnaissance confirmed that this part of the route is incised, and enclosed by a combination of topography and roadside vegetation. Consequently, no views of the proposed Development are anticipated from the A712, and therefore, **no residual effects** on the amenity of road users.

A713

6.6.67 The ZTVs and statistical analysis in Technical Appendix 6.4: Route Analysis in Volume 4 of the ES indicate potential intermittent visibility between Waterside (northwest of Dalmellington) and Loch Ken. However, views from locations within Dalmellington would be entirely screened by intervening buildings and vegetation. Similarly, views from sections of the route between Dalmellington and Benbrack, and between Lamford and Carsphairn would be screened by a combination of topography and intervening forest cover on the horizon. Views from locations south of Carsphairn would also be screened by a combination of intervening vegetation and topography. On this basis no actual visibility is anticipated from this route and **no residual effects** are predicted.

A719

6.6.68 A719, Part 1 - Maidens to Ayr: The ZTVs and statistical analysis indicate potential intermittent visibility from a large proportion of this route. Views from Part 1 of this route would be confined to a short section of the route south of Knoweside Hill, overlooking Culzean Bay. From where up to eight of the proposed turbines would be seen on the skyline to the east at distances of over 31 km, and would therefore be inconspicuous, representing a **negligible** change and **moderate/minor residual effect** on the amenity of the route.

6.6.69 The proposed Development would be seen in conjunction with the existing/consented Afton, Hare Hill, Hare Hill extension, the present Windy Standard Developments, Dersalloch, Knockshinnoch and Tralorg turbines, all of which would be seen distantly. In this context the proposed Development would constitute a **negligible** cumulative change and **moderate/minor cumulative effect**. This would remain the case in the event of the proposed wind farms being incorporated.

6.6.70 A719: Part 2 - between A77 (Ayr) and Galston: The only visibility would be between the A77 and Adamhill. On this stretch of the route intermittent views of up to sixteen turbines would be provided. The turbines would be seen at a distance of over 29 km and would appear as blade tips. Consequently, they would represent negligible change and **moderate/minor effect** on this route.

A762

6.6.71 Whilst the ZTV indicates potential views of up to four of the proposed turbines from field reconnaissance and interrogation of the digital wind farm model for this route suggests that the turbines would appear as blade tips only. Seen at distances in excess of 18.3 km the turbines would represent a **negligible** change and a **moderate/minor** effect. The proposed Development would be seen in conjunction with existing/consented Wether Hill and the present Windy Standard Developments and Afton wind farm. These schemes would be viewed intermittently and would be framed between the domed landforms of the intervening uplands. In this context, the proposed Development would represent a **negligible** cumulative change and **moderate/minor cumulative effect**. This would remain the case if the proposed wind farms were taken into account.

Rail Network

Glasgow South Western Line, between Kilmarnock and Dumfries

6.6.72 The principal railways in the study area that would be subject to potential views of the proposed Development include:

- Approximately 4 km of the route west of Mauchline; and
- Approximately 9 km of the line between Auchinleck and New Cumnock;

6.6.73 However, the route around Mauchline is predominantly in cutting and is oriented northwest to southeast, largely preventing views from the side window of trains.

6.6.74 Between Auchinleck and Netherhird the majority of the line is in cutting. Thereafter, as the route progresses southeastwards to New Cumnock the proposed Development would be screened by intervening topography and coniferous forestry.

6.6.75 On the basis of the preceding analysis, **no residual effects** are anticipated on this rail route.

The Prestwick to Mauchline line

6.6.76 Intermittent views of up to 12 of the proposed turbines are indicated in the ZTVs, the most notable concentration of visibility being east of Mossblown and between Falford and Mauchline. Field reconnaissance suggest, however, that the majority of the route is in cutting and/or enclosed by vegetation with the consequence that views of the proposed Development would be rare, and fleeting. Where views do occur the proposed turbines would be seen on the skyline over 25 km to the southeast and would appear as a series of blade tips. The proposed Development would also be seen in the context of the existing Hare Hill turbines. Consequently, the proposed Development would represent a **negligible** change to the amenity of passengers on this route, equating to a **moderate/minor residual effect**.

6.6.77 Because of the fleeting nature of potential visibility, cumulative visibility would primarily concern the present Windy Standard Developments, Hare Hill, and Afton schemes. In this context the proposed Development would represent a negligible addition to the cumulative baseline, and constitute a moderate/minor cumulative effect.

Residual Effects on Recreational Routes

6.6.78 As in the preceding analysis of the roads and rail network, the following route analysis describes the predicted visibility of the proposed Development. The analysis is based upon the ZTVs and the Route Analysis in Technical Appendix 6.4: Route Analysis in Volume 4 of the ES, as well as field reconnaissance.

National/Regional Trails and Core Paths (see ES Figure 6.4 and ES Figure 15.1 in Volume 3 of the ES)

The Southern Upland Way

6.6.79 The ZTVs and statistical analysis for this route indicate that the proposed Development would be visible from around 5 km of this 104 km long route within the study area, the key sections of visibility occurring at Culmark Hill, Benbrack, and Lowther Hill.

6.6.80 Viewed from Benbrack the proposed Development would be substantially obscured from this perspective; a total of four of the proposed turbines would be evident and would appear as two columns and rotors, and two blade tips. The turbines would appear on the skyline to the west of the existing Windy Standard Wind Farm array. The difference in turbines sizes would be apparent and would exaggerate the perspective between the two schemes. Given the presence of existing wind turbines in the vicinity of the proposed Development, its distance from this viewpoint, restricted visibility, and the relatively limited proportion of this expansive view affected, the magnitude of change experienced at this location would be **slight**, equating to a **moderate** residual effect.

6.6.81 Existing/consented wind farms are present on four sides of this viewpoint (northwest, northeast, west-southwest and southeast), many of which are prominent in the view due to their skyline position and proximity to this location. It is also apparent that considerable variation in turbine typologies would be apparent, especially when recently consented/constructed developments are seen in conjunction with long established developments such as Hare Hill and the existing Windy Standard Wind Farm. In this context, the proposed Development would be seen overlapping with and extending westwards from the Windy Standard II array, but would represent a relatively modest addition to the cumulative loading. The introduction of the proposed wind farms listed above would add to the extent of views affected by wind turbines, often seen to increase the complexity of the existing/consented cumulative context and, in places, to infill spaces between wind farms (as in the case of Leadhills and Longburns, Quantans Hill, Linfairn and Glenmount Wind Farms). Seen in the context of the existing and consented wind farms, the proposed Development would represent a **slight** magnitude of cumulative change. In the event of the proposed wind farms being incorporated, including the Windy Rig development, the magnitude of cumulative change attributable to the proposed Development would reduce to **negligible**, largely due to the greater prominence of the proposed Windy Rig turbines which would be interposed between receptors and the proposed Development. The proposed Development would result in a **moderate** effect in respect of existing/consented wind farms. In the event of the inclusion of proposed wind farms the effect would reduce to **moderate/minor** due to its relative recessive appearance compared to the intervening Windy Rig development.

6.6.82 Viewed from Lowther Hill, the proposed Development would appear as a series of up to eight turbines, predominantly blade tips, which would be seen at distances of over 30 km and would not be readily discernible. Consequently, the magnitude of change wrought by the proposed Development within this designated area would be **none to negligible**, equating to **minor or no effect**. This would also be the case when the proposed Development is considered in conjunction with the cumulative developments listed in Table 6.2 above. On this basis, the proposed Development is not considered to pose **a negligible change and minor effect** on the amenity of walkers on this route at this point.

Cairnsmore of Carsphairn by the Green Well Core Path

6.6.83 Walkers on this Core Path would experience views of up to eight of the proposed turbines from the elevated sections of this route. The turbines appear on the skyline approximately 2.78 km to the north of this route and would form prominent elements in the view. Given the proximity and prominence of the proposed Development is likely to represent a **substantial**, if localised change to the baseline visual amenity of this route, equating to a **major** residual effect. Consequently, seen in the context of existing/consented wind farms, the proposed Development would result in **negligible** cumulative change and a **moderate/minor cumulative effect**.

Carsphairn Forest Core Path

6.6.84 Whilst this path travels through an area of dense coniferous forest which would generally screen the proposed Development from this route, some more open areas exist, such as the Deugh crossing point east of White Hill and the previously felled forest compartments at Brownhill Ford. Viewed from these locations, up to sixteen of the proposed turbines would be seen on the skyline. Whilst intervening topography and forest cover along the eastern side of the Waters of Deugh would partially screen the turbines, they would overtop this vegetation and form prominent elements in views. Given the likely proximity of receptors to the proposed Development and the prominence of turbines, the magnitude of change at these locations would be **substantial**, equating to a **major** residual effect at these locations. However, it should be noted that a large proportion of this route would be subject to no views of the proposed Development and so the **overall effect on the amenity of this route would not be significant.**

6.6.85 Because of the incised position of this route and enclosure by forestry the cumulative context would be greatly reduced from that indicated in the ZTV and statistical analysis. However, viewed from the crossing point and Brownhill Ford the proposed Development would be seen in conjunction with the Windy Standard II array. The proposed Development, in this context, would represent a considerable extension of wind energy impacts and the difference on turbine geometry between the existing Windy Standard Wind Farm and Windy Standard II schemes would be apparent. This is expected to remain the case in the event of the proposed wind farms in the study area being incorporated. Of the proposed wind farms within the study area, the South Kyle, Pencloe would be most visible and prominent. In this context the proposed Development would represent a localised **moderate** cumulative change and **major/moderate** residual effect from the few locations where views of the proposed Development is possible and so, **overall, cumulative effects on the amenity of this route would not be significant.**

D17 Craigengillan / Eriff Core Path

6.6.86 The ZTV indicates potential views of the Waterhead Hill Cluster from this route, north of Loch Doon. Locations with predicted visibility include positions south of Bryan's Heights, and southeast of Little Eriff Hill. However, the turbines would be seen as a series of blade tips only, and are anticipated to be all but entirely obscured by intervening forestry. Consequently, the magnitude of change experienced by receptors on this route would range from **none to negligible**, equating to a worst case scenario of **localised moderate/minor effects**.

6.6.87 Cumulative visibility of the existing/consented Hadyard Hill, Torrs Hill and the present Windy Standard Development, consented Windy Standard II, and Dersalloch arrays is also predicted, the most prominent development being Dersalloch when viewed from elevated locations east of Craigengillan. In this context, the proposed Development would represent a cumulative change ranging from **none to negligible**, and cumulative residual effects ranging from **none to moderate/minor**. This would remain the case in the event of the proposed Benbrack, South Kyle and Glenmount schemes being incorporated.

Knockgorroch Core Path

6.6.88 Existing forestry would screen views of the proposed Development from a large proportion of this route. However, in the more open elevated section of the route, north of Lamford Hill up to twenty of the proposed turbines would be visible. The turbines would be seen at distances under 3 km and would occupy prominent skyline positions to the northeast. The turbines would be seen in the context of the present Windy Standard Development turbines. Given the proximity of this route to the proposed Development and its anticipated prominence in views, the magnitude of change on affected parts of this route would be **substantial**, and the residual effect would be **major** from the locations where visibility is possible. However, a large proportion of the route would afford no views of the proposed Development and so the **overall effect on the amenity of this route would not be significant.**

6.6.89 In cumulative terms, the principal context will be that of the existing/consented present Windy Standard Developments and Afton schemes. The proposed Development would add substantially to this context, introducing turbines to a prominent part of the view that is currently devoid of such features. This would represent a **major** residual cumulative effect from the few locations where visibility is possible. With the introduction of the propose Benbrack, Pencloe, the view to the north and north east would be dominated by wind energy development. The incorporation of Glenmount and Quantans Hills turbines would extend development to the west and southeast, respectively. In the context of all existing, consented and proposed wind farm the

proposed Development would constitute a **moderate** cumulative change and a **major/moderate** cumulative effect from the few locations where visibility is possible and so **the overall cumulative effect on the amenity of this route would not be significant**.

Cycleways

NCR 7

6.6.90 The ZTVs indicate potential intermittent views of the proposed Development between Maybole and Brown Carrick Hill from where up to twenty turbines would be seen on the horizon to the east/southeast at distances of between 28.52 km and 33.84 km. Whilst the turbines at the Waterhead Hill Cluster would appear as rotors and columns, the remainder of the proposed Development would appear as blade tips only, and would be seen amidst the existing Windy Standard Wind Farm. Given the limited proportion of this route that would be affected by views of the proposed Development, the routes distance from site and the context of existing wind turbines, the magnitude of change experienced on this route would be **negligible**, equating to a **moderate/minor** residual effect.

6.6.91 In addition to the existing Hare Hill and the existing Windy Standard Wind Farm, the proposed Development would be seen concurrently with the existing Hadyard Hill (seen between 9km and 28 km to the south of the route), and the Windy Standard II Wind Farm which is currently under construction and appears on the horizon, between 25 and 33 km to the southeast of this route. The key cumulative effect of the proposed Development would be associated with the turbines on the Waterhead Hill Cluster, which would result in lateral extension of wind energy development on the southern upland in the background of views from this route. The consented Hare Hill extension and Dersalloch turbines would be positioned closer to this route and would be considerably more prominent than the proposed Development. Consequently, seen in the context of existing/consented wind farms, the proposed Development would result in **negligible** cumulative change and a **moderate/minor** cumulative effect. In the event of the proposed wind farms being incorporated, including Pencloe, Benbrack and South Kyle, the cumulative context would be greatly complicated. Benbrack would form the westernmost extents of the complex of wind farms on the southern uplands, whilst South Kyle turbines would increase the perceived scale of the wind farms on the horizon to the southeast of the affected parts of this route. In this context the proposed Development would result in **negligible** cumulative change and a **moderate/minor** cumulative effect.

6.7 SUMMARY

Methodology

6.7.1 The preceding LVIA considers the potential landscape and visual effects of the proposed Development. The LVIA and accompanying illustrations were prepared in accordance with current professional guidance and with reference to consultation responses from ECDU, SNH and DGC, and matters identified during public exhibitions.

6.7.2 The assessment addresses potential landscape and visual effects, including cumulative effects on a range of receptors within 35 km of the proposed Development, as well as anticipated effects on the landscape fabric of the site.

Baseline Condition

6.7.3 The existing landscape and visual context of the study area was described in respect of key physical elements, character and landscape and visual receptors. The main receptors in the study area that were considered in the subsequent assessment of residual effects are listed below.

Designations

6.7.4 Regional and local designations, including:

- Dumfries and Galloway RSA;
- East Ayrshire Sensitive Landscape Area (EASLA);
- South Lanarkshire Special Landscape Area (SLSLA); and
- South Ayrshire Scenic Area (SASA).

Classified Landscapes

6.7.5 A small number of classified landscapes including:

- Craigengillan GDL; and
- Merrick WLA.

Landscape Character Types

- Landscape character areas including:
- Ayrshire lowland Valley;
- Coastal valley with policies;
- Coastal Headland;
- Foothills;
- Foothills with forest;
- Lowland Coast;
- Lowland Hills;
- Lowland River Valley;
- Plateau Moorland;
- Plateau Moorland with forest;
- Rugged Granite Uplands Southern Uplands;
- Southern Uplands with Forest;
- Upper Dale;
- Upland Basin; and
- Upper River Valley.

Settlements

6.7.6 Key settlements identified and assessed included Carsphairn, St. Johns of Dalry, Auchinleck, Ayr, Cumnock, New Cumnock, Mauchline and Maybole.

Transportation Routes

6.7.7 The baseline also identified a series of key roads in the study area, including the A70, A76, A77, A79, A712, A713, A719 and A762, as well as the Glasgow South Western railway and the Prestwick to Mauchline line.

Recreational Routes

6.7.8 Recreational routes identified in the baseline appraisal including NCR7 and the Southern Uplands Way and a series of local core paths.

Potential Sources of Landscape and Visual Effects

6.7.9 Sources of potential landscape and visual effect were identified and are summarised below.

Construction Elements

- Temporary compounds/accommodation works;
- Concrete batching plant;
- Preparatory felling of forest cover;
- Excavation of borrow pits;
- Construction of tracks;

- Crane pads;
- Construction of turbines and anemometer masts;
- Installation of cables connecting turbines to the grid connection point at the under construction substation and control building at Dunhill; and
- Reinstatement of temporary compounds, borrow pits, track sides, and replanting of forestry felled prior to construction works.

Operational Elements

- Turbines and transformers;
- Aviation lighting;
- Permanent anemometer masts;
- Site infrastructure, including tracks and crane pads; and
- Felled/replanted site.

Decommissioning Elements

- Removal of site infrastructure and above ground elements; and
- Reinstatement of site to a mixture of moorland and forestry.

Embedded Mitigation

6.7.10 Section 6.4 of the LVIA contains details of the key design responses to potential landscape and visual effects. Mitigation focused on:

- Taking advantage of the large scale upland forest character of the site and surrounding Southern Uplands which are unsettled and generally have a low sensitivity to the type of development proposed;
- The proximity of existing and consented wind farms and prospect for the proposed Development contribute to a clustering of development, rather than its dispersal/distribution throughout the area;
- The use of larger turbine in the interior of the uplands where they can be accommodated more readily. In contrast the use of smaller turbines on the Waterhead Hill Cluster in recognition of its greater visibility;
- The formulation of proposals for replanting of felled areas of forestry to match with the character of the remaining forest cover;
- The avoidance of the need for off-site highway improvements;
- The use wherever possible of existing forest and Windy Standard II tracks and minimisation of the requirement for new tracks;
- The undergrounding of cabling at the site and use of the Windy Standard II existing substation control building and substation;
- The siting of the proposed concrete batching plant within an existing borrow pit excavation, thereby reducing its visibility;
- Location of proposed borrow pits in areas close to access tracks/construction tracks thereby limiting their visibility from external viewpoints and shortening haul routes;
- Adoption of suitable construction and landscape reinstatement methods and programme to limit the duration of construction impacts and ensure rapid and effective reinstatement of disturbance at the site; and
- Phased decommissioning and concurrent reinstatement works to ensure rapid and effective restoration of the site following decommissioning of the site.

Summary of Significant Residual Landscape Effects

Landscape Designations

National Designations

6.7.11 No nationally important landscape would be significantly affected by the proposed Development

Regional Designations

6.7.12 Whilst significant effects were predicted at Croignit, Cairnsgarroch and Meaul Hills; and Cairnsmore of Carsphairn summit within the Dumfries and Galloway RSA the LVIA concludes that such effects would be localised and would not undermine the designations integrity in respect of its key characteristics or reason for designation, as described in paragraphs 6.6.7 to 6.6.11.

Local Designations

6.7.13 Considered in relation to the EASLA, the proposed Development would have limited visibility from this large scale and diverse designation. Whilst significant visual effects were predicted at Blackcraig Hill, these would be localised and not, in themselves, sufficient to result in a significant erosion of the character and quality of the designation. It is also important to note that this location is already subject to considerable visibility of wind farms and recently consented developments such as Afton and the Hare Hill extension will inevitably add to this.

Landscape Classifications

6.7.14 No significant effects were predicted in respect of the Craigengillan GDL or Merrick WLA.

Landscape Character Types

6.7.15 The following LCTS are predicted to be subject to potential localised significant effects:

- Southern Uplands (LCT DGW22) at the elevated summits on the northern side of this LCT, including Cairnsmore of Carsphairn;
- Southern Uplands with Forest (LCT DGW23) in the Carsphairn Unit;
- The Foothills (LCT AYS17) in the vicinity of Loch Doon primarily at the Big Hill of Glenmount, Herds Hill, and at Bryan's Heights;
- Southern Uplands LCT AYS23) at Blackcraig Hill; and
- Southern Uplands with Forest (LCT AYS24) at Hillend Hill, Strandlud Hill and Milray Hill.

6.7.16 The proposed Development is located within DGW23 along with the present Windy Standard Developments. The proposed Development would introduce further large scale engineered features and infrastructure to the LCT.

Summary of Significant Residual Visual Effects

Settlements

6.7.17 No significant effects were identified in respect of the settlements considered in the LVIA.

Transportation Routes

Roads and Rail

6.7.18 No significant effects were identified in respect of the key roads and rail routes considered in the LVIA.

Recreational Routes

6.7.19 No nationally or regionally important routes such as the Southern Upland Way and National Cycleway No.7 would be significantly affected by the proposed Development, but localised significant effects are predicted on a number of local Core Paths, including:

- Cairnsmore of Carsphairn by the Green Well Core Path;

- Carsphairn Forest Core Path; and
- Knockgorroch Core Path.

Representative Viewpoint

6.7.20 Of the eighteen viewpoints utilised as representative of key receptor locations, five would be subject to significant effects, a described below.

6.7.21 Viewpoint 1 – Cairnsmore of Carsphairn:

6.7.22 The proposed Development, and its ancillary components, would not be anomalous in the context of the existing/consented wind farms, and would be broadly consistent with the scale of the landscape. However, it would represent a prominent large scale new development which would further diversify the typologies of turbines in the view and would result in a major/moderate and significant residual effect.

6.7.23 Seen in the context of the existing/consented wind farms the proposed Development would represent a moderate additional effect on the landscape at this viewpoint, bringing large scale wind energy development closer to receptors, thereby increasing the prominence of such development. The proposed Development would be seen as an extension to the present Windy Standard Developments, albeit one which further diversifies turbine typologies, and adds further complexity to the landscape. In the event of the numerous proposed wind farms being consented and built the residual cumulative effect attributed to the proposed Development would reduce to moderate/minor which is not considered significant, due to the broader wind farm landscape of the uplands.

6.7.24 Viewpoint 6 – Garryhorn Mine Core Path: The proposed Development would not represent a wholly new element in the landscape viewed from this location, but would occupy a prominent skyline position, interrupting its underlying natural rolling form, and increase the appearance of movement and large scale vertical forms. Seen in conjunction with the existing/consented developments, the proposed Development would also represent a significant cumulative effect on the perceived character of the landscape at this viewpoint due to its relative prominence and scale. This would remain the case in the event of the proposed wind farms being constructed.

6.7.25 Viewpoint 7 – Blackcraig Hill: Significant effects at this viewpoint would be associated with views of the proposed Development in the context of the existing wind farms in the vicinity. Once consented developments, including the intervening Afton and Windy Standard II arrays are taken into account, the proposed Development would form a less prominent feature in the view. The introduction of the numerous other proposed wind farms would compound this

6.7.26 Viewpoint 8 – Carsphairn Heritage Trail: The proposed Development would occupy a prominent skyline position and introduce large scale engineered elements and movement to a section of the horizon currently devoid of such factors. The introduction of other proposals could significantly increase the prominence of wind energy developments, and in this context, the proposed Development would be interposed between these other developments.

6.7.27 Viewpoint 10 – Loch Doon: The Waterhead Hill Cluster of the proposed Developments turbines would result in significant effects on amenity and the perceived landscape character at this viewpoint. Similarly, when viewed in conjunction with the consented Windy Standard II and Afton arrays, the cumulative effects attributable to the proposed Development would be significant. However, once the proposed South Kyle and Windy Rig developments are taken into account the proposed Developments comparative prominence would be reduced and it would appear broadly consistent with what would be a continuous line of development on the horizon.

6.8 CONCLUSION

6.8.1 Any onshore commercial wind farm in Scotland will result in some significant effect on the landscape resource and visual amenity of an area. The proposed Development is consistent with this, but would, as a result of the mitigation proposed in Section 6.4 and paragraph 6.7.10, have a comparatively limited viewshed, result in generally localised and a relatively limited number of significant effects on what are generally considered to be receptors of local (rather than national or regional) importance.

6.8.2 The extent of significant cumulative effects attributable to the proposed Development is also considered to be of modest proportions. The proposed Development, seen in conjunction with existing and consented wind farms, would often represent the less prominent scheme and would often share the ‘envelope’ of other developments in views. This is even more the case when other proposed wind farms which are located on the edges or adjacent to the Southern uplands are taken into account. Moreover, whilst the numerous proposals for wind farm developments have the potential to result in fundamental change to some landscapes in the area. The LVIA has concluded that in such cases, the proposed Development would not significantly contribute to such a change.

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BROCKLOCH RIG III

Document history

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Client Details	
Contact	Gareth Swales
Client Name	Brockloch Rig III Ltd
Address	c/o Fred. Olsen Renewables Ltd

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Chapter 7

Ecology

Contents

Glossary

Term	Definition
Baseline	The existing conditions that prevail against which the effects of the proposed Development are compared.
Blanket Bog	Blanket bog is peatland habitat confined to cool, wet, typically oceanic climates. The term blanket 'bog' strictly applies only to that portion of a blanket 'mire'.
Environmental Impact Assessment	Environmental Impact Assessment (EIA) is a means of drawing together, in a systematic way, an assessment of the likely significant environmental effects arising from a proposed development.
Environmental Statement	A document reporting the findings of the EIA and produced in accordance with the EIA Regulations.
Habitats	The area or environment where a plant or species naturally occurs.
Mitigation	Measures, including any process, activity or design to avoid, reduce, remedy or compensate for adverse landscape and visual effects of a development.
Phase I Habitat Survey	A standardised method of recording habitat types and characteristic vegetation, as set out in the Handbook for Phase I Habitat Survey – a technique for Environmental Audit (JNCC, 2010). This survey method is extended through the additional recording of specific features indicating the presence, or likely presence, of protected species or other species of nature conservation significance.
Protected Species	Animals or plants protected by European legislation – The Conservation of Habitats and Species (Amendment) Regulations 2012 – and/or national legislation – The Wildlife and Countryside Act 1981 (as amended).
Present Windy Standard Developments	The 'present Windy Standard Developments' refers collectively to the existing Windy Standard and the under construction Windy Standard II Wind Farms
Site of Special Scientific Interest	SSSIs are protected areas that represent the UK's very best wildlife and/or geological sites.
Special Area of Conservation	Special Area of Conservation, an internationally important area for nature conservation designated under The Conservation of Habitats and Species (Amendment) Regulations 2012.
Special Protection Area	Special Protection Area, an internationally important area for nature conservation, specifically birds, designated under The Conservation of Habitats and Species (Amendment) Regulations 2012.
The proposed Development	The proposed Windy Standard III Wind Farm.
The proposed Development Area	The 'proposed Development Area' refers to the boundary as shown on ES Figure 7.1 and 7.3 in Volume 3 of the ES, which comprises turbine clusters: 'Meaul Hill Cluster' and 'Waterhead Hill Cluster'. It should be noted that some infrastructure (i.e. some existing track to be upgraded, the proposed construction compound, proposed batching plant and indicative borrow pits) are outwith the proposed Development Area, but are included within the survey areas for protected mammals and habitats; see ES Figures 7.1 and 7.3 in Volume 3 of the ES.

List of Abbreviations

Abbreviation	Description
BR3	Brockloch Rig III Ltd.
CIEEM	Chartered Institute of Ecology and Environmental Management (formerly known as IEEM)
CEMP	Construction Environmental Management Plan
CMS	Construction Method Statement
DAFOR	Dominant, abundant, frequent, occasional, rare
DDSFB	Kirkcudbrightshire Dee District Salmon Fishery Board

Abbreviation	Description
DGERC	Dumfries and Galloway Environmental Resources Centre
D&G LBAP	Dumfries and Galloway Local Biodiversity Action Plan
EcIA	Ecological Impact Assessment
EEC	European Economic Community
EIA	Environmental Impact Assessment
EPS	European Protected Species
ES	Environmental Statement
FC	Forestry Commission
GFT	Galloway Fisheries Trust
GIS	Geographic Information System
GWDTE	Ground Water Dependant Terrestrial Ecosystem
HMP	Habitat Management Plan
JNCC	Joint Nature Conservation Council
LBAP	Local Biodiversity Action Plan
LNR	Local Nature Reserve
LDP	Local Development Plan
MAGIC	Multi-Agency Geographic Information for the Countryside
MSS-FL	Marine Scotland Science – Freshwater Laboratory
NBN	National Biodiversity Network
NNR	National Nature Reserve
NPF	National Planning Framework
NPPG	National Planning Policy Guideline
NVC	National Vegetation Classification
ODPM	Office of the Deputy Prime Minister
PAN	Planning Advice Note
RSPB	Royal Society for the Protection of Birds
RSPW	Red Squirrel Priority Woodland
SAC	Special Area of Conservation
SBL	Scottish Biodiversity List
SEPA	Scottish Environment Protection Agency
SNH	Scottish Natural Heritage
SPA	Special Protection Area
SPP	Scottish Planning Policy
SSSI	Site of Special Scientific Interest
SWT	Scottish Wildlife Trust
UKBAP	UK Biodiversity Action Plan
UNESCO	United Nations Educational, Scientific and Cultural Organization
VER	Valued Ecological Receptor
WHS	World Heritage Site
WFD	Water Framework Directive

7.1 INTRODUCTION

7.1.1 This chapter provides an overview of the baseline ecological conditions relating to the habitats and (non-avian) fauna present within the proposed Development Area and immediate surrounding environment. Upon establishment of the ecological baseline, the potential for ecological effects and impacts associated with the proposed Development are identified, assessed and evaluated in terms of their significance to each ecological receptor. Several elements of this chapter relating to the identification and assessment of ecological receptors make reference to and are supported by the findings of the ornithological, hydrological and forestry assessments, reported in Chapter 8: Ornithology, Chapter 10: Hydrology, Geology and Hydrogeology and Chapter 12: Forestry, of the ES.

7.1.2 Baseline ecological conditions have been established through combining the results of a desk-based review and recent ecological field surveys, to obtain relevant ecological data, in order to ascertain the status of habitats and protected species occurring within the proposed Development Area and immediate surrounding environment. Information gathered from previous assessments undertaken at the existing Windy Standard and under construction Windy Standard II Wind Farms (the present Windy Standard Developments) has also been utilised in this assessment, providing background and contextual information. The identified habitats and species comprising the ecological baseline are described, evaluated and assessed using recognised criteria, in accordance with industry guidelines[1, 2]. The baseline studies referenced in this chapter are supported by the following technical appendices which provide detailed information regarding the ecological field survey methods and field data:

- Technical Appendix 7.1: Pre-EIA Ecology Review in Volume 4 of the ES[3];
- Technical Appendix 7.2: Habitat Survey Results in Volume 4 of the ES;
- Technical Appendix 7.3: Bat Survey and Impact Assessment in Volume 4 of the ES[4]; and
- Technical Appendix 7.4: 2012 Ecology Report in Volume 4 of the ES[5].

7.1.3 The potential for ecological impacts as a result of the proposed Development during the construction, operational and decommissioning phases have been identified and assessed, with particular attention paid to habitats and species of high vulnerability, conservation concern and those afforded a high level of legal protection. The ecological impact assessment (EcIA) has been undertaken on the basis that recommendations provided within this ES chapter will be incorporated into the proposed Development design, construction and operation, where appropriate. Where potentially adverse ecological impacts have been identified and/or predicted, recommendations for appropriate mitigation to avoid or minimise such impacts are provided.

7.1.4 It is important to note that prior to refinement of design, the proposed Development comprised three distinct turbine areas; these areas have historically been included in the baseline ecological assessment, particularly with regards to field surveys undertaken in 2012 (see Chapter 3: Design Evolution and Alternatives, of the ES and ES Figure 3.2 and 3.3 in Volume 3 of the ES). For the purposes of this assessment, this historical baseline data has been considered for context, in line with the proposed Development Area now comprising two distinct turbine areas, referred to as the Meaul Hill Cluster and Waterhead Hill Cluster.

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[1] SNH, 2013. A handbook on environmental impact assessment. Guidance for Competent Authorities, Consultees and others in involved in the Environmental Impact Assessment Process in Scotland. Natural Heritage Management. 4th Edition.

[2] CIEEM (formerly known as IEEM), 2006. Guidelines for Ecological Impact Assessment in the United Kingdom.

[3] Natural Power, 2014. Windy Standard III Pre-EIA Ecology Review 2013. Document reference: 1032387

[4] FDM Ecology, 2014. Windy Standard III Proposed Wind Farm: Bat Survey and Impact Assessment. Document reference: 1059102

[5] Natural Power, 2012. Windy Standard III Ecology Report 2012. Document reference: 1003393

7.2 TERMINOLOGY

7.2.1 The following zones are defined within this Chapter and its appendices:

- The 'proposed Development Area' refers to the boundary as shown on ES Figure 7.1 and 7.3 in Volume 3 of the ES, which comprises turbine clusters: 'Meaul Hill Cluster' and 'Waterhead Hill Cluster'. It should be noted that some infrastructure (i.e. some existing track to be upgraded, the proposed construction compound, proposed batching plant and indicative borrow pits) are outwith the proposed Development Area, but are included within the survey areas for protected mammals and habitats; see ES Figures 7.1 and 7.3 in Volume 3 of the ES; and
- The 'present Windy Standard Developments' refers collectively to the existing Windy Standard and the under construction Windy Standard II Wind Farms.

7.3 LEGISLATION, POLICY AND GUIDANCE

7.3.1 The following framework of international, European, national and local legislation and planning policy guidance, which exists to protect habitats and specific species, has been considered as part of the assessment. Ecological baseline surveys have been conducted following recognised guidelines and the ecological impact assessment takes account of the Chartered Institute of Ecology and Environmental Management guidelines (the IEEM Guidelines2):

Legislation

- Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora (the EC Habitats Directive);
- Environmental Impact Assessment Directive 85/337/EEC (the EIA Directive);
- The Conservation (Natural Habitats, &c.) Regulations 1994 (as amended) (the Habitats Regulations), which transposes the Habitats Directive into UK law;
- The Conservation (Natural Habitats, &c.) (Amendment) Regulations 2007;
- The Conservation of Habitats and Species (Amendment) Regulations 2012, relating to reserved matters in Scotland;
- Wildlife and Countryside Act 1981 (as amended);
- The Nature Conservation (Scotland) Act 2004;
- The Wildlife and Natural Environment (Scotland) Act 2011;
- Protection of Badgers Act 1992 (as amended);
- The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2000 and Amendment Regulations 2008;
- National Policy Guidance;
- Planning Advice Note (PAN) 1/2013 – Environmental Impact Assessment (Scottish Government 2013);
- PAN 51: Planning, Environmental Protection and Regulation (revised 2006);
- PAN 60: Planning for Natural Heritage (Scottish Government 2000);
- Nature Conservation: Implementation in Scotland of the Habitats and Birds Directives: Scottish Executive Circular 6/1995 as amended (June 2000); and
- Consolidated Scottish Planning Policy (SPP)[6].

[6] Scottish Government, 2014. Scottish Planning Policy. ISBM: 9781784125677

Other Guidance

7.3.2 Particular attention has also been given to the guidance documents listed below, that are applicable to assessing the effects of wind farm developments on ecology. Reference has also been made to guidance documents through the report where relevant:

- European Protected Species, Development Sites and the Planning System: Interim guidance for local authorities on licensing arrangements[7];
- Guidelines for Ecological Impact Assessment in the United Kingdom[2];
- Land Use Planning System SEPA Guidance Note 4: Planning Guidance on Windfarm Developments[8];
- Good Practice during Wind Farm Construction[9];
- Assessing the cumulative impact of onshore wind energy developments[10];
- Handbook for Phase 1 Habitat survey: a technique for environmental audit[11];
- National Vegetation Classification Users' handbook[12];
- Monitoring the Otter (*Lutra lutra*)[13];
- Ecology of the European Otter[14];
- The Water Vole (*Arvicola amphibius*) Conservation Handbook[15];
- Practical Techniques for Surveying and Monitoring Squirrels[16];
- Bats and Onshore Wind Turbines (Version 2)[17];
- Bat Surveys: Good Practice Guidelines (2nd Edition)[18];
- English Nature's Bat Mitigation Guidelines[19];
- Natural England's interim guidance on 'Bats and Onshore Wind Turbines' (Technical Information Note (TIN) 051)[20];

[7] Scottish Executive, 2001 (updated 2006). European protected species, development sites and the planning system: Interim guidadnce for local authorities on licensing arrangements. Scottish Executive, Edinburgh.

[8] SEPA, 2014. Land Use Planning System (LUPS), SEPA Guidance Note 4. Planning guidance on on-shore windfarm developments. Version 7. LUPS-GU4

[9] Scottish Renewables, SNH, SEPA, Forestry Commission Scotland, 2013. Good practice during windfarm construction. 2nd edition

[10] SNH, 2012. Assessing the cumulative impact of onshore wind energy developments. SNH, Scotland

[11] JNCC, 2010. Handbook for Phase 1 Habitat survey: a technique for environmental audit. JNCC, Peterborough

[12] Rodwell, J. S. 2006. National Vegetation Classification: Users' handbook. JNCC, Peterborough

[13] Chanin, P. 2003. Monitoring the Otter *Lutra lutra*. Conserving Natura 2000 Rivers: Monitoring Series No. 10. English Nature, Peterborough

[14] Chanin, P., 2003. Ecology of the European Otter. Conserving Natura 2000 Rivers Ecology Series No. 10. English Nature, Peterborough.

[15] Strachan, R., Moorhouse, T. & Gelling, M., 2011. The Water Vole Conservation Handbook. Third Edition, Wildlife Conservation Research Unit, University of Oxford, Abingdon.

[16] Gurnell, J., Lurz, P., McDonald, R., Pepper, H. 2009. Practical Techniques for Surveying and Monitoring Squirrels. Forestry Commission Scotland, Edinburgh

[17] Walsh, K., Matthews, J. and Raynor, R, 2012. Bats and Wind Turbines Version 2 – June 2012. Natural England, SNH and Countryside Council for Wales

[18] Hundt, L. 2012. Bat Surveys: Good Practice Guidelines, 2nd edition. BCT, London

[19] English Nature, 2004. Bat Mitigation Guidelines. English Nature

- Scottish Biodiversity List (SBL)[21, 22] (with habitat description from the UKBAP[23]); and
- Dumfries and Galloway Local Biodiversity Action Plan (D&G LBAP)[24].

7.4 CONSULTATION

7.4.1 As per best practice guidelines for EIA[25], a scoping document was issued to a range of consultees in March 2014, detailing the proposed ecology assessment methodology and providing an overview of the baseline ecological field surveys undertaken within the proposed Development Area. In addition to the scoping document, a meeting was held with Scottish Natural Heritage (SNH) on 7th March 2014 to discuss the results of the ecological field surveys and the approach to the EcIA. Details of the consultation undertaken, including an overview of the scoping responses of relevance to ecology, is provided in Table 7.1 below.

Table 7.1: Details of scoping responses relating to ecological elements of the proposed Development

Consultee	Date	Issues Raised and Recommendations	Scoping response addressed
Galloway Fisheries Trust (GFT)	Included in Scottish Government scoping opinion dated 27/12/13	**General Comments** The GFT also provided comment on the scoping report on behalf of the Kirkcudbrightshire Dee District Salmon Fishery Board (DDSFS). GFT is content with the proposals to use existing access tracks established in the development of the existing Windy Standard Wind Farm and Windy Standard II, to reduce the track length and number of watercourse crossings required for the proposed Development. GFT is content with the production of a Construction Method Statement (CMS) and Construction Environmental Management Plan (CEMP) as part of the proposed Development. **Ecological Baseline** GFT is content with the recording of baseline environmental conditions to enable prediction of potential impacts on environmental receptors. GFT suggest that fish and fish habitat information is considered within the environmental assessment with baseline surveys to inform of potential sensitivities to fish populations.	Fish and fish habitat information is considered, and surveys are proposed to be carried out pre-, during- and post-construction.
		Elements of concern In relation to potential issues and impacts to fish species and their habitats which may require mitigation, GFT note that the following elements of the proposed Development are of concern: • Watercourse crossings; • Habitat loss, run-off and pollution from felling and construction works; • Impediments to flow and fish passage/fish access; • Infrastructure locations; • Forestry re-planting plans, particularly within riparian zones; • Changes to hydrological and morphological conditions instream and in flush zones; and • Mortality of fish species. **Mitigation** GFT is content with the inclusion of mitigation measures as part of the EIA and state that it would be helpful if this information was presented in the CEMP. GFT commented that along with adoption of good practice guidelines, the CEMP and a Pollution Prevention Plan should be adhered to during the construction, operation and decommissioning phases of the proposed Development. GFT expect identification of mitigation measures to minimise impacts to fish species and their habitats, with adherence to the latest edition of Forests and Water Guidelines. GFT note the requirement for buffer zones of an adequate size located between the proposed Development and watercourses. GFT state that under no circumstances should any drainage ditches, road drains, road run-off areas, layby or hardstanding run-off be routed directly into a watercourse or channel that links directly into a watercourse. GFT state that it would be useful if a schedule of potential watercourse crossings is prepared to identify the best crossing structure for each watercourse crossing point. GFT reiterate that fish and fish habitats should be considered within the EIA and suggest that surveys are carried out to establish a baseline and highlight any sensitivities or mitigation measure required.	Mitigation for protection of fish and fish habitat is through pollution prevention and control measures that will be included in the CEMP (see Technical Appendix 4.1: Draft Construction Environmental Management Plan in Volume 4 of the ES), in accordance with the latest edition of Forests and Water Guidelines. A watercourse crossing assessment has been prepared (see Technical Appendix 10.4: Watercourse Crossing Assessment in Volume 4 of the ES). Pre-consent fish and macro-invertebrate surveys were not considered necessary at the proposed Development; this is discussed further in Section 7.5 below.
Marine Scotland	Included in Scottish	MSS-FL commented on the presence of salmon, trout and eel in the River Dee catchment,	Surveys for fish are proposed to be carried out pre-, during- and

[20] Natural England, 2014. Technical Information Note TIN051 Bats and onshore wind turbines interim guidance, 3rd Edition

[21] The Scottish Government, 2013b. Scottish Biodiversity List. Available at: http://www.scotland.gov.uk/Topics/Environment/Wildlife-Habitats/16118/Biodiversitylist/SBL Accessed January 2015

[22] The SBL forms a list of species and habitats of importance for biodiversity conservation in Scotland, produced by the Scottish Government

[23] http://jncc.defra.gov.uk/page-5706 last accessed 18/11/2015

[24] Dumfries and Galloway Biodiversity Partnership, 2009. Dumfries and Galloway Local Biodiversity Action Plan. Available at: www.dumgal.gov.uk.

[25] SNH, 2013. A handbook on environmental impact assessment. Guidance for Competent Authorities, Consultees and others in involved in the Environmental Impact Assessment Process in Scotland. Natural Heritage Management. 4th Edition.

Consultee	Date	Issues Raised and Recommendations	Scoping response addressed
Science-Freshwater Laboratory (MSS-FL)	Government scoping opinion dated 27/12/13	recommending assessment of fish populations and water quality, to determine appropriate site specific mitigation measures and the requirement of monitoring programmes. MSS-FL highlighted the presence of signal crayfish in the River Dee catchment and the requirement to exercise care to avoid the spread of this invasive non-native species.	post-construction. This is discussed further in Section 7.8 below. Precautionary measures to prevent the accidental spread of cray fish will be included in the CEMP (see Technical Appendix 4.1: Draft Construction Environmental Management Plan in Volume 4 of the ES).
RSPB	22/04/14	**Peatland Habitats** RSPB noted that vegetation surveys identified a range of 'modified' peatland habitat including wet bog and mire habitats. RSPB commented that peat is a significant store of carbon as well as having an important carbon sequestration role when it is in its active state and has a high biodiversity value. RSPB requested that mitigation should include measures undertaken as part of the design process to avoid construction and operations impact on deep peat soils: the ES should include carbon calculations to ensure that there is no net loss to carbon through this proposed Development as a result of impact to peat deposits.	A peat management plan will be prepared as part of the CEMP to ensure sensitive management of soils through the construction phase (see Technical Appendix 4.1: Draft Construction Environmental Management Plan in Volume 4 of the ES). Carbon loss from the proposed Development has been fully considered in Technical Appendix 10.5: Carbon Balance Assessment and 10.6: Carbon Balance Calculation Sheets in Volume 4 of the ES.
		Habitat Management RSPB expect the relevant proposals for habitat management as part of any proposed enhancement or mitigation measures to be included within the ES.	Since no significant effects are predicted for any receptor, a Habitat Management Plan (HMP) has not been proposed. Mitigation measures are outlined in Section 7.8 below
SNH	15/04/14	SNH is content with species survey methods and therefore had no further comments. SNH assumed that assessments in relation to watercourses were considered unnecessary and would be explained further in the ES.	Otter and water vole surveys were undertaken as part of the baseline. Pre-consent fish and macro-invertebrate surveys were not considered necessary at the proposed Development; this is discussed further in Section 7.5 below. Impacts on any rare or scarce species are assessed.
		SNH noted that Phase 1 and NVC surveys had been undertaken and commented that there should also	

Consultee	Date	Issues Raised and Recommendations	Scoping response addressed
		be an assessment of impacts on any rare and scarce associated species. Survey results should be used to inform the design and layout process, so that the proposed Development avoids, where possible, fragile and priority habitats. Where this is not possible, SNH noted that suitable restoration and/or compensation will be required.	
SEPA	01/04/14	**Ground Water Dependant Terrestrial Ecosytems (GWDTEs)** SEPA emphasises that the ES should demonstrate that turbine locations have been determined on the basis of habitats at the site, especially with regards to any areas of deep peat and intact hydrological units of mire vegetation. If wetland or peatland systems are present, the ES should demonstrate how the layout and design of the proposal, including any associated hardstanding, borrow pits and roads, avoids impact on such areas. A Phase 1 Habitat survey should be carried out for the whole site and the guidance 'A Functional Wetland Typology for Scotland' should be used to help identify all wetland areas. National Vegetation Classification (NVC) should be completed for any wetland areas identified. Results of these findings should be submitted, including a map of the proposed infrastructure overlain on the vegetation maps to clearly show which areas will be impacted and which areas will be avoided. The results of the NVC survey should also be used to identify if wetlands are GWDTEs. If GWDTEs are identified, the route of roads, tracks or trenches within 100 m of GWDTEs, or the locations of borrow pits or foundations within 250 m of GWDTEs should be reconsidered. If infrastructure cannot be relocated outwith the buffer zones of these ecosystems, the likely impact on GWDTEs will require further assessment. This assessment should be carried out if these ecosystems occur within or outwith the site boundary so that the full impacts on the proposals are assessed; with inclusion of the results of this assessment and mitigation within the ES. Where avoidance of impact on GWDTEs is impossible, details of how impacts upon wetlands are minimised and mitigated should be provided. Impacts that should be considered include those from drainage, pollution and waste management; preventative/mitigation measures should be included	A Phase 1 Habitat survey and an NVC survey were undertaken as part of the baseline field surveys, with the provision of a detailed map of results (see Section 7.5 and 7.6 below and ES Figure 7.5a and b and 7.6a and b in Volume 3 of the ES). Identification of potential GWDTEs and their potential for impact from the proposed Development have been fully considered (see Section 7.7 below). Relevant mitigation to avoid impact to GWDTEs is outlined in Section 7.8. Pollution prevention and control measures in addition to details regarding waste management will be included as part of the CEMP (see Technical Appendix 4.1: Draft Construction

Consultee	Date	Issues Raised and Recommendations	Scoping response addressed
		to avoid significant drying or oxidation of peat. Detailed information on waste management is required: mitigation should be detailed in the CEMP. **Forestry Waste and Ecological Benefits** If ecological benefit from the use of forest waste is to be claimed, then reliable site-specific evidence must be provided. Where it is sought to claim ecological benefit from deposition of forestry waste, the ecological benefit must relate to the land to which the waste is applied rather than off-site benefits and there must not be ecological harm associated with the deposition of the waste. If there are likely to be significant amounts of surplus forestry without a clear use and if the scope for an exemption under waste management is unclear, then SEPA may need to object to an application. The 'Principles for Use of Forest Residue for Peatland Restoration' should be applied; where the ecological benefit proposed by the fell to waste activity does not relate to the improvement of peatland habitats then the expected environmental benefit must be set out and fully justified in the ES.	Environmental Management Plan in Volume 4 of the ES). Issues relating to forestry are addressed in Chapter 12: Forestry, of the ES and the use of forestry waste specifically is addressed in Chapter 4: Description of Development, of the ES and will be addressed as part of the CEMP (see Technical Appendix 4.1: Draft Construction Environmental Management Plan in Volume 4 of the ES).

Source: Natural Power, 2015

7.5 METHODOLOGY

7.5.1 The following sources of information were used to establish baseline ecological conditions within the proposed Development Area:

- Background information prepared for the Windy Standard III Scoping Report, March 2014[26];
- A compilation and review of ecological information obtained from historical field surveys undertaken by Natural Power, presented as a Pre-EIA Ecology Review, May 2014[27];
- Relevant legislation, policy, and guidance including relevant publications from Scottish Natural Heritage (SNH), Scottish Environment Protection Agency (SEPA) and the Forestry Commission (FC);
- Consultation with relevant statutory and non-statutory bodies;
- A desk-based review of relevant data including information accessed from the Multi-Agency Geographic Information for the Countryside (MAGIC) website[28], SNH SiteLink[29], the National Biodiversity Network (NBN) Gateway[30] and historical protected species records obtained from the Dumfries and Galloway Environmental Resources Centre (DGERC); and
- The results of baseline ecological field surveys undertaken between July 2012 and August 2015, to establish the presence of important ecological interests within the proposed Development Area and immediate surrounding environment.

Desk-based Review

7.5.2 A desk-based review was undertaken to collate relevant public domain survey data, scientific publications, grey literature and to obtain historical records of protected and relevant species from within the proposed Development Area and surrounding environment. The purpose of the desk-based review was to provide background information on the habitats and species occurring within the proposed Development Area and immediate surrounding environment, to help inform and guide the baseline ecological field surveys and to provide context to their results. Information obtained from the desk-based review, combined with the results of the ecological field surveys, has been utilised to provide a comprehensive ecological baseline on which to base EcIA.

Statutory, National and Locally Designated Sites of Nature Conservation

7.5.3 A web-based search employing the SNH online tool Sitelink[29] and the online GIS tool MAGIC[28], was undertaken to identify and provide information on designated sites of nature conservation, located within 10 km of the proposed Development. Sites at local, national and international levels were searched for, including Special Areas for Conservation (SAC), Sites of Special Scientific Interest (SSSI), National Nature Reserves (NNR) and Local Nature Reserves (LNR). Sites designated solely for ornithological interests and of relevance to the proposed Development are considered separately in Chapter 8: Ornithology, of the ES.

7.5.4 A search of the Dumfries and Galloway Local Development Plan (LDP)[31] and consultation with the DGERC was undertaken to obtain information regarding nature conservation sites of local or regional importance, located within proximity to the proposed Development.

7.5.5 A search of the SEPA River Basin Management Plan[32] was undertaken for information on watercourses which may be designated under the Freshwater Fish Directive.

Protected Species and Habitats

7.5.6 To provide background information pertaining to the baseline status of protected species in the local environment, a web-based search for historical records of protected and relevant species was undertaken using the National Biodiversity Network (NBN) website[33]. A targeted search for existing records of protected or notable species occurring within 3 km of the proposed Development Area was also undertaken by DGERG to provide more detailed data.

Field Survey Methods

7.5.7 An overview of the historical ecology surveys undertaken within the proposed Development Area and surrounding environment is provided in Technical Appendix 7.1: Pre-EIA Ecology Review in Volume 4 of the ES. The location of each ecological field survey extent in relation to the proposed Development Area is shown in ES

[26] Natural Power, 2014a. Windy Standard Wind Farm (Phase III), Scoping Report. Document reference: 1044008

[27] Natural Power, 2014b. Windy Standard III, Dumfries and Galloway, Pre-EIA Ecology Review. Document reference: 1032387

[28] MAGIC, undated. Interactive mapping web-based tool. Available at: http://www.magic.gov.uk/ Accessed May 2014 and January 2015

[29] SNH, undated. Sitelink Interactive Map. Available online from: http://gateway.snh.gov.uk/sitelink/index.jsp. Accessed May 2014 and January 2015

[30] Pers comms. (telephone and email conversation) with Anne Youngman (BCT) in September 2014

[31] DCG, 2014. Local Development Plan (LDP). Available at http://www.dumgal.gov.uk/index.aspx?articleid=11907 Accessed January 2015

[32] SEPA, undated. River Basin Management Plan (RBMP) Interactive Map. Available at: http://gis.sepa.org.uk/rbmp/

[33] NBN, undated. National Biodiversity Network Gateway. Available at: https://data.nbn.org.uk/ Accessed May 2014 and January 2015

Figures 7.1 to 7.3 in Volume 3 of the ES, with an overview of each survey method provided below. The majority of ecological field survey was undertaken and/or managed by Natural Power in 2012, with update surveys conducted in 2014 (protected mammal surveys) and 2015 (Phase 1 Habitat survey and NVC survey). Surveys including the following:

- Protected mammal species surveys (including otter, water vole, red squirrel (*Sciurus vulgaris*), pine marten (*Martes martes*) and badger (*Meles meles*));
- Specialist bat surveys, employing various survey methods (undertaken by FDM Ecology Ltd.); and
- Vegetation surveys, incorporating a Phase 1 Habitat survey and NVC quadrats (undertaken by Clyde Ecology Ltd.).

Phase 1 Habitat Survey

2012

7.5.8 A Phase 1 Habitat Survey of the original proposed Development Area was carried out on the 14th and 28th September 2012, in accordance with the method described in the Joint Nature Conservation Committee's (JNCC's) Handbook for Phase 1 Habitat Survey[11]. The survey focussed on habitats within the original proposed Development Area, encompassing the Meaul Hill Cluster and Waterhead Hill Cluster. Habitat data was mapped to record habitat type and extent, with recording of target notes where deemed necessary. Recording of target notes ensured provision of supplementary survey data for features of interest, including identification of requirements for further ecological assessment and recording of data where habitat information was of a scale too small to map.

2015

7.5.9 Following an increase in size of the proposed Development Area in 2013, a further Phase 1 Habitat survey was undertaken on 20th, 21st, 22nd, 23rd, 28th, 29th and 30th of July and 7th and 8th August 2015. Habitat type and extent within the extended proposed Development Area were mapped, as well as within a 50 m micrositing buffer of infrastructure outwith the proposed Development Area (i.e. the construction compound, indicative borrow pits, proposed batching plant and existing track to be upgraded; see ES Figure 7.1 in Volume 3 of the ES). Surveys were carried out in accordance with the method described in the Joint Nature Conservation Committee's (JNCC's) Handbook for Phase 1 Habitat Survey11, with habitat data mapped on 1:10,000 basemaps in the field, and target notes taken to provide supplementary data for features of interest. This included collecting information on sightings and signs of protected species, including protected mammals and herpetiles.

National Vegetation Classification (NVC) Survey

7.5.10 NVC survey of wetland areas within the proposed Development was undertaken in 2015 during the same survey period as the updated Phase 1 Habitat survey, and following methods outlined in Rodwell (2006)[12] and guidance contained in Averis *et al.* (2004)[34]. The survey focussed on wetland habitats within the proposed Development Area, as well as within a 50 m micrositing buffer of infrastructure outwith the proposed Development Area (i.e. the construction compound, indicative borrow pits, proposed batching plant and existing track to be upgraded; see ES Figure 7.1 in Volume 3 of the ES). Assessment of the potential for communities to support GWDTEs, as defined in guidance[8] by the Scottish Environmental Protection Agency (SEPA), was also carried out and representative quadrat samples were taken. Grid references and representative photographs were taken at sample locations to visually catalogue the sample and habitat conditions present at the time of survey. Full details of NVC survey methods used are given in Technical Appendix 7.2: Habitat Survey Results in Volume 4 of the ES.

[34] Averis, A. *et al*. (2004). *An Illustrated Guide to British Upland Vegetation*. Joint Nature Conservation Committee. Peterborough.

Watercourse Assessment (Fish & Macroinvertebrate)

7.5.11 The watercourses which drain the proposed Development Area are tributary channels of the Water of Deugh, the upper reaches of which have been identified as important fisheries which support good populations of wild brown trout and coarse fish. Watercourses or their tributary catchments within the proposed Development Area are the Polwhat Burn, Lone Strand, Shalloch Burn and Bow Burn and several minor unnamed tributary burns. Within the proposed Development these watercourses are typical upland watercourses, situated in heavily vegetated riparian zones. Bed material encountered during the site survey ranged from watercourses with peat and vegetation to beds of cobbles and small boulders. For further description of these watercourses see Chapter 10; Hydrology, Geology and Hydrogeology, of the ES.

7.5.12 In general, watercourses within the proposed Development Area are the uppermost tributaries of the burns identified above, and therefore are unlikely to support fish populations due to being narrow and shallow, vegetated in places and heavily shaded by the surrounding conifer plantation. The highest potential is seen in the Shalloch Burn, however within the proposed Development boundary this watercourse is shallow and c. 0.3 – 0.5 m wide, so this potential is still low; as such, baseline electro-fishing and macro-invertebrate surveys were not considered necessary. It is likely that good spawning habitat for salmonids may exist further downstream of the proposed Development, but best practice and mitigation, as per the Good Practice During Wind Farm Construction guidance[35] will be applied during the construction phase to ensure protection of watercourses draining the proposed Development; for further information see Section 7.8 below.

Bat Surveys

7.5.13 A comprehensive baseline assessment of the potential for bat species within the proposed Development Area was undertaken in 2012, by specialist bat ecologists FDM Ecology Ltd. A bat specific desk-based review was undertaken to inform and guide the bat surveys, followed by a walkover survey to assess roosting potential and bat activity surveys, all of which were undertaken in accordance with relevant guidance[18],[17]. The methods employed in the assessment of bat potential included the following:

- Bat specific desk-based review: a desk-based search for current and historical bat records was undertaken for the proposed Development Area, including a surrounding buffer of 10 km;
- Walkover survey: a walkover of the proposed Development and immediate surrounding area was undertaken on 6th April 2012 to identify the presence of potential bat roost habitat (see ES Figure 7.2 in Volume 3 of the ES). Notes were taken where habitat suitable for roosting bats was identified during the survey, in addition to areas likely to provide important foraging or commuting habitat;
- Activity surveys (automated static detector surveys): to provide comprehensive data concerning use of the proposed Development Area by bats, automated Anabat detector surveys were undertaken once per survey season during the spring (April); summer (July); and autumn (September). Activity surveys were carried out during all three periods to account for differences in activity levels experienced throughout the active bat season. A total of 10 automated static detectors were deployed within the proposed Development Area (six Sample Locations and four Reference Locations (see ES Figure 7.2 in Volume 3 of the ES)) for three consecutive nights in the spring period, six nights in the summer and seven nights in the autumn period. Initially, three nights were chosen in accordance with existing guidance[36], but as this was up-dated during the survey period[18] the minimum requirement of five nights was adhered to for subsequent survey periods. For logistical reasons static detectors were left on site for more than the minimum five nights during the summer and autumn survey periods. At the outset of the bat activity surveys, the location of proposed

[35] SNH, 2015. Good Practice During Wind Farm Construction. A Scottish Renewables, SNH, SEPA, FCS, Historic Environment Scotland joint publication

[36] Bat Conservation Trust, 2012. Bat Surveys - Good Practice Guidelines 2nd Edition: Surveying for onshore wind farms. Bat Conservation Trust

turbines was not known; therefore six detectors were positioned in representative habitats (including within the Meaul Hill Cluster and Waterhead Hill Cluster). An additional four detectors were deployed outwith the proposed Development Area to provide reference data. Further detail regarding the activity survey methods and precise static detector locations is presented in Technical Appendix 7.3: Bat Survey and Impact Assessment Report in Volume 4 of the ES; and

- Transect surveys: transect surveys were undertaken in the spring, summer and autumn of 2012, with surveyors walking pre-determined survey routes across the Meaul Hill Cluster and Waterhead Hill Cluster, and a third transect to the south at Dodd Hill (route determined by the proposed option area current at the time of survey). Transect surveys were conducted using Anabat SD2 detectors coupled to a Batnav GPS device, in order to provide accurate locations for all bat recordings. Surveys commenced at sunset and continued for up to three hours, ensuring full coverage of the main bat activity period. The direction of transect routes was reversed on subsequent surveys to ensure coverage of different parts of the site at different periods of night.

Otter and Water Vole Survey

7.5.14 Otter and water vole surveys were undertaken by Natural Power on 12th and 13th July 2012, focussing on all forest rides, water courses and linear features within the proposed Development Area, including a surrounding 150 m buffer (see ES Figure 7.3 in Volume 3 of the ES). Surveys followed methods as described in Chanin[13] for otter, and Strachan *et al*.[15] for water vole. Field signs searched for were as described in Bang & Dahlstrøm[37], Sargent & Morris[38] and Strachan *et al*.[15]. Photographs and ten figure grid references were obtained where field evidence of otter or water vole was identified.

7.5.15 An updated survey for protected mammal species (including otter) was undertaken at both the Meaul Hill Cluster and Waterhead Hill Cluster on 19th May 2014 by Natural Power, to inform the design of the proposed Development access track layout which was current at the time of survey (see ES Figure 7.3 in Volume 3 of the ES). Survey findings are detailed in the relevant species sections in Section 7.6 below. The survey involved a search of forest rides, watercourses and linear features, within a 100 m buffer of the proposed access track and within a 250 m buffer of the proposed turbine locations (see ES Figure 7.3 in Volume 3 of the ES).

Red Squirrel Survey

7.5.16 Red squirrel checks were undertaken as part of the protected mammal survey carried out by Natural Power on 12th and 13th July 2012, focussing on forest rides within the proposed Development Area and a 150 m buffer (see ES Figure 7.3 in Volume 3 of the ES). Red squirrels were also considered in the updated protected mammal surveys undertaken on 19th May 2014 involving walking of several transects through forestry to search for squirrel feeding signs. Suitable forest habitats were surveyed for signs of red squirrel, following non-invasive basic methods as described in Cresswell *et al*.[39] and Gurnell *et al*.[16]. Surveyors undertook visual surveys whilst walking transects along forest rides and edges, searching for red squirrel field evidence; including feeding signs (chewed cones and/or feeding stations), dreys or sightings of squirrels.

Pine Marten Survey

7.5.17 The potential for pine marten was considered during the updated protected mammal surveys undertaken in May 2014. Suitable forest habitats were surveyed for field signs of pine marten, focussing on forestry rides and existing forest tracks (pine marten scats are often deposited on pathways through woodland and on prominent objects[39]) within a 100 m buffer of proposed access tracks current at the time of survey and within a 250 m buffer of turbine locations (see ES Figure 7.3 in Volume 3 of the ES). Surveyors undertook these passive sign surveys whilst walking transects along forest rides and edges, in accordance with the methods outlined in Cresswell *et al*.[39].

Badger Survey

7.5.18 Badger surveys were undertaken by Natural Power on 12th and 13th July 2012, focussing on all forest rides, water courses and linear features within the proposed Development Area, including a surrounding 150 m buffer (see ES Figure 7.3 in Volume 3 of the ES). Badgers were also considered as part of the protected mammal survey undertaken on 19th May 2014. Surveys followed methods as described in Neal and Cheeseman[40], Bang and Dahlstrøm[37] and SNH[41]. Habitat features likely to be used by badgers, such as field boundaries, forest rides and edges, were focussed on for the identification of badger field evidence during the survey.

Survey Limitations

7.5.19 The following limitations were experienced when undertaking bat surveys:

- All bat surveys were conducted from ground level;
- It is not always possible to identify a bat call to species level, especially for *Myotis* species, or if the recorded call is not clear. Recorded files from automated detectors may contain only fragments of a call, or the bat may be calling from a distance (from the detector) in which case it may not be clear enough to assign the call to a specific species;
- Some caution must be taken when comparing activity levels between species, as bias can be shown towards those species with 'louder' or 'lower frequency' echolocation calls. For example *Nyctalus* species have louder and low frequency echolocation calls which carry further than the quieter and more broadband brown long-eared bat (*Plecotus auritus*) echolocation calls; and
- A bat contact is defined as a single 15 second Anabat file which contains at least one bat call. Multiple contacts at any given detector location do not necessarily indicate the presence of more than one bat and should therefore be interpreted as a level of activity rather than the number of bats recorded.

Ecological Impact Assessment (EcIA) Method

7.5.20 This section outlines the approach to EcIA employed as part of the impact assessment, providing an overview of how the potential for impact has been determined and the method by which impact significance has been ascertained. The approach to EcIA adopted within this assessment follows the CIEEM guidelines[2], which set out the EcIA process through the following stages:

- Identification of Valued Ecological Receptors (VERs) through ecological field survey and /or research;
- Determination of the value of each identified VER;
- Assessment of impacts affecting those VERs and/or resources, using a defined threshold value with reference to ecological processes and functions as deemed appropriate;
- Determining the extent, magnitude, duration, timing and frequency of the impacts;
- Assessing the potential for impact reversibility;
- Determining the level of confidence in the above impact predictions; and
- Identification of likely significant impacts in the absence of mitigation.

[37] Bang, P. and Dahlstrøm, P. 2001. Animal Tracks and Signs. Oxford University Press, Oxford.

[38] Sargent, G., and Morris, P. 2003. How to find and identify mammals. The Mammal Society, London.

[39] Cresswell, W. J., Birks, J. D. S., Dean, M., Pacheco, M., Trewhalla, W. J., Wells, D. and Wray, S. 2012. UK BAP Mammals Interim Guidance for Survey Methodologies, Impact Assessment and Mitigation. Published by The Mammal Society.

[40] Neal, E. and Cheeseman, C. 1996. Badgers. T & A D Poyser, London, p271 pp

[41] SNH, 2001. Scotland's Wildlife: Badgers and Development. Scottish Natural Heritage, Perth.

Evaluating Features of Ecological Interest

7.5.21 In accordance with CIEEM guidelines[2], the value of an ecological feature is based upon its respective elements relating to biodiversity, social/community and economic value. Separate consideration should be given to the legal protection offered to an ecological feature along with additional policy implications. The value of an ecological feature is determined within a geographical frame of reference as detailed in Table 7.2, below. Statutory and non-statutory sites of nature conservation have inherent ecological value through site designation: this is taken into account as part of the EcIA[2].

7.5.22 Designations are normally indicative of a value level; for example, a Special Area of Conservation (SAC) designated under the Habitats Directive is explicitly of European (International) importance. Where a site is offered more than one designation, it is the one of higher level (within the geographic frame of reference) considered of overriding value. Ecological features of interest should be valued accordingly, with ecological features unrelated to the site designation assessed and evaluated according to their intrinsic value.

7.5.23 It should be acknowledged that some VERs, including certain legally protected species such as badger, may be of insufficient ecological and/or nature conservation value to warrant consideration within the EcIA; however, due to the level of legal protection offered to these features, they are considered separately in the EcIA within the context of legal and policy implications.

Table 7.2: Geographical context relating to the evaluation of a VER

Level of value	Example of VERs
International	An internationally designated site (e.g. SAC), or site meeting criteria for international designations such as a World Heritage Site (WHS)
	Species present in internationally important numbers (> 1 % of biogeographic populations)
National	A nationally designated site such as a SSSI, or a National Nature Reserve (NNR), or sites meeting the criteria for national designation (such as the JNCC guidelines[42])
	Species present in nationally important numbers (> 1 % UK population)
	Large areas of priority habitat listed on Annex I of the EC Habitats Directive, and smaller areas of such habitat that are essential to maintaining Annex I habitat viability
Regional	Species present in regionally important numbers (> 1 % of the SNH Natural Heritage Zone population)
	Sites falling short of criteria for selection as a SSSI, but of greater than local importance (see below)
Local	Scottish Wildlife Trust (SWT) Reserves and Local Nature Reserves (LNR) that do not contain features as described above
	UNESCO Biosphere Reserve
	Areas of semi-natural ancient woodland smaller than 0.25 ha
	Areas of habitat or species considered to appreciably enrich the ecological resource within the local context, e.g. species-rich flushes or hedgerows
Negligible	Usually widespread and common habitats and species. Receptors falling below Local value are not normally considered in detail in the assessment process

Source: Adapted from CIEEM guidelines[2]

7.5.24 Attributing value to an ecological receptor involves defining the population/habitat network, with application of professional judgment to identify an ecologically coherent population/habitat network against which effects on integrity can be assessed (refer to the 'Determining Significance of Potential Ecological Effects' below). For example, for wide-ranging species such as otter utilising freshwater habitats, it may be appropriate to value the otter population at a catchment level; whereas for more localised species such as water vole, value may be attributed to individual groups of related colonies occupying an individual watercourse, functioning as a larger meta-population. In accordance with CIEEM guidelines[2], when valuing ecological receptors, professional judgement must be made on the basis of an objective assessment of the best information available: in circumstances of reasonable doubt, a precautionary approach should be adopted.

7.5.25 For the purposes of this assessment and of assigning value to bats, the guidance set out in Natural England's TIN051[20] and Valuing Bats in Ecological Impact Assessment[43] has also been considered. TIN051 identifies the risk of wind turbines upon individual bat species, based upon behavioural characteristics, and upon bat populations, based upon species rarity. Table 7.3 below summarises the sensitivity of bats and bat and the risk of turbine impact.

Table 7.3: Risk of turbine impact affecting bat populations[44] (taken from TIN051)

Species	Turbine Impact	Sensitivity Of Population
Nathusius' pipistrelle	High	High
Noctule	High	High
Leisler's bat	High	High
Common pipistrelle	Medium	Low
Soprano pipistrelle	Medium	Low
Long-eared bats	Low	Low
Myotis species	Low risk	Low

7.5.26 The guidance provided by Wray *et. al.*[43] includes a framework for identifying the importance of bats in the landscapes through the evaluation of bat roosts and habitats. Applying this framework, bat roosts can be valued according to species rarity (see Table 7.4 below) and roost status (see Table 7.5 below).

Table 7.4: Species rarity in Wales (adapted from Wray *et. al.*[43])

Rarity	Species	
Common	Common pipistrelle (*Pipistrellus pipistrellus*)	
(population over 100,000)	Soprano pipistrelle (*Pipistrellus pygmaeus*)	
Rarer	Daubenton's (*Myotis daubentonii*)	
(population 10,000 to 100,000)	Natterer's (*Myotis nattereri*)	
	Brown long-eared	
Rarest	Whiskered (*Myotis mystacinus*)	Noctule
(population under 10,000)	Brandt's (*Myotis brandti*)	Nathusius' pipistrelle

[42] JNCC, 2013. Guidelines for the Selection of Biological SSSIs. Part 1: Rationale, Operational Approach and Criteria for Site Selection. Revision based upon Ratcliffe, D.A., ed. 1989. Guidelines for selection of biological SSSIs. Peterborough, Nature Conservancy Council. ISBN 978-1-86107-625-0

[43] Wray, S., Wells, D., Long, E., Mitchell-Jones, T., 2010. Valuing Bats in Ecological Impact Assessment. IEEM In-Practice. Number 70 (December 2010). Pp. 23-25.

[44] Only those species which are known to occur in Scotland are included. SNH, undated. Scottish bats and their roosts. Available at: http://www.snh.gov.uk/about-scotlands-nature/wildlife-and-you/bats/scottish-bats/

Table 7.5: Valuation of roosts

Geographic Scale of Importance*	Roost Type
Local	Feeding perches (common species)
	Individual bats (common species)
	Small numbers of non-breeding bats (common species)
	Mating sites (common species)
County	Maternity sites (common species)
	Small numbers of hibernating bats (common and rarer species)
	Feeding perches (rarer/rarest species)
	Individual bats (rarer/rarest species)
	Small numbers of non-breeding bats (rarer/rarest species)
Regional	Mating sites (rarer/rarest species) including well used swarming sites
	Maternity sites (rarer species)
	Hibernation sites (rarest species)
	Significant hibernation sites for rare/rarest species or all species assemblages
National	Maternity sites (rarest species)
	Sites meeting SSSI guidelines based on bats
International	SAC sites with bats as qualifying species

** applying the relevant geographic scale*

7.5.27 Wray *et. al*.[43] identifies a numerical scoring system which can be applied to foraging habitat (see Table 7.6 below) and commuting habitat (see Table 7.7 below). The total score derived by summing these evaluations is then applied to the geographical scale proposed by the CIEEM Ecological Impact Assessment (EcIA) guidelines (see Table 7.8 below). This system has been used for assessment in the absence of a more appropriate one, but it should be noted that this scoring system was not designed for an upland Scottish context as typical upland habitat types/features are not adequately represented by the feature categories in the final column of Table 7.6.

Table 7.6: Valuing foraging habitat for bats

Species (Score)	Number of Bats (Score)	Roosts/Potential Roosts Nearby (Score)	Type and Complexity of Linear Features (Score)
Common (2)	Individual bats (5)	None (1)	Industrial or other site without established vegetation (1)
Rarer (5)	Small number of bats (10)	Small number (3)	Suburban areas or intensive arable land (2)
Rarest (20)	Large number of bats (20)	Moderate number/not known (4)	Isolated woodland patches, less intensive arable and/or small towns and villages (3)
		Large number of roosts, or close to a SSSI for the species (5)	Larger or connected woodland blocks, mixed agriculture, and small villages/hamlets (4)
		Close to or within a SAC for the species (20)	Mosaic of pasture, woodlands and wetland areas (5)

Table 7.7: Valuing commuting habitat for bats

Species (Score)	Number of Bats (Score)	Roosts/Potential Roosts Nearby (Score)	Type and Complexity of Linear Features (Score)
Common (2)	Individual bats (5)	None (1)	Absence of (other) linear features (1)
		Small number (3)	Un-vegetated fences and large field sizes (2)
Rarer (5)	Small number of bats (10)	Moderate number/not known (4)	Walls, gappy or flailed hedgerows, isolated well-grown hedgerows, and moderate field sizes (3)
		Large number of roosts, or close to a SSSI for the species (5)	Well-grown and well connected hedgerows, small field size (4)
Rarest (20)	Large number of bats (20)	Close to or within a SAC for the species (20)	Complex network of mature well established hedgerows, small fields and rivers/streams (5)

Table 7.8: Scoring system for valuing commuting and foraging habitat features for bats

Score	Geographic Value
1 – 10	Not important
11 – 20	Local
21 – 30	County
31 – 40	Regional
41 – 50	National
>50	International

Characterising Potential Effects on Receptors

7.5.28 The process of identifying ecological effects and impacts should make reference to aspects of the ecological structure and function upon which the ecological receptor depends. Impacts must be assessed within the context of the predicted baseline conditions occurring in the Zone of Influence (i.e. the area affected by the proposed Development and/or within the immediate surrounding environment), within the lifetime of the proposed Development[2]. To ensure cumulative impacts are fully addressed, environmental trends such as climate change should be taken into account when considering the predicted baseline for VERs. When characterising effects and predicting impacts to ecological receptors, the following ecological aspects relating to receptor structure and function are considered:

- Available resources: food, territory, nutrients, soil minerals etc.;
- Stochastic processes: extreme weather events, disease, geomorphic processes, climate change etc.;
- Ecological processes: population dynamics (competition, dispersal etc.); vegetation dynamics (colonisation, succession etc.);
- Ecological relationships: food webs, predator-prey relationships, adaptation, dynamism etc.;
- Ecological role of function: decomposer, herbivore, parasite, predator, keystone species etc.;
- Ecosystem properties: connectivity, carrying capacity, population numbers, fragmentation etc.;
- Anthropogenic influences: environmental management, land use; and
- Historical Context: natural range of variation over a historical period, irregular perturbations beyond normal range.

7.5.29 When characterising ecological impacts, it is essential to consider the likelihood that a change/activity will occur as predicted, with a degree of confidence in the impact assessment (in relation to the impact on ecological structure and function). Where possible, the degree of confidence should be predicted quantitatively. Where this is not possible, a more qualitative approach is taken; particularly where the confidence level can only be based on expert judgement. Within this EcIA, the confidence levels employed when predicting impacts to ecological receptors are as follows:

- Certain/near certain: probability estimated at 95 % chance or higher;
- Probable: probability estimated above 50 % but below 95 %;
- Unlikely: probability estimated at above 5 % but less than 50 %; and
- Extremely unlikely: probability estimated at less than 5 %.

7.5.30 In addition to predicting the degree of confidence quantitatively, magnitude (the size or amount of an impact) should also be determined on a quantitative basis. Magnitude can be negative or positive, with the magnitude of impact varying from very high negative to positive. High negative magnitude impacts include large-scale permanent and/or high probability changes, affecting an ecological receptor's population or extent. Low magnitude impacts would typically be small in scale and/or temporary in effect. This impact assessment takes into account whether an impact is positive or negative, short-term (for example only during construction) or long-term (throughout the lifetime of the proposed Development), reversible or permanent. The criteria used in the EcIA for describing the overall magnitude of a potential impact are summarised in Table 7.9, below.

Table 7.9: Criteria used to determine the magnitude of ecological impacts

Impact magnitude	Description
Very high negative	Total or almost complete loss of an ecological receptor resulting in a permanent adverse impact on the integrity of the receptor. The conservation status of the receptor would be permanently affected
High negative	Result in large-scale, permanent changes in an ecological receptor, likely to change its ecological integrity. These impacts are therefore likely to result in overall changes in the conservation status of an ecological receptor
Moderate negative	Include moderate-scale long-term changes in an ecological receptor, or larger-scale temporary changes; however the integrity of the ecological receptor is not likely to be affected. This may result in temporary changes in the conservation status of the ecological receptor, but these are reversible and unlikely to be permanent
Low negative	Includes impacts that are small in magnitude, with small- scale temporary changes, and where integrity of the ecological receptor is not affected. These effects are unlikely to result in overall changes in the conservation status of an ecological receptor
Negligible	No perceptible change in the ecological receptor
Positive	The changes in the ecological receptor are considered to be beneficial to its ecological integrity or nature conservation status

Source: Adapted from CIEEM guidelines[2]

Determining Significance of Ecological Effects

7.5.31 In accordance with the CIEEM guidelines[2], within this assessment an ecologically significant impact is defined as an impact (positive or negative) on the integrity of a defined site or ecosystem, and/or the conservation status of habitats or species within a defined geographical area. The value of a VER is related directly to the impact consequences in terms of legislation, policy or development control at the appropriate level and is used to identify the geographical scale at which the impact is significant. It is acknowledged that if an impact is found to be not significant at the level it was valued (e.g. nationally), it potentially may be more significant at a local level.

7.5.32 Significant impacts on VERs should be mitigated or compensated for, in line with guidance derived from policies relevant to the geographic scale of the VER value. Any remaining significant impacts following the application of mitigation (i.e. residual impacts), together with an assessment of the likelihood of mitigation success, should be considered against relevant legislation, policy and development control.

7.5.33 To test whether or not an impact will affect the integrity of a site or an ecosystem (and is therefore significant), it is necessary to understand if changes/activities arising from the proposed Development are likely to move the baseline conditions for the ecological receptor closer to or further away from a favourable condition and the ecological status that constitutes 'integrity' for that system. The term integrity is used within this EcIA in accordance with the definition adopted by the Office of the Deputy Prime Minister (ODPM) Circular 06/2005 on Biodiversity and Geological Conservation (ODPM)[45], supported by the Scottish Executive Circular June 2000 (Habitats and Birds Directives Nature Conservation), as follows: *"The integrity of a site is the coherence of its ecological structure and function across its whole area, that enables it to sustain the habitat, complex of habitats and/or the levels of populations of species for which it was classified."* A site or ecosystem that achieves this level of ecological coherence is considered to be of favourable condition. Within this EcIA, integrity therefore refers to the maintenance of the conservation status of a habitat or population of a species, at a specific location or geographical scale. In accordance with CIEEM guidelines, the various components of ecological integrity (of an ecosystem or site) may include the following:

- An assemblage of different ecosystem processes, including anthropogenic influences;
- Dynamics of the ecosystem at several scales; and
- Levels of habitats or population where the desired condition is the average level that would be considered *"acceptably characteristic of the site or ecosystem"*[2].

7.5.34 When assessing potential impacts on the conservation status of an ecological receptor (such as site of national or international designation), integrity should be considered in line with published citations and conservation strategies specific to the receptor. Where reasonable doubt may exist in determining impacts on integrity, a precautionary view should always be taken and a negative effect on integrity predicted.

7.5.35 In line with the CIEEM guidelines, conservation status is used within this assessment to determine whether an impact on a habitat or species is ecologically significant. Conservation status is evaluated in terms of the geographical scale for each ecological receptor, as outlined above in Table 7.2 above. Assessment of the potential for effects and impacts to the conservation status of an ecological receptor is assessed using the same reasoning as applied to the integrity of an ecological feature (outlined above), along with an estimation of ecological resilience.

7.5.36 As outlined in the above sections, once value has been attributed to an ecological receptor with characterisation of potential impacts of the proposed Development, the significance of the ecological impact can be ascertained. In accordance with the CIEEM guidelines[2], two categories are used to classify impacts: 'significant' or 'not significant'. Within this EcIA, an impact that threatens the integrity of an ecological receptor is considered to be significant in terms of the EIA Regulations.

7.5.37 Significance in the context of the EIA Regulations is used here to describe the relative importance of impacts on any feature of ecological importance, regardless of the application of the Habitats Regulations. In this assessment, an ecologically significant impact has a negative or positive effect on the integrity of a site or ecosystem and/or the conservation objectives for habitats or species within a given geographical area. Using this method, significant impacts are distinguished from other lesser (and in the context of EIA, unimportant) effects.

7.5.38 Where potential impacts of the proposed Development are assessed as significant, mitigation and/or compensation measures are required in accordance with the relevant guidance, appropriate to the scale and

[45] ODPM, 2005. Government Circular: Biodiversity and Geological Conservation – statutory obligations and their impact within the planning system. 16 August 2005.

value of the ecological receptor. Where negative impacts considered not significant are identified, mitigation should also be applied as good practice. Following identification of mitigation requirements, consideration of residual impacts is undertaken, with identification of further mitigation, ecological monitoring or management requirements as deemed necessary.

7.5.39 In accordance with CEEM guidelines[2], a matrix system has not been employed for the determination of impact significance, as this method often places negative impacts to VERs of local value into a 'low significance' category, misleadingly downplaying local values of biodiversity. As part of the assessment process the value and magnitude of each ecological receptor is considered, in addition to the likelihood, permanency, frequency and longevity of a potential impact. It is therefore considered preferable to address each ecological impact qualitatively, ensuring inclusion of the aforementioned factors in the assessment process.

7.6 BASELINE SURVEY RESULTS

Designated Sites

International and National Designations

7.6.1 A web-based search employing online data bases (MAGIC and SNHi) did not identify any sites of international importance located within 10 km of the proposed Development. The search did identify four nationally important Sites of Special Scientific Interest (SSSIs) located approximately 7.5 to 10 km north and north-west from the proposed Development, detailed in Table 7.10 below.

Table 7.10: Details of statutorily protected nature conservation sites located within 10 km of the proposed Development

Site name	Designation	Designated Features	Approximate distance from the proposed Development
Loch Doon	SSSI	Supports the last 'naturally occurring' population of Arctic charr (*Salvelinus alpinus*) in south-west Scotland. The Loch Doon fish are now thought to be genetically distinct from other naturally occurring populations	7.5 km west
Ness Glen	SSSI	Supports upland mixed ash (*Fraxinus excelsior*) woodland within a narrow and steep-sided ravine cut through locally calcareous greywackes and shales: the best example of this type of gorge woodland in East Ayrshire	10 km west
Bogton Loch	SSSI	Supports open water transition fen habitat with an extensive range of associated wetland communities and an assemblage of breeding birds	10 km north-west
Benbeoch	SSSI	Supports a geological feature of Igneous petrology (Carboniferous-Permian Igneous)	10 km north-west

Source: MAGIC and SNHi web searches, February 2015

Local Designations

7.6.2 The proposed Development is located within the Galloway and Southern Ayrshire Biosphere Reserve. The Galloway and Southern Ayrshire Biosphere promotes the following three fundamental, complementary functions required of a UNESCO Biosphere Reserve; conservation, learning and research, and sustainable development. The core purpose of the biosphere reserve is for *"testing and demonstrating sustainable development on a regional scale".* This designation does not bring any additional regulation of activities within the biosphere area. The proposed Development is located within the Biosphere Reserve 'transition area', where the key aim is to promote sustainable development.

7.6.3 A search of the Dumfries & Galloway LDP did not identify any local nature conservation sites located within the vicinity of the proposed Development. A search of non-statutory sites, local designations and consultation zones was undertaken by the DGERC: the results of this search concur with the desk-based review, confirming that there are no locally designated sites within the vicinity of the proposed Development. This search highlighted the presence of the Carsphairn Forest Red Squirrel Priority Woodlands (RSPW), within which the proposed Development is located. The Carsphairn Forest RSPW does not bring any further regulation of activities, but has been selected to ensure positive woodland management for red squirrels. Within this RSPW, activities should focus on appropriate felling programmes and the reintroduction of tree species that will provide red squirrels with a long term reliable and diverse food source.

7.6.4 To identify watercourses designated under the Freshwater Fish Directive located within the vicinity of the proposed Development, a search of the SEPA River Basin Management Plan was undertaken. This identified classification of the watercourses local to the proposed Development as follows:

- Water of Deugh (the primary watercourse draining the proposed Development Area): classified as *"bad ecological potential"*[46];
- Bow Burn (a tributary of the Water of Deugh, located to the immediate south of the Waterhead Hill Cluster): classified as *"bad ecological potential"*; and
- Pochriegavin Burn (a tributary of the Water of Deugh to the north-west of the proposed Development): classified as *"moderate ecological potential".*

7.6.5 The above-listed watercourses and the proposed Development are located within the Dee-Ken Catchment Management Plan area[47]. The catchment management plan is included in the Dumfries and Galloway Local Biodiversity Action Plan (D&G LBAP) and aims to deliver projects that improve water quality and habitats at a catchment scale. Additionally, these watercourses fall under the designation of the River Dee which is designated as a Salmonid Water under the Freshwater Fish Directive. This designation requires compliance with physical and chemical environmental quality standards set out in the Directive: SEPA is the designated competent authority for this requirement and assesses annual compliance with the Directive using monitoring results.

[46] For surface water bodies, in the Catchment Management Plan **ecological status** is divided into five classes: high, good, moderate, poor and bad. This encompasses a spectrum ranging from water bodies in near natural condition which are at high ecological value, to those whose ecological quality has been severely damaged and which are at bad ecological status. Heavily modified waterbodies are classified according to a similar spectrum of five classes: maximum, good, moderate, poor and bad, but by **ecological potential** instead of status. This is a measure of the extent to which the water bodies' ecological quality has been maximised given the limits imposed by the physical modifications (eg a dam) necessary for the water bodies' use.

[47] SEPA, undated. The Dee-Ken Catchment Management Plan. Available at: www.sepa.org.uk/water/water_publications/idoc.ashx?docid...1 Accessed February 2015.

Historical Habitat Data

7.6.6 A search of historical habitat data was undertaken by DGERC to provide contextual information relating to historical land use and to determine baseline conditions prior to the establishment of coniferous plantation within the proposed Development Area. This search confirmed the historical presence of heathland habitats across the proposed Development Area: the majority of habitat was dominated by grassland-heathland with localised areas of upland heath/acid grassland in open areas located within the footprint of the Meaul Hill Cluster. To the south of the Bow Burn and to the north-west of the Water of Deugh, habitats were previously dominated by coniferous plantation. Small pockets of native woodland (as identified through the Native Woodland Survey of Scotland) are located approximately 0.25 km west of the Meaul Hill Cluster and approximately 1.25 km north-west of the Waterhead Hill Cluster in riparian areas of the Shalloch Lane burn.

Protected and Relevant Species Records

Existing Records

7.6.7 To provide background information regarding the historical presence of protected and relevant species in the local environment, a web-based search using the NBN website[33] was undertaken and identified the historical presence of the following species groups in the vicinity of the proposed Development Area:

- Protected mammals, including otter and red squirrel; and
- Invertebrates, including cranefly and hoverfly species.

7.6.8 A targeted search for existing records of protected or notable species occurring within 3 km of the proposed Development Area was undertaken by DGERG to provide more detailed data regarding historical records. This search returned only a solitary record: this absence of records may be explained by the remote location and largely inaccessible habitats (mature coniferous plantation) currently present within the proposed Development Area and surrounding environment. This data search identified the following:

- A historical record of otter (1978), recorded at the confluence of the Brownhill Burn/Water of Deugh, approximately 1.5 km from the Waterhead Hill Cluster.

Relevant Survey Data from Windy Standard II

7.6.9 A pre-construction protected mammal survey was undertaken by Natural Power in August 2013 to inform the construction phase of the adjacent Windy Standard II. The survey identified the presence of otter in the upper tributaries of the Shalloch Burn and in the Polwhat Burn, both of which are tributaries of the Water of Deugh, draining the proposed Development Area[48]. Signs included a potential otter holt and above ground couch, otter path, prints and three spraint[48]. Regular checks were undertaken of the potential otter holt and couch by an experienced Ecologist during enabling works for Windy Standard II from May to November 2014, however no evidence of use was observed. During an inspection visit of the holt and couch in January 2014, it was noted by the Ecological Clerk of Works (ECoW) that both the otter holt and above ground couch had been washed out by spate flows during the preceding months[49]. There were also records from ecological field surveys undertaken by Natural Power in 2010, of two spraints on the Water of Deugh and three spraints on the Fingland Burn (see Technical Appendix 7.1: Pre-EIA Ecology Review in Volume 4 of the ES).

7.6.10 No evidence of water vole was recorded during the pre-construction protected mammal surveys in 2013, with the majority of minor watercourses considered unsuitable for water vole due to fast-flowing water, subterranean watercourse sections, impacts from forestry activities, or a lack of bankside vegetation suitable for foraging and shelter.

7.6.11 The pre-construction protected mammal survey also confirmed the presence of badger in the local environment, with badger dung, prints and path recorded to the south of Brockloch Rig at Sware Brae; however no setts were identified[48].

7.6.12 Squirrel feeding signs were observed throughout the survey area, with suitability of woodland habitats varying throughout[48]. A visual observation of a red squirrel by the ECoW for Windy Standard II in the Sware Brae area in September 2014[50] (at NS58798 00964), confirms the presence of red squirrel in the local environment.

7.6.13 During the protected mammal survey the potential for pine marten was also acknowledged, with identification of potential denning sites and potential scats (inconclusive) in the Craignane area[48]. Further targeted pine marten scat searches in the Craignane area were undertaken by the ECoW for Windy Standard II throughout 2014, including use of a baited camera trap overlooking suitable habitat at the Water of Deugh; however no evidence of pine marten presence was recorded[51].

Incidental Records

7.6.14 Incidental records of protected species from surveys carried out at Windy Standard III in 2012, 2014 and 2015 are provided in Table 7.11 below.

Table 7.11: Incidental records of non-avian protected species observed at Windy Standard III

Date	Species	Sign	OS grid reference (NGR)	Distance to nearest turbine (m)	Distance to nearest infrastructure (m) and infrastructure type
12-13/09/2012	Squirrel	Six eaten cones	NGR NS 58095 00537	92 (T20)	77 (proposed new track)
12-13/09/2012	Red squirrel	Red squirrel sighting	NGR NX 54636 98554	2539 (T16)	2349 (anemometry mast)
12-13/09/2012	Badger	Feeding signs (five badger snuffle holes)	NGR NS 57923 03403	190 (T1)	21 (consented forest track to be upgraded)
12-13/09/2012	Badger	Feeding signs (three badger snuffle holes)	NGR NS 58544 02559	171 (T5)	155 (proposed crane pad)
12-13/09/2012	Badger	Feeding signs (one badger snuffle hole)	NGR NS 58148 02903	193 (T4)	171 (proposed crane pad)
30/07/2015	Badger	Feeding signs (10 badger snuffle holes)	NGR NS 58250 01356	227 (T12)	109 (existing track to be upgraded)
19/05/2014	Juvenile Common lizard	Sighting adjacent to artificial drainage ditch in clearfell	NGR NS 57558 00503	215 (T13)	119 (proposed new track)
22/07/2015	Common lizard	Sighting in forest ride	NGR NS 57292 03117	277 (T3)	256 (consented forest track to be upgraded)

[48] Natural Power, 2013. Windy Standard II Wind Farm. Protected Mammal Survey Report. Document reference: 1033787

[49] Natural Power, 2015. Windy Standard II Monthly ECoW Report May 2014. Document reference: 1076056

[50] Natural Power, 2015. Windy Standard II Monthly ECoW Report September 2014. Document reference: 1084398

[51] Natural Power, 2015. Windy Standard II Monthly ECoW Report November 2014. Document reference: 1084403

Date	Species	Sign	OS grid reference (NGR)	Distance to nearest turbine (m)	Distance to nearest infrastructure (m) and infrastructure type
29/07/2015	Common lizard	Sighting in ditch at forest track	NGR NS 57258 00615	244 (T14)	230 (proposed new track)
08/08/2015	Common lizard	Sighting next to access track	NGR NS 58359 01192	391 (T12)	16 (existing track to be upgraded)

Phase 1 Habitat Survey

7.6.15 The Phase 1 Habitat survey identified locally common and widespread habitats occurring within the proposed Development Area, with the dominant habitat comprising mature coniferous plantation. Smaller open areas such as rides and the tops of the hills support grassland, heathland and remnants of mire.

7.6.16 Tall bog sedge Carex magellanica was identified in two areas of the Meaul Hill Cluster, one area around the edges of Moor Loch just outwith the western boundary of the proposed Development Area, and also in an area of floodplain mire in a wide ride at the east of the Meaul Hill Cluster where it was locally frequent on the floating bog. This species is Nationally Scarce and is included in the *Vascular Plant Red Data List for Great Britain* 2006 Cheffings, C. and Farrell, L. (Editors)[52].

7.6.17 An overview of the Phase 1 Habitat survey results, showing the area of recorded habitat occurring within the proposed Development are provided below in Table 7.12 below and in ES Figure 7.5 in Volume 3 of the ES. Habitat descriptions are provided in Technical Appendix 7.2: Habitat Survey Results in Volume 4 of the ES.

Table 7.12: Phase 1 Habitat survey results

Phase 1 Habitat	Habitat Code	Habitat Area (ha)	Overall % of habitat
Broad-leaved plantation	A1.1.2	1.58	0.33
Coniferous plantation	A1.2.2	325.36	67.33
Recently-felled woodland	A4.2	60.02	12.42
Unimproved acid grassland	B1.1	0.12	0.03
Semi-improved acid grassland	B1.2	4.67	0.97
Marsh/ marshy grassland	B5	0.94	0.20
Poor semi-improved grassland	B6	0.61	0.13
Dry dwarf shrub heath	D1	0.46	0.10
Wet dwarf shrub heath	D2	0.11	0.02
Dry heath/acid grassland mosaic	D5	2.24	0.46
Wet modified bog	E1.7	82.12	16.99
Acid/neutral flush	E2.1	2.11	0.44
Fen	E3	0.09	0.02
Flood plain mire	E3.3	0.55	0.11
Running water	G2	n/a	n/a
Quarry	I2.1	0.49	0.10
Ephemeral/short perennial	J1.3	1.74	0.36

7.6.18 Within open areas and forestry rides, habitats are dominated by wet modified bog. The type and conditions of habitat recorded in the open areas concur with the historical habitat data, suggesting fragments of upland heath may indicate a historical presence of heathland habitats across the proposed Development Area, prior to afforestation.

7.6.19 Wet modified bog is mainly found on drying and degraded bog, with a peat depth greater than 0.5 m[53]. Results from the peat depth surveys indicate that *c.* 48 % of measured points have a peat depth of less than 0.5 m; therefore, around half of the proposed Development Area supports a peat depth greater than 0.5 m, with approximately 8 % of peat depth points greater than 1 m (refer to Chapter 10: Hydrology, Geology and Hydrogeology, of the ES).

7.6.20 In response to consultation with SEPA regarding the potential presence of GWDTEs, the Phase 1 Habitat survey data has been analysed in accordance with 'A Functional Wetland Typology for Scotland' guidance[53], to identify wetland areas which may support GWDTEs: initial assessment identified the potential for 'slope' and 'peatland' landscape settings for wetland habitats occurring within the proposed Development Area.

7.6.21 In accordance with the wetland typology landscape setting descriptions, the following habitat types are likely to occur within the proposed Development Area:

- Slope: springs, flushes and seepages, with other habitats on shallow slopes (e.g. peat bog); and
- Peatland: peat, quaking bog, potentially with other habitat types including seepages, flushes and springs.

7.6.22 The wetland habitat typology has been applied to the Phase 1 Habitat data, as outlined in Table 7.13 below, for identification of wetland habitat types within the proposed Development Area in accordance with SEPA guidance[8]. Hydrogeological assessment has shown that peat is present within the proposed Development Area, a soil indicator of the presence of wetland habitats.

Table 7.13: Application of wetland typology to proposed Development Phase 1 Habitat data[53]

Phase 1 Habitat	Wetland habitat typology	Potential for GWDTE?
Broad-leaved plantation – A1.1.2	N/A: not a wetland habitat	No
Coniferous plantation - A.2.2	N/A: not a wetland habitat	No
Recently felled woodland - A.4.2	N/A: not a wetland habitat	No
Unimproved acid grassland – B1.1	N/A: not a wetland habitat	No
Semi-improved acid grassland - B.1.2	N/A: not a wetland habitat	No
Marsh/marshy grassland – B5	2a Marshy grassland	Yes
Dry dwarf shrub heath – D1	N/A: not a wetland habitat	No
Wet dwarf shrub heath – D2	7 Wet heath	Yes
Dry heath/acid grassland mosaic – D5	N/A: not a wetland habitat	No
Wet modified bog – E.1.7	8a Peatbog	Yes

[52] Cheffings, C. and Farrell, L. (Editors). (2006). The Vascular Plant Red Data List for Great Britain

[53] SNIFFER, 2009. WFD95: A Functional Wetland Typology for Scotland – Project Report. ISBN: 978-1-906934-21-7

Phase 1 Habitat	Wetland habitat typology	Potential for GWDTE?
Acid/neutral flush – E.2.1	3d Seepages/flushes	Yes
Flood plain mire - E.3.3	8a Peatbog	Yes
Ephemeral/short perennial – J.1.3	N/A: not a wetland habitat	No

Source: Natural Power, 2012

7.6.23 Analysis of the Phase 1 Habitat survey data in accordance with the relevant guidance[53], [8] has identified the following wetland habitats within the proposed Development Area:

- 2a Marshy grassland
- 3d Seepages/flushes;
- 7 Wet heath; and
- 8a Peatbog.

7.6.24 The identified wetland habitats occurring within the proposed Development Area show evidence of anthropogenic pressures from current and historical land management practices, including; grazing (potentially from livestock and deer), artificial drainage from forestry works and desiccation/acidification effects from commercial coniferous plantations, present both within the proposed Development Area and immediate surrounding environment.

National Vegetation Classification (NVC) Survey

7.6.25 The communities and sub-communities identified at the proposed Development during the NVC survey undertaken in 2015 are shown in Table 7.14 below, and on ES Figure 7.6 in Volume 3 of the ES. Habitat descriptions and results from the representative quadrat samples are provided in Technical Appendix 7.2: Habitat Survey Results in Volume 4 of the ES.

7.6.26 In accordance with SEPA guidance8, the NVC data has been analysed to identify where potential wetland communities may be dependent upon ground water, where ground water dependency may be limited or where communities may be considered sensitive to impacts from ground water. This analysis identified six wetland habitats with moderate or high levels of ground water dependence or sensitivity within the proposed Development Area; M6, M23, M25, U6, MG9 and MG10.

Table 7.14: NVC survey results

NVC Community	NVC Code	Corresponding Phase 1 Habitat type (JNCC 2010) [54]	Annex 1 habitat	UKBAP Priority habitat	Potential GWDTE
Sphagnum auriculatum bog pool community	M1	E1.7 Wet modified bog	Blanket bog	Blanket bog	No
Sphagnum cuspidatum/ recurvum bog pool community	M2	E1.7 Wet modified bog	Blanket bog	Blanket bog	No
Carex rostrata-Sphagnum recurvum mire	M4	E2.1 Flush and spring – acid/neutral	Transition mires and quaking bogs	Upland flushes, fens and swamps	No
Carex echinata-Sphagnum recurvum/ auriculatum mire (*Carex echinata* sub-community)	M6a	E2.1 Flush and spring – acid/neutral	None	Upland flushes, fens and swamps	Yes (high)
Carex echinata-Sphagnum recurvum/ auriculatum mire (*Carex nigra-Nardus stricta* sub-community)	M6b	E2.1 Flush and spring – acid/neutral	None	Upland flushes, fens and swamps	Yes (high)
Carex echinata-Sphagnum recurvum/ auriculatum mire (*Juncus effusus* sub-community)	M6c	E2.1 Flush and spring – acid/neutral	None	Upland flushes, fens and swamps	Yes (high)
Carex echinata-Sphagnum recurvum/ auriculatum mire (*Juncus acutiflorus* sub-community)	M6d	E2.1 Flush and spring – acid/neutral	None	Upland flushes, fens and swamps	Yes (high)
Trichophorum cespitosum-Eriophorum vaginatum blanket mire	M17*	E1.7 Wet modified bog**	Blanket bog	Blanket bog	No
Erica tetralix-Sphagnum papillosum raised and blanket mire (*Sphagnum magellanicum-Andromeda polifolia* sub-community)	M18a	E1.7 Wet modified bog	Blanket bog	Blanket bog	No

[54] Although a comparison has been made here there is no direct correspondence between the Phase 1 Habitat and NVC systems. Each Phase 1 Habitat type may include a number of different NVC community types, and in some cases the same NVC community may occur in several different Phase 1Hhabitat types. This is due to the two systems being based on different classification approaches. Therefore the Phase 1 Habitat type which most broadly corresponds with the NVC community identified has been given, but in some cases this Phase 1 Habitat has not been identified on site, i.e. E1.6.1 blanket bog (all bog habitats found on site had been modified

NVC Community	NVC Code	Corresponding Phase 1 Habitat type (JNCC 2010) [54]	Annex 1 habitat	UKBAP Priority habitat	Potential GWDTE
Calluna vulgaris - Eriophorum vaginatum blanket mire	M19	E1.7 Wet modified bog	Blanket bog	Blanket bog	No
Eriophorum vaginatum blanket and raised mire	M20	E1.7 Wet modified bog	Blanket bog	Blanket bog	No
Juncus effusus/ acutiflorus- Galium palustre rush-pasture (*Juncus acutiflorus* sub-community)	M23a	B5 Marsh/Marshy grassland	None	Upland flushes, fen and swamp	Yes (high)
Juncus effusus/ acutiflorus- Galium palustre rush-pasture (*Juncus effusus* sub-community)	M23b	B5 Marsh/Marshy grassland	None	No	Yes (high)
Molinia caerulea- Potentilla erecta mire	M25	E1.7 Wet modified bog	Blanket bog	Blanket bog	Yes (moderate)
Molinia caerulea- Potentilla erecta mire (*Molinia caerulea- Potentilla erecta* mire *Erica tetralix* sub-community)	M25a	E1.7 Wet modified bog	Blanket bog	Blanket bog	Yes (moderate)
Juncus squarrosus– Festuca ovina grassland (*Carex nigra-Calypogeia trichomanis* sub-community)	U6	B1 Acid grassland	None	None	Yes (moderate)
Holcus lanatus- Deschampsia cespitosa grassland	MG9	B6 Poor semi-improved grassland	None	No	Yes (moderate)
Holcus lanatus- Juncus effusus rush-pasture	MG10	B5 Marsh/Marshy grassland	None	None	Yes (moderate)

Bat Survey Results

Walkover Survey Results

7.6.27 No trees or buildings with potential bat roost features were identified within the proposed Development Area or immediate surrounding environment. Notably, the timings of bat activity recorded during the automated bat surveys indicated that no bat roosts were located within or in the vicinity of the proposed Development Area, supporting the results of the walkover survey.

7.6.28 An initial assessment of the proposed Development Area's value for bats was undertaken following the walkover survey. Utilising a combination of desk-based records, including data gathered for other wind farms in the vicinity, and the walkover survey results, the following conclusions were drawn: due to the high altitude of the proposed Development, poor quality foraging and roosting habitats, low connectivity with higher quality foraging and roosting habitats and existing records of bats present at nearby, similar habitats, the proposed Development is considered to represent a low risk of negative impact to bat species. Activity and transect surveys were therefore conducted in line with this assessment of low risk, in accordance with the guidance documents noted in Section 7.3 above[17], [18].

Transect Surveys

7.6.29 Very low levels of bat activity were identified during the transect surveys. At least three species of bat were encountered, with a total of one contact by common pipistrelle, six contacts from soprano pipistrelle and two from *Myotis* sp. over five of the nine transects walked. Of the above records, only five soprano pipistrelle contacts and one *Myotis* sp. contact was recorded within the proposed Development Area (see ES Figure 7.8 in Volume 3 of the ES).

Fixed Position Static Detector Surveys

7.6.30 The automated bat surveys, employing fixed positioning monitoring techniques, identified very low levels of bat activity across the proposed Development Area, including in nearby reference locations situated within higher value bat habitats (see ES Figure 7.9 in Volume 3 of the ES). Four locally common species of bat were recorded during the automated bat surveys, with a total of 460 bat contacts recorded over 16 nights. The recorded species included the following;

- Common pipistrelle;
- Soprano pipistrelle;
- Daubenton's bat; and
- Brown long-eared bat.

7.6.31 However, since surveys were conducted in 2012, the proposed Development Area no longer includes the most southerly located detectors (Reference Location 2, 3 and 4 and Sample Location 5 and 6). As such, of the 460 total bat contacts recorded during the static detector surveys only 64 are located within the proposed Development Area (i.e. recorded at Reference Location 1 or Sample Location 1, 2 and 3). Two thirds of all bat contacts (332 contacts) were made at three of the reference locations (Location 2, 3 and 4, see Technical Appendix 7.3: Bat Survey and Impact Assessment in Volume 4 of the ES). Species contacts were as follows:

- Soprano pipistrelle was the most frequently recorded species, accounting for 225 of the total 460 contacts recorded during the survey period (18 of which were located within the proposed Development Area);
- Common pipistrelle accounted for 62 of the total bat contacts (9 of which were located within the proposed Development Area), with an additional 19 *Pipistrellus* spp. recorded (none of which are located within the proposed Development Area);
- Daubenton's bat was the next most frequently recorded species with 108 contacts (of which 35 were located within the proposed Development Area). A further 28 *Myotis* bat contacts were recorded which could not be accurately identified beyond genus level (none of which were located within the proposed Development Area). These were considered likely to be partial or distant calls of Daubenton's bat; however, this species could not be confirmed from the recordings;
- Brown long-eared bat accounted for two of the total bat contacts (none of which were located within the proposed Development Area); and
- Sixteen of the bat contacts could not be identified to species (i.e. unidentified bat) (see Technical Appendix 7.3: Bat Survey and Impact Assessment in Volume 4 of the ES) (two of which are located within the proposed Development Area).

7.6.32 Although only the above four species have been recorded during the automated surveys it is possible that other species (i.e. those known to be present in the locality) may also occasionally pass undetected through the proposed Development Area. This list cannot therefore be wholly inclusive; however, it does highlight that where other bat species may be present; their use of the site is comparatively infrequent and indicative of very low numbers.

7.6.33 Due to the low levels of recorded bat activity and absence of suitable bat roosting habitat within the proposed Development Area, habitats occurring within the proposed Development Area were considered to be of negligible value to bats.

Bat Activity Levels and Distribution

7.6.34 Activity indices were calculated to present the average number of contacts made per night. This method creates an un-biased measure of the relative levels of activity per location, or per season. As different seasons were surveyed for differing numbers of nights, the total average for the whole year is calculated by taking the average of each seasonal average activity index. In this way, differing survey effort is balanced across the season.

7.6.35 One of the key objectives of the automated detector survey was to identify spatial patterns of bat activity across the proposed Development Area, by comparing levels of bat activity at different detector locations. More detailed results of the automated survey for each location are presented in Technical Appendix 7.3: Bat Survey and Impact Assessment Report in Volume 4 of the ES.

7.6.36 The highest levels of bat activity were recorded at the reference location outwith the proposed Development Area, located on the Bow Burn to the south of the Waterhead Hill Cluster. This area produced a bat activity index of 12.80 contacts per night.

7.6.37 Another reference location on the Laggeran Burn, approximately 2 km south of the Waterhead Hill Cluster supported the next highest bat activity index of 3.32 contacts per night. Notably, the adjacent reference location consistently had lower activity indices, suggesting that the Laggeran Burn may provide a preferred commuting or foraging habitat for bats, in comparison to the open clearfell at the adjacent reference location.

7.6.38 The reference location adjacent to the Meaul Hill Cluster did not record any bats in the spring or autumn, with an average activity index of 0.33 contacts per night during the summer season.

7.6.39 It is notable that the baseline bat surveys did not record Leisler's bat (*Nyctalus leisleri*) or noctule bat (*Nyctalus noctula*) species within the proposed Development Area or reference locations. Both of these species are considered to be at high risk of impact from onshore wind developments due to their flight patterns, habitat preferences and echolocation characteristics[20]. A recent project confirmed the widespread presence of Leisler's bat throughout south-west Scotland; however no confirmed records of Leisler's bats were located in the immediate vicinity of the proposed Development, with the only confirmed records located several kilometres to the north-west and south of the proposed Development Area[55].

Otter and Water Vole Survey

7.6.40 No field evidence of otter or water vole was identified during the protected species surveys undertaken by Natural Power in July 2012. Protected mammal surveys undertaken in May 2014 of the proposed access track layout which was current at the time of survey, also recorded three otter spraints and otter feeding remains on the Polwhat Burn (see ES Figure 7.10 in Volume 3 of the ES and Table 7.15 below). A bog/pool system at NGR NS 57283 02613 situated at the western edge of the Meaul Hill Cluster and the Polwhat Burn to the northeast, was described during the 2014 protected mammal surveys as suitable foraging habitat for otter, with potential for commuting at the Waterhead Hill Cluster.

Table 7.15: Otter signs recorded during surveys conducted in 2010 and 2014

Date	Sign	Watercourse	Grid reference (NGR)	Distance from nearest turbine infrastructure (m)	Distance to nearest infrastructure (m)
19th May 2014	Spraint	Polwhat Burn	NGR NS 58968 03018	339 (T7)	333 (proposed new track)
19th May 2014	Prey remains (common frog (*Rana temporaria*)) and spraint	Polwhat Burn	NGR NS 59040 02978	340 (T7)	328 (proposed new track)
19th May 2014	Spraint	Polwhat Burn	NGR NS 59360 02360	505 (T8)	483 (proposed new track)

7.6.41 During the Phase 1 Habitat survey undertaken in 2012, it was noted that an area recorded as flood plain mire located within the Meaul Hill Cluster had limited potential to support otter. This survey also highlighted the suitability of the Water of Deugh to provide high quality habitat for otter, with potential for otter to occur across the proposed Development Area, particularly when foraging for amphibian prey.

7.6.42 A record of a possible water vole burrow was recorded on the Rowantree Burn during ornithological surveys in May 2013, adjacent to a minor watercourse, located to the immediate north of Waterhead Hill (see ES Figure 7.10 in Volume 3 of the ES). No other field evidence was identified, such as droppings, to enable positive identification of water vole. Where minor tributaries, drains and watercourses exist within coniferous plantation, ground vegetation is sparse, offering very limited potential for water vole foraging and shelter from predators. Due to the absence of tangible field evidence and limited habitat suitability, it is considered unlikely that water vole is present within the proposed Development Area.

7.6.43 Habitats with greater suitability for water vole may be present in the surrounding environment, particularly where watercourses transect open habitats, such as in larger forestry rides and in open habitats/clearfell. It is acknowledged that water vole may be present elsewhere within the Water of Deugh catchment, with potential for future colonisation of watercourses draining the proposed Development Area, where suitable habitat exists.

7.6.44 The results of the ecological field surveys suggest that otter use habitats in the surrounding environment and are active along watercourses draining the site, including the Polwhat Burn, Shalloch Burn and Bow Burn.

[55] Haddow, J. 2012. Looking for Leisler's – in Scotland. Central Scotland Bat Group/ Auritus Wildlife Consultancy.

Red Squirrel Survey

7.6.45 No dreys were recorded during the protected species surveys undertaken by Natural Power in July 2012; however evidence of squirrel feeding activity was identified across the proposed Development Area, with later sighting of red squirrel on a forestry track approximately 1.5-2 km from the Waterhead Hill sub-unit during the Phase 1 Habitat survey in 2012 (see Table 7.11 above for 'Incidental Records', Table 7.16 below and ES Figure 7.10 in Volume 3 of the ES). Feeding signs were also observed at one location within the Waterhead Hill Cluster during the Phase 1 Habitat survey.

7.6.46 Red squirrel was considered as part of the 2014 protected mammal surveys of the proposed access track current at the time of survey for Windy Standard III, however survey findings noted very low numbers of eaten cones along walked transect routes (see ES Figure 7.3 in Volume 3 of the ES). It was considered that the habitat was broadly suitable for red squirrel, both for foraging and drey construction, however there was no new cone crop and the signs were considered to be from pre-2013.

7.6.47 Red squirrel may be widespread throughout the Carsphairn Forest RSPW, however given the number of signs observed, they are considered to be present in low densities across the proposed Development Area. Red squirrel has potential to exist within the proposed Development Area where suitable habitat is present and where foraging resources are capable of supporting a local population.

Table 7.16: Squirrel signs observed during surveys conducted in 2012

Date	Sign	Grid reference (NGR)	Distance from nearest turbine infrastructure (m)	Distance to nearest infrastructure (m)
12th - 13th July 2012	Feeding sign (eaten cones)	NGR NS 57851 02765	136 (T4)	109 (proposed new track)
12th - 13th July 2012	Feeding sign (eaten cones)	NGR NS 58064 03273	153 (T1)	15 (consented forest track to be upgraded)
12th - 13th July 2012	Feeding sign (eaten cones)	NGR NS 58023 03441	228 (T1)	59 (consented forest track to be upgraded)
12th - 13th July 2012	Feeding sign (eaten cones)	NGR NS 57085 00325	225 (T15)	34 (proposed new track)
12th - 13th July 2012	Feeding sign (eaten cones)	NGR NS 57122 00233	235 (T15)	60 (proposed new track)
12th - 13th July 2012	Feeding sign (eaten cones)	NGR NS 57250 00300	154 (T14)	47 (proposed new track)
12th - 13th July 2012	Feeding sign (eaten cones)	NGR NS 57272 00382	99 (T14)	10 (proposed new track)
12th - 13th July 2012	Feeding sign (eaten cones)	NGR NX 55849 99729	953 (T16)	744 (anemometry mast)
12th - 13th July 2012	Feeding sign (eaten cones)	NGR NX 55940 99864	843 (T16)	633 (anemometry mast)
12th - 13th July 2012	Feeding sign (eaten cones)	NGR NX 55973 99867	810 (T16)	599 (anemometry mast)
12th - 13th July 2012	Feeding sign (eaten cones)	NGR NS 57083 00191	198 (T15)	90 (proposed new track)
12th - 13th July 2012	Feeding sign (eaten cones)	NGR NS 58426 03379	270 (T2)	248 (proposed crane pad)
12th - 13th July 2012	Feeding sign (eaten cones)	NGR NS 57843 02764	143 (T4)	116 (proposed new track)
12th - 13th July 2012	Feeding sign (eaten cones)	NGR NX 57133 99705	175 (T17)	162 (proposed new track)
12th - 13th July 2012	Feeding sign (eaten cones)	NGR NX 56172 99885	810 (T16)	402 (anemometry mast)

Pine Marten Survey

7.6.48 No field evidence of pine marten or habitats features likely to be utilised by this species were identified during the protected species surveys undertaken by Natural Power in July 2012. The extensive blocks of coniferous plantation, clearfell and open heathland/grassland habitats present within the proposed Development Area were considered unlikely to offer pine marten sustained foraging opportunities, with an absence of elevated arboreal cavities (generally required by this species for breeding in woodland habitats[39]) and alternative den sites such as rocky crevices and mammal burrows.

Badger Survey

7.6.49 A single badger print was identified approximately 1 km south of the Waterhead Hill Cluster during protected mammal surveys conducted by Natural Power in July 2012 (see ES Figure 7.10 in Volume 3 of the ES and Technical Appendix 7.4: 2012 Ecology Report in Volume 4 of the ES). No setts were identified within the proposed Development Area during the protected species surveys.

7.6.50 Incidental field evidence of badger (feeding signs) was observed within the Meaul Hill Cluster during the Phase 1 Habitat survey in 2012 (see 'Incidental Records' above). During this survey, consideration was given to the suitability of peat substrates within the proposed Development Area for sett construction. It was considered that the substrates within the proposed Development Area were generally unsuitable for the construction of stable and permanent badger setts. More suitable habitat for sett construction is located to the north-west of the proposed Development Area towards the Water of Deugh[48].

7.6.51 Badger feeding signs were also observed during the update protected mammal surveys of the proposed access track (current at the time of survey) in 2014 in the east of the Meaul Hill Cluster. Open habitat within the Waterhead Hill Cluster was described as suitable for foraging badger. Results are presented in Table 7.17 below.

Table 7.17: Badger signs observed during surveys conducted in 2012 and 2014

Date	Sign	Grid reference (NGR)	Distance from nearest turbine infrastructure (m)	Distance to nearest infrastructure (m)
12th - 13th July 2012	Badger prints	NGR NX 57400 98800	978 (T17)	962 (proposed new track)
19th May 2014	Feeding signs (snuffle holes)	NGR NS 59314 02425	460 (T8)	437 (proposed new track)

Reptile and Amphibian Species

7.6.52 The desk-based review did not identify any historical records of reptile or amphibian species within the proposed Development Area or surrounding environment, with no indication of important species assemblages, or species occurring at the edge of their geographical range. As such, targeted surveys for reptile and amphibian species were not undertaken, in accordance with SNH guidance[56].

7.6.53 The Phase 1 Habitat survey identified habitats within the proposed Development with some suitability to support reptile species; including forestry edges and rides on the edge of coniferous plantation blocks with flush habitats and south-facing open habitats within the Waterhead Hill Cluster. Clearfell habitats in the Waterhead Hill Cluster may also offer potential opportunities for establishment of hibernacula. A juvenile common lizard was incidentally observed in clearfell habitat on the northern slope of Waterhead Hill during the protected mammal survey in May 2014, confirming reptile presence within the proposed Development Area. During update Phase 1 Habitat surveys conducted in July and August 2015 incidental observations of common lizard were also observed (see Section 7.6 and Table 7.11 above for 'Incidental Records').

7.6.54 Common frog was observed within the proposed Development Area during the habitat surveys undertaken in 2012 (locational information not provided), with areas of wet modified bog and flush habitats occurring in forestry rides, potentially providing suitable habitat for this species and other amphibians. No other incidental sightings of amphibian species were recorded throughout the baseline surveys.

7.6.55 Potentially important habitat features within coniferous plantation include localised areas of open space such as forest roads, upland flushes, grassland and heath habitats, or transient habitats such as clearfell. Upland flushes are considered of importance for reptile and amphibian species, with common frogs and toad (*Bufo bufo*) frequently found in the habitat which also provides suitable foraging opportunities for common lizard and adder (*Vipera berus*)[24]. Regionally, grassland and heathland habitats are considered of importance for reptile and amphibian species[24], with these habitats present in the wider environment surrounding the proposed Development. However, the majority of the habitat within the proposed Development Area is comprised of dense coniferous plantation which is considered to be sub-optimal for reptile and amphibian species[24]. As such, the potentially suitable habitat is typically small in size or isolated within surrounding forestry providing poor habitat connectivity to potentially more suitable habitat in the wider area.

Invertebrates Species

7.6.56 The desk-based review did not identify any notable records of invertebrate species including local priority invertebrate species[24] from within the proposed Development Area and immediate surrounding environment with no indication of important species assemblages; therefore targeted surveys for invertebrate species were not undertaken.

7.6.57 Within Dumfries and Galloway, upland springs and flushes are considered of importance for invertebrate species[24]; however peatland/acid habitats tend to support fewer species, and as such flushes occurring in peatland/acid habitats are considered of less value to invertebrates than flush habitats on wet muds[24]. Grassland and heathland habitats are also considered of importance for invertebrate species[24].

7.6.58 Areas of *Sphagnum* moss occurring in wet modified bog within the proposed Development Area may support abundant microscopic aquatic animals such as protozoans, with larger species such as beetles, spiders, flies, aphids, snails and craneflies. Wet modified bog occurs within forestry rides and the open area of the Waterhead Hill Cluster, with the majority of habitat within the proposed Development comprising coniferous plantation. Large, dense stands of conifers of uniform age, such as those found at the proposed Development, are not of great interest for invertebrates. Those that do occur are either recent arrivals to Britain or common generalists that have spread from native plants. However, given the extent of conifer plantation in Dumfries & Galloway, their overall total contribution to invertebrate biodiversity in the region is not insignificant[24]. Nevertheless, the densely planted, uniform nature of the conifer crop at the proposed Development means that the proposed Development Area overall is considered to be of limited value to invertebrate species.

7.7 ECOLOGICAL IMPACT ASSESSMENT

7.7.1 The EcIA has been undertaken in accordance with CIEEM guidelines[2] (see Section 7.4) with establishment of baseline ecological conditions within the proposed Development Area and identification of valued ecological receptors (VERs) through a combination of ecological field surveys and a desk-based review. Each identified VER is assessed separately, with consideration of impact extent, magnitude, duration, timing, frequency and reversibility; along with assessment of the level of confidence in the impact assessment for the determination of impact significance.

Receptor Assessment

7.7.2 On the basis of the description of the ecological baseline and the definitions provided in Table 7.2 above, a summary of the habitats and species identified as VERs within Windy Standard III is provided in Table 7.18 below, together with the legislation and guidance defining their value.

7.7.3 In identification of designated sites as VERs, consideration has been given to the existence of pathways for effects to occur. This includes direct effects such as impact on habitats and indirect effects through downstream hydrological connectivity. Where habitat mosaics have been identified by the baseline survey, the constituent Phase 1 Habitat types are taken to be the relevant VERs.

7.7.4 Receptors of negligible conservation value are not considered further in this assessment; these receptors are generally common and widespread habitats/species (see Table 7.2 above for definition of negligible).

[56] SNH, 2015. SNH general advice, sources of guidance and information for onshore wind farms. Available at: http://www.snh.gov.uk/planning-and-development/renewable-energy/onshore-wind/general-advice-and-information/ Accessed January 2015.

Table 7.18: Summary of designated sites, habitat and species and their conservation value

Species/habitat	Covering legislation and guidance	Conservation value	VER	Rationale
Designated Sites				
Loch Doon SSSI	A SSSI is an area that has been notified as being of special interest due to its flora, fauna or geological or physiographical features under the Wildlife and Countryside Act 1981 (as amended) and the Nature Conservation (Scotland) Act, 2004.	National	No (distant from the proposed Development)	Loch Doon SSSI is situated approximately 7.5 km west of the proposed Development, and is designated for Arctic charr. Due to the geographic separation of Windy Standard III and the SSSI and the lack of habitat connectivity, any impact on the conservation objectives of the site is considered to be unlikely and is therefore not considered further in this assessment.
Ness Glen SSSI	See above.	National	No (distant from the proposed Development)	Ness Glen SSSI is situated approximately 10 km west of the proposed Development and is designated for upland mixed ash woodland. Due to the geographic separation of Windy Standard III and the SSSI and the lack of habitat connectivity, any impact on the conservation objectives of the site is considered to be unlikely and is therefore not considered further in this assessment.
Bogton Loch SSSI	See above.	National	No (distant from the proposed Development)	Bogton Loch SSSI is situated approximately 10 km north-west of the proposed Development and is designated for open water transition fen habitat and its assemblage of breeding birds. Due to the geographic separation of Windy Standard III and the SSSI and the lack of habitat connectivity, any impact on the conservation objectives of the site is considered to be unlikely and is therefore not considered further in this assessment.
Benbeoch SSSI	See above.	National	No (distant from the proposed Development)	Benbeoch SSSI is situated approximately 10 km north-west of the proposed Development and is designated for its geological features. Due to the geographic separation of Windy Standard III and the SSSI and the lack of habitat connectivity, any impact on the conservation objectives of the site is considered to be unlikely and is therefore not considered further in this assessment.
Habitats				
Broad-leaved plantation (A1.1.2)	None	Negligible	No	Broadleaved plantation woodland is found at five locations within the proposed Development Area; along the existing track to be upgraded to the west of Brockloch Rig and to the north of Upper Hill and Waterhead Hill. These comprise relatively young (2-3 m) birch, alder and rowan. This habitat has the potential to enhance the ecological value of the site as the plantation matures, however due to the limited extent of this habitat type within the proposed Development Area, and its growth stage, this habitat is not considered to be of importance in local terms.
Coniferous plantation (A2.2)	None	Negligible	No	Coniferous plantation is an agricultural forestry crop, comprising non-native species (predominantly Sitka spruce) at the proposed Development.
Recently felled conifer woodland (A4.2)	None	Negligible	No	The recently felled conifer woodland at the proposed Development is harvested and replanted agricultural forestry crop, comprising non-native species (predominantly Sitka spruce). Where there is vegetation cover in these felled areas it is relatively species-poor, primarily made up of semi-improved grassland and tall ruderal vegetation.
Unimproved acid grassland (B1.1)	Some unimproved acid grassland communities are included within the SBL priority habitat 'Lowland dry acid grassland'. Acid grassland is a priority habitat in the D&G LBAP. Some damper unimproved acid grassland communities with a marshy character are recognised as potential GWDTEs.	Negligible	No	Unimproved acid grassland is relatively scarce across the site, and most acid grassland patches show some improvement due grazing, or the species mix having been influenced by shading from the coniferous plantation or ground disturbance (along the verge of access tracks e.g.). Acid grassland is primarily present in mosaic with modified bog vegetation and dry heath, with existing grazing pressures limiting the development of the heath element. Due to the modified nature of this habitat within the survey area, it is not considered to be of importance in local terms. This habitat in mosaic with dry heath is considered further below.
Semi-improved acid grassland (B1.2)	Some unimproved acid grassland communities are included within the SBL priority habitat 'Lowland dry acid grassland'. Acid grassland is a priority habitat in the D&G LBAP. Some damper unimproved acid grassland	Negligible	No	Semi-improved acid grassland at the proposed Development is primarily found along rides and in small areas at the edges of tracks, and corresponds to the NVC community U2; either alone or in mosaic with M25 and MG10, both of which are classed as being moderately groundwater dependent. There are also two patches of this habitat on Waterhead Hill, where the mosaic is dominated by modified M20 (see Technical Appendix 7.2: Habitat Survey Results in Volume 4 of

Species/habitat	Covering legislation and guidance	Conservation value	VER	Rationale
	communities with a marshy character are recognised as potential GWDTEs.			the ES). Due to the limited extent and fragmented nature of the areas of B1.2 at the proposed Development, its limited diversity, and the widespread distribution of this habitat throughout northern and western Great Britain, they are unlikely to be locally important examples of this habitat. Where M25 and MG10 comprise at least 20 % in mosaics of this habitat then there is the potential for this habitat to be moderately dependent on groundwater flow and therefore be classed as a GWDTE. This aspect has been assessed separately in Section 7.7 above.
Marsh/marshy grassland (B5)	Some marshy grassland communities represent the SBL priority habitat 'purple moorgrass and rush pasture' and/or the SBL priority habitat upland flushes, fens and swamp', as described by the UKBAP. Marshy grassland habitats often support plant communities that are recognised as GWDTEs and afforded protection under the Water Framework Directive (WFD).	Negligible	No	The B5 habitat within the proposed Development Area is generally confined to small areas of verge alongside existing access track to be upgraded, and is made up of NVC community mosaics including M23b, MG10, U2, M25x and modified M19/M20, and containing few of the key species associated with priority examples of these habitats. As such it is unlikely to correspond with either of the possible SBL Priority habitats. As marshy grassland is a common and widespread habitat in SW Scotland, it is not considered to be of importance in local terms. Where this habitat coincides with M25 and MG10 it may have moderate dependence on groundwater flow, and high dependence on groundwater flow where it coincides with M23b, and therefore be classed as a GWDTE. This aspect has been assessed separately in Section 7.7 above.
Poor semi-improved grassland (B6)	Some unimproved acid grassland communities are included within the SBL priority habitat 'Lowland dry acid grassland'. Acid grassland is a priority habitat in the D&G LBAP. Some damper unimproved acid grassland communities with a marshy character are recognised as potential GWDTEs.	Negligible	No	In the survey buffer of the borrow pit to the north of Waterhead Hill, and alongside the track to the east of the borrow pit, a small area of semi improved grassland grades into poor semi-improved grassland, showing more improvement and lower species diversity than the adjacent B1.2. This habitat comprises a mosaic of U2, MG9 and MG10, and is not considered to be of importance at any geographical scale. Due to the presence in the mosaic of greater than 20 % MG9 and MG10, this habitat may have moderate dependence on groundwater flow, and high dependence on groundwater flow and therefore be classed as a GWDTE. This aspect has been assessed separately in Section 7.7 above.
Dry dwarf shrub heath (D1)	Dry dwarf shrub heath is included within the Annex I habitat 'European dry heaths' and is afforded protection under the EC Habitats Directive. Lowland and upland heath are listed on the SBL, and upland heath is a priority habitat in the D&G LBAP.	Negligible	No	Three small areas (totalling 0.46 ha) of dry heath were identified at the proposed Development, in forestry rides south of the Meaul Hill Cluster. One of these was classified as NVC community H18a, one was H12a, and the third, largest area was a mosaic of H12a with a non-NVC community. This therefore represents examples of the 'Upland heathland' SBL priority habitat, consisting primarily of co-dominant heather and blaeberry, with wavy hairgrass the most prominent other species. Due to the very limited and fragmented extent of this habitat on site, and the relatively low species diversity, this is not considered to be an example of this habitat type which is important at the local scale.
Wet Dwarf Shrub Heath (D2)	Wet dwarf shrub heath is included within the Annex I habitat 'Northern Atlantic wet heaths with *Erica tetralix*' and is afforded protection under the EC Habitats Directive. Lowland and upland heath are SBL priority habitats and upland heath is listed on the D&G LBAP. Wet heath is recognised as possibly having moderate groundwater dependence, and may class as a GWDTE and be afforded protection under the WFD.	Local	Yes	Only one small area of D2 was found at the proposed Development, along a ride to the north-west of Brockloch Rig, in the Meaul Hill Cluster. This habitat had typical heath species heather and blaeberry, and hare's tail cotton grass indicating wetness, but was distinguished from the surrounding wet modified bog on the basis of being located on shallow (<0.5 m) peat. It comprises NVC communities H12, modified M19 and U2. Wet heath is widespread in the north and west of Great Britain, but has a strongly oceanic distribution and is rare in Europe. The wet heath within the proposed Development does not qualify as Annex I priority habitat due to the lack of the key indicator species *Erica tetralix*. It is included in the SBL priority habitat 'Upland heathland', but is not considered to represent this habitat in 'favourable condition' as described on the UKBAP, again due to the lack of key indicator species, with its vegetation more characteristic of the wet modified bog surrounding it. As such, this habitat is not considered to have greater than local importance. The NVC communities making up this habitat indicate that in this location it is unlikely to have

Species/habitat	Covering legislation and guidance	Conservation value	VER	Rationale
				dependence on groundwater flow.
Dry heath/acid grassland mosaic (D5)	Lowland and upland heath are included within the Annex I habitat 'European dry heaths'. Lowland dry acid grassland, and lowland and upland heath, are also priority habitats under the SBL	Negligible	No	Acid grassland is present in mosaic with dry heath in a very small area around the access track north-west of Brockloch Rig, and on a steep slope south of Upper Hill, with existing grazing pressures probably limiting the development of the heath element in this location. The mosaic is primarily U4 acid grassland, but frequency of blaeberry exceeds 25 % cover within scattered, isolated patches. Due to the modified nature of both the acid grassland and dry heath elements of this mosaic, it is not considered to correspond to either the Annex 1 or SBL priority habitat types, and is therefore not considered to be of importance at greater than site level.
Wet modified bog (E1.7)	Blanket bog is an Annex I habitat afforded protection under the EC Habitats Directive and corresponding UK legislation. Blanket bog is also an SBL and D&G LBAP priority habitat. Some mire habitats that can be classed as blanket bog (chiefly purple moor grass dominated mires) are recognised as GWDTEs and protected under the WFD	Local	Yes	Most of the vegetation within the proposed Development has developed on peat greater than 0.5 m deep, and after habitats associated with the agricultural forestry crop, wet modified bog is the most extensive habitat at the proposed Development. It occurs in the majority of the forest rides, and on the large open area at the top of Waterhead Hill, however, the NVC shows that in most areas this vegetation is now a mosaic of grassland, mire and heath communities. Even where the mire is present without heath and grassland, modified mire communities are often present (Modified M19/Modified M20 i.e.) and some communities that are so modified they can no longer be classified under the NVC; see Technical Appendix 7.2: Habitat Survey Results in Volume 4 of the ES. Some of the vegetation of the un-forested habitats is still close to blanket bog, but most has been modified through centuries of land management particularly livestock grazing and afforestation. Wet modified bog corresponds to the Annex 1 and SBL priority habitat 'Blanket Bog'. However, this is a common and widespread habitat in south-west Scotland, and is rarely pristine when found in the agricultural plantation forestry setting. The heavy modification due to drainage and shading means that this habitat is unlikely to be important at a greater than local scale.
Acid/neutral flush (E2.1)	Upland flushes, fens and swamps (as described in the UKBAP), are priority habitats on the SBL and the D&G LBAP. Acid and neutral flush vegetation communities are recognised as GWDTEs and afforded protection under the WFD.	Negligible	No	Most acid/neutral flushes were relatively small (less than 0.25 ha) and found on the steeper slopes above small watercourses scattered throughout the survey areas. Five larger tracts (approximately 0.3-0.4 ha were identified in the Meaul Hill Cluster and either side of the new track between the two clusters. All of the flushes were clearly acid in character being very mossy with a relatively restricted range of species, the most prominent being common rush and sedge species, and a limited range of forbs, growing through a more or less continuous carpet of acidophilus mosses. The flushes at the proposed Development comprise NVC communities M4, M6, M20, M23, U4/U2 and [MG10], as well as modified M19 and M20 (see ES Figure 7.6 in Volume 3 of the ES). M4, M6 and M23 are indicative of the SBL Priority habitat 'Upland flushes, fens and swamps'. However, none of the rich flora of vascular plants supported by this habitat as defined by the UKBAP are present, and the habitat description for the priority habitat specifies that it excludes species-poor or 'weedy' *Juncus effusus* swards (M23b and MG10), and therefore it is unlikely that the examples of this habitat at the proposed Development correspond with the priority habitat. The M6 NVC community is the most widespread soligenous mire habitat in the British uplands, with the rush-dominated M6c and M6d sub-communities being widespread in southern Scotland, and as such the flush habitats at the proposed Development are unlikely to be of local importance as they are not species rich, and do not appreciably enrich the ecological resource within the local context. However, where M6 and M23 comprise greater than 20 % of habitat mosaics this habitat may have high dependence on groundwater flow, with potential for moderate dependence where [MG10] occurs, and therefore be classed as a GWDTE. This aspect has been assessed separately in Section 7.7 above.
Fen (E3)	Upland flushes, fens and swamps (as described in the UKBAP), are priority habitats on the SBL and the D&G LBAP. Some fen communities are recognised	Negligible	No	A very small (>0.1 ha) area of 'poor fen' was located on the wet modified bog on the open ground above Upper Hill, containing acid water and short vegetation such as hare's tail cotton grass, heath rush, blaeberry and heather, with a high proportion of mosses. This is a very small area of

Species/habitat	Covering legislation and guidance	Conservation value	VER	Rationale
	as GWDTEs and are afforded protection under the WFD. Bog moss *Sphagnum* species, which are present within fen habitat types, are listed on Annex V of the Habitats Directive which specifies that taking in the wild of specimens of wild flora listed on Annex V as well as their exploitation must be compatible with ensuring these species status is maintained at favourable conservation status.			habitat surrounded by wet modified bog, and the NVC identified the predominant vegetation in this location as a heath/grassland community, comprising H18, U2 and M20. This makes it unlikely that this habitat corresponds to the priority habitat Upland flushes, fens and swamps, which exclude ombrotrophic bogs and associated bog pools and seepages. Given this and the very small extent of the habitat at the proposed Development, this fen habitat is unlikely to be of local importance as it is not species rich, and does not appreciably enrich the ecological resource within the local context. Some fen communities have high dependence on groundwater flow, and can therefore be classed as GWDTEs. This aspect has been assessed separately in Section 7.7 above.
Fen: Flood plain mire (E3.3)	Upland flushes, fens and swamps (as described in the UKBAP), are priority habitats on the SBL and the D&G LBAP. Some fen communities are recognised as GWDTEs and are afforded protection under the WFD. Bog moss *Sphagnum* species, which are present within fen habitat types, are listed on Annex V of the Habitats Directive which specifies that taking in the wild of specimens of wild flora listed on Annex V as well as their exploitation must be compatible with ensuring these species status is maintained at favourable conservation status.	Local	Yes	Flood plain mire was found in one ride at the proposed Development, at the east of the Meaul Hill Cluster. It comprises a mosaic of M19, M6, M2 and M20, and is one of the few places that M2 is found at the proposed Development. However, M6 is the only one of these habitats that corresponds with the UKBAP description of the SBL Priority habitat 'Upland flushes, fens and swamps', and M6 only made up 25 % of the habitat mosaic in this location. Additionally the M6 habitats on site were found to be relatively species poor. Therefore it is not considered that the flood plain mire at the proposed Development represents a priority example of this habitat. However, due to the presence of a Nationally Scarce species within the flood plain mire (tall bog sedge – assessed separately below), it is considered that this habitat enriches the ecological resource within the local context, and is therefore of local importance. The presence of greater than 20 % M6 in the vegetation mosaic for this habitat shows that it may have high dependence on groundwater flow, and therefore be classed as a GWDTE. This aspect has been assessed separately in Section 7.7 above.
Watercourses (G2)	Rivers and streams are listed on the SBL, river headwaters are a priority habitat in the D&G LBAP. The Water of Deugh downstream of the proposed Development supports important fisheries.	Local	Yes	The watercourses which drain the proposed Development Area are uppermost tributary channels of burns which feed into the Water of Deugh, the upper reaches of which have been identified as important fisheries which support good populations of wild brown trout and coarse fish. Within the proposed Development these watercourses are typical upland watercourses, narrow, shallow and vegetated in places, shaded by the surrounding conifer plantation and situated in heavily vegetated riparian zones. Given the above, the watercourses within the proposed Development are unlikely to be of importance in regional terms. However, It is likely that good spawning habitat for salmonids may exist further downstream of the proposed Development, and as such the watercourses at Windy Standard III are probably locally important.
Ephemeral/short perennial (J1.3)	None	Negligible	No	The J1.3 vegetation at the proposed Development was present on the floor of the five small quarries within the survey area (see ES Figure 7.1 in Volume 3 of the ES). The plant community comprised common and widespread species which thrive on disturbed ground, and regenerating Sitka spruce. This habitat is not considered to have importance at any geographical scale.
Species				
Tall bog sedge *Carex magellanica*	Nationally Scarce; included in the Vascular Plant Red Data List for Great Britain[52]	Regional	Yes	Tall bog sedge was found in one location within the survey area (see ES Figure 7.1 in Volume 3 of the ES); in a flood plain mire in a ride southeast of Meaul, in the Meaul Hill Cluster. This plant was found to be Frequent in places in the wettest mosaics of the mire. While unlikely to be present on site in Nationally important numbers, due to its status as Nationally Scarce, this species is considered important at a Regional level.
Common and soprano pipistrelle	All bat species are protected under the Conservation of Habitats and Species Regulations 2010 (as amended) (Habitat Regulations). Common and soprano pipistrelle are listed on the SBL, and soprano pipistrelle is a priority species in the D&G LBAP.	Roost sites – n/a Commuting habitat – Local Foraging habitat – Local	Yes	Soprano pipistrelle was the most frequently recorded species, accounted for 225 of the total 460 contacts recorded during the static detector surveys. Common pipistrelle accounted for 62 of the total 460 contacts. Common and soprano pipistrelle were also the most frequently recorded species during the transect surveys accounting for one and six of the total bat contacts.

Species/habitat	Covering legislation and guidance	Conservation value	VER	Rationale
	Both common and soprano pipistrelle bats are widespread and commonly occurring in the UK with an estimated combined population of 2 million individuals[57].			Based on the evaluation criteria detailed in Wray *et al.*[43]: Foraging habitat within the site is of local importance as a resource for these species (common species (2), small numbers (10), no roosts (1), larger or connected woodland blocks (4), total: 17). Commuting habitat within the site is of local importance as a resource for these species (common species (2), small numbers (10), no roosts (1), absence of (other) linear features (1)[58], total: 13).
Daubenton's bat	All bat species are protected under the Conservation of Habitats and Species Regulations 2010 (as amended) (Habitat Regulations). Daubenton's bat is listed on the SBL and is a priority species in the D&G LBAP. Daubenton's bat is a widespread and relatively common species in the UK, with an estimated Scottish population of 40,000 individuals[57].	Roost sites – n/a Commuting habitat – Local Foraging habitat – Local	Yes	Daubenton's bat accounted for 108 of the 460 contacts recorded during the static detector surveys. A further 28 *Myotis* bat contacts were recorded which could not be accurately identified beyond genus level. Two of the bat contacts recorded during transect surveys were of *Myotis* sp. Based on the evaluation criteria detailed in Wray *et al* 2010[43]: Foraging habitat within the site is of local importance as a resource for this species (rarer species (5), small numbers (10), no roosts (1), larger or connected woodland blocks (4), total: 20). Commuting habitat within the site is of local importance as a resource for these species (rarer species (5), small numbers (10), no roosts (1), absence of (other) linear features (1)[59], total: 17).
Brown long-eared bat	All bat species are protected under the Conservation of Habitats and Species Regulations 2010 (as amended) (Habitat Regulations). Brown long-eared bat is listed on the SBL. Noctule bat is a locally common species in the UK with an estimated population of 50,000 individuals[57].	Roost sites – n/a Commuting habitat – Negligible Foraging habitat – Negligible	No	Brown long-eared bat accounted for 2 of the total 460 bat contacts. No brown long-eared bat were recorded during the transect surveys. Based on the evaluation criteria detailed in Wray *et al* 2010[43]: Foraging habitat within the site is of local importance as a resource for this species (rarer species (5), individual bats (5), no roosts (1), larger or connected woodland blocks (4), total: 15). Commuting habitat within the site is of local importance as a resource for these species (rarer species (5), individual bats (5), no roosts (1), absence of (other) linear features (1)[60], total: 12). However, brown long-eared bat were recorded in so few numbers during bat activity surveys that the proposed Development Area is considered to be of negligible importance to this species. This species is not considered further in this assessment.
Otter	Otter is listed on Annexes II and IV of the Habitats Directive and is therefore a European Protected Species. It is protected under Schedule 2 of the Conservation (Natural Habitats, &c.) Regulations, 1994 (as amended). Otter is a priority species in the D&G LBAP and is included on the SBL.	Local	Yes	No field evidence of otter was observed within the proposed Development Area, however signs of otter were observed in the wider area in 2010 along Water of Deugh and Fingland Burn, and three otter spraint and otter feeding remains were observed along the Polwhat Burn outside of the proposed Development Area in 2014. Evidence of otter was also observed on the upper tributaries of the Shalloch Burn and Polwhat burn during pre-construction surveys conducted for the adjacent Windy Standard II, including a potential otter holt and above ground couch, otter path, prints and spraint (see Section 7.6 'Relevant Survey Data' above). No evidence of use by otter was observed during checks of the otter resting sites by the ECoW for Windy Standard II in 2014. Otter are known to be active along watercourses draining the site and in the wider vicinity, and suitable habitat is present in both the Meaul Hill and Waterhead Hill Cluster. However given the low presence of field evidence within the proposed Development Area, the area is considered to be of no more than local importance for this species.
Water vole	In Scotland, water vole habitat (rather than water vole themselves) is protected under the WCA 1981 (as amended). Water vole is also a priority species in the D&G LBAP and is included on the SBL.	Negligible	No	No field evidence of water vole was observed within the survey area during surveys conducted in 2012 or 2014. An inconclusive record of a possible water vole burrow was recorded on Rowantree Burn in 2013, however due to the absence of all other signs, could not be confirmed. As coniferous plantation (unsuitable habitat for this species) dominates habitat within the proposed

[57] Harris, S. and Yalden, D.W. Eds, 2008. Mammals of the British Isles: Handbook, 4th Edition. The Mammal Society, Southampton

[58] Absence of linear features such as hedgerows, rivers and streams

[59] Absence of linear features such as hedgerows, rivers and streams

[60] Absence of linear features such as hedgerows, rivers and streams

Species/habitat	Covering legislation and guidance	Conservation value	VER	Rationale
				Development, the overall potential for water vole is considered low. Where minor tributaries, drains and watercourses exist within coniferous plantation, ground vegetation is sparse, offering very limited potential for water vole foraging and shelter from predators. Due to the absence of tangible field evidence and limited habitat suitability, the proposed Development Area is therefore considered to be of negligible importance for this species.
Red squirrel	Red squirrel is protected under the WCA 1981 (as amended) and is a priority species in the D&G LBAP. Red squirrel is also listed on the SBL. The proposed Development falls within the Carsphairn Forest Red Squirrel Priority Woodland (RSPW); one of the largest woodland areas designated as a priority for the conservation of red squirrels, encompassing over 10,000 ha of coniferous woodland in the Strathclyde south region (as classified by SNH during a study for identification of priority woodland areas[61])	Local	Yes	Squirrel feeding signs were observed within the proposed Development Area during protected mammal surveys in 2012, with a later sighting of red squirrel and eaten cones during the Phase 1 Habitat survey in 2012 (see ES Figure 7.10 in volume 3 of the ES) and sighting of red squirrel during ECoW visits for Windy Standard II in 2014 (see Section 7.6: 'Relevant Survey Data' above). Very low numbers of eaten cones were observed during update protected mammal surveys in 2014. It was considered that the habitat was broadly suitable for red squirrel, both for foraging and drey construction, however no recent cone crop was observed. Additionally, grey squirrel *Sciurus carolinensis* may also be present in the area, and some of the feeding signs observed at the proposed Development may be attributable to this species. Red squirrel are considered likely to occur in low densities within Windy Standard III where suitable habitat exists and where foraging resources are capable of supporting a local population. Given that the proposed Development comprises a very small proportion of the Carsphairn Forest RSPW (3.25 %), the proposed Development Area is not considered to be of greater than local importance to this species.
Pine marten	Pine marten is protected under Schedule 5 of the WCA 1981 (as amended), and is listed on the SBL	Negligible	No	No evidence of pine marten was identified during the baseline ecological assessment, with habitats occurring within the proposed Development considered unlikely to offer pine marten sustained foraging opportunities, with elevated arboreal cavities (generally required by this species for breeding in woodland habitats[39]) and alternative den sites absent from the proposed Development Area. The proposed Development Area is considered to be of negligible importance for this species.
Badger	Badger is protected under the WCA 1981 (as amended) and the Protection of Badgers Act 1992 (as amended). Badger is included in the D&G LBAP due to it being identified as being important to the Scottish public in the Scottish Biodiversity Strategy. Badger are generally widespread and common in Dumfries and Galloway.	Local	Yes	A single badger print was observed south of the Waterhead Hill Cluster in 2012 and feedings signs were observed within the Meaul Hill Cluster during the Phase 1 survey in 2012. Badger dung, prints and path were recorded to the south of Brockloch Rig at Sware Brae during pre-construction protected mammal surveys for Windy Standard II in 2013. Badger feeding signs were also observed during the protected mammal surveys of the proposed access track in 2014 and incidental records of badger feeding signs during the Phase 1 Habitat survey in 2015. The proposed Development Area was considered to be sub-optimal for sett construction but did offer potential for foraging, and as such the proposed Development Area is considered to be of local importance for this species.
Reptiles and amphibians	Reptiles such as adder and common lizard, and amphibians such as common toad and common frog are protected under Schedule 5 of the WCA 1981 (as amended). Adder is also a priority species in the D&G LBAP, and common toad, adder, and common lizard are listed on the SBL.	Negligible	No	The desk-based review did not identify any historical records of reptile or amphibian species within the proposed Development Area, however incidental records of common lizard and common frog were observed during surveys in 2014 and 2015 (see 'Reptile and Amphibian Species' above). Coniferous plantation, which comprises the majority of habitat within the proposed Development Area, has potential to support all of the region's amphibian and reptile species; however dense conifer plantation is unlikely to represent optimal habitat for them. In addition, the potentially suitable habitat such as upland flushes, grassland and heath habitat is either small in size or isolated within the forestry and as such offer little habitat connectivity to more suitable habitat in the wider area. In addition, habitats with greater potential to support these species are locally widespread and abundant throughout the region. As such the proposed Development is considered to be of negligible importance to reptile and amphibian species.

[61] Poulsom, L., Griffiths, M., Broome, A. & Mayle, B. (2005). Identification of priority woodlands for red squirrel conservation in North and Central Scotland: a preliminary analysis. Scottish Natural Heritage Commissioned Report No. 089 (ROAME No. F02AC334).

Species/habitat	Covering legislation and guidance	Conservation value	VER	Rationale
				However, the legal protection offered to all native reptile species in the UK is recognised; therefore to ensure accidental injury or killing of reptile species avoided during the construction phase, the provision of a working method statement for the protection of reptile species is recommended.
Invertebrates	A number of invertebrate species are priority species within the D&G LBAP[24] and listed on the SBL.	Negligible	No	The desk-based review did not identify any notable invertebrate records from within the proposed Development. Habitats within the proposed Development Area have limited potential to support invertebrate species, with flush and wet modified bog habitats locally widespread and abundant throughout the region. Better quality grassland and heathland invertebrate habitat is present elsewhere in the surrounding environment, unconnected to habitats within the proposed Development. It is therefore concluded that the invertebrate species and populations likely to be affected by the proposed Development are of negligible ecological value.

Predicted Effects

Habitats

Construction Effects on Habitats

7.7.5 The preparation and construction phase of Windy Standard III would result in habitat loss due to the construction of turbine bases, access tracks, crane hardstandings, construction compound, substation and borrow pits. The extent of loss of each habitat recorded within the survey area is shown in Table 7.19 below.

7.7.6 Some areas of ground would be reinstated following construction but in some instances there is the potential that habitats may not return to their state or type present prior to construction. Therefore all habitat loss has been calculated as permanent habitat loss, presenting a worst-case scenario.

7.7.7 In order to give a complete picture of the total extent of habitat loss, Table 7.19 below includes all habitats recorded, not just those identified as VERs. However, only those habitats which have been identified as VERs are assessed or discussed further in this assessment.

Table 7.19: Habitats that would be permanently lost due to construction (listed in descending order of % lost)

Phase 1 Habitat type	Phase 1 code	Extent within the survey area (ha)	Extent lost within the survey area (ha)	% loss within the survey area
Coniferous plantation	A1.2.2	325.36	13.2	3.46
Wet modified bog	E1.7	82.12	6.32	6.61
Recently-felled woodland	A4.2	60.02	2.6	4.34
Ephemeral/short perennial	J1.3	1.74	0.44	25.4
Semi-improved acid grassland	B1.2	4.67	0.28	6.03
Acid/neutral flush	E2.1	2.11	0.17	4.53
Marsh/ marshy grassland	B5	0.94	0.12	13.1
Dry heath/acid grassland mosaic	D5	2.24	0.08	3.55
Quarry	I2.1	0.49	0.05	9.14
Broad-leaved plantation	A1.1.2	1.58	0.04	2.77
Dry dwarf shrub heath	D1	0.46	0.04	7.66
Wet dwarf shrub heath	D2	0.11	0.01	0.07
Unimproved acid grassland	B1.1	0.12	0	0
Poor semi-improved grassland	B6	0.61	0	0
Fen	E3	0.09	0	0
Flood plain mire	E3.3	0.55	0	0

Wet Modified Bog

7.7.8 The total extent of wet modified bog is 82.12 ha, which comprises 17 % of the survey area. 7 % (6.32 ha) of wet modified bog would be lost during preparation and construction of the turbines, crane pads and access tracks. Construction activities may also result in indirect effects on wet modified bog due to changes in underlying hydrological flow; construction activities have the potential to interrupt hydrological connectivity and affect the overall integrity of this habitat type. There is also a small risk of disturbance or damage to this habitat type from dust created from construction activities. Dust particles can interfere with photosynthesis, transpiration and respiration of vascular plants, and impact on the absorption of water and nutrients from the surface of non-vascular plants. Non-vascular plants such as mosses are highly susceptible to adverse impacts of dust and changes in surface conditions[62] [63]. There is also a small risk of water pollution incidents occurring during the preparation and construction of Windy Standard III, potentially impacting on the plant species present.

7.7.9 Any unmitigated effects of preparation and construction, in terms of hydrology, loss of habitat and risk of impacts from dust, on wet modified bog is predicted (probable) to be of moderate negative magnitude and therefore likely not significant. However, it is expected that proposed mitigation measures will reduce the magnitude of impacts to not significant; see the Section 7.8 below.

Wet Dwarf Shrub Heath

7.7.10 The total extent of wet dwarf shrub heath habitat at the proposed Development is 0.11 ha, which comprises 0.02 % of the survey area. 0.07 % (0.01 ha) of this habitat will be lost as a result of as a result of preparation and construction of Windy Standard III. Construction activities may also result in indirect effects on wet dwarf shrub heath due to changes in underlying hydrological flow; construction activities have the potential to interrupt hydrological connectivity and affect the overall integrity of this habitat type. As outlined above for wet modified bog, there is also a risk of disturbance or damage to this habitat type from dust created from construction activities, and a small risk of water pollution incidents occurring during the preparation and construction of Windy Standard III.

Due to the very small area of this habitat at the proposed Development, any unmitigated effects of preparation and construction, in terms of hydrology, loss of habitat and risk of impacts from dust, on wet dwarf shrub heath is predicted (probable) to be of low negative magnitude and therefore not significant.

Fen: Flood Plain Mire

7.7.11 The total extent of flood plain mire habitat is 0.55 ha, which comprises 0.1 % of the survey area, located in an isolated patch in a ride in the east of the Meaul Hill Cluster. No loss of this habitat will occur as a result of preparation and construction of Windy Standard III. Due to the distance of this habitat type from the nearest infrastructure (125 m from T5 at its closest point), construction activities are unlikely to result in any changes to hydrological connectivity, or cause a risk of disturbance or damage to this habitat type from dust. However there is the potential for this habitat type to be impacted during felling works, as harvesting machinery access through forest rides.

7.7.12 Due to the very small area of this habitat at the proposed Development, any unmitigated effects of preparation, in terms of hydrological impacts and impacts from dust is predicted (probable) to be of low negative magnitude and therefore not significant.

Watercourses

7.7.13 In order to minimise potential impacts on watercourses, where possible a minimum distance of 50 m has been maintained between the proposed infrastructure and watercourses at the design stage, with the exception of three new watercourse crossings (see Technical Appendix 10.4: Watercourse Crossing Assessment in volume 4 of the ES). Construction of the watercourse crossings has the potential to restrict flow in the various channels and reduce hydraulic capacity, resulting in a potential increase in flood risk, the promotion of erosion and sedimentation. Works may also result in indirect effects caused by changes to hydrology via access track drainage. There is also a risk of water pollution incidents occurring during preparation and construction, which is discussed further in Chapter 10: Hydrology, Geology and Hydrogeology, of the ES.

7.7.14 Any unmitigated effects of preparation and construction on watercourses at the proposed Development is predicted to be of moderate magnitude and therefore likely not significant.

[62] Farmer, A. 1993. The effects of dust on vegetation – a review. Environmental Pollution. Volume 79, Issue 1, Pages 63-75

[63] Grantz, D., Garner, J., Johnson, D. 2003. Ecological effects of particulate matter. Environment International. Volume 29, Pages 213-39

Operational Effects on Habitats

7.7.15 Operation of the proposed Development will not cause any additional habitat loss. It is expected that some infrastructure associated with the construction phase, such as crane pads, will remain in situ throughout the lifetime of the wind farm for maintenance purposes. There is a low risk (unlikely) of accidental pollution incidents relating to spillages into watercourses from vehicles using the access tracks or to unplanned major maintenance/repair activities which may be required during the operational phase, e.g. due to turbine failure.

7.7.16 Any unmitigated operational effect on habitats within the proposed development is predicted to be of low negative magnitude and therefore not significant.

Ground Water Dependant Terrestrial Ecosystems (GWDTEs)

7.7.17 Six NVC plant communities with the potential to be GWDTEs were recorded within the survey area[8, 53]:

- M6 – highly groundwater dependent
- M23 – highly groundwater dependent
- M25 – moderately groundwater dependent
- MG9 – moderately groundwater dependent
- MG10 – moderately groundwater dependent
- U6 – moderately groundwater dependent

7.7.18 Analysis has been undertaken of the habitats identified from the NVC survey as having high to moderate potential to be dependent on groundwater flow; i.e. where habitats with high or moderate potential identified above comprise greater than 20 % of an NVC polygon. These habitat data, along with their location in relation to infrastructure, have been overlaid onto a Topographical Wetness Index (TWI) (see ES Figure 7.7 in Volume 3 of the ES) in order to understand where they occur in relation to likelihood of ground saturation. This has then been cross referenced back to the results from the Phase 1 Habitat survey (see ES Figure 7.5 in Volume 3 of the ES).

7.7.19 The analysis of Phase 1 Habitat, NVC and TWI data strongly suggests that few GWDTEs are present within the proposed Development Area. Hydrogeological conditions across the proposed Development Area are dominated by low aquifer productivity, with the majority of water flow through fractures and other discontinuities such as weathered zones (see Chapter 10; Hydrology, Geology and Hydrogeology, of the ES). As the open habitats across the proposed Development Area are generally located on sloping ground or in the case of Waterhead Hill on an open hill top, the hydrogeological conditions (as shown by the TWI) and landscape setting make it highly likely that open habitats are ombrogenous (rain water dependent) rather than ground water dependant.

7.7.20 In lower lying areas the water table generally occurs at or just below the surface, demonstrated by areas of saturated ground and the presence of acid/neutral flush and flood plain mire habitats. It is considered highly likely that the presence of flood plain mire is associated with surface water inundation from the adjacent minor water course, reliant on rainfall rather than ground water flow.

7.7.21 Assessment of historical habitat data obtained from the DGERC confirms the historical presence of grassland and heathland within the proposed Development Area with areas of upland heath occurring at the summit of Waterhead Hill. This historical data, combined with observations made during the ecological field surveys, confirms that the majority of the potential GWDTEs identified at the site are present on wet modified bog habitats, therefore ombrogenous and upland in nature, and unlikely to be dependent on groundwater flow. Both the Phase 1 Habitat and NVC data illustrate that the habitats present at the proposed Development are largely degraded and modified from historical and present land uses, particularly extensive afforestation of commercial coniferous plantation, resulting in widespread clearfell, modified bog, grassland and heathland habitats deemed of limited ecological value.

7.7.22 Where potential GWDTEs have been identified in close proximity to the proposed Development infrastructure (flush habitat, primarily at the head of tributaries of the Shalloch Burn, north of Waterhead Hill and southwest of Meaul Hill), there is the potential for impact from excavation of soil and bedrock during the construction of access tracks, foundations and borrow pits, which may cause localised disruption to ground water flow. There is also the potential for GWDTEs to be impacted by accidental pollution events and diffuse pollution from run-off.

7.7.23 A precautionary worst case scenario would assume that any unmitigated impact of preparation and construction could result in a loss of GWDTEs (i.e. a significant effect). However, the potential for groundwater dependency and therefore presence of GWDTE habitats is less than might be suggested by ES Figure 7.7 in Volume 3 of the ES, given the underlying hydrology and geology (as described above) which also suggests any disruptions to ground water flow are likely to be very localised around excavations with groundwater levels quickly returning to baseline levels in surrounding areas. In addition, due to the heavily modified nature of the existing habitats on site, any GWDTEs which may be present are predicted to be degraded and of low ecological value. Any unmitigated effects of preparation and construction on GWDTEs is therefore predicted to be of low magnitude and not significant. Through micrositing and mitigation by design impacts would also be minimised on these habitats (see 'Mitigation' section below).

Tall Bog Sedge *Carex magellanica*

Construction Effects on Tall Bog Sedge

Tall bog sedge was found in one location within the proposed Development Area, within an area of flood plain mire *c.* 125 m from T5 (the closest infrastructure); see ES Figure 7.6a in Volume 3 of the ES. This species, a plant of wet bogs with some water movement, is Nationally Scarce and is included in the *Vascular Plant Red Data List for Great Britain* (Least Concern)[52].

7.7.24 There will be no loss of tall bog sedge as a direct result of preparation and construction of the proposed Development, and due to the distance of the floodplain mire containing this plant from the nearest infrastructure, construction activities are unlikely to result in any changes to hydrological connectivity, or cause a risk of disturbance or damage to this species from dust. However there is the potential for this species to be impacted during felling works, as harvesting machinery access through forest rides.

Any unmitigated effects of preparation and construction on this species are predicted (probable) to be of moderate negative magnitude and therefore likely not significant.

Operational Effects on Tall Bog Sedge

The ride containing the tall bog sedge is located 125 m from the nearest infrastructure at T5, and is therefore too distant from the proposed development for there to be any effects of the operational phase on this species, and as such no impacts are predicted (certain).

Any unmitigated operational effects of the proposed development on tall bog sedge would be of negligible magnitude and therefore not significant.

Bat Species

7.7.25 As summarised in Section 7.6 above, very low levels of activity from four species of bat (all of which are common to the south-west of Scotland) were recorded within the proposed Development Area. No uncommon or rare bat species were recorded within the proposed Development Area and surrounding environment, with only low levels of bat activity recorded during the ecological field surveys. Additionally, the ecological field surveys confirmed an absence of potential bat roosting habitat or indications that bat roosts may exist in the immediate surrounding environment. According to guidance as described by Wray *et al.*[43], and corresponding evaluation criteria, habitats within the proposed Development Area are considered to be of local value as a commuting and foraging resource for some species of bats. However, given the low numbers recorded, this would be considered a precautionary approach.

7.7.26 Further details of the impact assessment relating to bat species can be found in Technical Appendix 7.3: Bat Survey and Impact Assessment Report in Volume 4 of the ES[4].

Effects on Individual Bat Species

7.7.27 Based on our current knowledge, typical flight behaviour of many bat species in the UK would not be expected to bring them into contact with turbine blades at operational wind farms. This is because UK bats are not known to migrate at high altitude and many UK species, such as Myotis species, rarely fly at heights with potential to intersect with turbine blades. However, this is based on relatively few studies in a UK context, and therefore actual collision rates are still largely unknown. Some species are more at risk of accidental collision than others, and frequent passes at height by *Pipistrellus* and *Nyctalus* or *Eptesicus* species have been recorded by Collins and Jones[64]. Based on available information of example flight heights, speeds, hunting techniques, habitat preference and migration (although not specifically in relation to behaviour near wind turbines) Natural England has produced guidance[20] which puts species of UK bats into different risk categories (high, medium, low) (see Table 7.3 in Section 7.5 above).

Pipistrelle Bats (Common and Soprano)

7.7.28 Although individual soprano and common pipistrelle bats may be at risk from accidental injury or death (common and soprano pipistrelles are considered to be in the medium risk category as they occasionally fly at height and across open habitats; see Table 7.3), the low number of bat contacts recorded at the main sample locations indicates that the proposed Development Area is only used infrequently by low numbers of individuals. Both common and soprano pipistrelle bats are widespread and commonly occurring species, with estimated UK populations of over 1 million individuals each[57]; therefore the risk of impact at the population level is considered to be low.

Daubenton's Bat

7.7.29 Daubenton's bat is considered to be at low risk from accidental death or injury from wind turbines because it rarely flies at height and is highly associated with riparian habitats and linear watercourses, rather than open habitats. Daubenton's bat is a widespread and relatively common species, with an estimated Scottish population of 40,000 individuals[57]. At population level, operational wind turbines are considered to represent a low threat to Daubenton's bat.

Construction Effects on Bat Species

7.7.30 During the construction phase, permanent habitat loss will occur as a result of the felling of the existing mature coniferous plantation, required to enable construction of the proposed Development. Construction phase impacts to bat species are considered to be most apparent from the felling works, with localised impacts of habitat disturbance and loss and with small-scale impacts such as reduced habitat connectivity and foraging opportunities. However, a baseline forest felling programme exists for Carsphairn Forest, and in the absence of Windy Standard III several coupes are planned to be felled prior to 2016 and 2017 to 2021 (see predicted effects on 'Habitats' section above). This suggests that a change in habitat type would still occur in the absence of the proposed Development.

7.7.31 It is important to note that the existing forest felling plan, with staged felling of coupes within the proposed Development Area over a longer period (i.e. felling in Phase 3: 2022 to 2026 and Phase 4: 2027 to 2031), would promote the creation of edge habitat alongside longer term retention of forestry, and as such maintain and/or promote the foraging and commuting habitat for these species. When compared to the proposed felling plan for Windy Standard III a larger extent is required to be clear-felled within a shorter timescale (the period 2017 to 2021). As such more significant change to habitat (i.e. loss of edge habitat) and therefore the commuting and foraging resource for bat species is expected as part of the proposed Development.

7.7.32 Felling of forestry sections earmarked for Phase 1 (2012 to 2016) and Phase 2 (2017 to 2021) will be most apparent in the footprint of the Meaul Hill Cluster, where all turbines are located within mature plantation to be felled. Removal of these forestry areas would potentially reduce habitat connectivity in the local landscape, with a reduction of foraging opportunities at a local scale. However, restocking of this habitat type will occur within a 30 m corridor of access tracks and a 70 m radius of turbines and crane pads, promoting the creation of edge habitat and therefore foraging and commuting opportunities in the long term.

7.7.33 Nearby plantation on the slopes of Brockloch and Polwhat Rig will be retained for a longer period (i.e. outside of the plan period), with localised areas of woodland on the southerly slopes of Waterhead Hill earmarked for long term retention (see Chapter 12: Forestry, of the ES). The longer term retention of these woodland habitats may reduce potential effects of reduced habitat connectivity in the wider environment, and will ensure retention of some suitable foraging habitat in the locality. These woodland habitats to be retained long-term may provide bat species with the resources and connectivity to remain in the local environ throughout the construction phase and beyond.

7.7.34 Although some change to the foraging and commuting resource for bats is expected, given the low levels of bat activity recorded across the proposed Development Area and in the surrounding environment, any unmitigated construction phase impacts on bats is predicted to be of low negative magnitude (probable) to the local bat community and therefore not significant.

7.7.35 No potential roost locations were identified within or adjacent to the proposed Development. A daytime walkover of the site did not identify any habitat suitability for roosting sites within the blocks of coniferous plantation. The most sensitive period of the year for bats is during the maternity season when female bats are raising their young at maternal roosts. The maternity period typically runs through the mid to late summer season i.e. from May to the end of July. The highest levels of activity at the proposed Development were recorded in September, outside this sensitive period, suggesting that maternal roosts are likely to be absent from the locality and immediate surrounding environment; therefore, potential for effects on bat species during the maternity season is considered to be of negligible magnitude and therefore not significant.

Operational Effects on Bats

7.7.36 Potential effects on bat species from the operational phase of the proposed Development are from accidental injury or death to bats, through turbine collision or barotrauma. Barotrauma injuries may occur when bats fly near to a moving turbine blade and suffer internal haemorrhaging as a result of the rapidly decreasing air pressure in the lee of the turning blade[65]. Scientific evidence from both North America and continental Europe indicate that both single large wind turbines and multiple turbine wind farms can have direct effects on bats and bat populations[43]. Very few bat deaths have been reported at UK wind farms to date, and all have been soprano pipistrelles[66]. However, this data may not be representative due to a lack of post-construction monitoring carried out to date; the Bats and Wind Turbines project[67] is due to be reported in the near future, which is expected to report on recorded collision mortality as part of a UK wide study, and make recommendations on how survey work for bats should be conducted at wind farm projects. It is also difficult to accurately predict the extent of effects of bats as there is little reported research highlighting any other change in behaviour that may take place as a result of the turbines. Other research (see e.g. Jones *et al.*[66]) has shown that bats may be attracted to turbines. Given the lack of currently available information regarding impacts in the UK, a precautionary approach is adopted here, based on the available guidance documents.

7.7.37 Increased risk of accidental injury of death of bats from turbine collision or barotrauma may occur throughout the operation of the proposed Development, with potential for long term effects to local bat populations. Removal of potentially suitable foraging and commuting habitats during the felling works associated with the construction phase may reduce bat activity even further, with long term removal of foraging and commuting habitats,

[64] Collins, J. and Jones, G., 2009. Differences in bat activity in relation to bat detector height: implications for bat surveys at proposed windfarm sites. Acta Chiropterologica, 11 (2): 343-350.

[65] Baerwald, E. F., D'Amours G. H., Klug B. J. and Barclay R. M. (2008). Barotrauma is a significant cause of bat fatalities at wind turbines. Current Biology 18 (16): 695–696

[66] Jones, G., Cooper-Bohannon, R., Barlow, R. and Parsons, K. 2009. Scoping and Method Development Report: Determining the potential ecological impact of wind turbines on bat populations in Britain. University of Bristol and Bat Conservation Trust

[67] Currently unpublished work from the University of Exeter, headed by Fiona Mathews

particularly in the Phase 1 (prior to 2016) and Phase 2 (2017 to 2021) felling areas (see Chapter 12: Forestry, of the ES). As discussed above, for construction impacts, a baseline forest felling plan exists in the absence of the proposed Development, and as such a change in habitat type would occur in the longer term. However, a larger extent is required to be clear-felled within a shorter timescale (the period 2017 to 2021), and as such increased loss of edge habitat as a foraging and commuting resource for bats in the shorter term. Removal of suitable foraging and commuting habitat from felling operations may potentially make it less likely that bats will use habitats within the proposed Development Area during the operational phase.

7.7.38 When considering the low levels of bat activity recorded in the proposed Development Area and the bat species recorded (i.e. of medium/low risk of accidental death and likelihood of utilising open habitats), potential for impact to bat populations due to accidental injury or death of bats from turbine collision or barotrauma during the operational phase is considered unlikely, although there is a degree of uncertainty in this prediction due to an evolving understanding of how bats interact with wind turbines[67]. Nevertheless, it is considered that at a local scale impact to bats during operation will be of low magnitude and therefore not significant.

Otter

Construction Effects on Otter

7.7.39 The results of the ecological field surveys and desk-based review suggest that although not present within the proposed Development Area, otter frequently use habitats in the surrounding environment and are active along watercourses draining the proposed Development. As conifer plantation dominates much of the proposed Development Area and the surrounding environment, it is considered likely that there are limited foraging opportunities present, and as such otters using these habitats will likely have large home ranges with a wide distribution across the local environment, occurring at low density.

7.7.40 The presence of otter using watercourses within the immediate surrounding environment gives rise to potential for construction related (direct and indirect) impacts to this species; including disturbance due to noise and presence of site personnel and site machinery, increased risk of accidental road traffic mortality from construction-related activity and habitat degradation from accidental spillages and other accidental pollution incidents.

7.7.41 The main disturbance impact is considered to be during the felling stage; plantation woodland to be felled in proximity to watercourses such as the Polwhat Burn has the potential to impact on otter through disturbance, or damage or destruction of potential otter resting/breeding places (i.e. holts or couches). However it is important to note that a baseline forest felling programme exists for Carsphairn Forest, and in the absence of the proposed Development several coupes are planned to be felled prior to 2016 and in 2017 to 2021, including coupes in proximity to watercourses considered to be suitable for otter. As such it is considered that impacts of felling would not be significantly greater than baseline conditions. Restocking of commercial plantation will occur within a 30 m corridor of access tracks and 70 m radius of turbines and crane pads, returning the habitat type to continuous cover forestry in the long term.

7.7.42 Habitats likely to be used by otters within the proposed Development Area include tributaries of the Shalloch Burn and Polwhat Burn. New watercourse crossings are required at three different points across the proposed Development Area. Construction of watercourse crossings has the potential to create barriers to otter movement.

7.7.43 Should disturbance impacts of increased noise and anthropogenic activity take place in close proximity to habitats used by otters, negative effects such as increased stress to individuals, temporary loss of habitat (due to avoidance of disturbed habitat) and reduced habitat connectivity in the local environment (from avoidance of the proposed Development Area), may affect the local otter population.

7.7.44 Increased risk of accidental road traffic mortality may impact upon the local otter population should an accidental road traffic fatality occur, with individuals potentially being indirectly affected through changes to local population dynamics and territorial behaviour. Accidental pollution events (such as fuel spillages and sedimentation of watercourses) have potential to indirectly affect the local otter population through localised habitat degradation; this may result in negative impacts to freshwater prey species and a reduction of locally available foraging opportunities. This potential (unmitigated) impact is considered probable, due to construction/upgrading of access tracks at seven locations and storage/use of fuel and chemicals within the proposed working area.

7.7.45 The above potential construction-related impacts to otters are likely to be localised to the proposed Development Area and of a temporary duration, taking place only throughout the construction phase and therefore are considered reversible over time, with a return to baseline conditions following completion of construction. In addition due to the widespread availability of similar and better quality habitat in the surrounding environment (such as the Water of Deugh and Bow Burn), any displacement impacts are considered to be low. Overall, potential unmitigated construction phase impacts on otter is considered to be of low negative magnitude (certain) and therefore not significant. However, reasonable mitigation measures should be adopted to ensure legislative compliance (see 'Mitigation' section below).

Operational Effects on Otter

7.7.46 Disturbance to otter during the operation phase is considered to be unlikely. Otter are generally nocturnal, whilst operational maintenance is carried out during the day. There remains a potential risk of contamination of watercourses from surface run-off, oil or other leaks from turbine machinery, spills during maintenance or leaks from maintenance vehicles which may result in loss of prey abundance. Prevention and consideration of hydrological effects are further discussed in Chapter 9: Hydrology, Geology and Hydrogeology, of the ES. There would be a reduced level of onsite traffic during operation, reducing the risk of collision of these species and any impact is considered to be unlikely. Any unmitigated operational impact of the operational phase on otter is considered to be of low magnitude and therefore not significant.

Red Squirrel

Construction Effects on Red Squirrel

7.7.47 A search for local designations undertaken by the DGERC highlighted the presence of the Carsphairn Forest Red Squirrel Priority Woodlands (RSPW), within which the proposed Development is located[61]. Within this priority woodland area, conifer diversity is low with majority of woodland comprising commercial plantation supporting three coniferous tree species or less. Sitka spruce, the predominant tree species present, is widely accepted to be poor quality foraging habitat for red squirrel; nevertheless, the red squirrel population in this area is considered to be stable.[61]

7.7.48 No red squirrel dreys were identified within or adjacent to the proposed Development Area and although feeding signs were scattered throughout the coniferous plantation (see ES Figure 7.10 in Volume 3 of the ES) and red squirrel sightings observed, the majority of signs were old and widely dispersed through the plantation, suggesting that within the proposed Development Area, red squirrels are widespread and occurring at low frequencies.

7.7.49 During the construction phase, permanent habitat loss will occur as a result of the felling of the existing mature coniferous plantation, required to enable construction of the proposed Development. The total extent of coniferous plantation at Windy Standard III is 325.36 ha, which comprises 67 % of the proposed Development Area; 3.5 % (13.20 ha) of this habitat type will be permanently lost to infrastructure, The main potential impact on red squirrels during this phase is the loss of, or disturbance to foraging areas or habitats with potential to support dreys. Felling for the proposed Development has been scheduled to take place prior to end of 2016 (Phase 1) or within the period 2017 to 2021 (Phase 2). Felling of forestry sections earmarked for felling during Phase 1 and Phase 2 will be most apparent in the footprint of the Meaul Hill Cluster, where all turbines are located within mature plantation to be felled. Removal of this forest habitat may reduce habitat connectivity in the local landscape, with a reduction of red squirrel foraging opportunities at a local scale in the short term, and the potential to negatively impact upon red squirrel movements and dispersal.

7.7.50 It is important to note however, that a baseline forest felling programme exists for Carsphairn Forest, with staged felling of coupes over a longer timeframe (i.e. felling in Phase 3: 2022 to 2026 and Phase 4: 2027 to 2031; see Chapter 12: Forestry, of the ES), and as such a change in habitat type would still occur in the absence of the proposed Development, but the proposed felling plan for Windy Standard III requires a larger extent to be clear-

felled within the period 2017 to 2021. It is also proposed as part of the felling plan for the proposed Development that restocking of coniferous forestry will occur within a 30 m corridor of access tracks and a 70 m radius of turbines and crane pads, with returned foraging opportunities for red squirrel in the long term. Nearby plantation on the slopes of Brockloch and Polwhat Rig will also be retained for a longer period (i.e. outside of the plan period), with distinct areas of woodland on the southerly slopes of Waterhead Hill earmarked for long term retention (see Chapter 12: Forestry, of the ES). These woodland habitats to be retained long-term may provide red squirrels with the resources and connectivity to remain in the local environ throughout the construction phase and beyond.

7.7.51 The most sensitive period of the year for red squirrels is during the breeding season (February to September), particularly during breeding peaks, where mating in winter and spring leads to spring born (February to April inclusive) and summer born (May to August inclusive) litters[39]. Should felling take place during this sensitive period, disturbance and habitat destruction may impact upon breeding success, with potential for medium-long term impacts on the viability of the local population using habitats within the proposed Development Area. Removal of trees during a short time frame may also result in dispersal of red squirrels from forest within the proposed Development Area to surrounding blocks of coniferous plantation.

7.7.52 In terms of grey squirrel (*Sciurus carolinensis*) encroachment, the woodland habitats in the local environment are considered to be of low preference to grey squirrels. Evidence suggests that grey squirrel rarely use larch and Sitka spruce[68] which comprise the majority of plantation in the local environment. Grey squirrel colonisation is faster in the presence of large-seeded broadleaved tree species, with Sitka spruce plantation representative of low preference grey squirrel habitat[68]. Woodland habitats within the proposed Development Area and immediate surrounding environment are therefore considered as unlikely to facilitate grey squirrel distribution through the local environment, with the risk of inadvertently attracting grey squirrel from felling plantation considered low.

7.7.53 The potential effects such as disturbance and loss of habitat from felling operations will be restricted to the areas earmarked for felling only, with limited potential for impact to the wider (local) red squirrel population and the Carsphairn Forest RSPW: alternative red squirrel habitat is abundant in the surrounding environment, therefore should any individual squirrels be displaced, it is considered highly likely that they will move to areas of adjacent habitat similar to baseline conditions occurring within the proposed Development Area (mature coniferous plantation). Should red squirrel be present and using forestry habitats within the proposed Development Area at the time of felling, the potential impacts of accidental habitat disturbance and loss on the local red squirrel population is considered to be of low negative impact (probable) and are therefore considered not significant. However, reasonable mitigation measures should be adopted during the construction phase of the development to ensure legislative compliance (see Section 7.8 'Mitigation' below).

Operational Effects on Red Squirrel

7.7.54 Disturbance to red squirrel during the operation phase is considered to be unlikely. The number of site personnel and vehicles present would be reduced and limited to that required to carry out regular operation and maintenance works and the proposed restocking of any of the felled areas of plantation which have not already been replanted during the construction phase. Any ongoing forest maintenance and beating up works are considered to be non-intrusive and will require minimal personnel. Any unmitigated impacts of the operational phase on red squirrel is considered to be of low negative magnitude and therefore not significant.

[68] Bryce, J., Cartmel, S. and Quine, C.P. 2005. Habitat Use by Red and Grey Squirrel: Results of Two Recent Studies and Implications for Management. Forestry Commission Information Note

Badger

Construction Effects on Badger

7.7.55 Badger feeding signs, dung, prints and paths have been recorded within the proposed Development Area during surveys conducted between 2012 and 2015 (see Section 7.6 above). This suggests that badgers are using habitats both within the site and in the immediate surrounding environment for commuting and foraging. Substrates within the proposed Development Area were considered generally unsuitable for the construction of stable and permanent badger setts; however there is some potential for the construction of new setts where suitable habitat exists.

7.7.56 During the construction phase, temporary disturbance effects and longer term habitat loss (i.e. badger foraging habitat) are likely to occur within the proposed Development Area as a result of felling of the existing mature coniferous plantation. Loss of habitat may also have potential to negatively affect badger habitat connectivity in the local environment, due to removal of coniferous plantation as a commuting resource. The risks to badger during construction include injury or mortality caused by entrapment in open trenches, holes and pipes and due to increased levels of site traffic.

7.7.57 The forest felling programme for Windy Standard III includes clear-felling of large areas of forest within Phase 1 (prior to 2016) and Phase 2 (2017 to 2021) and restocking to within a 30 m buffer of access tracks and 70 m buffer of turbines and crane pads. In the absence of the proposed development a baseline forest felling programme exists for Carsphairn Forest, with staged felling and restocking of coupes over a longer time frame (up until 2036). Although over differing timeframes the magnitude of impacts for the proposed Development are considered to be similar to baseline conditions.

7.7.58 During the construction phase, nearby areas of coniferous plantation on the slopes of Brockloch and Polwhat Rig will be retained for a longer period than forestry habitats within the footprint of the Meaul Hill Cluster, with distinct areas of woodland on the southerly slopes of Waterhead Hill also earmarked for long term retention. These areas of permanent woodland will likely provide badger with sufficient connectivity between forested areas to remain in the local environ throughout the construction phase. Due to the availability of similar habitat elsewhere in the surrounding environment, impacts of the construction phase on the local badger population is considered to be unlikely. Any unmitigated effects of preparation and construction on badger is considered to be of low magnitude (probable) and therefore not significant.

Operational Effects on Badger

7.7.59 During the operation phase of Windy Standard III, the number of site personnel and vehicles or machinery present would be reduced and limited to that required to carry out regular operation and maintenance works. This is most likely to occur during daylight hours, minimising disturbance during the night when badger are most active. Any unmitigated effects of the operational phase on badger is considered to be of low magnitude (certain) and therefore not significant.

7.8 MITIGATION

Mitigation by Design

7.8.1 During the design process, several aspects were taken into consideration in order to minimise the potential risk to species and habitats arising from Windy Standard III. See Chapter 3: Design Evolution and Alternatives, of the ES for detail on the overall site design process.

7.8.2 In order to minimise land take and potential impacts on habitats and protected species, use of existing access tracks for the Windy Standard Developments, and the existing forest tracks within the conifer plantation, is proposed where possible. The use of existing tracks would also minimise the extent of higher value and suitable habitats for protected species, such as otter and badger, being impacted by construction. A minimum distance of 50 m has been maintained between the proposed infrastructure and watercourses where possible, with the exception of three new watercourse crossings (see Technical Appendix 10.4: Watercourse Crossing

Assessment in Volume 4 of the ES). The watercourse crossings required for Windy Standard III will be designed in keeping with SEPA good practice[69], and to ensure that there are no restrictions to movement of otter (see Chapter 10: Hydrology, Geology and Hydrogeology, of the ES). Dry culverts or mammal ledges will be installed where appropriate[70], in particular where watercourse crossings are sited close to the main flow of the Polwhat Burn where otter signs were observed.

7.8.3 The layout of the turbines, access track and associated infrastructure has minimised impact on sensitive habitats where possible (i.e. flush habitat), and areas of deepest peat and peat slide hazard zones, taking into account other constraints. Where avoidance has not been possible the access infrastructure will be constructed in such a way as to ensure the integrity and connectivity of the hydrology of sensitive habitats, such as floodplain mire, basin mire and acid/neutral flush would be maintained. Access tracks would be designed in keeping with SNH good practice guidance Constructed Tracks in the Scottish Uplands[71],[9]. Further detail is provided in Chapter 10: Hydrology, Geology and Hydrogeology, of the ES and will be included in the Construction Environment Management Plan (CEMP).

7.8.4 The two turbine blade lengths proposed at Windy Standard III is 41.2 m and 56.5 m, therefore following Natural England guidance the minimum distance which should be maintained between any forest edge habitat (i.e. potential bat foraging and commuting feature) and proposed turbine locations is 69.15 m[20], [72]. The proposed restocking of forestry following clear-fell will ensure a 70 m buffer is maintained of turbine bases and crane pads. These measures will ensure that in the long term as the forestry matures the risk of impacts to bat populations is minimised.

7.8.5 The proposed forest felling plan for Windy Standard III involves clear felling of the coupes within which turbines and associated infrastructure are located, and subsequent restocking to leave a 30 m open corridor around access tracks and 70 m radius of turbines and crane pads (see Chapter 12: Forestry, of the ES). In addition, planting of mixed broadleaved woodland would be carried out within the riparian zones of watercourses (see ES Figure 12.7 in Volume 3 of the ES: Chapter 12: Forestry, of the ES). The new broadleaved planting should include tree species of benefit to red squirrels, and will promote dappled shade and sheltered habitat along sections of watercourses, potentially enhancing habitat suitability for species such as otter in the long term, and creating habitat connectivity (for instance for bats) with the wider areas of Carsphairn Forest.

Pre-Commencement Mitigation Measures

7.8.6 Prior to commencement of works at Windy Standard III (including felling), pre-construction surveys will be carried out, including surveys for badger, red squirrel drey searches and a check of all riparian habitat for otter. This will enable any refinements to be made if necessary to mitigation, micrositing and/or the construction programme to take into account any updated distribution or presence of protected species. All relevant mitigation measures would be implemented through a Construction Method Statement (CMS) (see Chapter 4: Description of Development, of the ES) which will be agreed with the local planning authority in consultation with SEPA and SNH. It is recommended that pre-commencement mitigation measures are agreed through planning consent conditions.

Mitigation Measures During Felling

7.8.7 The felling schedule will be informed by pre-construction surveys. If applicable following pre-construction survey results, to reduce potential for localised effects of disturbance and associated impacts of red squirrel population instability, felling works should be scheduled to avoid the red squirrel breeding season as far as practically possible (February to September). To minimise potential for localised impacts of habitat destruction, disturbance and reduced connectivity, felling activities should be scheduled appropriately through the implementation of a felling design plan. Where replanting of trees take place in the locality, coniferous tree species, which are known to provide a medium to high carrying capacity for red squirrel16 should be reintroduced to ensure a long term reliable and diverse food source for red squirrel, contributing to the long term stability of the Carsphairn Forest RSPW.

7.8.8 Plant required for the felling operations will avoid tracking over the area of flood plain mire and associated tall bog sedge in the Meaul Hill Cluster, and alternative access to coupes adjacent to this ride will be used. Logs from the felled forestry will not be stacked in this sensitive habitat, or brash piled or spread in this area.

7.8.9 All felling operations would take into account guidance included in the Forestry Commission and Scottish Government's policy on the Control of Woodland Removal[73], and follow best practice in relation to protected species[74]. A suitably qualified ecologist should be on site to supervise felling works, to ensure any potential for impacts to sensitive habitats and species is minimised. Any additional mitigation (where appropriate) would be agreed with SNH and the local planning authority if new evidence of protected species is recorded within the felling area.

Mitigation Measures During Construction

7.8.10 It is recommended that an Ecological Clerk of Works (ECoW) is present on site during enabling works and construction. They should be a suitably experienced individual, whose role would be to ensure that works are carried out in accordance with environmental measures detailed in the CMS, and to ensure compliance with international and national legislation (see 'Legislation, Policy and Guidance' above). The ECoW would carry out pre-construction surveys and contribute to all relevant CMS documents. Once work has commenced, their role should be to work on site providing ecological, pollution control advice, water quality monitoring and supervision for all relevant mitigation measures (see also Chapter 10: Hydrology, Geology and Hydrogeology, of the ES). The ECoW would have the authority to stop any construction activity that is having or likely to have a significant environmental impact, or be in breach of legislation.

7.8.11 The ECoW would ensure that any micro-siting of infrastructure during construction does not impact on the most sensitive habitats and any other identified ecological constraints. This is particularly important when working in close proximity to waterbodies and sensitive habitats such as acid/neutral flush and fen habitats. Micro-siting would be used within a maximum limit of deviation of 50 m where it does not affect other constraints. Where micro-siting cannot avoid areas of sensitive habitats or features the ECoW would discuss and agree additional required mitigation to ensure impacts are minimised.

7.8.12 Contractors should be made aware of the ecological sensitivities on site through regular toolbox talks, including the presence of European and nationally protected species and habitats. Should any otter resting sites, badger setts or red squirrel dreys be found an appropriate exclusion zone would be immediately established around the area and the contractor notified. Contractors should report any signs or sightings of protected species to the ECoW in the event any ecological interests are observed within the area of works (see also Chapter 8: Ornithology, of the ES).

7.8.13 The pre-construction quality of watercourses and waterbodies would be maintained during construction and post construction (see Chapter 10: Hydrology, Geology and Hydrogeology, of the ES). Watercourse protection measures would include protection against siltation and sedimentation, and pollution incidents such as the

[69] SEPA, 2010. Engineering in the water environment: good practice guide - river crossings (2nd Edition), SEPA.

[70] SNH. Otters and Development. Available at: http://www.snh.org.uk/publications/on-line/wildlife/otters/mitigation.asp

[71] SNH, 2013. Constructed tracks in the Scottish Uplands. Available at: http://www.snh.org.uk/pdfs/publications/heritagemanagement/constructedtracks.pdf

[72] Assuming an approximate tree height of 30 m.

[73] Forestry Commission, 2009. The Scottish Government's Policy on the Control of Woodland Removal. Available at: http://www.forestry.gov.uk/pdf/fcfc125.pdf/$FILE/fcfc125.pdf (last accessed 12/03/2015)

[74] Forestry Commission, 2011. Forests and biodiversity. UK Forestry Standard Guidelines. Available at: http://www.forestry.gov.uk/pdf/FCGL001.pdf/$file/FCGL001.pdf (last accessed 12/03/2015)

implementation of a pollution response plan and the safe storage of chemicals in bunded containers. Refuelling of vehicles and machinery would be carried out at a central designated area, on an impermeable surface, located at least 50 m away from any watercourse. Monitoring of water quality would be carried out during construction. The implementation of these measures would ensure impacts on protected species such as otter and fish species are minimised. The requirement for pre-, during and post-construction electrofishing and macro-invertebrate surveys will be outlined in the CEMP. Further details of protection measures for watercourses are included in Chapter 10: Hydrology, Geology and Hydrogeology, of the ES and water management and protection measures will be included in the CEMP (see Technical Appendix 4.1: Draft Construction Environmental Management Plan in Volume 4 of the ES).

7.8.14 Good practice measures would be implemented during the construction of the three watercourse crossings (i.e. culverts) such as ensuring no building materials block passage of protected species such as fish along a watercourse (see Chapter 10: Hydrology, Geology and Hydrogeology, of the ES for further detail). A watching brief during construction may also be required by the ECoW to ensure impacts on both otter and fish species are minimised. Should further mitigation be required, the ECoW would be responsible for contacting SNH and the local planning authority to discuss specific mitigation measures.

7.8.15 Any land degraded by construction and not required for the operation of Windy Standard III would be restored after construction is completed, such as the construction compound, around areas of tracks, crane hardstandings, borrow pits and turbine bases. Turfs from Windy Standard III would be recovered during construction as far as practicable, and stored following best practice9 for re-use in the restoration of areas not required for the operation of the proposed Development. As such any vegetation removed for the construction phase would be reinstated within the site boundary, and allowing natural re-colonisation of vegetation communities. Permanent habitat loss would be limited to that required for the footprint of infrastructure for Windy Standard III, and best site management practices would be implemented on site to minimise the risk of encroachment of the construction corridor into adjacent habitats. Felling proposals would take into account guidance included in the Forestry Commission and Scottish Government's policy on the Control of Woodland Removal[75] (see Chapter 12: Forestry, of the ES).

7.8.16 Measures to control the impact of dust on sensitive habitats would be implemented during the preparation and construction phase. These measures will be adopted when necessary, in dry weather, in areas of active development, and will most likely involve the controlled damping of tracks utilised by construction vehicles. In addition, as far as possible materials for construction would be sourced from on-site borrow pits, which would ensure the composition of materials used within Windy Standard III is as close to the local conditions as possible. Further detail on the mitigation of potential dust impacts will be detailed within the CEMP (see Technical Appendix 4.1: Draft Construction Environmental Management Plan in Volume 4 of the ES).

7.8.17 To prevent accidental mortality of protected species during construction, deep excavations, foundations and pipe openings etc. should be covered when not active to prevent entrapment of animals such as otter, badger or red squirrel, or alternatively a temporary ramp installed to enable them to exit any steep-sided excavation. In addition, a speed limit of 15 mph will be enforced for any vehicle within Windy Standard III, in order to reduce the risk of collision with protected species.

GWDTEs

7.8.18 Details of how impacts upon groundwater flow are minimised and mitigated are provided in Chapter 10 Hydrology, Geology and Hydrogeology, of the ES; particularly with respect to drainage, pollution and waste management. Mitigation measures will be detailed within a CEMP (see Technical Appendix 4.1: Draft Construction Environmental Management Plan in Volume 4 of the ES), and are summarised below.

7.8.19 Where possible (and where other constraints allow) micro-siting of infrastructure will be undertaken in consultation with the ECoW to minimise proximity to a potential GWDTEs. Where micro-siting is not possible, foundation excavation will be undertaken with care, assessing for water ingress and the degree of bedrock fracturing and weathering.

Shallow groundwater may be encountered, therefore the foundation excavations will be walled and sealed with a geotectile membrane prior to concrete pouring to prevent concrete migration into shallow groundwater and collapse of excavation walls. The concrete type will be of an appropriate quick setting and non-leachable specification to prevent concrete migration into the groundwater.

Infrastructure will be designed to allow the continuation of groundwater seepage down gradient as similar to natural conditions as possible. This would include the positioning of regular tracks and directing natural runoff around or below infrastructure. Access tracks will be constructed in a manner that prevents them acting as a hydrogeological preferential pathway or hydrological barrier. Construction of tracks will use materials to promote permeability, where possible, such as coarse aggregate under a geo-membrane base layer to prevent over compaction and reduction of permeability.

7.8.20 Any excavation and construction works within the catchment of an identified potential GWDTE will avoid periods of heavy rainfall and be undertaken and restored within as short a period as possible.

7.8.21 Where groundwater is encountered, dewatering will be kept to a minimum to prevent altering the water table by drawdown. Where dewatering is required, the water will be pumped into a designated bunded area away from the GWDTEs and preferably to a groundwater recharge zone for filtration treatment, where required and to allow natural filtration of the water into the bedrock.

7.8.22 Sustainable drainage systems (SuDS) will not be placed on areas determined to be GWDTEs.

7.8.23 All other potential effects on GWDTEs can be mitigated by minor micro-siting and precautionary mitigation measures, including fencing off or demarking the GWDTEs. Should the development be consented further detail on intended drainage management at the site will be provided as part of the CEMP during planning condition discharge (see Technical Appendix 4.1: Draft Construction Environmental Management Plan in Volume 4 of the ES).

Bats

7.8.24 Although no significant impact to bats is predicted, due to the high level of legal protection afforded to bat species, a precautionary approach should be adopted during the construction phase, with implementation of good working practices during felling operations[74]. Replanting of trees following completion of construction will ensure a minimum buffer of 70 m from turbine bases to the edge of suitable habitat, is maintained in line with good practice guidance (i.e. >50 m from the edge of the turbine's rotor swept area)[20]. This mitigation measure will also ensure minimisation of collision risk to bat species potentially using woodland edge habitats during the operational phase.

Otters

7.8.25 Otters are a European Protected Species (EPS), therefore are afforded a high level of legal protection against disturbance. To ensure appropriate mitigation measures are in place, a precautionary approach should be adopted, with an otter survey undertaken of suitable habitats within the proposed Development Area and a 250 m buffer prior to commencement of felling and construction. This will identify any new habitat features being utilised by the local otter population, such as new holts and/or resting sites, and will confirm any licensing requirements to ensure legislative compliance during the construction phase. Undertaking a pre-construction survey will ensure relevant mitigation measures, such as appropriate working practices, are in place providing protection to the local otter population where deemed necessary.

7.8.26 A detailed assessment of each watercourse crossing should be undertaken, to identify if any otter specific mitigation is required, such as the installation of culverts and/or steering fencing, to enable safe passage of otters under new or upgraded access tracks. Where risk of increased road traffic mortality is identified, additional

[75] Forestry Commission, 2009. The Scottish Government's Policy on the Control of Woodland Removal. Available at: http://www.forestry.gov.uk/pdf/fcfc125.pdf/$FILE/fcfc125.pdf

mitigation such as the use of wildlife reflectors and/or warning signs should also be considered, particularly where works are scheduled to take place during the winter months.

Red Squirrel

7.8.27 The potential impacts of disturbance and habitat loss to the local red squirrel population may be lessened, should adjacent areas of coniferous plantation in the local environment be retained or replanted. To ensure compliance with relevant environmental legislation and to minimise the potential for impact to red squirrels using forestry habitats within the proposed Development Area, the following mitigation is recommended:

- During the red squirrel breeding season (February to September) the felling of trees containing dreys should be avoided, to minimise potential for impact[76, 39];
- Pre-felling surveys / drey searches should be undertaken prior to commencement of felling to identify any trees containing dreys. Pre-felling surveys should be undertaken at a maximum of three weeks before commencement of felling[76]. Should a red squirrel drey be identified, trees within 50 m of the tree should not be felled during the breeding season to avoid disturbance[56];
- Where felling works are scheduled to take place outside the red squirrel breeding season, isolation of stands should be avoided to enable squirrels to relocate; and
- To increase suitability for red squirrel capacity in remnant habitats following completion of felling, new plantings should consider the introduction of tree species which are known to provide a medium to high carrying capacity for red squirrel[16].

Badger

7.8.28 The potential impacts of habitat loss to the local badger population may be reduced, should adjacent areas of coniferous plantation in the local environment be retained or replanted. In particular, planting of mixed broadleaved woodland along riparian zones (see Chapter 12: Forestry, of the ES and 'Mitigation by Design' above) would provide increased foraging opportunities. Establishment of new areas of woodland and creating tree lines would provide safe commuting routes between woodland blocks.

Mitigation Measures During Operation

7.8.29 With the exception of the operation of the wind turbines and general maintenance of the turbines, there will be little on-site activity during the operational phase and therefore embedded mitigation requirements during operation are minimal.

7.8.30 Where potential effects exist, construction phase control measures will continue during the operational phase. In particular, the potential for pollution incidents during routine maintenance activities will be minimised by adoption of SEPA best practice guidance[77].

7.8.31 Permanent features of the Windy Standard III are not predicted to have any continuing effects on the ecological resource once they have been completed during the construction phase. The areas surrounding these will be reinstated using turfs recovered during the construction phase, following best practice guidance9.

7.8.32 Any maintenance works will take place during the day to minimise the potential for disturbance to protected species on site (since these are mostly nocturnal) and a speed limit of 15 mph will be enforced for any vehicle going on site, in order to reduce the risk of collision with protected species.

7.8.33 Areas of ground around turbines (i.e. within the 70 m buffer which will not be replanted) will be managed to ensure that they remain free of tree and tall shrub growth in order to maintain an appropriate buffer between potential bat features and the rotor swept area (see 'Mitigation by Design' above). Should any bat mortality impacts be identified during operation, an appropriate mitigation strategy will be discussed and agreed in consultation with SNH and the local planning authority.

Mitigation Measures During Decommissioning

7.8.34 Best practice measures as described in the construction stage will be followed including specific best practice guidance for the restoration and decommissioning of wind farms[78]. New guidance available at the decommissioning phase would be adopted if appropriate.

7.9 RESIDUAL EFFECTS

7.9.1 The mitigation measures are expected to reduce the magnitude of residual effects for all VERs to which they apply, in the short and long term. Further detail is provided in Table 7.22 below.

7.10 SUMMARY OF EFFECTS

7.10.1 No significant effects on any species and habitats are predicted during the site preparation and construction phase of Windy Standard III. The magnitude of pre-mitigation effects and the magnitude and significance of residual effects on each VER during the construction phase and operation before and after mitigation is detailed in Table 7.20 below.

[76] SNH, 2012. Assessing the cumulative impact of onshore wind energy developments. Guidance.

[77] Scottish Environmental Protection Agency, 2010. Engineering in the water environment: good practice guide - river crossings (2nd Edition), SEPA.

[78] Welstead, J., Hirst, R., Keogh, D., Robb G. and Bainsfair, R. 2013. Research and guidance on restoration and decommissioning of onshore wind farms. Scottish Natural Heritage Commissioned Report No. 591

Table 7.20: Summary of pre-mitigation effects and residual effects on each VER, and the residual significance of effect

VER	Conservation value within Windy Standard III	Nature of potential pre-mitigation effect	Magnitude of pre-mitigation effect	Significance of pre-mitigation effect	Specific mitigation measure	Magnitude of residual effect	Residual significance	Level of certainty/comments
Construction and Decommissioning Impacts								
Habitats								
Wet dwarf shrub heath	Local	Permanent habitat loss; Changes to hydrology via drainage; disturbance or damage from dust; damage due to accidental pollution incidents	Low	Not significant	Design of infrastructure to maintain hydrological connectivity in the surrounding habitat, through the use of cross drains i.e. Best practice measures during construction including: • Keeping within clearly defined construction areas • Dust management • Use of suitable storage areas for materials • Effective drainage regime, implemented through the CEMP • A pollution contingency plan will be created to minimise potential pollution effects, implemented through the CMS and CEMP (see Technical Appendix 4.1: Draft Construction Environmental Management Plan in Volume 4 of the ES) Further details are provided in Chapter 10: Hydrology, Geology and Hydrogeology, of the ES	Negligible	Not significant	Given that the loss of this habitat will total < 0.1% of its extent within the proposed Development, should the above mitigation be implemented a measurable residual negative effect on this habitat at a local level is considered to be extremely unlikely.
Wet modified bog	Local	Permanent habitat loss; Changes to hydrology via drainage; disturbance or damage from dust; damage due to accidental pollution incidents	Moderate	Not significant	Use of existing forestry tracks where possible to minimise impacts to habitats. Design of infrastructure to maintain hydrological connectivity in the surrounding habitat, through the use of cross drains i.e. Best practice measures during construction including: • Keeping within clearly defined construction areas • Dust management • Use of suitable storage areas for materials • Effective drainage regime, implemented through the CEMP (see Technical Appendix 4.1: Draft Construction Environmental Management Plan in Volume 4 of the ES) • A pollution contingency plan will be created to minimise potential pollution effects, implemented through the CMS and CEMP	Low	Not significant	Given the degraded, nature of this habitat at the proposed Development, including extensive modification due to drainage for forestry activities, should the above mitigation be implemented a measurable residual negative effect on this habitat at a local level is considered to be unlikely.

VER	Conservation value within Windy Standard III	Nature of potential pre-mitigation effect	Magnitude of pre-mitigation effect	Significance of pre-mitigation effect	Specific mitigation measure	Magnitude of residual effect	Residual significance	Level of certainty/comments
					(see Technical Appendix 4.1: Draft Construction Environmental Management Plan in Volume 4 of the ES) Further details are provided in Chapter 10: Hydrology, Geology and Hydrogeology, of the ES			
Flood plain mire	Local	Damage caused by felling plant during forestry felling operations	Low	Not significant	Forestry plant to avoid accessing coupes to be felled via the ride containing this habitat. Appropriate protection of watercourses and water quality during felling and construction activities, to ensure sensitive habitats are not impacted, and implementation of a pollution response plan (see Chapter 10: Hydrology, Geology and Hydrogeology, of the ES).	Negligible	Not significant	Given the distance of this habitat (>70 m) from infrastructure, if adequate protection via avoidance is implemented during forestry operations, it is considered there will be no measurable residual negative effect on this receptor (certain).
Watercourses	Local	Damage during construction of three watercourse crossings; hydrological effects i.e. change in flow rate/ reduced hydraulic capacity; risk of sedimentation and erosion, and risk of impacts from run-off and potential water pollution incidents.	Moderate	Not significant	Mitigation by design, including: • Minimum buffer of 50 m between proposed infrastructure and watercourses except at watercourse crossings; • Watercourse crossings to be designed in keeping with SEPA good practice[69]; Best practice during construction, including: • Implementation of a pollution response plan, through the CMS and CEMP (see Technical Appendix 4.1: Draft Construction Environmental Management Plan in Volume 4 of the ES); • Use of suitable storage areas for materials; • ECoW presence during construction; • Monitoring of water quality will also be carried out during construction. For further detail on mitigation of impacts on watercourses see Chapter 10: Hydrology, Geology and Hydrogeology, of the ES.	Negligible	Not significant	Watercourse crossings would be designed in keeping with best practice. Mitigation measures would minimise risk of sedimentation, erosion and risk of impacts from pollution incidents. A measurable effect at a local level is considered highly unlikely.
Species								
Tall bog sedge	Regional	Damage caused by felling plant during forestry felling operations	Moderate	Not significant	Forestry plant to avoid accessing coupes to be felled via the ride containing this species. Appropriate protection of watercourses and water quality during felling and construction activities, to ensure sensitive habitats and species are not impacted, and implementation of a pollution response plan (see Chapter 10: Hydrology, Geology and Hydrogeology, of the ES).	Negligible	Not significant	Given the distance of the habitat containing this species (>70 m) from infrastructure, if adequate protection via avoidance is implemented during forestry operations it is considered there will be no measurable residual negative effect on this receptor at a regional level (certain).
Bat species	Roost sites – n/a	Fragmentation of commuting and	Low	Not significant	Minimum buffer of 70 m between turbine	Negligible	Not	Very low numbers of bats were recorded within

VER	Conservation value within Windy Standard III	Nature of potential pre-mitigation effect	Magnitude of pre-mitigation effect	Significance of pre-mitigation effect	Specific mitigation measure	Magnitude of residual effect	Residual significance	Level of certainty/comments
	Commuting habitat – Local Foraging habitat – Local	foraging habitats; disturbance to commuting and foraging bats.			locations and forest edge habitat (i.e. during clearfelling and replanting); Broadleaved planting along riparian zones would enhance the area as a foraging and commuting resource for bats.		significant	the proposed Development Area during surveys. Should the above mitigation be implemented a measurable residual negative effect at a local level is considered to be unlikely.
Otter	Local	Disturbance to otter; risk of incidental injury or mortality; accidental water pollution incident resulting in loss of prey abundance; construction of watercourse crossings creating barriers to movement.	Low	Not significant	Pre-felling/construction surveys; Design of watercourse crossings to allow the passage of otter; Use of wildlife reflectors and/or warning signs were required; Best practice measures during construction such as covering deep excavation and pipe openings when not active to avoid entrapment of otter and protection of watercourses and water quality and implementation of a pollution response plan (see Chapter 10: Hydrology, Geology and Hydrogeology, of the ES); Enforcing a speed limit of 15 mph for any vehicles on site, to reduce the risk of collision with protected species.	Negligible	Not significant	Should the above mitigation be implemented a measurable residual negative effect at a local level is considered to be unlikely. Planting of broadleaved woodland along riparian zones as part of the forestry plan for the proposed Development has the potential to positively impact on otter in the long term, through improved conditions for prey species such as fish and promoting suitable habitat for resting sites.
Red squirrel	Local	Loss of or disturbance to foraging areas or habitats with potential to support dreys.	Low	Not significant	Pre-felling/construction surveys; Felling of trees containing dreys to be avoided during the red squirrel breeding season (February to September) where possible; New planting to consider the introduction of tree/scrub species with a medium to high carrying capacity for red squirrel.	Negligible	Not significant	Should the above mitigation be implemented a measurable residual negative effect at a local level is considered to be unlikely.
Badger	Local	Loss of badger foraging habitat (i.e. felling of forestry); disturbance to badger; reduction in habitat connectivity in local environment; accidental injury or mortality.	Low	Not significant	Pre-felling/construction surveys; Best practice measures during construction such as covering deep excavation and pipe openings when not active to avoid entrapment; Enforcing a speed limit of 15 mph for any vehicles on site, to reduce the risk of collision with protected species.	Negligible	Not significant	Should the above mitigation be implemented a measurable residual negative effect at a local level is considered to be unlikely. Planting of broadleaved woodland as part of the forestry plan for the proposed Development has the potential to positively impact on badger in the long term, through improved foraging habitat.
Operational Impacts **Habitats**								
Dry dwarf shrub heath, wet modified bog, flood plain mire and watercourses	Local	Accidental pollution incidents due to maintenance/repair activities	Low	Not significant	Construction phase control measures will continue during the operational phase. The potential for chance pollution incidents during routine maintenance activities will be minimised by adoption of best practice guidance, and contingency plans will ensure the risk of these incidents remains low, and that there is a plan in place to deal with any incidents that do occur. (see Chapter 10: Hydrology, Geology	Negligible	Not significant	Near certain there will be no measurable residual negative effect at a local level

VER	Conservation value within Windy Standard III	Nature of potential pre-mitigation effect	Magnitude of pre-mitigation effect	Significance of pre-mitigation effect	Specific mitigation measure	Magnitude of residual effect	Residual significance	Level of certainty/comments
					and Hydrogeology, of the ES)			
Species								
Tall bog sedge	Regional	None predicted	Negligible	Not significant	None required	Negligible	Not significant	It is certain there will be no measurable residual negative effect at a regional level
Bat species	Roost sites – n/a Commuting habitat – Local Foraging habitat – Local	Potential risk of collision or barotrauma.	Low	Not significant	Conifer and small shrub control in areas of open ground around turbines (i.e. 70 m buffer which is not to be replanted). An appropriate mitigation strategy to be considered should bat mortality impacts be identified during operation.	Low	Not significant	Baseline bat activity surveys for Windy Standard III have shown overall bat activity levels to be very low. Should the above mitigation be implemented, it is considered probable that due to the predicted low negative impact, there will be no residual impact of significance from the operation of the proposed Development on bat species using habitats in the local environment. However, there is uncertainty in this prediction due to the expected findings of the pending Bats and Wind Turbines Project[67], the magnitude of residual impact is classed as 'Low' (probable) rather than 'Negligible' in order to adopt a precautionary approach.
Otter	Local	Disturbance; accidental pollution incident leading to contamination of watercourses.	Low	Not significant	Construction phase control measures will continue during the operational phase, such as continued run-off management and erosion control. Any maintenance works will take place during the day. Enforcing a speed limit of 15 mph for any vehicles on site, to reduce the risk of collision with protected species.	Negligible	Not significant	Mitigation measures will minimise the potential for significant effects. A measurable residual negative effect at a local level is considered unlikely. Planting of broadleaved woodland along riparian zones as part of the forestry plan for the proposed Development has the potential to positively impact on otter in the long term, through improved conditions for prey species such as fish and promoting suitable habitat for resting sites.
Red squirrel	Local	Disturbance.	Low	Not significant	Any maintenance works will take place during the day. Minimise number of site personnel and vehicles required to carry out site maintenance works, restocking of felled areas and ongoing forest management and beating up works.	Negligible	Not significant	Mitigation measures will minimise the potential for significant effects. A measurable residual negative effect at a local level is considered unlikely.
Badger	Local	Disturbance.	Low	Not significant	Any maintenance works will take place during the day. Enforcing a speed limit of 15 mph for any vehicles on site, to reduce the risk of collision with protected species.	Negligible	Not significant	Mitigation measures will minimise the potential for significant effects. A measurable residual negative effect at a local level is considered unlikely. Planting of broadleaved woodland as part of the forestry plan for the proposed Development has the potential to positively impact on badger in the long term, through improved foraging habitat.

7.11 CUMULATIVE IMPACTS

7.11.1 The context in which cumulative effects are considered depends upon the ecology of the species or habitat in question.

7.11.2 Of all protected mammal species observed, bats are most likely to be affected by additional wind farm development because of the distances travelled by some species of foraging bat and the cumulative risks to bat populations as a result of barotrauma and/or collision with wind turbines during operation. Bat activity within Windy Standard III was low, and following implementation of specific mitigation measures (such as maintaining a minimum buffer of 70 m between turbine locations and forest edge habitat, a residual impact during operation is considered to be of low magnitude and not significant.

7.11.3 All developments currently operational, under construction, consented or with planning applications currently submitted to the local planning authority, within 10 km of Windy Standard III, were considered as part of the assessment of cumulative impacts (other than those of less than three turbines). Within this search area there are a total of 13 developments that have been included in the cumulative impact assessment. Cumulative impact assessments may be complicated by availability of Environmental Statements and Appraisals for consented sites and, where this information is available, survey periods and methodologies may differ between sites; furthermore, some schemes may have been in existence for many years, and thus contemporary data may not be available. There was no environmental impact assessment information publically available for Lorg and Monquhill, both of which are at the scoping stage, and therefore scoping documents were used as part of CIA.

7.11.4 Any wind farm developments of fewer than three turbines were excluded from the cumulative impact assessment. Only VERs for which a greater than negligible residual impact is predicted are considered in the cumulative impact assessment; at Windy Standard III this comprises only wet modified bog and bats.

7.11.5 The results of the cumulative impact assessment are detailed in Table 7.21 below.

Table 7.21: Summary of residual effects of operational, under construction, consented and submitted developments within 10 km of the proposed Development

Site Description	Approximate distance from Windy Standard III	Wet modified bog	Bats (all species grouped)
Windy Standard III Development 20 turbines	N/A	Permanent loss of 6.32 ha of this habitat to construction. Mitigation measures including best practice measures during construction implemented via a CEMP (see Technical Appendix 4.1: Draft Construction Environmental Management Plan in Volume 4 of the ES), and appointment of an ECoW. Residual impacts of low adverse magnitude and not significant.	442 contacts of *Myotis* or pipistrelle were recorded during static detector surveys, and 9 during transect surveys. Mitigation measures including best practice measures during construction implemented via a CEMP (see Technical Appendix 4.1: Draft Construction Environmental Management Plan in Volume 4 of the ES), and appointment of an ECoW, and also maintaining stand-off distances between the turbines and forestry edges. Residual impacts are predicted to be of low adverse magnitude and therefore not significant.
Windy Standard II Under construction 36 turbines	1.5km	No mention of wet modified bog.	There has been no systematic survey of the fauna of the study area. Data collection has been undertaken routinely during other surveys with information gathered from other parties. No mention of bats or other species discussed in this impact assessment.
Windy Standard Operational 30 Turbines	2 km	No mention of wet modified bog.	No mention of bat species.
South Kyle Submitted 50 Turbines	4 km	0.66 ha of wet modified bog will be permanently lost to construction. Impact assessed as 'Low' and not significant. Mitigation includes micrositing of infrastructure to avoid impact on drainage, using floating tracks and defined working areas to prevent entry to sensitive habitats close to construction areas, appointment of an ECoW, application of good practice measures outlined in a CMS, production of a CEMP outlining habitat protection, management and restoration measures. An HMP is proposed with measures for improving quality of habitats on site, including bog via measures such as ditch blocking. The residual impact is then considered minor (low) and not significant.	During surveys in 2012, no likely roost sites were identified in the forestry area, but a confirmed soprano pipistrelle roost (2 bats) was found in a small building. *Myotis* and *Pipistrelle* species were identified during both transect and static detector surveys. There were 93 passes recorded during transect surveys (91 pipistrelle sp. and 2 *Myotis* sp.) and 3,501 during static detector survey (2,111 *Pipistrelle* sp. and 390 *Myotis* sp.). The majority of bat passes were of commuting bats. Receptor value classed at medium. Prior to mitigation the potential impact is considered low to negligible. Mitigation includes pre-construction roost surveys, and where disturbing roosts is unavoidable, a mitigation plan and licence will be required. Following mitigation the residual impact is considered low not significant.
Pencloe Approved 21 turbines	4 km	0.19 ha of wet modified bog will be permanently lost during construction. Compensation for this loss will be provided via a habitat management plan, with 23.6 ha of cleared forestry available for restoration of habitats including bog (via raising of water levels). Mitigation during construction will include best practice measures as outlined in a CEMP, and appointment of an ECoW. With the implementation of the proposed habitat management measures, significant positive impacts on wet modified bog are expected, outweighing the potential loss of habitat during construction.	No likely roost sites identified. The static monitoring recorded 303 bat passes in total, and identified the presence of *Myotis* bat species. Common and soprano pipistrelle were recorded during transect surveys (22 passes in total). No significant impacts are anticipated on bats during construction, the apparent absence of suitable roosting habitat within the application site suggests that individual bats only use the site for commuting or foraging. Construction will only occur during the day to reduce potential disturbance to any bats, bat buffers to forest edges will be maintained. Broadleaved planting and habitat improvements will be implemented via an HMP. Following mitigation, impacts are considered low and not significant.
Monquhill[79] Scoping 5 turbines	4 km	Wet modified bog was recorded during the extended phase one habitat survey. The habitats at this site have either been created or highly modified by human agency, this reduces their value. No further information on wet modified bog.	No likely roost sites identified, but suitable foraging and commuting habitat present. Transect and static detector surveys undertaken but results not yet reported. An HMP will be proposed as part of the ES, which will include a monitoring programme.

[79] Scoping document used as part of CIA. No EIA available

Site Description	Approximate distance from Windy Standard III	Wet modified bog	Bats (all species grouped)
Afton Approved 27 turbines	4 km	Approximately 5 ha of modified bog will be lost to construction. This is an insignificant proportion of the total area of modified bog in Ayrshire (0.016 % of 31,329 ha of blanket bog as estimated in the Ayrshire LBAP). Mitigation proposed to offset impacts to birds includes establishment of a habitat management group to agree measures to enhance the ecological value of the site. Due to the very small amount being lost, no specific mitigation measures proposed and residual effects are considered minor (negligible), and not significant.	There are no structures or trees present within the study and in the surrounding area suitable for bat roosts. *Pipistrelle* bats are likely to be present in the general area and may use the adjacent forest habitats in low densities, however there is no evidence that bats are present in the study area, therefore no further information was given or assessment carried out.
Windy Rig Submitted 25 turbines	5 km	0.039 ha of wet modified bog (0.01 % of this habitat within the survey area) will be permanently lost to construction; due to the small size of the stand it is considered to be less than local value. Mitigation measures include best practice measures to be implemented via a CEMP, and appointment of an ECoW. The magnitude of residual effects are predicted to be minor/slight (negligible) and therefore not significant.	45 bat passes were recorded during transect surveys; 44 of these were *Pipistrelle* species, and 690 bat passes were recorded during static detector surveys; 607 of these were *Pipistrelle* and 81 *Myotis* species. Prior to mitigation the magnitude of impacts to bat species are considered low and not significant. Mitigation includes reducing 'light leakage' during construction, best practice measures implemented via a CEMP and appointment of an ECoW. The magnitude of residual impacts is identified as slight and not significant, with bat activity assessed as of negligible ecological value at a cumulative scale.
Benbrack Submitted 18 turbines	6 km	2.2 ha of wet modified bog will be permanently lost to construction activities. Mitigation will include best practice measures (such as clearly defined working areas) implemented via a CEMP, and appointment of an ECoW, The magnitude of residual impacts are considered to be negligible and not significant.	Very low numbers of bats were recorded; 864 passes recorded from the static detector surveys, which included *Pipistrelle* and *Myotis* species. Bats were not assessed as VERs, but it was considered that pre-mitigation effects would be negligible and not significant. Mitigation measures proposed included best practice measures, such as clearly defined working areas, implemented via a CEMP, appointment of an ECoW, work only being carried out during daylight hours and updated bat roost survey pre-construction. The magnitude of residual effects was considered negligible and not significant.
Enoch Hill Scoping 23 turbines	6 km	The Development Site is dominated by dry modified bog, wet modified bog and marshy grassland. The areas of wet modified bog are described as small and botanically unremarkable M25, forming 12 % of the blanket mire habitats (c. 9 % of the survey area), and considered of District value. Loss of this habitat amounts to 0.64 ha of permanent loss, and a further 1.36 ha of temporary loss, which is predicted to be of negligible impact and therefore not significant even in the absence of mitigation. General mitigation and best practice (such as clearly defined working areas, habitat reinstatement measures) will be incorporated into the construction phase via a CEMP (including a Drainage Management Plan and a Pollution Prevention Plan), and appointment of an ECoW is proposed. Following these measures predicted residual impacts remain negligible and not significant.	No results are given within the Chapter and the Technical Appendix is not in the public domain. Overall bat activity levels were reported as low, however twice as much activity was recorded for Leisler's/*Nyctalus* sp. when compared to pipistrelle species. The Development Site was assessed as being of Local value to all bat species. No bat roosts were identified within the Development Site and the habitat is considered generally unsuitable for providing roosting habitat, although there were roosts identified within nearby (but >1.5 km from the nearest wind farm infrastructure). Likely bat activity within the Development Site is therefore limited to foraging and commuting which is likely to be in the lower-lying, sheltered areas of the Development Site, along edge habitats and along watercourses. Bat activity recorded during transect surveys was generally low. Bat activity (dominated by pipistrelle bats) was concentrated near the boundaries, along sheltered valleys, along watercourses within the Development Site. Mitigation measures include pre-construction surveys, sensitive timing/phasing of works, keeping artificial lighting to a minimum and ensuring it is directed away from sensitive species and habitats, SNH licence applications where appropriate, compliance with the CEMP, works to be overseen by an ECoW and adoption of best practice. Residual effects on bats were considered to be negligible for operation, to small (low) for construction and not significant.

Site Description	Approximate distance from Windy Standard III	Wet modified bog	Bats (all species grouped)
Quantans Hill Submitted 19 turbines	7.5 km	Wet modified bog was the most dominant habitat type across the proposed development. 2.34 ha of this habitat will be permanently lost to construction. Due to grazing activity and drainage modifications, these habitats have been identified as degraded and the magnitude is therefore considered minor (low) and not significant. General mitigation and best practice (such as clearly defined working areas) will be incorporated into the construction phase via a CMS, and appointment of an ECoW is proposed. The residual effects are predicted to be minor (low), and not significant.	Overall bat activity was low, 151 bat passes were recorded during transect surveys, including *Pipistrelle* and *Myotis* species (only 2 passes were *Myotis*), and a total of 1,371 bat passes were recorded from October 2011 to September 2012 collected from SM2 static bat detectors. The low levels of activity suggest the site is being used for occasional feeding or commuting and therefore impacts are considered to be minor (low) - negligible and not significant. Mitigation will include limiting work during daylight hours, where it's unavoidable to work during hours of darkness, artificial light will be kept to a minimum and avoided near woodland. Best practice measures during construction such as clearly defined working areas, CMS, and appointment of an ECoW. Residual effects are predicted to be negligible and not significant.
Ashmark Hill Submitted 7 turbines	7.5 km	Found on the tops of Ewe hill, Lamb hill and Corby Knowes. None of the bog habitat is intact but there is evidence of bog given the diverse habitat. No further mention of wet modified bog	No mention of bat species
Lorg[79] Scoping 28 turbines	8 km	Wet modified bog was recorded in the scoping report; it was located mostly on the flatter hill tops. No further information given	A likely bat roost was identified at Lorg Farm, is thought to possibly support myotis and pipistrelle bat species. Recordings of *Myotis* and *Pipistrelle* bats were recorded during automated surveys. There were very low levels of activity recorded across the open hill tops and the majority of the activity recorded at the main site is considered to represent commuting bats. With some foraging activity. Killing/ injury of foraging and commuting bats as a result of blade strikes will be resolved with relevant guidelines with regard to stand-off distances of turbines from features known to be used by bats, thereby reducing the potential for adverse effects to occur. No further information given
Hare Hill Operational 20 turbines	9 km	1.52 ha of wet modified bog will be permanently lost to construction. It is given a low (local) level of conservation importance, but is not treated as a VER and is therefore not assessed further. Mitigation includes ecological spot checks, construction areas and vegetation clearance kept to a minimum, best practice measures to be implemented via an EMP.	No likely roosts identified. In absence of suitable habitat for bats it has been concluded that it is not likely there will be any negative impacts on bats and residual impacts are considered slight (low) adverse and not significant. Mitigation includes a mammal protection plan.
Cumulative Impact Assessment		In total, from the ESs that assessed and quantified loss of wet modified bog habitat, c. 20 ha of this habitat will be lost to construction of all of the schemes assessed for this cumulative impact assessment. This represents 0.04 % of the up to 50,000 ha of blanket bog estimated to be present in Dumfries and Galloway[24], and 0.06 % of the *c.* 31,000 ha in Ayrshire[80]. Given the heavily modified and degraded nature and the low ecological value of the wet modified bog present at the majority of the schemes assessed, and the likelihood that many of them will have habitat enhancement measures associated with them (employing measures known to be successful in restoring bog habitats such as re-wetting via ditch blocking conifer regeneration control, reduction in grazing pressure), it is considered likely that there will be no cumulative negative impacts and probable overall positive impacts for this habitat in the long term.	Due to differences between all of the sites assessed; e.g. in bat survey methods (number of detectors, survey effort etc.), habitats present and assessment criteria, like for like comparison between sites is not possible. Number of bat passes recorded has therefore been used to establish broad activity levels for each site where this information was available. These figures indicate that for all of the sites within the zone of influence of Windy Standard III, bat activity levels were relatively low with the majority of the bat passes recorded being attributed to *Pipistrelle* species, which are common and widespread[57]. No significant residual effects were predicted and none of the schemes assessed are considered to be important for bat species, consisting largely of habitats which are sub-optimal for anything other than occasional foraging and commuting. Despite the uncertainty surrounding collision risk for bat species, it is considered unlikely that there will a measurable population level effect on bat species from the cumulative effects of the schemes assessed, and the impacts on the conservation status of bats as a receptor will therefore not be significant.

[80] Milne, J., Macchi, M. and Price, M.F. 2007. Effective delivery of biodiversity policy and action in the uplands of Scotland. Centre for Mountain Studies, Perth College-UHI, Crieff Road, Perth, PH1 2NX

7.12 STATEMENT OF SIGNIFICANCE

7.12.1 An assessment has been made of the potential for significant effects of Windy Standard III on habitats and non-avian species. This assessment did not identify potential significant effects (in terms of the EIA Regulations) on any receptors, even in the absence of mitigation, during the preparation, construction, operation and decommissioning of Windy Standard III:

7.12.2 By applying effective mitigation measures, mainly through the design process and following best practice guidelines during construction, the magnitude of residual effects of Windy Standard III both alone and in combination with other schemes are assessed as being low to negligible magnitude, and thus not significant in terms of the EIA Regulations.

Document history

Authors	Liz Coiffait & Emily Nelson	12/02/2015
Checked	Robin Cox	19/01/2015
Approved	Laura Turner	13/11/2015

Client Details	
Contact	Gareth Swales
Client Name	Brockloch Rig III Ltd
Address	c/o Fred. Olsen Renewables Ltd

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Chapter 8

Ornithology

Contents

Glossary

Term	Definition
Baseline	The existing conditions that prevail against which the effects of the proposed Development are compared.
Blanket Bog	Blanket bog is peatland habitat confined to cool, wet, typically oceanic climates. The term blanket 'bog' strictly applies only to that portion of a blanket 'mire'.
Environmental Impact Assessment	Environmental Impact Assessment (EIA) is a means of drawing together, in a systematic way, an assessment of the likely significant environmental effects arising from a proposed development.
Environmental Statement	A document reporting the findings of the EIA and produced in accordance with the EIA Regulations.
Habitats	The area or environment where a plant or species naturally occurs.
Mitigation	Measures, including any process, activity or design to avoid, reduce, remedy or compensate for adverse landscape and visual effects of a development.
Present Windy Standard Developments	The 'present Windy Standard Developments' refers collectively to the existing Windy Standard and the under construction Windy Standard II Wind Farms
Protected Species	Animals or plants protected by European legislation – The Conservation of Habitats and Species (Amendment) Regulations 2012 – and/or national legislation – The Wildlife and Countryside Act 1981 (as amended).
Site of Special Scientific Interest	SSSIs are protected areas that represent the UK's very best wildlife and/or geological sites.
Special Area of Conservation	Special Area of Conservation, an internationally important area for nature conservation designated under The Conservation of Habitats and Species (Amendment) Regulations 2012.
Special Protection Area	Special Protection Area, an internationally important area for nature conservation, specifically birds, designated under The Conservation of Habitats and Species (Amendment) Regulations 2012.
Survey Area	This is the area within which ornithological baseline surveys were undertaken.
The proposed Development	The proposed Windy Standard III Wind Farm.
The proposed Development Area	The project development area within the site boundary which is subdivided into the Meaul Hill Cluster and Waterhead Hill Cluster.

List of Abbreviations

Abbreviation	Description
AA	Appropriate Assessment
BoCC	Birds of Conservation Concern
CRM	Collision Risk Modelling
DGRSG	Dumfries and Galloway Raptor Study Group
EIA	Environmental Impact Assessment
ECoW	Environmental Clerk of Works
ES	Environmental Statement
HMP	Habitat Management Plan
IEEM	Institute of Ecology and Environmental Management
JNCC	Joint Nature Conservation Committee
LBAP	Local (Dumfries and Galloway) Biodiversity Action Plan
Natural Power	Natural Power Consultants
NHZ	Natural Heritage Zone
ODPM	Office of the Deputy Prime Minister
PAN	Planning Advice Note
PCH	Potential Collision Height
RSPB	Royal Society for the Protection of Birds
SAC	Special Area of Conservation
SBL	Scottish Biodiversity List
SPA	Special Protected Area
SPEC	Species of European Conservation Concern
SNH	Scottish Natural Heritage
SPP	Scottish Planning Policy
SSSI	Sites of Special Scientific Interest
VER	Valued Ecological Receptor
VP	Vantage Point

8.1 INTRODUCTION

8.1.1 This Chapter describes the ornithological interest at the proposed Development and assesses the predicted effects on these interests. It details the methods used to identify the baseline bird community within the proposed Development Area and surrounding locale, and the process used to determine the nature conservation value of the bird populations present. The chapter then sets out the potential effects of the proposed Development on birds during construction, operation and decommissioning, and assesses the significance of potential impacts on bird populations, including cumulative impacts, at an appropriate bio-geographic scale. An assessment of residual impacts, taking into consideration proposed mitigation measures, is also provided. Non-avian ecology is assessed in Chapter 7: Ecology, of the ES and complements this Chapter.

Key Issues

8.1.2 It is widely accepted that wind turbines present three main areas of potential risk to birds (Drewitt & Langston, 2006[1]; Band *et al*., 2007[2]).

1. Direct habitat loss resulting from the construction of a wind farm and associated infrastructure.
2. Displacement of birds from wind farms due to disturbance during the construction and operational phases; this may be temporary or permanent. Displacement can include barrier effects in which birds alter their migration flyways or local flight paths to avoid a wind farm.
3. Death due to collision (or interaction) with rotating turbine blades, overhead wires, guy lines and fencing. Collision risk depends on a range of factors related to the species, numbers and behaviour of birds, weather conditions and topography, and the nature of the wind farm itself, but is generally considered to be of particular relevance for sites located in areas known to support raptors or large concentrations of wildfowl.

8.1.3 These issues are considered in this assessment (Section 8.4 below).

8.1.4 The potential key ornithological issues relating to the proposed Development are as follows:

- The potential for the proposed Development to adversely affect the conservation status of raptor and owl species afforded the highest level of statutory protection via inclusion in Annex I of the Birds Directive and/or Schedule 1 of the Wildlife & Countryside Act 1981 (as amended).
- The potential for the proposed Development to adversely affect the conservation status of breeding black grouse or waders, through habitat loss, disturbance and displacement, and collisions with the turbines.
- The potential for the proposed Development to adversely affect the conservation status of wildfowl such as geese due to the risk of turbine collisions as they fly through the area on migration or while commuting locally.
- The potential for the proposed Development to adversely affect the conservation status of rare or vulnerable breeding passerines, primarily through habitat loss, disturbance and displacement.
- The potential for the proposed Development to adversely affect the bird populations at local sites of international or national importance designated for their ornithological features.

Changes to Development Boundary

8.1.5 The boundary parameters of the proposed Development changed during the scheme evolution, resulting in the earlier ornithological survey areas extending beyond the proposed Development Area as shown in ES Figure 8.1 in Volume 3 of the ES. The changes also resulted in changes to VP locations, as discussed in Section 8.2.

[1] Drewitt, A.L. & Langston, R.H.W. 2006. Assessing the impacts of wind farms on birds. Ibis, 148: 29-42.

[2] Band, W., Madders, M. & Whitfield, D.P. 2007 Developing field and analytical methods to assess avian collision risk at wind farms. In de Lucas, M., Janss, G. & Ferrer, M. (eds.) Birds and Wind Power. Quercus, Madrid.

Terminology

8.1.6 The ornithology survey areas are shown on ES Figure 8.1 in Volume 3 of the ES, and VP locations and viewsheds are shown on ES Figure 8.2 in Volume 3 of the ES.

8.1.7 The following areas are defined within this chapter and its appendices:

- **'proposed Development Area'**: the project development area within the site boundary which is subdivided into two turbine clusters. **'Turbine clusters'**: the two turbine clusters (Meaul Hill Cluster and Waterhead Hill Cluster) that, together, comprise the '**proposed Development**'.
- '**Original site boundary**': the original site boundary, which comprised a larger area than the proposed Development Area (made up of three turbine areas, including the two current ones). Some of the earlier ornithology surveys were based on this area (see Chapter 3: Design Evolution and Alternatives, of the ES).
- '**Survey area**': this is the area within which ornithological baseline surveys were undertaken, comprising the following (see ES Figure 8.1 in Volume 3 of the ES):
  - **Vantage Point (VP) surveys**: viewsheds extended to 2.0 km from VP locations (see ES Figure 8.1 in Volume 3 of the ES);
  - **Barn owl (*Tyto alba*) surveys**: all suitable roosting and breeding habitat within 1.0 km of the original site boundary (see ES Figure 8.1 in Volume 3 of the ES);
  - **Black grouse (*Tetrao tetrix*) surveys**: all suitable lekking habitat within 1.5 km of the original site boundary (see ES Figure 8.1 in Volume 3 of the ES);
  - **Breeding raptor surveys**: all suitable breeding habitat within 2.0 km of the proposed Development Area (see ES Figure 8.1 in Volume 3 of the ES); and
  - **Upland breeding bird survey**: all areas of open ground within the proposed Development Area (see ES Figure 8.1 in Volume 3 of the ES).
- '**Collision risk zone'**: This is the area derived by applying a buffer around each turbine with a radius equal to the length of the turbine blades, plus an additional precautionary 200 m.

8.2 METHODS

8.2.1 Consultation with Scottish Natural Heritage (SNH) regarding the ornithological assessment of the proposed Development was undertaken by Natural Power Consultants (Natural Power) in 2009-2010 and in 2012. This latter consultation took place via email in October 2012 (Natural Power email to SNH, dated 25/10/2012). Christine Welsh of SNH (Operations Officer, Southern Scotland) provided a response to Natural Power via email on 09/11/2012, as summarised in Table 8.1. SNH were also provided with a detailed breakdown of the VP work undertaken to date in a pre-EIA Ecology Review in May 2014.

8.2.2 In addition, a scoping document was issued to a wide range of consultees in March 2014, which included summaries of the ornithology survey methods and initial results. All consultee responses relevant to ornithology are summarised in Table 8.2.

Table 8.1: Summary of SNH response to the ornithological assessment of the proposed Development (November 2012)

ORNITHOLOGY ELEMENT	SUMMARY OF SNH RESPONSE	ACTION UNDERTAKEN
Black grouse	Data up to five years old is acceptable; the 2009-10 black grouse data were collected within this period, therefore SNH did not require further data.	None required
VP locations	VP locations missed some of the proposed turbine areas due to the site topography and density of trees. From VPs 4 and 5, birds should be visible flying in and out of the dead ground and there was no evidence of significant numbers of target species flying into this area. As there was no alternative VP location and only low levels of bird activity, SNH considered the data sufficient to inform the assessment.	None required
VP methods and work undertaken	A breakdown of VP work has not been provided; SNH were therefore unable to check the method, and could not confirm that VP surveys had been done satisfactorily.	SNH were provided with a detailed breakdown of the VP work undertaken to date in a pre-EIA Ecology Review (Natural Power, 2014[3]). SNH confirmed via email that survey effort was sufficient to inform the assessment (John Gibson; 28/05/2014).
Breeding raptor surveys	Previous SNH advice was that sufficient breeding raptor surveys and breeding bird surveys had not been carried out. Although additional VP surveys had since been undertaken, advised that this did not allow an assessment of breeding raptors in the wider area (within 2 km of the proposed Development). Advised that breeding raptor surveys within 2 km of the proposed Development were required (following Hardey *et al*., 2009[4]).	Breeding raptor surveys within 2 km of the proposed Development were undertaken during the 2013 breeding season (using a combination of VP surveys and walkovers, along with specific surveys for merlin, *Falco columbarius*).
Merlin and goshawk (*Accipiter gentilis*) potential nest sites	Stated that, at the time of consultation, one potential merlin nest site had been identified and there was potential for additional merlin and goshawk nest sites within 2 km of the proposed Development. Further stated that this should be quantified and assessed, since merlin and goshawk activity may be hard to detect via VP surveys and the absence of flight lines does not mean an absence of breeding birds in the vicinity. Recommended a complete survey of breeding raptors within 2 km of the proposed Development.	As above.
Barn owl	Noted that the barn owl survey did not follow methods outlined in Hardey *et al*., (2009)4.	An initial check for evidence of barn owl occupation and breeding was undertaken in April 2009. Repeat barn owl nest checks were undertaken in May and June 2012. SNH confirmed via email that survey effort was sufficient to inform the assessment (John Gibson; 28/05/2014)
Breeding bird surveys of open ground.	Recommended that breeding bird surveys of open areas should be carried out as per SNH guidance.	Breeding bird surveys of open ground were undertaken during the 2013 breeding season.

Table 8.2: Consultation responses to scoping report (with relevance to ornithology)

CONSULTEE	RESPONSE DATE	ISSUES RAISED AND RECOMMENDATIONS	RESPONSE
SNH	15/04/2014	Noted that ornithological survey work was largely complete at the time the Scoping Report was submitted. Stated that ornithology survey methods appeared to have followed SNH guidance, and that SNH therefore had nothing further on which to comment, although brief discussions had taken place with Natural Power who provided SNH with additional information on which to base their response.	N/A

[3] Natural Power. 2014. Windy Standard III, Confidential Pre-EIA Ecology Review. Document Reference: 1032387

[4] Hardey, J., Crick, H., Wenham, C., Riley, H., Etheridge, B. & Thompson, D. 2009. Raptors: A Field Guide For Surveys and Monitoring, 2nd Edition. The Stationery Office. Edinburgh.

CONSULTEE	RESPONSE DATE	ISSUES RAISED AND RECOMMENDATIONS	RESPONSE
Royal Society for the Protection of Birds (RSPB)	22/04/2014	<u>VP surveys</u> Stated that, in general, the level of VP surveys has been sufficient to record the level of ornithological interest at the proposed Development. Further stated that, although it is unfortunate that the VP survey data are now four years out of date, it was acknowledged that more recent survey work has been carried out following advice from SNH (as summarised in Table 8.1), in order to more fully assess the raptor interest at the proposed Development.	N/A
		Noted that on two occasions (23 & 26/04/2013) the walkover raptor survey work coincided with the raptor VP surveys, which may have compromised survey results as surveyors on foot could have influenced flight behaviour across the site. However, since details of viewsheds were not provided in the scoping report, the RSPB were unable to assess whether this factor is likely to have affected the assessment of potential impact of the proposed Development on ornithological receptors. Advised that full detail of VP watches, including clear viewshed maps, is provided as part of the Environmental Statement (ES).	Viewsheds are shown in ES Figure 8.2 in Volume 3 of the ES and full details of VP surveys are provided in Technical Appendix 8.1: Ornithology Technical Appendix in Volume 4 of the ES. There was no overlap between raptor walkover survey areas and the viewsheds of VP 4 and 5 on 23 & 24/04/2013. As such, the survey results are unlikely to be compromised. It must also be noted that the proposed Development Area is located within commercial forestry plantation with activity (planting and felling) happening at all times and there is, to an extent, always a degree of disturbance as baseline.
		<u>Raptor surveys</u> Noted that, with the exception of peregrine (*Falco peregrinus*) and merlin, the level of raptor flight activity and nest detection recorded at the proposed Development was low. Also noted that survey work had identified breeding merlin 2 km south of the proposed Development Area in 2012, and that potential signs of breeding merlin were recorded during the 2013 breeding raptor surveys within 100 m of the proposed	Note that, although merlin potentially bred within 2 km of the proposed Development in 2012, no nest was located during a specific survey for this species and breeding was not confirmed. Furthermore, no activity was detected after 11/07/2012, indicating that any breeding attempt may have been unsuccessful. In addition, there was no evidence to suggest that merlin bred within the raptor survey area in 2013.
		locations of the southern turbines, whilst the Dumfries and Galloway Raptor Study Group (DGRSG) confirmed the presence of two peregrine nest sites within 5 km of the proposed Development Area.	
		Further noted that peregrine collisions have been reported at wind farm sites in Scotland and requested that full consideration is given to potential collision impacts on peregrine and merlin, with a clear summary of the assessment presented in the ES.	Collision risk has been assessed for peregrine and merlin. See Section 8.4 below for further details.
		<u>Black grouse</u> Stated that the proposed Development falls within a known breeding area for black grouse and noted that the 2010 lek surveys identified the presence of four lek sites in the vicinity of the proposed Development, and that five black grouse flights were recorded during VP surveys in 2009-10. Welcomed the inclusion of specific black grouse surveys and assessment of potential impacts on this species. Further welcomed confirmation that subsequent design refinement has included the removal of a turbine at Dodd Hill to mitigate potential impact to black grouse species in this area.	Further measures have been proposed to mitigate for potential disturbance to black grouse, including exclusion zones around any active lek sites. No development at Dodd Hill is now proposed as part of this application.
		<u>Collision risk assessment</u> Raised concerns that the turbine layout changed between VP survey years (2009-10 and 2012-13). Although the Scoping Report suggests that this will not have any implications for the relevance of survey work undertaken in 2013, highlighted the need to fully address this issue through collision risk analysis to ensure that the results of the ornithological survey work are fully assessed in relation to the final design of the proposed Development. Requested that full details of the collision risk model and analysis, including flight line maps for all species, is provided as part of the ES to enable full verification of assessment of impact made. Highlighted the potential issue with assessing the proposed Development based on a design that has two turbine	Very low numbers of target species flights were recorded within the collision risk zone at potential collision height. Flight lines are presented in ES Figures 8.4, 8.5, 8.6, 8.8 and 8.9 in Volume 3 of the ES and in the Confidential Ornithology Appendix (ES Figure 8B.2). The effects of collision have been assessed in Section 8.4 including justification for collision risk modelling not being required.

CONSULTEE	RESPONSE DATE	ISSUES RAISED AND RECOMMENDATIONS	RESPONSE
		clusters more than 2 km apart and requested that this factor is fully considered through the Environmental Impact Assessment (EIA) process.	
		Habitat Management Plan (HMP) Stated that habitat management, proposed as part of any enhancement or mitigation measures, are expected to be included within the ES.	Since no significant effects are predicted for any receptor, an HMP has not been proposed. Mitigation measures are outlined in Section 8.5 below.

Legislation and Guidance

8.2.3 The ornithological baseline surveys and assessment have been carried out with reference to a number of national policy documents, as addressed in Chapter 2: Planning and Policy Context and Chapter 7: Ecology, of the ES. Legislative and guidance documents with relevance to ornithology are listed below:

Legislation

- Directive 2009/147/EC on the Conservation of Wild Birds (the Birds Directive);
- Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora (the Habitats Directive);
- The Conservation (Natural Habitats, &c.) Regulations 1994 (as amended) (the Habitats Regulations), which transposes the Habitats Directive into UK law;
- The Conservation (Natural Habitats, &c.) (Amendment) Regulations 2007;
- The Conservation of Habitats and Species (Amendment) Regulations 2012, relating to reserved matters in Scotland;
- Wildlife and Countryside Act 1981 (as amended);
- The Nature Conservation (Scotland) Act 2004;
- The Wildlife and Natural Environment (Scotland) Act 2011; and
- The electricity works (Environmental Impact Assessment) (Scotland) Regulations 2000 and Amendment Regulations 2008.

National Policy Guidance

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

Other Guidance

- Guidelines for Ecological Impact Assessment in the United Kingdom (Institute of Ecology and Environmental Management, 2006)[5];
- Survey methods for use in assessing the impacts of onshore wind farms on bird communities (SNH, 2005; revised 2010)[6, 7];
- Recommended bird survey methods to inform impact assessment of onshore wind farms (SNH, 2013a; revised 2014[8]);
- Bird Monitoring Methods (Gilbert *et al*., 1998[9]);
- Raptors: A Field Guide to Survey and Monitoring (2nd edition; Hardey *et al*., 20094);
- Birds and Wind Farms: Risk Assessment and Mitigation (de Lucas *et al*., 2007[10]);
- Developing field and analytical methods to assess avian collision risk at wind farms (Band *et al*., 20072);
- Assessing significance of impacts from onshore windfarms on birds outside designated areas (SNH, 2006[11]);
- Monitoring the impacts of onshore wind farms on birds (SNH, 2009a[12]);
- Guidance on methods for monitoring bird populations at onshore wind farms (SNH, 2009b[13]);
- Assessing the cumulative impact of onshore wind energy developments (SNH, 2012[14]);
- Assessing connectivity with Special Protection Areas (SPAs) (SNH, 2013b[15]);
- Good Practice during Wind Farm Construction (Scottish Renewables *et al*., 2010[16]);
- Birds of Conservation Concern 3: the population status of birds in the United Kingdom, Channel Islands and the Isle of Man (Eaton *et al*., 2009[17]);
- The Local (Dumfries and Galloway) Biodiversity Action Plan (LBAP); and
- Scottish Biodiversity List (SBL).

Desk Study

8.2.4 A desk study was undertaken to collate relevant survey data, public domain survey data, scientific publications, grey literature, and the outcome of consultations. The purpose of the desk study was to provide information on bird populations in and around the proposed Development, and to identify target species for baseline surveys. This information, combined with baseline survey results, was utilised to put the populations of target bird species recorded at the proposed Development into context in terms of their regional importance.

8.2.5 Primary sources of contextual data were as follows:

[5] IEEM. 2006. Institute of Ecology and Environmental Management Guidelines for Ecological Impact Assessment in the United Kingdom.

[6] SNH 2005; revised in 2010. Survey methods for use in assessing the impacts of onshore windfarms on bird communities. SNH, Battleby.

[7] Since much of the ornithological survey programme took place prior to the publication of revised methodology guidance (SNH, 2013a; revised 2014) previous guidance has also been referred to (SNH, 2005; revised 2010).

[8] SNH. 2013a; revised 2014. Recommended bird survey methods to inform impact assessment of onshore wind farms. SNH, Battleby.

[9] Gilbert, G., Gibbons, D.W. & Evans, J. 1998. Bird Monitoring Methods. RSPB, Sandy.

[10] de Lucas, M., Janss, G. & Ferrer, M. (eds.) 2007. Birds and Wind Power. Quercus, Madrid.

[11] SNH. 2006. Assessing significance of impacts from onshore windfarms on birds outside designated areas. SNH, Inverness.

[12] SNH. 2009a. Monitoring the impact of onshore wind farms on birds (Guidance note). Scottish Natural Heritage, Edinburgh, Scotland.

[13] SNH. 2009b. Guidance on methods for monitoring bird populations at onshore wind farms.

[14] SNH. 2012. Assessing the cumulative impact of onshore wind energy developments. SNH.

[15] SNH. 2013b. Assessing connectivity with Special Protection Areas (SPAs) (Guidance note). SNH.

[16] Scottish Renewables, Scottish Natural Heritage, Scottish Environment Protection Agency, Forestry Commission Scotland. 2010. Good practice during windfarm construction.

[17] Eaton, M.A., Brown, A.F., Noble, D.G., Musgrove, A.J., Hearn, R.D., Aebischer, N.J., Gibbons, D.W., Evans, A. & Gregory, R.D. 2009. Birds of Conservation Concern 3: the population status of birds in the United Kingdom, Channel Islands and Isle of Man. British Birds, 102: 296–341.

- The Birds of Scotland (Forrester *et al*., 2007[18])
- Dumfries and Galloway Bird Report 2012 (Chambers & Youdale, 2014[19])
- Scottish Raptor Monitoring Scheme Report 2013 (Challis *et al*., 2014[20])

Existing Records

8.2.6 Data from the existing Windy Standard and the under construction Windy Standard II Wind Farms (present Windy Standard Developments) and the neighbouring Windy Rig Wind Farm were available in the form of ES sections.

8.2.7 In addition, requests were made to the DGRSG, the RSPB, and the county bird recorder during December 2014 for updated records of target species within 5 km of the proposed Development Area.

Statutory Sites

8.2.8 A search was made for all sites with an international, national or local authority designation for ornithological interests. This included SPAs, Ramsar sites, and Sites of Special Scientific Interest (SSSIs) within a 25 km radius of the proposed Development Area; those sites within 10-25 km of the proposed Development were only considered if geese were listed as a qualifying feature. This distance was considered appropriate for geese based on published information on maximum distances travelled by wildfowl between roost sites and foraging areas (e.g. Giroux & Patterson, 1995[21]), and exceeds the core winter foraging range for pink-footed goose (*Anser brachyrhynchus*) and greylag goose (*Anser anser*) of 15-20 km cited in SNH guidance (SNH, 2013b[15]). The following sources were accessed to obtain information on designated sites:

- Joint Nature Conservation Committee (JNCC) website (http://www.jncc.gov.uk) and;
- SNH Sitelink website (http://gateway.snh.gov.uk/sitelink/index.jsp).

Target Species

8.2.9 SNH guidance (SNH, 2013a8) suggests that assessment of the effects of wind farms on birds should, in most circumstances, be limited to those protected species and other species of conservation concern that, as a result of their flight patterns or response behaviour, are likely to be affected by or subject to significant and adverse impacts from wind farms. The guidance states that there are three overarching lists describing protected species and species of conservation concern:

- Species listed in Annex I of the Council Directive 2009/147/EC on the Conservation of Wild Birds.
- Species protected under Schedule 1 of the Wildlife & Countryside Act 1981 (as amended).
- Red-listed Birds of Conservation Concern (BoCC).

8.2.10 In addition, special consideration should be given to LBAP priority species, SBL species and any other species of which the proposed wind farm hosts a particular concentration.

8.2.11 Within these lists, greatest attention should be paid to those species most likely to be affected by wind farms, such as raptors and species that are not manoeuvrable in flight (e.g. geese and swans), as these species are considered to be particularly vulnerable to collision risk.

8.2.12 Such species are termed ‘target species’.

8.2.13 Upland breeding passerines, including those on the UK BoCC Red list, are not currently thought to be particularly susceptible to impacts from wind farms, and thus do not require special consideration.

8.2.14 Proposed wind farm sites may differ considerably in their ornithological sensitivity; SNH guidance (SNH, 2013a8) therefore recommends that survey programmes and the level of survey effort should be tailored to an individual site’s needs.

8.2.15 The following target species were identified at the proposed Development:

- All wild goose, swan and duck species (except mallard *Anas platyrhynchos*);
- All raptors and owls listed on Annex I of the Birds Directive or Schedule 1 of the Wildlife and Countryside Act 1981 (as amended);
- All wader species; and
- Black grouse.

8.2.16 Secondary species included the following:

- All other waterfowl (e.g. mallard and grey heron *Ardea cinerea*);
- All other raptor species;
- Raven (*Corvus corax*); and
- Any large aggregations of red-listed passerines.

Ornithological Survey Programme

8.2.17 In order to assess the potential effects of a wind farm on birds, both the value of the site itself to birds and the level of flight activity within and around the site should be determined. In view of the target species identified as potentially occurring within the proposed Development Area, and following consultation with SNH, the surveys listed below were undertaken, in line with SNH guidance that was current at the time of survey (SNH, 2005; 2010[6]; 2013a[8]).

- VP surveys: April 2009 to August 2010 (inclusive);
- Barn owl survey: 2009 and 2012;
- Black grouse lek survey: 2009 and 2010;
- Breeding raptor surveys: 2012 and 2013; and
- Breeding bird survey of open ground: 2013.

Baseline Surveys

8.2.18 A summary of each baseline ornithology survey method provided below, with further details of survey timings, weather conditions and, where necessary, survey methods, provided in Technical Appendix 8.1: Ornithology Technical Appendix in Volume 4 of the ES.

Vantage Point Surveys: 2009-10

8.2.19 Flight activity surveys from VP locations were carried out following methods advocated by SNH guidance that was current at the time of survey (SNH, 2005; 2010[6]). This method focuses on identifying flight-paths and flight heights of target species, such as waterfowl and raptors, and allows any regular patterns of flight lines to be identified, allowing turbine locations to be designed to minimise collision risk to birds. The data generated can also be used to estimate the theoretical collision risk of a particular species.

8.2.20 Flight activity of secondary species, i.e. species such as kestrel (*Falco tinnunculus*) that are considered to be of lower conservation concern than target species, was also summarised during each VP survey.

[18] Forrester, R.W., Andrews, I.J., McInerny, C.J., Murray, R.D., McGowan, R.Y., Zonfrillo, B., Betts, M.W., Jardine, D.C. & Grundy D.S. (eds). 2007. The Birds of Scotland. The Scottish Ornithologists’ Club, Aberlady.

[19] Chambers, G. & Youdale, M. (eds.) 2014. Birds in Dumfries and Galloway 2012. Dumfries and Galloway Bird Report (No. 23). Scottish Ornithologists Club Dumfries and Galloway Branches.

[20] Challis, A., Holling, M., Stevenson, A., Roos, S., Stirling-Aird, P. & Wilson, M. 2014. Scottish Raptor Monitoring Scheme 2013. Scottish Raptor Study Groups.

[21] Giroux, J-F. & Patterson, I.J. 1995. Daily movements and habitat use by radio-tagged pink-footed geese *Anser brachyrhynchus* wintering in north-east Scotland. Wildfowl 46, 31-44.

8.2.21 All incidental records of target species (i.e. birds that were not in flight, birds that were heard but not seen, birds that were observed well beyond the survey area and records outside of the formal VP surveys) were also recorded.

8.2.22 VP surveys commenced in April 2009 and initially comprised the following three locations that provided a view over the original site boundary:

- VP 1: 259467 603697
- VP 2: 262032 604242
- VP 3: 256431 603458

8.2.23 However, in September 2009, a reduction in the development boundary led to changes to the VP locations. Surveys from VP 1 continued, but VPs 2 and 3 were replaced with three new locations from September 2009 until August 2010. During consultation following a pre-EIA Ecology Review (Natural Power, 20143), SNH confirmed via email that data gathered from these VP locations would be sufficient to inform an assessment despite the changes (John Gibson; 28/05/2014). The coordinates of the new locations were as follows:

- VP 4: 254400 600400
- VP 5: 258900 599600
- VP 6: 258452 597778

8.2.24 A summary of the monthly, seasonal and total survey effort is provided in Table 8.3 below. During the winter of 2009-2010, weather conditions presented a constraining factor to the VP surveys, with heavy snowfall restricting access to VP locations from December 2009 to March 2010, resulting in a shortfall of survey hours during the non-breeding season. SNH confirmed via email that survey effort was sufficient to inform the assessment (John Gibson; 28/05/2014).

8.2.25 For the purposes of the collision risk assessment, only data collected during the VP surveys (September 2009 to August 2010) and the breeding raptor VP surveys (2012 and 2013) from VPs 1 and 5 were considered. Flight data recorded during the earlier VP surveys (hereafter referred to as preliminary VP surveys) are presented separately, to provide contextual information.

8.2.26 All six VP locations and viewsheds are shown in ES Figure 8.2 in Volume 3 of the ES.

Table 8.3: Summary of VP survey effort by month

YEAR	SEASON	MONTH	LOCATION USED THROUGHOUT SURVEY PERIOD	PRELIMINARY VP LOCATIONS (UNTIL SEP 2009)		REVISED VP LOCATIONS (FROM SEP 2009)		
			VP 1	VP 2	VP 3	VP 4	VP 5	VP 6
2009	Breeding season	April	12	12	12	-	-	-
		May	3	-	6	-	-	-
		June	3	3	6	-	-	-
		July	6	15	9.5	-	-	-
		August	9	9.5	3	-	-	-
Total survey effort			**33**	**39.5**	**36.5**	**-**	**-**	**-**
2009	Non-breeding season	September	9	4	-	-	-	4
		October	3	-	-	3	-	-
		November	9.5	-	-	6	9	10.67
		December	4	-	-	4.5	4.5	4.5
		January	-	-	-	11	-	10
		February	3	-	-	6	9.25	-
		March	-	-	-	3	7.5	5
Total survey effort			**28.5**	**4**	**-**	**33.5**	**30.25**	**34.17**
2010	Breeding season	April	-	-	-	3	6	-
		May	6	-	-	9	6	6
		June	12	-	-	12	-	6
		July	6	-	-	-	12	12
		August	12	-	-	12	12	12
Total survey effort			**36**	**-**	**-**	**36**	**36**	**36**

Barn Owl Survey: 2009 and 2012

8.2.27 A barn owl survey was undertaken in 2009 and 2012. This included a desk-based review of existing information to identify possible barn owl nesting sites (e.g. uninhabited roofed buildings, outhouses, barns etc.) located within 1 km of the proposed Development Area. Of the buildings identified within the search area, three were considered to be potentially suitable for breeding barn owl; the locations are provided in ES Figure 8B.1 of the Confidential Ornithology Appendix. The three buildings were checked for evidence of barn owl occupation and breeding in April 2009, with repeat barn owl nest checks undertaken in May and June 2012. SNH confirmed via email that survey effort was sufficient to inform the assessment (John Gibson; 28/05/2014)

Black Grouse Lek Surveys: 2009 and 2010

8.2.28 Surveys for lekking black grouse were carried out in 2009 and 2010 following the National Black Grouse Survey Instructions (Etheridge & Baines, 1995[22]) summarised in Gilbert *et al*. (1998)[9].

8.2.29 **2009 Survey**: in 2009 an initial survey visit was made in early April to assess areas of suitable black grouse lekking habitat within 1.5 km of the original site boundary. All areas of suitable habitat identified were then revisited 1-2 times around the hours of dusk or dawn in mid-April to identify whether lekking males were present. Further details of survey visits are provided in Technical Appendix 8.1: Ornithology Technical Appendix in Volume 4 of the ES.

8.2.30 **2010 Survey**: a repeat black grouse survey was carried out in 2010, following further revisions to the site boundary. This survey covered an extended area (compared with 2009), as shown in ES Figure 8.1 in Volume 3 of the ES. All areas of suitable lekking habitat within the survey area were visited 1-2 times around the hours of dawn between late April and mid-May. Where a lek site was detected, lekking males and any females attending the site were observed from a suitable VP, and the numbers of birds counted. Further details of survey visits are provided in Technical Appendix 8.1: Ornithology Technical Appendix in Volume 4 of the ES.

Breeding Raptor Surveys: 2012 and 2013

8.2.31 To provide a comprehensive assessment of breeding raptor activity within 2 km of the proposed Development Area, breeding raptor surveys were carried out during the breeding seasons of 2012 and 2013.

[22] Etheridge, B and Baines, D (1995) Instructions for the Black Grouse Survey 1995/6: a joint RSPB/GCT/JNCC/SNH project. Unpublished.

8.2.32 A combination of VP and walkover surveys was undertaken. In addition, specific surveys for breeding merlin were carried out. All surveys followed the methods described in Hardey *et al*., (2009)4, as advocated by SNH (SNH, 2013a[8]), and were carried out under a Schedule 1 Licence by suitably experienced surveyors. Details of all target species flights (including height, duration and the number of birds) were recorded, with flight lines recorded on 1:10,000 scale field maps.

8.2.33 **VP surveys**: VP surveys were carried out throughout the 2012 breeding season (late March to early September), and during the early part of the 2013 breeding season (late March and throughout April 2013) with the aim of identifying courtship displays and territorial behaviour of raptor species such as goshawk. Details of all target species flights (including height, duration and the number of birds) were recorded, with flight lines recorded on 1:10,000 scale field maps.

8.2.34 Flight activity of secondary raptor species (i.e. buzzard *Buteo buteo*, kestrel and sparrowhawk *Accipiter nisus*), and other secondary species (such as waders, red grouse *Lagopus lagopus* and raven), was summarised during each VP watch.

8.2.35 Observations of other target species (such as waders) were also recorded.

8.2.36 Details of VP locations, survey effort and weather conditions during the breeding raptor VP surveys are provided in Technical Appendix 8.1: Ornithology Technical Appendix in Volume 4 of the ES.

8.2.37 **Walkover surveys**: in addition to the VP surveys, walkover surveys were carried out each month between April and July 2013 (inclusive) to check for signs of breeding raptors and, where relevant, to locate nest sites. Although searches focussed on areas identified during the VP surveys as potentially occupied by breeding raptors, all areas identified as providing suitable nesting habitat were surveyed, regardless of whether or not VP surveys indicated raptor occupancy. Details of survey dates and times are provided in Technical Appendix 8.1: Ornithology Technical Appendix in Volume 4 of the ES.

8.2.38 **Breeding merlin surveys**: specific surveys for breeding merlin were carried out in July 2012, and June/July 2013, following the method described in Hardey *et al*., (2009)4. This involved surveyors checking forest rides and edges within the breeding raptor survey area for signs of breeding activity, such as nests, plucking posts and direct visual/auditory observations of birds. Details of the breeding merlin survey dates, times and weather conditions are provided in Technical Appendix 8.1: Ornithology Technical Appendix in Volume 4 of the ES.

8.2.39 **Peregrine nest check**: two peregrine nest sites were identified by the DGRSG within 5 km of the proposed Development Area. These were checked for signs of breeding activity on 02/05/2012 and 03/05/2012. As a peregrine was observed at one of the sites visited, this location was monitored for further signs of activity during a walkover survey on 12/06/2012 and revisited on 14/06/2012. Due to the sensitive nature of this information, further details of the nest check are presented in the Confidential Ornithology Appendix.

Upland Breeding Bird Survey (Open Areas): 2013

8.2.40 An upland breeding bird survey of open habitats within the Waterhead Hill Cluster was undertaken between late April and early July 2013 (ES Figure 8.1 in Volume 3 of the ES; there is no open ground within the Meaul Hill Cluster). The survey method was based on Brown & Shepherd (1993)[23]; this is a generic method to survey upland breeding waders, which is commonly adapted to include other moorland species such as passerines. SNH confirmed via email that they were satisfied with this survey approach during consultation in 2014 (John Gibson; 28/05/2014).

8.2.41 The survey involved a single surveyor walking the areas of open ground, recording the location and behaviour of all birds seen and heard on 1:10,000 scale maps. In line with revised SNH guidance (SNH, 2013a[8]), four visits were carried out. Details of survey dates, times and weather conditions during the surveys are provided in Technical Appendix 8.1: Ornithology Technical Appendix in Volume 4 of the ES.

[23]Brown, A. F. & Shepherd, K. B. 1993. A method for censusing upland breeding waders. Bird Study, 40: 189-195.

8.2.42 Birds were confirmed as having bred if young, eggs or nests were observed. Birds displaying breeding behaviour within a territory during more than one visit were assessed as breeding; except for species which can be under recorded e.g. snipe and common sandpiper where displaying breeding behaviour within a territory during a single visit only were assessed as breeding. Further details of the territory mapping analysis methods are provided in Technical Appendix 8.1: Ornithology Technical Appendix in Volume 4 of the ES.

Collision Risk Modelling

8.2.43 Collision risk modelling (CRM) is used to predict the number of individuals per target species that might collide with the wind turbine rotors. This is undertaken when sufficient flight activity occurs within the collision risk zone at Potential Collision Height (PCH; 43-177.5 m). Sufficient flight activity was defined as ≥ 3 flights or ≥ 10 individuals at PCH in the collision risk zone. No species met these criteria and as such, CRM was not undertaken.

8.2.44 The number of target species flights and individuals recorded during the VP surveys (September 2009 to August 2010) and the breeding raptor VP surveys (2012 and 2013) that passed through the collision risk zone are summarised in Section 8.3 (Table 8.10 below).

Impact Assessment

8.2.45 This section summarises how the significance of effects on the ornithological interests within the proposed Development Area was assessed.

8.2.46 The approach taken to the assessment of ornithological impacts followed the guidance produced by the Institute of Ecology and Environmental Management (IEEM, 20065). These guidelines set out the process for assessment through the following stages:

- Describing the ornithological baseline in the zone of influence through survey and desk study.
- Identifying Valued Ecological Receptors (VERs): these are the species, habitats and designated sites of highest ornithological value present in the zone of influence.
- Determining the nature conservation value of the VERs present within the zone of influence that may be affected by the development.
- Identifying and characterising the potential impacts on these VERs, based on the nature of the construction, operation and decommissioning activities associated with the development.
- Determining the magnitude of the impacts including consideration of the sensitivity of the receptor and the duration and reversibility of the effect.
- Determining the significance of the impacts based on the interaction between the effect magnitude/duration, the nature conservation value and the likelihood of the effect occurring. In addition, sensitivity of the receptor affected is also considered for potential ornithological impacts.
- Identifying mitigation measures required to address significant adverse effects.
- Determining the residual impact significance after the effects of mitigation have been considered, including a description of any legal and policy consequences.
- Identification of any monitoring requirements.

Evaluating Ornithological Interests

8.2.47 The assessment process involves identifying VERs. These ornithological receptors and their values are determined by the criteria defined in Table 8.4 below. It should be noted that these criteria are intended as a guide and are not definitive.

Table 8.4: Approach to valuing ecological receptors

VALUE LEVEL	EXAMPLES
International	A species listed as a qualifying feature of an internationally designated site (e.g. SPA or

VALUE LEVEL	EXAMPLES
	Ramsar wetland site). A species present in internationally important numbers.
National	A species listed as a qualifying feature of a nationally designated site (e.g. SSSI). A species present in nationally important numbers. A species listed under Schedule 1 of the Wildlife and Countryside Act or Annex I of the Birds Directive.
Regional	A species occurring within SPAs, Ramsar sites and SSSIs, but not crucial to the integrity of the site. A species present in regionally important numbers. An LBAP priority species.
Local	Species described above but which are present very infrequently or in very low numbers. Other species of conservation concern, including LBAP priority species, and species included on the UK BoCC Red and Amber lists.
Negligible	All other species that are widespread and common and which are not present in locally important (or greater) numbers and which are considered to be of low conservation concern (e.g. UK BoCC Green List species).

8.2.48 The assessment of ornithological receptors recorded during the baseline surveys also considers the value of the proposed Development Area for the species under consideration, rather than only considering the nature conservation importance of the species itself. To illustrate the rationale of this approach, while hen harrier (*Circus cyaneus*) would be considered to be a species of national conservation importance using the criteria in Table 8.4 below by virtue of being a Schedule 1 species, the value of a development site which was overflown once by a single hen harrier would be limited. Therefore, in this case, nature conservation importance would be assessed as being 'Local'.

8.2.49 Therefore, while the importance of the species is taken into account, in order to assess the nature conservation importance of the site, the number of individuals of that species using it and the nature and level of this use is also taken into account. An assessment is then made of the importance of the proposed Development Area to that species.

Characterising Potential Effects on Receptors

8.2.50 Effects on VERs are judged in terms of magnitude and duration (Regini, 2000[24]).

8.2.51 Magnitude refers to the size of an impact, and is determined on a quantitative basis where possible. This may relate to the area of habitat lost to the development footprint in the case of a habitat receptor, or predicted loss of individuals in the case of a population of a particular species of bird. Magnitude is assessed within five levels, as detailed in Table 8.5 below.

Table 8.5: Criteria for assessing magnitude

EFFECT MAGNITUDE	DESCRIPTION
Very High Negative	Total or almost complete loss of a receptor resulting in a permanent adverse effect on the integrity of the receptor. The conservation status of the receptor would be affected.
High Negative	Result in large-scale, permanent changes in a receptor, and likely to change its ecological integrity. These effects are therefore likely to result in overall changes in the conservation status of a receptor.
Moderate Negative	Include moderate-scale long-term changes in a receptor, or larger-scale temporary changes, but the integrity of the receptor is not likely to be affected. This may mean that there are temporary changes in the conservation status of the receptor, but these are reversible and unlikely to be permanent.
Low Negative	Include effects that are small in magnitude, have small- scale temporary changes, and where integrity is not affected. These effects are unlikely to result in overall changes in the conservation status of a receptor.
Negligible	No perceptible change in the ecological receptor.

8.2.52 In the case of designated sites, spatial magnitude is assessed in respect of the area within the designated site boundary. For non-designated sites, spatial magnitude is assessed at an appropriate scale depending on the value of the receptor e.g. impacts on breeding bird populations are assessed in a regional context.

8.2.53 Effects and spatial magnitude are assessed within the appropriate bio-geographic regions as recommended in SNH guidance (SNH, 2006[11]). These are detailed below:

- Impacts on breeding bird populations are assessed in a regional context. The appropriate regional bio-geographic unit has been identified by SNH as Natural Heritage Zones (NHZ). NHZ classifications represent areas with a high level of bio-geographic coherence, and are unrelated to administrative boundaries. At this stage, little data on bird populations for the majority of species is available at NHZ level. The constraints of available data therefore make assessment at NHZ level difficult. The proposed Development lies within the Western Southern Uplands and Inner Solway NHZ, and regional impacts are assessed within this area as far as is practicable.
- Effects on non-breeding bird populations are assessed in a national context.
- Any potential impacts on migratory goose populations of conservation value are assessed at an international level, in context with local sites for which these species are qualifying features.

8.2.54 Duration is defined as the time over which the impact is expected to last before recovery – i.e. return to pre-construction baseline conditions (SNH, 2006[11]). This is summarised in Table 8.6 below.

Table 8.6: Criteria for describing duration

DURATION	DEFINITION
Permanent	Effects continuing indefinitely beyond the span of one human generation (taken as approximately 25 years), except where there is likely to be substantial improvement after this period (e.g. the replacement of mature trees by young trees which need > 25 years to reach maturity, or restoration of ground after removal of a development. Such exceptions can be termed "very long-term effects").
Temporary	Long-term (15 - 25 years or longer - see above) Medium term (5 – 15 years) Short-term (up to 5 years)

8.2.55 Knowledge of how rapidly the population or performance of a species is likely to recover following loss or disturbance (e.g. by individuals being recruited from other populations elsewhere) is used to assess duration, where such information is available.

[24] Regini, K. 2000. Guidelines for ecological evaluation and impact assessment. Ecology and Environmental Management. In Practice, 29 (September), pp. 1, 3-7. Winchester, Institute of Ecology and Environmental Management.

8.2.56 In addition, birds are assessed with consideration of their behavioural sensitivity and ability to recover from temporary adverse conditions. Behavioural sensitivity is determined subjectively based on the species' ecology and behaviour, using the broad criteria set out in Table 8.7 below. The judgement takes account of information available on the responses of birds to various stimuli (e.g. predators, noise and disturbance by humans).

8.2.57 It should be noted that behavioural sensitivity can differ between similar species and between different populations of the same species. Thus the behavioural responses of birds are likely to vary with both the nature and context of the stimulus and the experience of the individual bird. Sensitivity also depends on the activity of the bird, for example, a species is likely to be less adaptable to disturbance whilst breeding than at other times. In addition, individual birds of the same species will differ in their tolerance depending on the level of human disturbance that they regularly experience in a particular area, and have become habituated to (e.g. individuals that live in an area with high human population and activity levels are likely to have a greater tolerance than those that occupy remote locations with little or no human disturbance). However, tolerance is likely to increase as breeding progresses.

Table 8.7: Behavioural sensitivity of birds

SENSITIVITY	DEFINITION
High	Species or populations occupying habitats remote from human activities, or that exhibit strong and long-lasting (guide: > 20 minutes) reactions to disturbance events.
Moderate	Species or populations that appear to be warily tolerant of human activities, or exhibit short-term reactions (guide: 5-20 minutes) to disturbance events.
Low	Species or populations occupying areas subject to frequent human activity and exhibiting mild and brief reaction (including flushing behaviour) to disturbance events.

Determining Significance of Potential Ornithological Effects

8.2.58 Having followed the process of attributing a value to an ornithological receptor, determining its sensitivity, and characterising potential effects, the significance of the effect is then determined. The IEEM Guidelines (IEEM, 20065) use only two categories to classify effects: 'significant' or 'not significant'. The significance of an effect is determined by considering the value of the receptor and the magnitude of the effect and applying professional judgement as to whether the integrity of the receptor will be affected. This concept can be applied to both designated sites (for example, a SSSI) and to defined populations (for example a regional breeding curlew *Numenius arquata* population).

8.2.59 The term integrity is used here in accordance with the definition adopted by the Office of the Deputy Prime Minister (ODPM) Circular 06/2005 on Biodiversity and Geological Conservation whereby designated site integrity refers to "…*coherence of ecological structure and function…that enables it to sustain the habitat, complex of habitats and/or levels of populations of species for which it was classified*". Integrity therefore refers to the maintenance of the conservation status of a population of a species at a specific location or geographical scale.

8.2.60 Effects are more likely to be considered significant where they affect receptors of higher conservation value or where the magnitude of the effect is high. Effects not considered to be significant would be those where the integrity of the receptor is not threatened, effects on receptors of lower conservation value, or where the magnitude of the effect is low.

8.2.61 In this assessment, an effect that threatens the integrity of a receptor is considered to be significant in terms of the EIA Regulations. Effects that do not threaten the integrity of a receptor are considered as not significant in terms of the EIA Regulations.

8.2.62 Where appropriate, mitigation and/or compensation measures, including the design process, are identified in order to avoid and reduce potentially significant effects. It is also good practice to propose mitigation measures to reduce negative effects that are not significant.

8.2.63 The significance of residual impacts on receptors after the effects of mitigation have been considered can then be determined, along with any monitoring requirements (in line with the recommendations in SNH, 2009a[12]; 2009b[13]).

8.2.64 Note that a matrix system has not been used in determining significance as it is not referred to in any part of the 2006 IEEM guidance methods. This guidance seeks to determine whether an effect is either significant or not significant; this is done by looking at the integrity of the wider population. Value and magnitude are considered but so are likelihood, permanency, frequency and longevity of a given effect.

8.3 RESULTS

Desk Study

Existing Records

8.3.1 The following information was available for the present Windy Standard Developments:

- The existing Windy Standard Wind Farm ES – no information was available regarding survey methods. Further details regarding ornithological records presented in the assessment are detailed in Technical Appendix 8.1: Ornithology Technical Appendix in Volume 4 of the ES.
- Windy Standard II ES – surveys were undertaken during the pre-construction period from 1994 through to 2000 for both the existing Windy Standard Wind Farm and a larger control area. Additional breeding bird surveys were undertaken during 2001.
- Windy Standard II pre-construction survey report – pre-felling breeding bird surveys were undertaken between late March and mid-July 2013 including raptor surveys, a black grouse lek survey, common crossbill point count surveys and a survey for birds breeding in areas of open ground.

8.3.2 A range of passerines were recorded during these surveys, with the majority being common and widespread species. Further details are provided in Technical Appendix 8.1: Ornithology Technical Appendix in Volume 4 of the ES.

8.3.3 Consultation with the DGRSG returned information on two regular peregrine nest sites within the search area. Further details are provided in the Confidential Ornithology Appendix (note that precise locations were not provided).

8.3.4 No other records of nesting raptor species were returned, although it was stated that merlin and barn owl have been known to breed in the vicinity (the current status of both species in the area was unknown). It was further stated that short-eared owls (*Asio flammeus*) regularly forage and probably breed within the search area. Hen harriers occasionally forage in the area outside the breeding season, but are not known to breed. Further details are included in the Confidential Ornithology Appendix.

8.3.5 Records of protected bird species and birds of conservation concern within 5 km of the proposed Development held by the RSPB are included in Technical Appendix 8.1: Ornithology Technical Appendix in Volume 4 of the ES and Confidential Ornithology Appendix.

8.3.6 The county bird recorder confirmed that key or interesting bird records are included in the Dumfries and Galloway Bird Report, the latest version of which was consulted for the target species assessments (Section 8.4 below)

Statutory Sites

8.3.7 A single statutory site designated for ornithological features was identified within 10 km of the proposed Development Area, and a second statutory site with geese as a designated feature was identified within 25 km. Details of the two sites are provided below and the locations are shown in ES Figure 8.3 in Volume 3 of the ES.

1. **Bogton Loch SSSI** is located approximately 9.9 km to the north-west. The breeding bird assemblage within this site is a designated feature, and includes song thrush (*Turdus philomelos*), grasshopper warbler (*Locustella naevia*), spotted flycatcher (*Muscicapa striata*), willow tit (*Poecile montanus*), reed bunting

(*Emberiza schoeniclus*) and, sporadically, a small colony of black-headed gulls (*Chroicocephalus ridibundus*).

2. **Loch Ken and River Dee Marshes SPA/Ramsar site** is located approximately 22.6 km to the south of the proposed Development Area. This SPA supports internationally important overwintering populations of Greenland white-fronted goose (*Anser albifrons*) and Icelandic greylag goose.

Baseline Surveys

Preliminary VP Surveys (Apr-Sep 2009)

Target species flights

8.3.8 A total of eight flights of three target species were recorded during the preliminary VP surveys:

- **Merlin**: a single confirmed flight of a female merlin was recorded at VP 2 on 01/09/2009, and one possible merlin was recorded at VP 1 on 25/08/2009.
- **Peregrine**: five peregrine flights were recorded during the preliminary VP surveys (Apr-Sep 2009), including three flights of a pair of adults on 23/07/2009 and a single juvenile recorded on 24/07/2009 (all from VP 2), and a single bird recorded from VP 1 on 25/08/2009.
- **Golden plover** (*Pluvialis apricaria*): a single flight (3 birds) recorded from VP 1 on 31/07/2009.

Incidental records of target species:

8.3.9 In addition, there were several incidental records of peregrine (i.e. birds that were not in flight, were seen only or birds observed outside the VP viewshed). Details are summarised below:

- During a preliminary survey from VP 2 on 24/06/2009, a peregrine was heard near VP 2 at 09:40 and again at 12:47 to the south of the VP.
- During a preliminary survey from VP 2 on 02/07/2009, a peregrine was observed to the east of the application boundary over the plantation between Black Hill and Lamb Hill, where it dropped into the forest. A peregrine was also heard calling in this area several times during the VP survey.
- During a preliminary survey from VP 2 on 09/07/2009, a peregrine was heard calling to the south.
- During a preliminary survey from VP 2 on 10/07/2009, a peregrine was again heard calling but was not visible.

8.3.10 Target species flights are shown in ES Figure 8.4 in Volume 3 of the ES, with further details provided in Technical Appendix 8.1: Ornithology Technical Appendix in Volume 4 of the ES.

Secondary species

8.3.11 Seven secondary species were also observed during the preliminary VP surveys. Activity of each of these species is summarised below.

- **Sparrowhawk**: there was a single sparrowhawk record of a hunting female on 17/04/2009.
- **Buzzard**: with a total of 51 records, buzzard was the most frequently recorded secondary species during preliminary VP surveys. The highest level of buzzard activity was recorded in July.
- **Kestrel**: there were six records of kestrel during the preliminary VP surveys; all were of single birds in flight.
- **Lesser black-backed gull** (*Larus fuscus*): a single lesser black-backed gull was recorded flying south-west over the proposed Development Area during a preliminary VP survey on 19/06/2009. In addition, six adult lesser black-backed gulls together with six juveniles flew south towards Jedburgh Knees (to the east of the existing Windy Standard Wind Farm) during a preliminary VP survey on 01/09/2009.
- **Herring gull** (*Larus argentatus*): two herring gulls were recorded flying south over the Meaul Hill Cluster during a preliminary VP survey on 25/06/2009.
- **Raven**: there were 14 raven records during the preliminary VP surveys; the majority were of 1-2 birds in flight.
- **Common crossbill** (*Loxia curvirostra*): two common crossbills were heard calling whilst in flight near VP 3 on 17/04/2009.

Other species

8.3.12 Woodpigeon (*Columba palumbus*), swift (*Apus apus*) and a number of passerine species were also noted during the preliminary VP surveys. These included four species that are included on the BoCC Red list:

- Skylark (*Alauda arvensis*);
- Song thrush;
- Tree pipit (*Anthus trivialis*); and
- Lesser redpoll *(Carduelis cabaret*).

8.3.13 Other passerine species were generally common and widespread; these are listed below:

- Carrion crow (*Corvus corone*)
- Goldcrest (*Regulus regulus*)
- Coal tit (*Periparus ater*)
- Sand martin (*Riparia riparia*)
- Swallow (*Hirundo rustica*)
- House martin (*Delichon urbicum*)
- Chiffchaff (*Phylloscopus collybita*)
- Willow warbler (*Phylloscopus trochilus*)
- Wren (*Troglodytes troglodytes*)
- Blackbird (*Turdus merula*)
- Robin (*Erithacus rubecula*)
- Stonechat (*Saxicola rubicola*)
- Wheatear (*Oenanthe oenanthe*)
- Grey wagtail (*Motacilla cinerea*)
- Meadow pipit (*Anthus pratensis*)
- Chaffinch (*Fringilla coelebs*)
- Siskin (*Carduelis spinus*)

VP Surveys (Sep 2009-Aug 2010)

Target species flights

8.3.14 During the non-breeding season (Sep 2009-Mar 2010) a total of five flights of two target species were recorded during VP surveys:

- **Black grouse**: single males recorded from VP 4 on 25/11/2009, and from VP 6 on 26/11/2009 and 27/11/2009; and
- **Peregrine**: two flights of a male bird recorded from VP 1 on 17/09/2009.

8.3.15 During the breeding season (Apr-Aug 2010): a total of 27 flights of eight target species were recorded during the breeding season VP surveys:

- **Hen harrier**: a female bird recorded from VP 4 on 20/08/2010;
- **Goshawk**: a female bird recorded from VP 5 on 27/08/2010;
- **Merlin**: a male bird was recorded from VP 5 on 05/07/2010, and three flights of a female bird were recorded from VP 4 on 20/08/2010;
- **Peregrine**: three flights of single birds recorded from VP 4 in June and August 2010 were recorded. Two further flights of a male bird were recorded from VP 5 in April and August 2010 and a single flight of a male bird was recorded from VP 6 on 11/06/2010;
- **Oystercatcher** (*Haematopus ostralegus*): one flight (2 birds) recorded from VP 4 on 29/04/2010 and a single bird recorded from VP 6 on 28/05/2010;

- **Snipe** (*Gallinago gallinago*): four flights (of 1-2 birds) recorded from VP 4 in May and June 2010, and seven flights (all single birds) recorded from VP 5 in early June 2010;
- **Curlew**: a single flight (2 birds) recorded from VP 4 on 29/04/2010; and
- **Short-eared owl**: a single bird recorded from VP 1 on 25/06/2010.

8.3.16 Flight lines of target raptor species are shown in ES Figure 8.5 in Volume 3 of the ES and black grouse and wader flights are shown in ES Figure 8.6 in Volume 3 of the ES. Further details are presented in Technical Appendix 8.1: Ornithology Technical Appendix in Volume 4 of the ES.

Incidental records of target species

8.3.17 In addition, there were several incidental records of target species (i.e. birds that were not in flight, were heard only, were observed well beyond the survey area, or were observed outside of the formal VP surveys). These are summarised below:

- **Greylag goose**: a flock of 18 greylag geese was observed flying south over Laggeran Hill (to the south of the Waterhead Hill Cluster) prior to the start of a VP survey on 29/01/2010.
- **Unidentified goose species**: a very distant flock of ≥30 unidentified geese were observed flying north, to the north-northwest of the survey area on 29/01/2010.
- **Goosander** (*Mergus merganser*): a pair of goosander was observed from VP 4 moving south along the Water of Deugh on 25/11/2009. A pair of goosander was also observed over a sluice along the Water of Deugh from the same VP on 28/01/2010.
- **Black grouse**: a male black grouse was flushed from a tree at the end of a plantation ride to the west of Standing Stone Rig before the start of a survey from VP 6 on 26/11/2009. The bird flew south-west over the plantation. During the breeding season, a single lekking male black grouse was observed on Polwhat Rig on 14/05/2010, extremely close to the existing Windy Standard Wind Farm and active forest operations; a single male had been observed lekking at this location earlier on the same date during a black grouse survey visit (see below). A female black grouse was also flushed from the open ground to the west of the application boundary as a surveyor drove off site at the end of a survey from VP 1 on 26/08/2010.
- **Merlin**: a female merlin was observed as a surveyor drove off site at the end of a VP survey on 05/07/2010. A female merlin was again observed in the same area as a surveyor drove off site at the end of a VP survey on 23/08/2010.
- **Snipe**: a snipe was heard 'chipping'[25] to the east-southeast of VP 4 throughout a survey from this location on 10/06/2010, and there were several records of chipping snipe during a survey from the same VP on 10/06/2010. A snipe was also heard chipping to the south-west of VP 6 during a survey from this location on 11/06/2010.
- **Short-eared owl**: fresh owl pellets, likely to have been produced by short-eared owl were noted in the open ground to the east of the proposed Development Area during a VP survey on 04/05/2010; older pellets were also present. A short-eared owl was heard (but not seen) to the north of VP 6 on 28/05/2010.
- **Barn owl**: a barn owl was observed to the south-west of the proposed Development Area as a surveyor drove off site at the end of a VP survey at 23:40 on 11/08/2010.

Secondary species

8.3.18 Ten secondary species were also observed during the VP surveys. Activity of each of these species is summarised below:

[25] 'Chipping' is a sustained snipe vocalisation often undertaken from a post or other perch by both male and female birds.

- **Red grouse**: small numbers of red grouse (1-3 birds) were occasionally seen or heard during the VP surveys. In addition, birds were sometimes flushed/encountered by surveyors en route to VPs; these records numbered up to 20 birds and included a record of a female red grouse with chicks recorded on 25/06/2010 approximately 200 m south-west of VP 1.
- **Grey heron**: on 02/07/2010 a grey heron was observed hunting on Polsue Barn, east of Dodd Hill.
- **Sparrowhawk**: there were 14 records of sparrowhawk during the VP surveys, generally of single birds (although two birds were noted during a VP survey on 17/09/2009).
- **Buzzard**: with a total of 126 observations, buzzard was recorded frequently during the VP surveys. Records included a pair of adult birds displaying below VP 5 above Bow Burn on 19/03/2010, and records of two adult birds together with two juveniles over Wee Meaul on 12/08/2010. This indicates that at least one pair bred in the area in 2010.
- **Kestrel**: with a total of 41 records, kestrel was regularly observed during the VP surveys; records were generally of single birds, which were often hunting.
- **Common gull** (*Larus canus*): eight common gulls were recorded flying up Bow Burn, then over VP 5 heading south-east on 04/05/2010. In addition, two common gulls were recorded twice over Dunool (to the south of the proposed Development Area) during a VP survey on 11/06/2010.
- **Herring gull**: there were two records of single herring gulls during the VP surveys; one following Water of Deugh, heading south-west on 06/07/2010 and the second drifting over Waterhead Hill on 27/08/2010.
- **Tawny owl** (*Strix aluco*): a tawny owl was observed close to Polwhat Burn, west of the existing Windy Standard Wind Farm as a surveyor was driving to VP 1 on 25/06/2010.
- **Raven**: with a total of 136 observations, raven was the most frequently recorded secondary species during VP surveys. The majority of records were of 1-2 birds, but up to 4 birds were occasionally observed.
- **Common crossbill**: three common crossbills were recorded flying west over VP 1 on 04/11/2009.

Other species

8.3.19 Stock dove (*Columba oenas*), woodpigeon and a number of passerine species were also noted during the VP surveys. These included a flock of 18 fieldfare (*Turdus pilaris*) during a VP survey on 15/10/2009. The birds took off from the forest edge to the south-west of VP 1 and flew south-east. Fieldfare is a Schedule 1 species and is included on the UK BoCC Red list (Eaton *et al*., 2009). However, these designations relate to breeding populations in the UK, whereas the birds recorded at the proposed Development were likely to have been on passage or overwintering. Five other common and widespread passerines species were noted during the VP surveys, including:

- Carrion crow;
- Swallow;
- Meadow pipit;
- Chaffinch; and
- Siskin.

Barn Owl Surveys: 2009 and 2012

8.3.20 Of the buildings surveyed, only two (a derelict farm house and nearby barn) were considered to be suitable for breeding barn owl. A suitable nesting platform was present in the eaves of one of these buildings, suggesting that it had been intentionally maintained to secure a potential barn owl breeding site. Old owl pellets were also observed within the building, suggesting that barn owl had used the platform as a roosting site. However, no evidence of breeding barn owls was identified during either of the nest checks undertaken in 2009 or 2012. Further details are provided in the Confidential Ornithology Appendix.

Black Grouse Lek Survey: 2009 and 2010

Black grouse records

8.3.21 No black grouse were observed during the 2009 black grouse lek survey visits.

8.3.22 During the 2010 survey, six active black grouse leks were recorded. A further three historical black grouse leks were described by the local sporting tenant. These were visited during the 2010 survey but were found to be inactive. Further details are provided in the Confidential Ornithology Appendix.

Other target species

8.3.23 There were also several records of short-eared owl during the 2010 black grouse lek survey. These are summarised below:

- On 13/04/2010 short-eared owl pellets were recorded at four locations to the south of the existing Windy Standard Wind Farm, and a bird was also heard 'barking'[26] in the same area.
- On 14/04/2010 a short-eared owl was flushed on Dugland Hill (to the east of the proposed Development).

Breeding Raptor Surveys: 2012 and 2013

Target raptor species flights

8.3.24 **Vantage point surveys 2012**: in total there were 14 flights of four target raptor species recorded during the breeding season raptor VP surveys. These records are summarised below, with further details of all species (except merlin and peregrine) provided in Technical Appendix 8.1: Ornithology Technical Appendix in Volume 4 of the ES. Details of merlin and peregrine flights are included in the Confidential Ornithology Appendix.

- **Red kite** (*Milvus milvus*): a single bird was recorded from VP 4 on 25/06/2012.
- **Osprey** (*Pandion haliaetus*): a single bird was recorded from VP 5 on 20/08/2012. In addition, there was an incidental record of an osprey flying north up the valley on the eastern side of Cairnsmore of Carsphairn prior to the start of a VP survey on 03/05/2012.
- **Merlin**: 11 flights were recorded between late March and mid-July 2012; all flights were of single birds, with six sightings identified as a male bird and four as a female (one record was of an unsexed bird). Due to the sensitive nature of this information, the VP location and flight lines are presented in the Confidential Ornithology Appendix.
- **Peregrine**: a single female bird was recorded on 29/03/2012. Due to the sensitive nature of this information, the VP location and flight lines are presented in the Confidential Ornithology Appendix.

8.3.25 **Vantage point surveys 2013**: in total there were five flights of four target raptor species recorded during the breeding season VP surveys. These records are summarised below, with further details provided in Technical Appendix 8.1: Ornithology Technical Appendix in Volume 4 of the ES and the Confidential Ornithology Appendix.

- **Hen harrier**: a single adult male was recorded on 23/04/2013; based on the timing, this was considered likely to be a passage bird.
- **Goshawk**: two flights (presumed to be the same bird) were recorded on 04/04/2013.
- **Merlin**: a small raptor, possibly a merlin, was recorded on 30/04/2013.
- **Peregrine**: a single bird was recorded on 24/04/2013.

8.3.26 Merlin and peregrine flights recorded during the 2012 and 2013 breeding raptor VP surveys are shown on ES Figure 8B.3 of the Confidential Ornithology Appendix; flight lines of other target raptor species flights are shown in ES Figure 8.7 in Volume 3 of the ES.

8.3.27 **Walkover surveys 2013**: no target raptor species were recorded during the breeding raptor walkover survey and no evidence of recent breeding was recorded for any target raptor species. However, an old stick nest was identified on 16/07/2013 close to a plucking post. It is unknown what species these field signs relate to; the old stick nest is considered likely to have been a buzzard or carrion crow (*Corvus corone*) nest. However, the possibility that the nest and/or post may have been used by a Schedule 1 raptor species, such as merlin cannot be excluded; details of the locations are therefore provided in the Confidential Ornithology Appendix.

8.3.28 **Peregrine nest check 2012**: during an initial visit to crags in the vicinity of the two peregrine breeding locations (provided by the DGRSG) on 02/05/2012 and 03/05/2012, a peregrine was observed at one of the sites; there was no evidence of any breeding birds in the vicinity of the second site. No peregrines were observed near the active site during a subsequent walkover survey on 12/06/2012, and no birds or any signs of breeding were observed during another visit to the location on 14/06/2012. Further details are provided in the Confidential Ornithology Appendix.

8.3.29 **Merlin surveys 2012 and 2013**: merlin were not recorded during the specific surveys for this species carried out in 2012 and 2013.

Other target species

8.3.30 Several wader species were recorded during the 2012 and 2013 breeding raptor surveys, as summarised below:

- **Oystercatcher**: there was a single record of an oystercatcher; the bird was calling from the water of Deugh on 26/04/2013.
- **Golden plover**: a flock of four birds was recorded from VP 1 on 30/03/2012 and a second flight of a single bird was recorded from VP 5 on 14/05/2012.
- **Snipe**: six snipe flights and six incidental records (a bird that was heard but not seen) were observed from VP 4 between late April and late June 2012. There were also five incidental records of snipe during a single survey from VP 4 on 26/04/2013.
- **Curlew**: a single bird was recorded during a VP survey on 26/04/2013.
- **Common sandpiper** (*Actitis hypoleucos*): during the 2013 walkover surveys a common sandpiper was recorded nesting next to an existing access track at NS 55992 02611, to the west of the Meaul Hill Cluster.

8.3.31 All wader flights and the location of the common sandpiper nest recorded during the 2012 and 2013 breeding raptor VP surveys are shown in ES Figure 8.8 in Volume 3 of the ES, with further details of all non-raptor target species records provided in Technical Appendix 8.1: Ornithology Technical Appendix in Volume 4 of the ES.

Secondary raptor species

8.3.32 Three secondary raptor species were recorded during the 2012 and 2013 breeding raptor surveys, with evidence that all three may have held breeding territories within the survey area in 2013. Details are provided below.

- **Sparrowhawk**: nine flights were recorded during the 2012 surveys and two flights were recorded during the 2013 surveys. One of the 2013 flights involved a male bird displaying briefly over Bow Burn (to the south of the Waterhead Hill Cluster), which may indicate that the bird was holding a breeding territory in the area, though no nests were identified. All flights were of single birds. There was also a single record of a male sparrowhawk during the 2012 breeding merlin survey.
- **Buzzard**: with a total of 157 flights recorded during the 2012 surveys, and 49 records (39 flights plus 10 records of birds not in flight) during the 2013 surveys, buzzard was the most frequently encountered species during the breeding raptor surveys. The 2013 records included a buzzard calling from a possible active nest at approximately NS 576 012 near Shalloch Burn and, as described above, an inactive stick nest that may have previously been used by buzzard was also recorded (details of the location are provided in the Confidential Ornithology Appendix). The flights included several displaying birds (three in 2013 and one in 2012, although the latter was not mapped). The majority of records were of single birds, although pairs were also recorded regularly, and occasionally three or four birds were recorded together. There were also two records of a single buzzard during the 2012 breeding merlin survey.
- **Kestrel**: 36 flights were recorded during the 2012 surveys and three flights were recorded during the 2013 surveys. Kestrel is thought to have bred within the raptor survey area in both survey years. In 2012 a female

[26] 'Barking' is a short-eared owl vocalisation which is produced as an alarm or contact call by both male and female birds.

and probable immature bird were observed to the south-west of the Waterhead Hill Cluster (although no nest was identified that year). In 2013 an active nest (in an artificial nest box) was located to the west of the proposed Development Area on 06/05/2013, and a female bird with at least three fledged young was subsequently observed at the nest site on 10/07/2013.

8.3.33 The location of the active kestrel nest, potentially active buzzard nest and the observations of kestrel with young birds are shown on ES Figure 8.9 in Volume 3 of the ES.

Other secondary species

8.3.34 In addition to the secondary raptor species, a further six secondary species were observed during the 2012 and 2013 breeding raptor surveys. Activity of each of these species is summarised below.

- **Goosander**: a female goosander was recorded fishing in Bow Burn to the south of the Waterhead Hill Cluster on 22/05/2013.
- **Red grouse**: there were four records of red grouse during the April 2012 breeding raptor VP surveys and a further five records during the April 2013 breeding raptor VP surveys; the majority of records were from the open ground to the south-east of the proposed Development and numbers ranged from one to three birds.
- **Cormorant** (*Phalacrocorax carbo*): a single cormorant was recorded during a VP survey on 25/06/2012; the bird flew south over the western edge of the site and adjacent valley.
- **Common gull**: two adult birds were recorded during a VP survey on 25/06/2012; the birds flew south-west up a valley to the south of VP 4.
- **Gull species**: one or more gulls were heard (but not seen) calling in the distance during a breeding raptor VP survey on 30/08/2012. In addition, a flock of 20 large, unidentified gulls were observed circling high to the north-east of Dodd Hill, later flying east, during a VP survey on 26/04/2013.
- **Raven**: the majority of non-raptor species recorded during the breeding raptor VP surveys were ravens (54 records in 2012 and 30 records in 2013). Evidence of an active nest was recorded at NS 54426 98486 (just beyond the breeding raptor survey area, to the south-west) in 2013, and a bird was recorded flying north below Dun Hill during 2013, carrying nesting material.

Other species

8.3.35 In addition to the target and secondary species listed above, a single great spotted woodpecker (*Dendrocopos major*) and two records of a pair of jays (*Garrulus glandarius*) were noted during the breeding raptor surveys. Although the plantation within the proposed Development Area provides suitable breeding habitat for both of these species, neither species is considered to be of conservation concern.

Upland Breeding Bird Survey (Open Areas): 2013

8.3.36 During the breeding bird survey of open ground within the Waterhead Hill Cluster, five species of conservation concern (LBAP and SBL priority species and UK BoCC Red and Amber listed species) were recorded in the survey area (further details are provided in Technical Appendix 8.1: Ornithology Technical Appendix in Volume 4 of the ES). Only skylark was recorded as breeding however, with six territories present in the survey area; approximate territory locations are shown in ES Figure 8.10 in Volume 3 of the ES.

8.3.37 In addition, two hen harriers (sex unknown) were recorded within the Waterhead Hill Cluster at approximately NS 571 003 during the June 2013 breeding bird survey visit. One bird flew west-north-west and the other flew south then west. As the only other record of this species during 2013 was a probable passage bird during a VP survey in April (as noted above), hen harrier was not considered to be breeding within the survey area.

Incidental Records during other Surveys

8.3.38 An incidental sighting of crossbill, a protected Schedule 1 species, was recorded during a vegetation survey carried out in September 2012. Five individuals were observed approximately 500 m to the south-west of the Waterhead Hill Cluster. Mature coniferous plantation occurring across the footprint of the proposed Development Area was considered as suitable breeding habitat for this species.

8.3.39 Additionally, incidental sightings of a single lesser redpoll and a single dunnock (*Prunella modularis*), were recorded in habitats to the south of the Waterhead Hill Cluster. Both of the aforementioned species are UK BoCC species (Eaton *et al*., 2009); lesser redpoll is red-listed and dunnock is amber–listed. These species were considered likely to breed at low density across the proposed Development Area, where suitable habitats exist. Furthermore, two incidental records of song thrush, a red-listed BoCC species, were observed to the south of the Meaul Hill Cluster. Song thrush was also considered to be breeding at low density across the footprint of the proposed Development Area.

Collision Risk Modelling

8.3.40 The number of target species flights and individuals recorded during the VP surveys (September 2009 to August 2010) and breeding raptor VP surveys (2012 and 2013) that passed through the collision risk zone are shown in Table 8.8 below.

Table 8.8: Number of flights and individuals observed passing through the collision risk zone (CRZ) during VP surveys (September 2009 to August 2010) and breeding raptor VP surveys (2012 and 2013).

SPECIES	TOTAL NO. OF FLIGHTS RECORDED IN CRZ	FLIGHTS THROUGH COLLISION RISK ZONE AT PCH		COLLISION MODELLING CARRIED OUT?
		FLIGHTS	INDIVIDUALS	
Goshawk	1	0	0	No
Osprey	1	1	1	No
Merlin	2	2	2	No
Peregrine	2	2	2	No

Trends and Projected Future Baseline

8.3.41 In the absence of development, it is assumed that the proposed Development Area would remain a combination of plantation woodland and open habitats for the foreseeable future. Forestry would likely be felled in compartments over time and subsequently replanted. No change in open habitats is anticipated in the short-term and consequently the bird community is likely to remain broadly similar. However, it is more difficult to predict changes that may occur in the long-term, especially in the wake of climate change, which is predicted to cause range shifts in some bird species (e.g. Huntley *et al*., 2007[27]).

8.3.42 It is planned that plantation woodland will be felled before construction and replanted with a 70 m buffer around turbine bases and a 30 m buffer along access tracks. This will have an effect on the bird community supported by this part of the proposed Development Area. The bird community that will develop here will depend upon habitat development but it is anticipated that they will be species adapted to open habitats comprising moorland, grassland and scrub.

8.3.43 Baseline surveys carried out for the proposed Development represent a snapshot of the bird community at the time and cannot be extrapolated to predict future population trends in the event of climate change or a future change in land use at the site.

Information Gaps

8.3.44 No significant information gaps have been identified.

[27] Huntley, B., Green, R.E., Collingham, Y.C. & Willis, S.G. 2007. A climatic atlas of European breeding birds. Durham University, The RSPB and Lynx Edicions, Barcelona.

8.4 ASSESSMENT

8.4.1 The following section assesses the potential impacts during the construction, operation and decommissioning of the proposed Development on ornithological receptors. The proposed Development has undergone several design iterations in order to site the proposed turbines away from areas highlighted as being of ecological importance (see Chapter 3: Design Evolution and Alternatives, of the ES for further details). Consequently, ecological constraints have been considered during the scheme evolution, and potential impacts are assessed against this final design.

8.4.2 The main ways in which the proposed Development may affect ornithological receptors are via:

- Habitat loss due to land-take;
- Disturbance or displacement; and
- Collision with turbines.

8.4.3 In addition to effects which are directly related to the proposed Development, there may be other effects which arise as a result of the combined effects of multiple wind farms within the local or regional area. These cumulative effects may also result in effects which individually would not be significant becoming more important and significant in context.

8.4.4 Each of these potential effects is discussed in turn below for each phase of the proposed Development (construction, operation and decommissioning).

Effects during Construction

Habitat Loss

8.4.5 Construction of the turbine base, access tracks and other structures will lead to direct habitat loss and could also result in destruction or damage to nests, eggs and/or chicks. The effects of habitat loss will depend upon the extent of land-take and the type of habitat affected. Under the Wildlife and Countryside Act 1981 (as amended) it is an offence to kill or injure any bird, or to damage or destroy nests and eggs (as discussed in Section 8.5 below) measures will be put in place to ensure that nest damage or destruction is avoided.

Disturbance and Displacement

8.4.6 During the construction phase of the proposed Development, the potential effects of associated noise and visual disturbance could lead to the temporary displacement or disruption of breeding and foraging birds. The level of impact depends on the timing of potentially disturbing activities, the extent of displacement (both spatially and temporally) and the availability of suitable habitats in the surrounding area for displaced birds to occupy.

8.4.7 Potential effects are likely to be greatest during the breeding season (predominantly between March and August, depending on the species under consideration); behavioural sensitivity to the effects will vary between species.

8.4.8 Disturbance of birds due to construction activities of this type have not been sufficiently quantified and the available information is often contradictory. However, it is likely that construction impacts will be greater on species that are intolerant of noise and other sources of disturbance. Larger bird species, those higher up the food chain or those that feed in flocks in the open tend to be more vulnerable to disturbance than small birds living in structurally complex or closed habitats such as woodland (Hill *et al*., 1997[28]).

8.4.9 The potential effects associated with construction activities are only likely to occur for as long as the construction phase continues, and are thus short-term and can be readily mitigated by avoiding sensitive areas and by timing construction activities to avoid periods where sensitive species are present, such as the breeding season. The exception to this would be if an adverse effect on the breeding success of a receptor were such that the local population becomes extinct and replacement through recruitment or recolonisation does not occur. For example, a recent study by Pearce-Higgins *et al*. (2012)[29] found that snipe and curlew densities declined significantly on wind farms during construction and had not recovered by the first year post-construction.

Effects during Operation

Disturbance and Displacement

8.4.10 The operation of turbines and associated human activities for maintenance purposes also has the potential to cause disturbance and displace birds from the proposed Development Area. Disturbance effects during the operational phase may be less than during the construction phase, as species may become habituated to turbines and disturbance due to human activities will be considerably reduced.

8.4.11 Studies have shown that, in general, species are not disturbed beyond 500 to 800 m from turbines (e.g. Drewitt & Langston, 20061, and references therein, Hötker *et al*., 2006[30]; Pearce-Higgins *et al*., 2009[31]) and, in some cases, birds do not appear to have been disturbed at all (e.g. Devereux *et al*., 2008[32]; Whitfield *et al*., 2010[33]; Douglas *et al*., 2011[34]; Fielding & Haworth, 2013[35]).

8.4.12 For example, Pearce-Higgins *et al*., (2009)[31] found evidence of lower frequencies of occurrence of some species within the vicinity of wind turbines during the breeding season, with a significant reduction in frequency of occurrence (compared to control sites) in seven of the 12 species studied. The authors extrapolated these findings to predict a percentage reduction in breeding densities within 500 m of turbines and found that seven of the 12 species showed a significantly lower frequency of occurrence, including buzzard, hen harrier, golden plover, snipe, curlew, meadow pipit and wheatear. There was no significant effect of wind farm proximity on kestrel, red grouse, lapwing, skylark or stonechat distribution.

8.4.13 In contrast, recent studies of golden plover (Douglas *et al*., 2011[34]; Fielding & Haworth, 2013[35]) and curlew (Whitfield *et al*., 2010[33]), involving long-term monitoring found no evidence of displacement due to wind farm infrastructure in either species.

8.4.14 In addition, a synthesis of European work (Hötker *et al*., 2006[30]) found no statistically significant negative effect on breeding population density of any bird species in published literature, including several species recorded within the proposed Development Area such as buzzard, carrion crow, skylark, chiffchaff, willow warbler, blackbird, stonechat and meadow pipit.

8.4.15 In terms of non-breeding population densities, Hötker *et al*. (2006)[30] reported a significantly negative effect on geese (several species combined), wigeon, golden plover and lapwing and a significantly positive effect on starling, although the distances involved were relatively limited (mean distances were between 30 m for starling

[28] Hill, D.A. Hockin, D. Price, D. Tucker, G. Morris, R. & Treweek, J. 1997. Bird disturbance: improving the quality of disturbance research. Journal of Applied Ecology 34, 275-288.

[29] Pearce-Higgins, J.W., Stephen, L., Douse, A. and Langston, R. H. W. 2012. Greater impacts of wind farms on bird populations during construction than subsequent operation: results of a multi-site and multi-species analysis. Journal of Applied Ecology, 49: 386–394.

[30] Hötker, H., Thomsen, K.-M. & Koster, H. 2006. The impact of renewable energy generation on biodiversity with reference to birds and bats – facts, gaps in our knowledge, areas for further research and ornithological criteria for the expansion of renewables. NABU Report, Germany.

[31] Pearce-Higgins, J.W., Stephen, L., Langston, R.H.W., Bainbridge, I.P. & Bullman, R. 2009. The distribution of breeding birds around upland wind farms. Journal of Applied Ecology 46, 1323-1331.

[32] Devereux, C.L., Denny, M.J.H. & Whittingham, M.J. 2008. Minimal effects of wind turbines on the distribution of wintering farmland birds. Journal of Applied Ecology 45, 1689–1694.

[33] Whitfield, D.P., Green, M. & Fielding, A.H. 2010. Are breeding Eurasian curlew *Numenius arquata* displaced by wind energy developments? Natural Research Projects Ltd, Banchory, Scotland.

[34] Douglas, D.J.T., Bellamy, P.E. & Pearce-Higgins, J.W. 2011. Changes in the abundance and distribution of upland breeding birds at an operational wind farm. Bird Study 58, 37-43.

[35] Fielding, A.H. & Haworth, P.F. 2013. Farr wind farm: A review of displacement disturbance on golden plover arising from operational turbines 2005-2013. Haworth Conservation, Isle of Mull, Scotland.

and 373 m for geese). In their study of the effects of wind turbines on the distribution of wintering farmland birds Devereux *et al*. (2008)[32] found no effect on four species groups (seed-eaters, corvids, gamebirds and skylarks); the only exception was pheasant.

8.4.16 Disturbance distances at onshore wind farms of up to 800 m have been recorded for wintering waterfowl (Pederson & Poulson, 1991; cited in Drewitt & Langston, 20061), although, according to Drewitt & Langston (2006)1, it is widely accepted that 600 m is the maximum reliably recorded distance.

8.4.17 Individual turbines, or a wind farm as a whole, may present a barrier to the movement of birds, restricting or displacing birds from much larger areas. The effect this would have on a population is subtle and difficult to predict with any degree of certainty. If birds regularly have to fly over or around obstacles or are forced into suboptimal habitats, this may result in reduced feeding efficiency and greater energy expenditure. By implication, this will reduce the efficiency with which they accumulate reserves, potentially affecting breeding success or survival.

Collision with Turbines

8.4.18 Collision of a bird with turbine rotors is almost certain to result in the death of the bird. In low density populations, such as raptors, this could have a more adverse effect on the local population than in higher density populations (e.g. skylark) because a higher proportion of the local population would be affected in a low density population. The frequency and likelihood of a collision occurring depends on a number of factors. These include aspects of the size and behaviour of the bird (including their use of the proposed Development Area) the nature of the surrounding environment and the structure and layout of the turbines.

8.4.19 Collision risk is perceived to be higher for birds that spend much of the time in the air, such as foraging raptors and those that have regular flight paths between feeding and breeding / roosting grounds (e.g. geese). The risk of bird collisions at wind farms is greatest in areas where large concentrations of birds are present (such as on major migration routes), and in poor flying conditions, such as strong winds that affect birds' ability to control flight manoeuvres, or in rain, fog, and on dark nights when visibility is reduced (Langston & Pullan, 2003[36]; Drewitt & Langston, 20061 and references therein). Birds may also be more susceptible if the wind farm is located in an area of high prey density. For diurnal foraging raptors, the proximity of structures on which to perch can increase the likelihood of collision with turbines (e.g. Percival, 2005[37] and references therein).

8.4.20 It should be noted that operational disturbance and collision risk effects are mutually exclusive in a spatial sense, i.e. a bird that avoids the wind farm area due to disturbance cannot be at risk of collision with the turbine rotors at the same time. However, they are not mutually exclusive in a temporal sense; a bird may initially avoid the wind farm but habituate to it, and then could be at risk of collision (Band *et al*., 2007[2]).

8.4.21 Passerines nesting within a wind farm site would be expected to be regularly flying between turbines and could therefore be expected to be most at risk of collision. However, passerines tend to fly below PCH and evidence suggests that passerines collide with turbines only infrequently. Moreover, most of the species concerned are of low or negligible nature conservation value. Collision is therefore mainly considered in relation to species of high sensitivity, e.g. target raptor species and species not particularly manoeuvrable in flight, such as geese and swans.

8.4.22 A summary of collisions at European wind farm sites, based on Hötker *et al*. (2006)[30] and Dürr (2014)[38], for target species recorded at the proposed Development, is presented in Table 8.9 below.

Table 8.9: Reported collisions at European wind farms of target species recorded during VP surveys (September 2009 to August 2010) and breeding raptor VP surveys (2012 and 2013) at the proposed Development (after Hötker *et al*., 2006[30] and Dürr, 2014[38]).

SPECIES	COLLISIONS (INDIVIDUALS)	COUNTRIES IN WHICH COLLISION(S) OCCURRED	EUROPEAN POPULATION (BirdLife International, 2004[39])
Greylag goose	13	Belgium (1) Germany (5) Spain (3) The Netherlands (1) Norway (3)	65,000-87,000[1] 350,000[2]
Red kite	281	Germany (232) Denmark (1) Spain (29) France (4) UK (3) Sweden (12)	18,000-23,000[1]
Hen harrier	5	Spain (1) UK (3) Norway (1)	11,000-18,000[1]
Goshawk	10	Germany (6) Spain (4)	46,000-70-000[1]
Osprey	17	Germany (10) Spain (6) UK (1)	182-200[1]
Merlin	4	Germany (2) Spain (1) Norway (1)	7,600-10,000[1]
Peregrine	18	Austria (1) Belgium (2) Germany (8) Spain (6) UK (1)	7,400-8,800[1]
Oystercatcher	15	Belgium (5) Germany (3) The Netherlands (7)	5,300-6,300[1]
Golden plover	24	Germany (15) Spain (3) The Netherlands (1) Norway (4)	130,000-240,000[1] 820,000[2]

[36] Langston, R.H.W. & Pullan, J.D. 2003. Windfarms and birds: an analysis of the effects of wind farms on birds, and guidance on environmental assessment criteria and site selection issues. Report T-PVS/Inf. 2003. 12, by BirdLife International to the Council of Europe, Bern Convention on the Conservation of European Wildlife and Natural Habitats. RSPB/BirdLife in the UK.

[37] Percival, S. 2005. Birds and windfarms: what are the real issues? British Birds 98, 194-204.

[38] Dürr, T. 2014. Vogelverluste an Windenergieanlagen / bird fatalities at windturbines in Europe. Daten aus der zentralen Fundkartei der Staatlichen Vogelschutzwarte im Landesamt für Umwelt, Gesundheit und Verbraucherschutz Brandenburg zusammengestellt. Tobias Dürr; Stand vom: 04 April 2014. Available from http://www.lugv.brandenburg.de/cms/detail.php/bb1.c.312579.de.

[39] BirdLife International. 2004 Birds in Europe – Population estimates, trends and conservation status. Cambridge, UK.

SPECIES	COLLISIONS (INDIVIDUALS)	COUNTRIES IN WHICH COLLISION(S) OCCURRED	EUROPEAN POPULATION (BirdLife International, 2004[39])
		Sweden (1)	
Curlew	1	Germany (1)	160,000-220,000[1] 410,000[2]
Snipe	17	Germany (1) Spain (1) France (1) UK (1) The Netherlands (1) Norway (11) Portugal (1)	300,000-450,000[1] 290,000[2]
Short-eared owl	3	Germany (2) Spain (1)	5,200-19,000[1]

[1] breeding pairs; [2] wintering individuals

Effects during Decommissioning

8.4.23 Turbine removal may cause disturbance to birds breeding, foraging or roosting within the proposed Development Area. The level of impact will depend on the bird species present at the time of decommissioning and cannot be reliably predicted at this stage. However, as decommissioning activities are of a similar type and intensity as construction activities, the assessment considers that the potential effects of decommissioning will be similar in nature to the potential effects of construction, with the exception that habitat is likely to be restored and displaced birds will be able to return to abandoned territories.

Receptor Assessment

8.4.24 A summary of identified avian VERs is provided in Table 8.10 below.

Table 8.10: Summary of identified avian receptors within the proposed Development Area.

VALUE	VER	JUSTIFICATION
International	Greylag goose	Qualifying feature of an SPA/Ramsar site within 25 km of the proposed Development, but not recorded in internationally important numbers.
National	No nationally important VERs present	N/A
Regional	Merlin Peregrine	Target species that are afforded special protection (Schedule 1 and Annex I species), that are present in regionally important numbers but are not a qualifying feature of any statutory sites within 10 km of the proposed Development Area.
	Black grouse	Target species of high conservation concern (LBAP species and/or species on the UK BoCC Red List), that are present in regionally important numbers but are not a qualifying feature of any statutory sites within 10 km of the proposed Development Area.
Local	Red kite Hen harrier Goshawk Osprey Golden plover Barn owl Short-eared owl	Target species that are afforded special protection (Schedule 1 and Annex I species), but are not a qualifying feature of any statutory sites within 10 km of the proposed Development Area and that were recorded infrequently.
	Oystercatcher Snipe Curlew Common sandpiper Common gull Lesser black-backed gull Herring gull	Target wader and gull species that are not afforded special protection and are not a qualifying feature of any statutory sites within 10 km of the proposed Development Area.
	Fieldfare Common crossbill	Passerine species that are afforded special protection (Schedule 1 species), but are not a qualifying feature of any statutory sites within 10 km of the proposed Development Area and that were recorded infrequently.
	Red grouse Kestrel Swift LBAP/Red-listed passerine species (skylark, song thrush, dunnock, tree pipit, siskin, lesser redpoll)	Non-target species that are considered to be of medium/high conservation concern (i.e. LBAP species and/or species on the UK BoCC Red List) that are not a qualifying feature of any statutory sites within 10 km of the proposed Development Area.
Negligible	Goosander Cormorant Secondary raptor and owl species (buzzard, sparrowhawk, tawny owl) Stock dove Woodpigeon Great-spotted woodpecker Passerine species of low to moderate conservation concern (jay, carrion crow, raven, goldcrest, coal tit, sand martin, swallow, house martin, chiffchaff, willow warbler, wren, blackbird, robin, stonechat, wheatear, grey wagtail, meadow pipit, chaffinch)	Common and widespread non-target species of low conservation concern (i.e. species on the UK BoCC Green Lists that are not LBAP species nor afforded any special protection) that are not a designated feature of any statutory sites within 10 km of the proposed Development Area.

8.4.25 Receptors of negligible conservation value are not considered further in this assessment; these receptors are generally common and widespread species and none were recorded in exceptionally high numbers within the survey areas.

8.4.26 Results from all relevant surveys have been compiled to produce baseline descriptions for each receptor detected. Receptors of regional or higher value that were recorded regularly are discussed individually; those assessed as being of local value are included in a summary table. Potential disturbance/displacement effects and potential collision effects are considered for each receptor.

8.4.27 Potential decommissioning effects are considered to be of the same nature as construction disturbance/displacement effects; with the exception that habitat is likely to be restored thus providing additional habitat to the operational phase.

Greylag goose

8.4.28 Greylag goose is included on the UK BoCC Amber list (Eaton *et al*., 2009[17]) due to the large numbers that winter in the UK (at least 20 % of the north-west European flyway) and its restricted distribution (at least 50 % of birds in ten or fewer sites). The species is a common resident in Scotland with a native population in the north and west (20,000 birds post-breeding) and a naturalised, probably re-established population in the south and east (5,000 birds post-breeding; at least 700 pairs). After the breeding season, these birds are joined by 85,000+ immigrants from Iceland that winter in lowland areas (Forrester *et al*., 2007[18]). In Dumfries and Galloway greylag goose is described as a common winter visitor on coasts and inland waters, and a widespread breeding species on many inland lochs (Chambers & Youdale, 2014[19]). Wintering Icelandic greylag goose is a designated feature of the Loch Ken and River Dee Marshes SPA/Ramsar site is located approximately 22.6 km to the south of the proposed Development Area.

Baseline

8.4.29 A single flock of 18 greylag geese flying south over Laggeran Hill (to the south of the proposed Development) prior to the start of a VP survey on 29/01/2010 was the only record of this species during baseline ornithological surveys for the proposed Development.

Potential Construction Effects

8.4.30 As the only record of this species was a single flock of 18 birds flying outside the proposed Development Area, with no evidence that birds were foraging or roosting within the vicinity of the proposed Development Area, it is considered unlikely that that there will be any disturbance or displacement impacts on greylag goose during construction. Therefore, there is **no predicted impact** due to disturbance or displacement on this species.

Potential Operation Effects

8.4.31 Flight activity of greylag goose within the proposed Development Area was very low and no regular flight patterns were detected. The single flight recorded was outside the collision risk zone.

8.4.32 Should occasional goose flocks continue to fly past after turbine construction, the most likely scenario is that the flocks would fly around the proposed Development, avoiding it altogether (Madsen & Boertmann, 2008[40]; Plonczkier & Simms, 2012[41]). As such, the potential effect as a result of collision risk is considered to be of **negligible magnitude**, and therefore **not significant** for greylag goose.

Black Grouse

8.4.33 Black grouse is a SBL and LBAP priority species and is Red-listed due to both historical and recent population declines (Eaton *et al*., 2009[17]). The most recent national survey in 2005 (Sim *et al*., 2008[42]) found an estimated 3,344 lekking males in Scotland of which 800 were in south-west Scotland; this represents a 49 % decline between 1995 and 2005 in this area (Forrester *et al*., 2007[18]). Similarly, a recent SNH report into black grouse abundance in southern Scotland found a 64 % decline between 1989/99 and 2006/12 (Warren *et al*. 2014[43]). However, the RSPB reported (online[44]) that numbers of lekking males in Dumfries and Galloway rose by 31 % between 2010 and 2011. The most recent Dumfries and Galloway bird report (Chambers & Youdale, 2014[19]) describes black grouse as a scarce resident breeding in small numbers throughout the region.

Baseline

8.4.34 Six active leks were identified during the 2010 black grouse surveys, two of which were within 1.5 km of the proposed Development Area (to the west of the proposed Development Area; ES Figure 8B.2 of the Confidential Ornithology Appendix); one of these is known to have been used historically. A further three historic leks (identified by the local sporting tenant) were checked during the 2010 black grouse lek survey but were inactive. One of these is within 1.5 km of the proposed Development Area (to the north-west). Numbers of lekking birds was generally small (1-2) birds, with the largest (one of the leks within 1.5 km of the proposed Development Area) attended by four males and one female. In addition, small numbers of black grouse were recorded during VP surveys: two flights of single males during the non-breeding season VP surveys (ES Figure 8.6 in Volume 3 of the ES; note that neither of these flights was within the collision risk zone at PCH), and three incidental records (all single birds; with one bird likely to have been the same recorded during a lek survey visit on 14/05/2010).

Potential Construction Effects

8.4.35 There is a potential for small numbers of black grouse to be displaced during the construction phase. Research in Austria (Zeiler & Grünschachner-Berger, 2009[45]) indicated that black grouse lekking behaviour was not affected by construction disturbance, but that the number of birds attending leks may decline. A more recent study on black grouse distribution and abundance at seven wind farm sites in Scotland (Zwart *et al*., 2013[46]) found that leks within 500 m of turbines appear to move ('locally') away from turbine locations after construction, but overall there was no reduction in lekking black grouse numbers around wind farms. Although three of the four historic leks reported by the local sporting tenant were inactive in 2010, five new lek sites were identified, and the number of lekking birds in the vicinity of the proposed Development does not appear to have changed (with up to eight lekking males reported at historic leks, and up to nine lekking males recorded at active leks in 2010).

8.4.36 A maximum of five male black grouse were recorded at the two active leks identified within 1.5 km of the proposed Development. With the exception of the lek on Polwhat Rig (attended by a single male) most of the construction activity will be a minimum of 1 km away from lek sites, indicating that potential displacement will be minimal. However, there is likely to be sufficient suitable lekking habitat in the surrounding area to accommodate any displaced birds. Based on the estimated regional population of 800 lekking males in south-west Scotland (Sim *et al*., 2008[42]), the loss of five individual lekking birds via construction of both the wind farm and access track constitutes approximately 0.625 % of the regional population.

8.4.37 It is considered that, during the construction phase, the effects of the proposed Development on the regional black grouse population are likely to be of a **low magnitude** (displacement of less than 1 % of the regional population) and of short duration and therefore **not significant**.

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[40] Madsen, J. & Boertmann, D. 2008. Animal behavioural adaptation to changing landscapes: spring staging geese habituate to wind farms. Landscape Ecology 23, 1007-1011.

[41] Plonczkier, P., & Simms, I. C. 2012. Radar monitoring of migrating pink-footed geese: behavioural responses to offshore wind farm development. Journal of Applied Ecology 49, 1187-1194.

[42] Sim, I.M.W. Eaton, M.A. Setchfield, R.P. Warren, P.K. & Lindley, P. 2008. Abundance of male Black Grouse *Tetrao tetrix* in Britain in 2005, and change since 1995-96. Bird Study, 55, 304-313.

[43] Warren, P., Atterton, F., Baines, D. & Whote, P.J.C. 2014. Black grouse conservation in southern Scotland. SNH Commissioned Report No. 741.

[44] http://www.rspb.org.uk/news/308115-black-grouse-numbers-on-the-rise-in-scotland. Last accessed 18/09/2014.

[45] Zeiler, H.P. & Grünschachner-Berger, V. 2009. Impact of wind power plants on black grouse, *Lyrurus tetrix* in Alpine regions. Folia Zoologica 58, 173–182.

[46] Zwart, M., Robson, P., Rankin, S., McGowan, P. & Whittingham, M. 2013. The use of land developer's data: localised movement, but no change in abundance, of black grouse at wind farms in Scotland. Poster presented at EOU2013UK – the 9th Conference of the European Ornithologists' Union.

Potential Operation Effects

8.4.38 It is possible that black grouse may be displaced whilst the proposed Development is operational. However, in order to minimise disturbance to lekking birds, turbines have been located a minimum of 1 km away from all active and historic lek locations identified in 2010, with the exception of one location (already within 500 m of the existing Windy Standard Wind Farm) attended by a single male. Moreover, three of the active leks (totalling up to six males) were within approximately 1 km of the existing Windy Standard Wind Farm, suggesting that birds from the local black grouse population will continue to lek in the vicinity of operational turbines.

8.4.39 Although the possibility that black grouse may collide with turbines cannot be ruled out, flight activity of this species at the proposed Development was very low, with just two flights recorded during VP surveys (ES Figure 8.6 in Volume 3 of the ES), neither of which was within the collision risk zone at PCH. Furthermore, only six black grouse collisions have been reported at European wind farms, all of which occurred in Austria (Table 8.9; Dürr, 2014[38]).

8.4.40 The potential effect as a result of displacement and collision risk during the operational phase of the proposed Development is considered to be of a **low to negligible magnitude**, and therefore **not significant** for black grouse.

Merlin

8.4.41 Merlin is an Annex I and Schedule 1 species; it is also an LBAP and SBL priority species. Following a substantial decline over the past two centuries, merlin shows indications of a recent doubling of population (Rebecca & Bainbridge, 1998[47]), which led to the species being moved from the Red to the Amber BoCC list in 2002 (Gregory *et al*., 2002[48]), where it remains (Eaton *et al*., 2009[17]). The most recent national survey found that numbers of UK breeding merlin appear to be relatively stable (Ewing *et al*., 2011[49]). In Scotland, merlin is a scarce resident breeder on upland heather moors, and passage and winter visitor mainly to coastal and low-lying areas. With an estimated 800 breeding pairs, the species occurs widely, but in low densities in the Highlands and Southern Uplands (Forrester *et al*., 2007[18]). In Dumfries and Galloway, merlin is described as a scarce, breeding resident (Chambers & Youdale, 2014[19]). Of the 10 home ranges surveyed in Dumfries and Galloway by raptor workers, nine were occupied during 2013 (Challis *et al*., 2014[20]).

Baseline

8.4.42 During the preliminary VP surveys there was one confirmed flight of a female merlin on 01/09/2009, and one possible merlin recorded on 25/08/2009 (ES Figure 8.4 in Volume 3 of the ES). During the 2010 breeding season VP surveys, five merlin flights were recorded (four of a female bird and one of a male bird) between early July and mid-August (ES Figure 8.5 in Volume 3 of the ES) and there were two incidental records of female merlin. There were also several merlin flights during the 2012 breeding raptor VP surveys between late March and mid-July 2012, including several of birds in the same locale exhibiting signs of breeding behaviour (further details are provided in the Confidential Ornithology Appendix). However, a subsequent search for a nest site in the area where merlin flight activity was concentrated did not identify any nests, and no merlin flights were subsequently recorded during the 2012 breeding raptor surveys, which continued until early September. Thus, it is considered likely that the species may have established a territory, but that any breeding attempt was unsuccessful.

8.4.43 There was limited evidence that merlin was present within the proposed Development Area in 2013: a small raptor, possibly a merlin, recorded on 30/04/2013 and an old stick nest was identified on 16/07/2013 close to a plucking post (the locations are shown in ES Figure 8B.3 of the Confidential Ornithology Appendix); the old stick nest is considered likely to have been a buzzard or crow nest, but the possibility that the nest and/or post may have been used by merlin cannot be excluded. While the DGRSG did not return any records of breeding merlin, it was stated that the species has been known to breed in the vicinity of the proposed Development (the current status of merlin in the area was unknown).

Potential Construction Effects

8.4.44 Although there was evidence that merlin may have attempted to breed within 2 km of the proposed Development in 2012, breeding was not confirmed. Although foraging birds may be displaced during construction activities, there is suitable foraging habitat in the surrounding area. Specific mitigation is recommended to ensure that any breeding birds within 2 km of the proposed Development Area are protected during construction, in order to ensure compliance with the Wildlife and Countryside Act (1981) as amended by the Nature Conservation (Scotland) Act (2004). Without mitigation, potential effects due to disturbance are predicted to be of **moderate magnitude** and **not significant**.

Potential Operation Effects

8.4.45 There is a possibility that merlin may collide with turbines at the proposed Development. However, the majority of merlin flight activity was outside the proposed Development Area, with just two flights of single birds within the collision risk zone at PCH (Table 8.8). As such, there was considered to be insufficient flight activity to carry out collision risk modelling for this species as the result would be negligible based on these data.

Only four merlin collisions have been reported at European wind farms (Dürr, 2014[38]), none of which were in the UK (Table 8.9). Thus, merlin collisions appear to be a relatively rare event. As such, the potential effect as a result of collision risk is considered to be of **negligible magnitude**, and therefore **not significant** for merlin.

Although there was evidence that merlin may have attempted to breed in the vicinity of the proposed Development during 2012, this was not confirmed and the potential breeding territory was outside the proposed Development Area. Whilst foraging birds may be displaced during operation, there is suitable foraging habitat in the surrounding area. Therefore, displacement due to disturbance during operation of the proposed Development is predicted to be of **low magnitude** and therefore **not significant**.

Peregrine

8.4.46 Peregrine is an Annex I and Schedule 1 species, and is also an LBAP and SBL priority species. The species is Amber-listed due to a historical population decline (Eaton *et al*., 2009[17]) caused by the detrimental effects of organochlorine pesticides in the 1950s and 1960s. Although numbers, distribution and breeding performance of the UK peregrine population have all largely recovered from these declines, populations and breeding performance have since declined in north-west Scotland and the Northern Isles (Crick & Ratcliffe, 1995[50]). There is evidence that illegal persecution on land managed for grouse shooting is still an important pressure on the population, at least in some areas (Amar *et al*., 2012[51]). In Dumfries and Galloway, peregrine is described as a widespread, if scarce, resident (Chambers & Youdale, 2014[19]). The most recent census in 2002 (Banks *et al*.,

[47] Rebecca, G.W. & Bainbridge, I.P. 1998. The breeding status of the Merlin *Falco columbarius* in Britain in 1993–94. Bird Study 45: 172–187.

[48] Gregory, R.D., Wilkinson, N.I., Noble, D.G., Brown, A.F., Robinson, J.A., Hughes, J., Procter, D.A., Gibbons, D.W., & Galbraith, C.A. 2002. The population status of birds in the United Kingdom, Channel Islands and Isle of Man: an analysis of conservation concern 2002–2007. British Birds 95, 410–448.

[49] Ewing, S.R., Rebecca, G.W., Heavisides, A., Court, I., Lindley, P., Ruddock, M., Cohen, S. & Eaton, M.A. 2011. Breeding status of the Merlin *Falco columbarius* in the UK in 2008. Bird Study 58: 379–389.

[50] Crick, H.Q.P. & Ratcliffe, D.A. 1995. The Peregrine *Falco peregrinus* population of the United Kingdom in 1991. Bird Study, 42: 1–19.

[51] Amar, A., Court, I.R., Davison, M., Downing, S., Grimshaw, T., Pickford, T. & Raw, D. 2012. Linking nest histories, remotely sensed land use data and wildlife crime records to explore the impact of grouse moor management on peregrine falcon populations. Biological Conservation, 145: 86-94.

2003[52]) recorded an estimated 78 occupied peregrine territories in Dumfries and Galloway, while raptor workers in the region checked 112 home ranges in 2013, of which 50 were occupied (Challis *et al*., 2014[20]).

Baseline

8.4.47 During the preliminary VP surveys (April to September 2009), five peregrine flights were recorded, including three flights of a pair of adults on 23/07/2009 and a single juvenile recorded on 24/07/2009, all from the same VP location; there were also four incidental records of peregrine observed from this VP location between late June and early July 2009 (full details are provided in the Confidential Ornithology Appendix). The observation of a juvenile and a pair of adults in the same area provides evidence that a pair successfully bred in the area in 2009. A further eight peregrine flights were recorded during the VP surveys between September 2009 and August 2010 (ES Figure 8.5 in Volume 3 of the ES).

8.4.48 Single flights of peregrine were also recorded during the 2012 and 2013 breeding raptor surveys (ES Figure 8B.3 of the Confidential Ornithology Appendix). In addition, the DGRSG provided records of two known peregrine nest sites within 5 km of the proposed Development Area. Although a peregrine was observed at one of these sites during the 2012 nest checks, there was no evidence of attempted breeding. However, it is recognised that both nesting sites have potential to be occupied by breeding peregrine in the future. Nonetheless, there was no evidence of any breeding sites within 2 km of the proposed Development Area.

Potential Construction Effects

8.4.49 Although there is potential for historic nest sites in the vicinity of the proposed Development Area to be re-occupied by breeding peregrine in the future, these sites are located c.3-5 km from the proposed Development. Although foraging birds may be displaced during construction activities, there is suitable foraging habitat in the surrounding area. Therefore, displacement due to disturbance is predicted to be of **low magnitude** and therefore **not significant** for this species.

Potential Operation Effects

8.4.50 There is a possibility that peregrines may collide with turbines at the proposed Development. However, flight activity of this species was low with just two flights of single birds within the collision risk zone at PCH (Table 8.8 above). As such, there was considered to be insufficient flight activity to carry out collision risk modelling for this species as the result would be negligible based on these data.

8.4.51 Eighteen peregrine collisions have been reported at European wind farms, one of which was in the UK (Dürr, 2014[38]; Table 8.9 above). Whilst it is acknowledged that there are likely to be other, unpublished collisions of this species, peregrine collisions nevertheless appear to be a relatively rare event. As such, the potential effect as a result of collision risk is considered to be of **negligible magnitude**, and therefore **not significant** for peregrine.

Although there are two historic nest sites in the vicinity of the proposed Development, these are located c.3-5 km from the proposed Development. Whilst foraging peregrines may be displaced during operation, there is suitable foraging habitat in the surrounding area. Therefore, displacement due to disturbance during operation of the proposed Development is predicted to be of **low magnitude** and therefore **not significant** for peregrine.

Other Ornithological Receptors

8.4.52 Assessments of receptors of local value are presented in Table 8.11 below.

[52] Banks, A.N., Coombes, R.H. & Crick, H.Q.P. 2003. The Peregrine Falcon breeding population of the UK & Isle of Man in 2002. Research Report 330. BTO, Thetford.

Table 8.11: Assessment of potential effects on avian receptors of local value recorded within the proposed Development Area.

SPECIES	LEGAL PROTECTION/ CONSERVATION STATUS (EATON *ET AL*., 2009[17])	SCOTTISH CONTEXT	SCOTTISH POPULATION†	STATUS IN REGION (CHAMBERS & YOUDALE, 2014[19]; CHALLIS *ET AL*. 2014[20])	BASELINE	POTENTIAL DISTURBANCE/ DISPLACEMENT EFFECTS	POTENTIAL COLLISION EFFECTS
Red grouse	SBL priority species; Amber-listed due to moderate declines in UK breeding population.	Common and widespread resident in areas of heather moorland, on which it depends for food, nesting habitat and cover from predators.	100,000-150,000*; 200,000-300,000‡	Resident; breeds on heather moorlands.	A single red grouse was recorded in 2013 within the Waterhead Hill Cluster during the upland breeding bird survey. The species was also regularly encountered during other ornithology surveys, generally in areas of open habitat outside the application boundary.	Although very low numbers of birds may be displaced by the proposed Development, there is alternative breeding habitat in the surrounding area. Effects of disturbance/ displacement predicted to be of a **low magnitude** and therefore **not significant**.	Not considered to be a target species in terms of collision risk; if any collisions do occur, the effect is likely to be undetectable against the natural mortality rate. Collision effects predicted to be of **negligible magnitude** and therefore **not significant**.
Red kite	Annex I and Schedule 1 and 1A species; LBAP and SBL priority species; Amber-listed due to status as a Species of European Conservation Concern (SPEC).	Following successful reintroduction programmes (including to Loch Ken in 2001), red kite numbers are increasing in Scotland (Forrester *et al*., 2007[18]) and the species was moved from the Red to the Amber List of UK BoCC in 2002 (Gregory *et al*., 2002[48]).	60 (232 pairs located by raptor workers in 2012)*; 300-350‡	Scarce resident; rare vagrant away from Loch Ken re-introduction area. Raptor workers in Dumfries and Galloway identified 70 pairs on breeding territories in the region during 2012.	A single red kite was recorded during a breeding raptor VP survey on 25/06/2012.	No evidence of any breeding attempts within survey area, and available foraging habitat is limited and fragmented. Effect of displacement due to disturbance predicted to be of **negligible magnitude**, and therefore **not significant**.	A single flight outside the collision risk zone was the only record during VP surveys. Collision effects predicted to be of **negligible magnitude** and therefore **not significant**.
Hen harrier	Annex I and Schedule 1 and 1A species; LBAP and SBL priority species; Red-listed due to historical decline in the UK and SPEC status	A widespread but generally scarce breeding species found mostly in upland areas. Persecution across Scotland is well documented and remains severe in certain areas.	633 (259 pairs located by raptor workers in 2012)*; 1,050-1,540‡	Scarce resident; breeds. Raptor workers in Dumfries and Galloway identified just five pairs on breeding territories in the region during 2012.	A single flight of a female bird was recorded during a VP survey in August 2010 and a single adult male was recorded during a breeding raptor survey in April 2013 (considered likely to be a passage bird). In addition, two hen harriers were recorded within the Waterhead Hill Cluster during the June 2013 breeding bird survey visit.	No evidence of any breeding attempts within survey area, and available foraging habitat is limited and fragmented. Effect of displacement due to disturbance predicted to be of **negligible magnitude**, and therefore **not significant**.	Flight activity was relatively low, with no flights recorded within collision risk area at PCH. As hen harrier were not making regular use of the site the potential effect on the species as a result of collision risk is considered to be of **negligible magnitude**, and therefore **not significant**.
Goshawk	Schedule 1 species.	Numbers and range slowly expanding following historical population demise. A scarce breeding bird, with most pairs in the Borders and north-east Scotland	130+ (128* pairs located by raptor workers in 2012); 350-450‡	Rare resident; breeds. Raptor workers in Dumfries and Galloway identified 26 pairs on breeding territories in the region during 2012.	A female bird was recorded during a VP survey in 2010, and two flights (presumed to be the same bird) were recorded during a breeding raptor survey in April 2013.	No evidence of any breeding attempts within survey area (although it is acknowledged that suitable breeding habitat is present and goshawk may breed there in future). Nonetheless, effect of displacement due to disturbance predicted to be of **low magnitude**, and therefore **not significant**.	Flight activity was relatively low, with no flights recorded within collision risk area at PCH. The potential effect on the species as a result of collision risk is considered to be of **negligible magnitude**, and therefore **not significant**.

SPECIES	LEGAL PROTECTION/ CONSERVATION STATUS (EATON *ET AL.*, 2009[17])	SCOTTISH CONTEXT	SCOTTISH POPULATION†	STATUS IN REGION (CHAMBERS & YOUDALE, 2014[19]; CHALLIS *ET AL.* 2014[20])	BASELINE	POTENTIAL DISTURBANCE/ DISPLACEMENT EFFECTS	POTENTIAL COLLISION EFFECTS
Osprey	Annex I and Schedule 1 species; LBAP and SBL priority species; Amber-listed due to breeding rarity in UK and SPEC status.	Increasing summer visitor to much of mainland Scotland; migrant birds also seen outside breeding areas, in all parts of the country.	182-200 (195 pairs located by raptor workers in 2012)*	Scarce summer visitor and rare breeder. Raptor workers in Dumfries and Galloway identified six pairs on breeding territories in the region during 2012.	During the 2012 breeding raptor surveys a single osprey flight was recorded in August 2012 and there was an incidental record of a single bird in May.	No evidence of any breeding attempts within the survey area. Effect of displacement due to disturbance predicted to be of **negligible magnitude**, and therefore **not significant**.	Flight activity was very low, with just one flight within collision risk area at PCH. As ospreys were not making regular use of the site the potential effect on the species as a result of collision risk is considered to be of **negligible magnitude**, and therefore **not significant**.
Kestrel	LBAP and SBL priority species; Amber-listed due to SPEC status.	Although kestrel is a common and widespread resident across Scotland (Forrester *et al*., 2007[18]), numbers of breeding birds in Scotland showed a significant decline of 65 % between 1995 and 2012 (Harris *et al*., 2014[53]).	7,500-7,800 (172 pairs located by raptor workers in 2012)*; 15,000-25,000‡	Common resident, but recently experienced significant decline with maturation of conifer forests; more in good vole years. Raptor workers in Dumfries and Galloway identified just four pairs on breeding territories in the region during 2012.	Kestrel was recorded regularly during the VP surveys and breeding raptor surveys, and is thought to have bred within the raptor survey area in both 2012 (when a female and probable immature bird were observed to the south-west of the Waterhead Hill Cluster) and 2013 (when an active nest was located to the west of the proposed Development Area, with a female bird and at least three fledged young subsequently observed at the nest site).	Although an active kestrel nest (within a nest box) was located in 2013, this is 1.47 km from the nearest turbine. The presence of an immature bird in 2012 indicates that the species was also likely to have nested in the breeding raptor survey area in 2012; although a nest site was not identified, this observation was 1.35 km from the nearest turbine. Specific mitigation is recommended to ensure that any breeding birds within the proposed Development Area are protected during construction. Potential effects due to disturbance are predicted to be of **low magnitude** and **not significant**.	Kestrels are not considered to be a target species in terms of collision risk. The majority of flights were recorded from VP 4, which is located to the west of the Waterhead Hill Cluster, away from all turbines, and are likely to relate to birds breeding in the area (away from turbines) in 2012 and 2013. Suitable foraging habitat within the proposed Development Area is limited and fragmented, suggesting that birds will make limited use of the area. Collision effects predicted to be of **low magnitude** and therefore **not significant**.
Oystercatcher	Amber-listed due to the international importance of the UK breeding and wintering populations, and due to localisation of the UK wintering population.	Widespread and common breeding species both on farmland and coastal areas. Most Scottish birds migrate to England, Ireland and the continent during winter, but are replaced by immigrants from further north (Forrester *et al*., 2007[18]) A 26 % decline	84,500-116,500*; 80,000-120,000‡	Common resident on coast, common summer visitor to farmland and inland waters; breeds.	Two flights recorded during VP surveys in 2010 (2 birds recorded in April and a single bird in May) and an incidental record of a bird calling from the Water of Deugh during a breeding raptor survey in May 2010 were the only records of this species.	No evidence of any breeding attempts within the survey area, and little suitable breeding habitat available. Effect of displacement due to disturbance predicted to be of **negligible magnitude**, and therefore **not significant**.	Flight activity was very low, with no flights recorded within the collision risk area at PCH. Collision risk is considered to be of **negligible magnitude**, and therefore **not significant**.

[53] Harris, S.J., Risely, K., Massimino, D., Newson, S.E., Eaton, M.A., Musgrove, A.J., Noble, D.G., Procter, D. & Baillie, S.R. 2014. The Breeding Bird Survey 2013. BTO Research Report 658. British Trust for Ornithology, Thetford.

SPECIES	LEGAL PROTECTION/ CONSERVATION STATUS (EATON *ET AL*., 2009[17])	SCOTTISH CONTEXT	SCOTTISH POPULATION†	STATUS IN REGION (CHAMBERS & YOUDALE, 2014[19]; CHALLIS *ET AL*. 2014[20])	BASELINE	POTENTIAL DISTURBANCE/ DISPLACEMENT EFFECTS	POTENTIAL COLLISION EFFECTS
		in the Scottish breeding population has been recorded between 1995 and 2012 (Harris *et al*., 2014[53]).					
Golden plover	Annex I species; LBAP and SBL priority species; Amber-listed because UK supports internationally important numbers of wintering birds.	A widespread breeding species across the Scottish uplands, with most moving short distances to coastal locations (and a few further south) during the winter (Forrester *et al*., 2007[18]). Numbers have experienced mixed fortunes in recent decades with significant declines in southern Scotland and significant increases in other parts of the country (Sim *et al*., 2005[54]).	c. 15,000*; 25,000-35,000‡	Common winter visitor on coast and scarce winter visitor to inland farmland. Scarce summer visitor to uplands; breeds.	A single flight (3 birds) was recorded during a preliminary VP survey in July 2009, and there were two flights during the 2012 breeding raptor surveys (4 birds in March and a single bird in May).	No evidence of any breeding attempts within survey area. Effect of displacement due to disturbance predicted to be of **negligible magnitude**, and therefore **not significant**.	Flight activity was low, with no flights recorded within the collision risk area at PCH. Collision risk is considered to be of **negligible magnitude**, and therefore **not significant**.
Snipe	Amber-listed due to SPEC status.	A widespread breeding species; in winter birds move south and to lower elevations, and Scottish birds are joined by migrants from Scandinavia and northern Europe (Forrester *et al*., 2007[18]). A 13 % increase in the Scottish breeding population of has been recorded between 1995 and 2012 (Harris *et al*., 2014[53]).	34,000-40,000*; 10,000-30,000‡	Common resident; breeds.	Eleven flights (of 1-2 birds) and several incidental records during 2010 VP surveys between May and June. In addition, six flights and six incidental observations recorded during 2012 breeding raptor VP surveys, and five incidental records during a 2013 breeding raptor survey on 26/04/2013. Flight activity concentrated in areas of open ground to the east and west of the Waterhead Hill Cluster (ES Figures 8.6 and 8.9 in Volume 3 of the ES).	Several incidental records of chipping snipe during VP surveys in June 2010 indicating breeding attempts within survey area. Flight activity was concentrated in areas to east and west of proposed Development Area. Although it is possible small numbers of breeding snipe may be displaced during construction/operation of proposed Development, there is alternative breeding habitat in surrounding area. Effect of displacement due to disturbance predicted to be of **low magnitude**, and therefore **not significant**.	Flight activity was low, with just one flight recorded at PCH. Flight activity concentrated outside proposed Development Area. Collision risk is considered to be of **negligible magnitude**, and therefore **not significant**.
Curlew	LBAP and SBL priority species; Amber-listed, due to widespread declines in UK breeding population, SPEC status, and because UK	Widespread resident breeding on farmland and uplands; common passage and winter visitor to coasts and nearby fields (Forrester	c.58,800*; c.85,700‡	Common resident; breeds.	A single flight (2 birds) recorded during a VP survey on 29/04/2010, and a single bird recorded during a breeding raptor VP survey on	Few records of curlew and no evidence of any breeding attempts within survey area. Effect of displacement due to disturbance predicted to be of	Flight activity was very low, with no flights within the collision risk area. Collision risk is considered to be of **negligible magnitude**, and

[54] Sim, I.M.W., Gregory, R.D., Hancock, M.H. & Brown, A.F. 2005. Recent changes in the abundance of British upland breeding birds. Bird Study 52, 261-275.

SPECIES	LEGAL PROTECTION/ CONSERVATION STATUS (EATON *ET AL*., 2009[17])	SCOTTISH CONTEXT	SCOTTISH POPULATION†	STATUS IN REGION (CHAMBERS & YOUDALE, 2014[19]; CHALLIS *ET AL*. 2014[20])	BASELINE	POTENTIAL DISTURBANCE/ DISPLACEMENT EFFECTS	POTENTIAL COLLISION EFFECTS
	supports internationally important numbers of breeding and wintering birds.	*et al*., 2007[18]). Recent records for Scotland indicate a 55 % decline in breeding birds between 1995 and 2012 (Harris *et al*., 2014[53]).			26/04/2013, were the only records of curlew.	**negligible magnitude**, and therefore **not significant**.	therefore **not significant**.
Common sandpiper	Amber-listed due to SPEC status and a moderate decline in the UK breeding population.	A widely distributed breeding bird across upland Scotland, and a common and widespread passage migrant (Forrester *et al*., 2007[18]). The Scottish breeding population declined by 12 % between 1995 and 2012 (Harris *et al*., 2014[53]).	17,000-24,000*; 1-4‡	Common summer visitor on rivers, lochs and coasts; breeds.	A nesting bird recorded next to an existing access track during the 2013 breeding raptor surveys.	Although it is possible that very low numbers of birds may be displaced by the proposed Development, there is alternative breeding habitat in the surrounding area. Effects of disturbance/ displacement predicted to be of a **low magnitude** and therefore **not significant**.	No flights recorded. Collision effects predicted to be of **negligible magnitude** and therefore **not significant**.
Common gull	Amber-listed due to SPEC status and international importance of UK wintering population.	A widely distributed breeding species that nests at the coast and at inland sites. In most areas, wintering birds are common in lowland, urban and coastal areas (Forrester *et al*., 2007[18]).	48,000*; 79,700‡	Common winter visitor to coasts, inland waters and farmland. Breeds near coasts and on islands in inland lochs.	Three flights recorded during VP surveys in 2010 (a flock of 8 birds in May, and 2 birds recorded twice in June). A flight (2 adults) also recorded during a breeding raptor VP survey on 25/06/2012.	Low level of flight activity within survey area and no evidence of breeding. Effects of disturbance/ displacement predicted to be of **negligible magnitude** and therefore **not significant**.	Low level of flight activity and small numbers of birds recorded. Collision effects predicted to be of **negligible magnitude** and therefore **not significant.**
Lesser black-backed gull	Amber-listed due to localisation and international importance of UK wintering population.	Common and widespread summer visitor and breeding bird. Nests in a range of coastal habitats, and also inland, usually in moorland or bog areas; readily nests on buildings both at coast and inland. Most birds leave Scotland for period between late November and early March (Forrester *et al*., 2007[18]).	25,000*; 200-600‡	Common summer visitor and increasing winter visitor; breeds.	Two flights recorded during preliminary VP surveys in 2009 (a single bird on 19/06/2009) and 6 adults plus 6 juveniles south on 01/09/2009.	Low level of flight activity within survey area and no evidence of breeding. Effects of disturbance/ displacement predicted to be of **negligible magnitude** and therefore **not significant**.	Low level of flight activity and small numbers of birds recorded. Collision effects predicted to be of **negligible magnitude** and therefore **not significant**.
Herring gull	LBAP and SBL priority species; Red -listed due to declines in breeding and wintering populations.	Common resident breeder. Scottish population thought to represent at least 49 % of UK and Irish breeding population. Numbers of breeding pairs at Scottish coastal colonies have declined by 55 % between 1969/70 and 1998-2002 (Forrester *et al*., 2007[18]).	72,100*; 91,000‡	Common resident; breeds.	A single flight (2 birds) during a preliminary VP survey on 25/06/2009, and Two flights (both single birds) during VP surveys in 2010.	Low level of flight activity within survey area and no evidence of breeding. Effects of disturbance/ displacement predicted to be of **negligible magnitude** and therefore **not significant**.	Low level of flight activity and small numbers of birds recorded. Collision effects predicted to be of **negligible magnitude** and therefore **not significant**.
Barn owl	Schedule 1 species; LBAP	A resident breeding bird with	500-1,000 (295 pairs located	Fairly common resident;	Old barn owl pellets were	No evidence of breeding	No flight activity and small

SPECIES	LEGAL PROTECTION/ CONSERVATION STATUS (EATON *ET AL.*, 2009[17])	SCOTTISH CONTEXT	SCOTTISH POPULATION†	STATUS IN REGION (CHAMBERS & YOUDALE, 2014[19]; CHALLIS *ET AL.* 2014[20])	BASELINE	POTENTIAL DISTURBANCE/ DISPLACEMENT EFFECTS	POTENTIAL COLLISION EFFECTS
	and SBL priority species; Amber-listed due to SPEC status and moderate contraction of UK breeding range.	highest numbers in south and west. Its range in Scotland is limited by hard winters, particularly extended periods of snow cover, which make hunting difficult (Forrester *et al*., 2007[18]). There is some evidence that numbers of breeding birds have declined in recent years (Challis *et al*., 2014[20]).	by raptor workers in 2012)*; 1,000-2,000‡	breeds. Raptor workers in Dumfries and Galloway identified 144 pairs on breeding territories in the region during 2012.	found in a building during the 2009 breeding barn owl survey and there was an incidental record of a bird to the south-west of the proposed Development Area after a dusk VP survey on 11/08/2010.	within 1 km of proposed Development although limited suitable breeding and roosting habitat is available and could be used in future. Suitable foraging habitat is limited. Effects of disturbance/ displacement predicted to be of a **low magnitude** and therefore **not significant**.	numbers of birds recorded. Limited foraging habitat suggests barn owl is unlikely to make regular use of proposed Development Area. Collision effects predicted to be of **negligible magnitude** and therefore **not significant**.
Short-eared owl	Annex I species; LBAP and SBL priority species; Amber-listed due to SPEC status.	A restricted resident breeder, with birds usually moving between separate breeding and wintering areas. Species is essentially nomadic, with movements, breeding density and productivity strongly linked to cyclic populations of field voles (*Microtus agrestis*; Forrester *et al*., 2007[18]).	125-1,250 (105 pairs located by raptor workers in 2012)*; 300-3,000‡	Scarce resident; regular breeder. Raptor workers in Dumfries and Galloway identified 45 pairs on breeding territories in the region during 2012.	A single flight recorded during a VP survey on 25/06/2010; and two incidental records (one during a VP survey on 28/05/2010 and one during a black grouse survey on 14/04/2010). Fresh and old pellets (likely produced by short-eared owl) also noted in open ground during 2010 VP and black grouse surveys.	Signs suggest that birds may have been hunting within survey area in 2010 but no evidence of breeding, and no evidence that they were present in 2012 or 2013. Effects of disturbance/ displacement predicted to be of a **low magnitude** and therefore **not significant**.	Flight activity was low, with just one flight within collision risk area at PCH. Effect on the species as a result of collision risk is considered to be of **negligible magnitude**, and therefore **not significant**.
Swift	LBAP and SBL priority species. Amber-listed due to a moderate decline in the UK breeding population.	A summer visitor and breeder, occurring mainly in the south and east, but nests as far north as Caithness and Sutherland; concentrated in urban areas (Forrester *et al*., 2007[18]). The species is experiencing a long-term decline in Scotland, with a 62 % reduction recorded between 1995 and 2012 (Harris *et al*., 2014[53]).	6,000-8,000*	A common breeding summer visitor over farmland and towns.	Presence noted during 2009 preliminary VP surveys, but systematic surveys/recording not carried out for this species.	Unlikely to be breeding within proposed Development Area due to limited availability of suitable nest sites. Effects of disturbance/ displacement predicted to be of a **negligible magnitude** and therefore **not significant**.	Not considered to be a target species in terms of collision risk; if any collisions do occur, the effect is likely to be undetectable against the natural mortality rate. Collision effects predicted to be of **negligible magnitude** and therefore **not significant**.
Skylark	LBAP and SBL priority species; Red-listed, due to declines in breeding population and SPEC status.	Has experienced declines in UK breeding population since 1970s (Baillie *et al*., 2014[55]), and numbers in Scotland declined by 27 % between 1995 and 2012 (Harris *et al*., 2014). Nonetheless, remains	290,000-557,000*; 13,000-40,000‡	Common breeding resident on farmland and rough grassland, both near the coast and in upland areas.	Presence noted during 2009 preliminary VP surveys, and six breeding territories recorded in 2013 within the Waterhead Hill Cluster. This represents a breeding density of 0.51 pairs per km^2.	Land take within the Waterhead Hill Cluster will result in the loss of up to 2.27 ha of potential skylark breeding habitat, which equates to loss of habitat for approximately 0.01 pairs of	Not considered to be a target species in terms of collision risk; if any collisions do occur, the effect is likely to be undetectable against the natural mortality rate. Collision effects predicted to

[55] Baillie, S.R., Marchant, J.H., Leech, D.I., Massimino, D., Eglington, S.M., Johnston, A., Noble, D.G., Barimore, C., Kew, A.J., Downie, I.S., Risely, K. & Robinson, R.A. 2014. BirdTrends 2013: trends in numbers, breeding success and survival for UK breeding birds. BTO Research Report No. 652. BTO, Thetford. http://www.bto.org/birdtrends

SPECIES	LEGAL PROTECTION/ CONSERVATION STATUS (EATON *ET AL.*, 2009[17])	SCOTTISH CONTEXT	SCOTTISH POPULATION†	STATUS IN REGION (CHAMBERS & YOUDALE, 2014[19]; CHALLIS *ET AL.* 2014[20])	BASELINE	POTENTIAL DISTURBANCE/ DISPLACEMENT EFFECTS	POTENTIAL COLLISION EFFECTS
		common and widespread in Scotland in suitable open habitat (Forrester *et al*., 2007[18]).				skylark. It is likely that displaced birds will relocate to suitable habitat available nearby. Effect of displacement due to disturbance predicted to be of **low magnitude**, and therefore **not significant**.	be of **negligible magnitude** and therefore **not significant**.
Fieldfare	Schedule 1 species; recently Red-listed due to UK breeding population declines and breeding rarity.	Abundant autumn and spring passage migrant and winter visitor. Rare and sporadic breeder since nesting was first reported in the late 1960s (Forrester *et al*., 2007[18]).	≤5*; 40,000-100,000‡	Common winter visitor.	A flock of 18 birds recorded during a VP survey on 15/10/2009 was the only record of this species.	Not recorded regularly or in large numbers. Effect of displacement due to disturbance predicted to be of **negligible magnitude**, and therefore **not significant**.	Not considered to be a target species in terms of collision risk; if any collisions do occur, the effect is likely to be undetectable against the natural mortality rate. Collision effects predicted to be of **negligible magnitude** and therefore **not significant**.
Song thrush	LBAP and SBL priority species; Red-listed, due to long-term decline in UK breeding population.	Breeds throughout mainland but is most common in the lowlands. Many Scottish breeding birds migrate in winter (Forrester *et al*., 2007[18]).	250,000-260,000*; 20,000-60,000‡	Resident in gardens, farmland and conifer plantations.	Presence noted during 2009 preliminary VP surveys and two incidental records during non-ornithological surveys in the proposed Development Area in September 2012; considered likely to be breeding at low density across the footprint of the proposed Development Area in areas of suitable breeding habitat.	Although small numbers of birds may be displaced by the proposed Development, there is alternative breeding habitat in the surrounding area. Effects of disturbance/ displacement predicted to be of a **low magnitude** and therefore **not significant**.	Not considered to be a target species in terms of collision risk; if any collisions do occur, the effect is likely to be undetectable against the natural mortality rate. Collision effects predicted to be of **negligible magnitude** and therefore **not significant**.
Dunnock	SBL priority species; Amber-listed due to moderate decline in UK breeding population.	Common resident breeder over much of Scotland. UK breeding population declined substantially between mid - 1970s and mid-1980s, the cause of which is unknown; some recovery has occurred since the late 1990s (Baillie *et al*., 2014[55]). Numbers of breeding birds recorded in Scotland have declined by 61 % between 1995 and 2012 (Harris *et al*., 2014[53]).	215,000-305,000*; 600,000-1,000,000‡	Common resident; breeds.	An incidental record during non-ornithological surveys in the proposed Development Area in September 2012 was the only record (although systematic surveys/ recording not carried out for this species); considered likely to be breeding at low density across the footprint of the proposed Development Area in areas of suitable breeding habitat.	Although small numbers of birds may be displaced by the proposed Development, there is alternative breeding habitat in the surrounding area. Effects of disturbance/ displacement predicted to be of a **low magnitude** and therefore **not significant**.	Not considered to be a target species in terms of collision risk; if any collisions do occur, the effect is likely to be undetectable against the natural mortality rate. Collision effects predicted to be of **negligible magnitude** and therefore **not significant**.
Tree pipit	SBL priority species; Red-listed, due to breeding	Widespread summer visitor to Scotland, breeding in most	43,000*	Scarce summer visitor; breeds.	Presence noted during 2009 preliminary VP surveys, but	Although small numbers of birds may be displaced by	Not considered to be a target species in terms of collision

SPECIES	LEGAL PROTECTION/ CONSERVATION STATUS (EATON *ET AL.*, 2009[17])	SCOTTISH CONTEXT	SCOTTISH POPULATION†	STATUS IN REGION (CHAMBERS & YOUDALE, 2014[19]; CHALLIS *ET AL.* 2014[20])	BASELINE	POTENTIAL DISTURBANCE/ DISPLACEMENT EFFECTS	POTENTIAL COLLISION EFFECTS
	population declines.	parts of the mainland and some of the Inner Hebrides where suitable habitat exists. Also a regular spring and autumn migrant (Forrester *et al*., 2007[18]).			systematic surveys/recording not carried out for this species. Considered likely to be breeding at low density across the proposed Development Area in areas of suitable breeding habitat.	the proposed Development, there is alternative breeding habitat in the surrounding area. Effects of disturbance/ displacement predicted to be of a **low magnitude** and therefore **not significant**.	risk; if any collisions do occur, the effect is likely to be undetectable against the natural mortality rate. Collision effects predicted to be of **negligible magnitude** and therefore **not significant**.
Siskin	LBAP and SBL priority species.	A well-established breeding species throughout most of Scotland (Forrester *et al*., 2007[18]); numbers have increased by 65 % between 1995 and 2012 (Harris *et al*., 2014[53]). Numbers and distribution of wintering are highly variable and influenced by cone crops in Scotland, Scandinavia and the rest of the continent (Forrester *et al*., 2007[18]).	0.5-3.5 million*; 100,000-5 million‡	Common resident in woodland, especially in conifers; breeds.	Presence noted during 2009 preliminary VP surveys and 2009-10 VP surveys, but systematic surveys/recording not carried out for this species. Considered likely to be breeding at low density across the proposed Development Area in areas of suitable breeding habitat.	Although small numbers of birds may be displaced by the proposed Development, there is alternative breeding habitat in the surrounding area. Effects of disturbance/ displacement predicted to be of a **low magnitude** and therefore **not significant**.	Not considered to be a target species in terms of collision risk; if any collisions do occur, the effect is likely to be undetectable against the natural mortality rate. Collision effects predicted to be of **negligible magnitude** and therefore **not significant**.
Lesser redpoll	SBL priority species; recently Red-listed due to declines in UK breeding population.	Breeds across much of mainland and on many islands. Also occurs as a passage migrant, with occasional irruptive movements (Forrester *et al*., 2007[18]).	7,500-15,000*; 20,000-40,000‡	Scarce resident in woodland and farmland; breeds.	Presence noted during 2009 preliminary VP surveys and an incidental record during non-ornithological surveys in the proposed Development Area in September 2012 (systematic surveys/ recording not carried out for this species); considered likely to be breeding at low density across the footprint of the proposed Development Area in areas of suitable breeding habitat.	Although small numbers of birds may be displaced by the proposed Development, there is alternative breeding habitat in the surrounding area. Effects of disturbance/ displacement predicted to be of a **low magnitude** and therefore **not significant**.	Not considered to be a target species in terms of collision risk; if any collisions do occur, the effect is likely to be undetectable against the natural mortality rate. Collision effects predicted to be of **negligible magnitude** and therefore **not significant**.
Common crossbill	Schedule 1 species	Highly mobile in response to variations in conifer seed production and occurs across Scotland; numbers highly variable, dependent on annual cone crop (Forrester *et al*., 2007[18]).	5,000-50,000 *; 10,000-100,000‡ (in most years)	Resident in coniferous plantations; breeds.	One flight (2 birds) recorded during preliminary VP survey on 17/04/2009 and a flight (3 birds) during VP survey on 04/11/2009. Also, an incidental record (5 birds) during non-ornithological surveys in the proposed Development Area in September 2012; considered likely to be breeding at low	Although small numbers of birds may be displaced by the proposed Development, there is alternative breeding habitat in the surrounding area. Effects of disturbance/ displacement predicted to be of a **low magnitude** and therefore **not significant**.	Not considered to be a target species in terms of collision risk; if any collisions do occur, the effect is likely to be undetectable against the natural mortality rate. Collision effects predicted to be of **negligible magnitude** and therefore **not significant**.

SPECIES	LEGAL PROTECTION/ CONSERVATION STATUS (EATON *ET AL.*, 2009[17])	SCOTTISH CONTEXT	SCOTTISH POPULATION†	STATUS IN REGION (CHAMBERS & YOUDALE, 2014[19]; CHALLIS *ET AL.* 2014[20])	BASELINE	POTENTIAL DISTURBANCE/ DISPLACEMENT EFFECTS	POTENTIAL COLLISION EFFECTS
					density across the footprint of the proposed Development Area in areas of suitable breeding habitat.		

Notes: †Population estimates taken from Forrester *et al.*, (2007)[18]; numbers in parentheses are taken from Challis *et al.*, 2014

Key: *breeding pairs/adults on nest (gulls); ‡wintering individuals

8.5 MITIGATION AND HABITAT ENHANCEMENT

8.5.1 Although the proposed Development is not predicted to have a significant impact on any ornithological receptors, specific mitigation is proposed for black grouse, merlin, barn owl and kestrel to minimise the potential effects of disturbance and to ensure compliance with the Wildlife and Countryside Act (1981) as amended by the Nature Conservation (Scotland) Act (2004). No other specific mitigation is required although various measures will be implemented to ensure compliance with legislation, and to follow best-practice guidance and consultation recommendations with regards to breeding birds. Furthermore, it is proposed that a comprehensive monitoring programme is implemented to monitor the baseline bird community during and after construction. These measures are described below.

Mitigation for Black Grouse

8.5.2 Pre-construction surveys for black grouse leks will be undertaken prior to construction and any behaviour indicating active leks will be recorded and monitored. All monitoring will be carried out by suitably experienced surveyors.

8.5.3 Should an active lek be located during pre-construction monitoring, an exclusion zone of 500 m radius around the lek will be enforced during the peak lekking period of the last week in March to mid-May, following current best practice. Evidence suggests that black grouse can be disturbed at distances of between 300-1000 m (Ruddock & Whitfield, 2007[56]); as such, the 500 m exclusion zone will be monitored and extended if necessary. Felling in the vicinity of the exclusion zone will be undertaken outside the peak black grouse lekking season where possible. Where it is not possible to maintain this exclusion zone for the duration of the lekking season it will be maintained during the times of day when peak lekking occurs (one hour after dawn and before dusk).

Residual impacts

8.5.4 Following implementation of the mitigation measures proposed above, potential effects due to disturbance during construction are predicted to be of **negligible magnitude** and therefore **not significant** for black grouse.

Mitigation for Merlin

8.5.5 Pre-construction surveys for breeding merlin will be undertaken prior to construction, and any behaviour indicating new breeding territories/occupied nest sites will be recorded and monitored. All nest searches and monitoring will be carried out under a Schedule 1 Licence by suitably experienced surveyors.

8.5.6 Should an active nest be located during pre-construction monitoring, an exclusion zone of 500 m radius around the nest will be enforced, following Ruddock & Whitfield (2007)[56]. This exclusion zone will be monitored and extended if necessary. Felling in the vicinity of the exclusion zone will be delayed until either the nest is identified as inactive (e.g. when the chicks have fledged) by an Environmental Clerk of Works (ECoW), or until the end of the peak merlin breeding season in August.

8.5.7 Should a merlin nest be located within 500 m of a track essential for access to the proposed Development, construction traffic will be monitored and any disturbance to the nest identified. A plan to prevent or minimise any disturbance to breeding merlin, whilst maintaining access to the proposed Development, should then be agreed in consultation with SNH. Any access agreement should take account of the merlin breeding cycle and be monitored and revised as appropriate (Hardey *et al*., 2009)4.

Residual impacts

8.5.8 Following implementation of the mitigation measures proposed above, potential effects due to disturbance during construction are predicted to be of **low magnitude** and therefore **not significant** for merlin.

[56] Ruddock, M. & Whitfield, D.P. 2007. A review of disturbance distances in selected bird species. A report from Natural Research (Projects) Ltd to Scottish Natural Heritage.

Mitigation for Barn Owl

8.5.9 All known barn owl breeding sites located in the vicinity of the proposed Development Area will be monitored for breeding activity prior to construction, and any behaviour indicating new breeding territories/occupied nest sites will be recorded and monitored. All nest searches and monitoring will be carried out under a Schedule 1 Licence by suitably experienced surveyors.

8.5.10 Should an active breeding site be located during pre-construction monitoring, an exclusion zone of 200 m radius around the breeding site will be enforced, following best practice guidance (Shawyer, 2011[57]). The effectiveness of the 200 m exclusion zone will be monitored and extended to 350 m if deemed necessary by an ECoW (Shawyer, 2011[57]). Since barn owls are most sensitive to disturbance just prior to egg-laying, during incubation and during the brooding of small young, construction in the vicinity of the breeding site should be delayed until late June (Percival, 1990[58]; Taylor, 1991[59]; Shawyer, 2011[57]).

8.5.11 It is also recommended that construction activities in the vicinity of barn owl breeding sites are restricted to daylight hours since barn owls are most active around dusk and during the night (Shawyer, 2011[57]). Combined with an exclusion zone, this should prevent disturbance to breeding barn owls for the duration of the breeding season.

8.5.12 Should any barn owl nesting habitat be lost due to re-development of buildings, it is proposed that a barn owl nesting box be installed in alternative suitable habitat within the breeding pair's home-range but at a distance of >200 m from the nearest proposed turbine location (Shawyer, 2011[57]). This would involve a desk-based evaluation of habitats surrounding the proposed Development Area to identify a suitable site, followed by a site visit to confirm suitability, after which the box would be installed (assuming landowner agreement).

Residual impacts

8.5.13 Following implementation of the mitigation measures proposed above, potential effects due to disturbance during construction are predicted to be of **negligible magnitude** and therefore **not significant** for barn owl.

Mitigation for Kestrel

8.5.14 All known kestrel nest sites located in the vicinity of the proposed Development Area will be monitored for breeding activity prior to construction and any behaviour indicating new breeding territories/occupied nest sites will be recorded and monitored. All nest searches and monitoring will be carried out by suitably experienced surveyors.

8.5.15 Should an active nest be located during pre-construction monitoring, an exclusion zone of 50 m radius around the nest will be enforced, following best practice regarding breeding birds. This exclusion zone will be monitored and extended if necessary. Felling in the vicinity of the exclusion zone will be delayed until either the nest is identified as inactive (e.g. when the chicks have fledged) by an ECoW, or until the end of the peak kestrel breeding season in August.

8.5.16 Should any kestrel nesting habitat be lost during construction, it is proposed that a kestrel nesting box be installed in alternative suitable habitat within the breeding pair's home-range but at a distance of >1.5 km from the nearest proposed turbine location (Canham, 1992[60]; Shawyer & Sheppard, 2009[61]). This would involve a

[57] Shawyer, C.R. 2011. Barn owl *Tyto alba* survey methodology and techniques for use in Ecological Assessment: developing best practice in survey and reporting. IEEM, Winchester.

[58] Percival, S. 1990. Population trends in British barn and tawny owls in relation to environmental change. BTO Research Report No. 57, Thetford.

[59] Taylor, I.R. 1991. Effects of nest inspections and radiotagging on barn owl breeding success. Journal of Wildlife Management 55, 312-315.

[60] Canham, M. 1992. Nest boxes for kestrels. Research Information Note 215, Forestry Commission Research Division.

desk-based evaluation of habitats surrounding the proposed Development Area to identify a suitable site, followed by a site visit to confirm suitability, after which the box would be installed (assuming landowner agreement).

Residual impacts

8.5.17 Following implementation of the mitigation measures proposed above, potential effects due to disturbance during construction are predicted to be of **negligible magnitude** and therefore **not significant** for kestrel.

Best Practice Regarding Breeding Birds

8.5.18 Under the Wildlife and Countryside Act (1981) as amended by the Nature Conservation (Scotland) Act (2004), it is an offence, with only limited exceptions, to:

- Intentionally or recklessly take, interfere with, damage or destroy the nest of any wild bird whilst it is in use or being built (applies year round for nests of birds included in Schedule A1);
- Obstruct or prevent any wild bird from using its nest;
- Intentionally or recklessly take, interfere with or destroy the egg of any wild bird;
- Intentionally or recklessly disturb any wild bird listed on Schedule 1 while it is nest building, or at (or near) a nest containing eggs or young, or disturb the dependent young of such a bird;
- Intentionally or recklessly harass any wild bird included in Schedule 1A; or
- Knowingly cause or permit to be done any of the above acts.

8.5.19 Best practice will be necessary to reduce the possibility of illegal damage, destruction or disturbance to occupied bird nests during the construction phase. Three good practice measures will be adopted: timing, pre-construction surveys, and the use of an ECoW.

8.5.20 If site clearance and construction activities are required to take place during the main breeding bird season, from March to August inclusive, pre-commencement survey work will be required to ensure that nest destruction and disturbance to breeding birds are avoided. Where applicable, construction will not take place within disturbance exclusion zones (to be agreed with SNH) for certain sensitive species during the breeding season.

8.5.21 Compliance with the law will also be achieved by the appointment of a suitably experienced ornithologist as ECoW during the bird breeding season (March to August, inclusive). Among other tasks, this will involve locating any active nests close to construction works shortly before these commence. Any active nests found will be cordoned off to a suitable distance for the species concerned (up to 50 m for open-ground nesting species and up to 20 m for woodland and scrub nesters) and construction operations delayed within the cordon until the young have fledged and/or the nest becomes vacant. There will be a clear line of responsibility for ensuring these measures are adhered to.

8.5.22 Prior to the start of construction/the breeding bird season, contractors will be made aware of the ornithological sensitivities within the proposed Development Area (particularly with regard to the potential presence of Schedule 1 breeding species) through the use of on-site posters and a toolbox talk. Should any breeding birds be found within construction areas, all works would stop immediately and appropriate exclusion zones (depending on the species) would be established. No works would recommence within the exclusion zone until the breeding attempt is complete and the nest site is no longer active.

Post Construction Monitoring

8.5.23 Post construction monitoring of the breeding and wintering bird population will be undertaken to assess predicted impacts against the actual effects. The monitoring programme will be subject to consultation with SNH, Dumfries and Galloway Council and RSPB Scotland. It is likely that the programme will target black grouse and raptors and will complement current monitoring to be undertaken as part of the Environmental Monitoring Plan for Windy Standard II (Natural Power, 2013[62]).

Mitigation of Decommissioning Activities

8.5.24 Mitigation of decommissioning activities should follow that proposed for the mitigation of construction activities, including pre-decommissioning surveys and ecological supervision of activities.

[61] Shawyer, C & Sheppard, R. 2009. Species Action Plan for incorporation within internal drainage board BAPS: kestrel. Association of Drainage Authorities.

[62] Natural Power. 2013. Windy Standard II, Environmental Monitoring Report. Document Reference: 1040588.

8.6 CUMULATIVE IMPACTS

8.6.1 The following section assesses the predicted cumulative effects of wind farm developments within the vicinity of the proposed Development and follows recently published SNH guidance (SNH, 2012[14]).

8.6.2 The context in which cumulative effects are considered depends upon the ecology of the species in question. For example, it may be appropriate to consider cumulative collision risk to geese associated with an SPA within the context of their wider foraging range. This may involve the consideration of wind farms within, for example, 25 km of the SPA (the actual range considered would be informed by the available information on area use by the particular roost population).

8.6.3 For other receptors, such as breeding waders, it may be appropriate to consider the effects on the local population as identified in the assessment in the context of any planned wind farms in the immediate vicinity which have the potential to cause additional displacement. It may be considered that breeding pairs will move into adjacent suitable habitat when the proposed Development is considered in isolation, when in reality, this land may be unavailable due to consent of another proposed project nearby.

8.6.4 The main target species recorded at the proposed Development for which cumulative impacts may occur are as follows:

- Greylag goose
- Black grouse
- Merlin
- Peregrine

8.6.5 These species are receptors of regional or higher value that were recorded regularly at the proposed Development.

8.6.6 Cumulative impact assessments may be complicated by availability of Environmental Statements and Appraisals for consented wind farm sites and, where this information is available, survey periods and methods may differ between sites; furthermore, some schemes may have been in existence for many years, and thus contemporary data may not be available.

8.6.7 Existing, proposed and submitted developments within 25 km of the proposed Development Area were considered (this distance was considered appropriate based on the target bird species most likely to be affected by cumulative impacts). Within this search area, information was available for one operational, six consented/under construction and four submitted wind energy developments, and six open cast coal mines.

8.6.8 Applications for single and small groups of turbines (<4) have not been included in the cumulative impact assessment due to there being no numeric collision data associated with these applications.

8.6.9 The residual effect of the individual operational, consented and submitted developments for which information was available and the cumulative residual effect on each of the target species most likely to be affected by cumulative impacts (as listed above) is summarised in Table 8.12 below.

Table 8.12: Summary of the residual effects of operational, consented/under construction, submitted and at appeal developments within 25 km of the proposed Development Area on Valued Ecological Receptors (VERs).

Individual Residual Effect	Site Description	VER and Potential Effect						
		Collision risk to greylag goose	Collision risk to merlin	Disturbance or displacement to merlin	Collision risk to peregrine	Disturbance or displacement to peregrine	Collision risk to black grouse	Disturbance or displacement to black grouse
Proposed Development	20 turbines Total habitat loss of 8.77 ha. Bird surveys carried out Apr 2009 – Aug 2013.	A single flight only (18 birds). Outside collision risk zone thus CRM not undertaken and no significant negative effect predicted	Two flights (2 birds) within the collision risk zone at PCH. Therefore, CRM not undertaken and no significant effect predicted.	Impact considered to be of moderate significance dropping to not significant following mitigation. Pre-construction breeding raptor surveys and exclusion zones proposed.	Two flights (2 birds) within the collision risk zone at PCH. Therefore, CRM not undertaken and no significant effect predicted.	Two historic nest sites situated 3-5 km from proposed Development. No significant negative effect predicted.	Two flights (2 birds) only. Outside collision risk zone thus CRM not undertaken and no significant negative effect predicted.	Maximum of five males at two active leks constituting <1 % of regional population. Thus no significant negative effect predicted. Exclusion zones proposed.
Windy Standard Wind Farm	36 turbines: operational. Habitat loss unknown. Details of bird surveys not available.	None assessed, thus no significant effect predicted.	None assessed, thus no significant effect predicted.	None assessed, thus no significant effect predicted.	Peregrine noted to overfly the site. No significant effect predicted.	Peregrine noted to overfly the site. No significant effect predicted.	None assessed, thus no significant effect predicted.	None assessed, thus no significant effect predicted.
Windy Standard II Wind Farm	30 turbines: consented. Habitat loss unknown. Breeding bird surveys carried out during spring/summer of 1994-2001.	Recorded as a casual/vagrant species. No significant negative effect predicted.	Recorded as a casual/vagrant species. No significant negative effect predicted.	Recorded as a casual/vagrant species. No significant negative effect predicted	Recorded as a casual/vagrant species. No significant negative effect predicted.	Recorded as a casual/vagrant species. No significant negative effect predicted	Not recorded during surveys, thus no significant negative effect predicted.	Not recorded during surveys, thus no significant negative effect predicted.
Afton Wind Farm	27 turbines: consented. Habitat loss unknown. Breeding bird survey, winter walkover survey, black grouse survey and VP surveys carried out during 2003-2004.	None recorded, thus no significant effect predicted.	One flight over survey area during winter. No predicted mortality using 95 % avoidance rate.	One flight over survey area during winter. No significant negative effect predicted.	Two flights over the survey area during winter. Predicted mortality of 0.07 birds per year using 95 % avoidance rate. Impact predicted to be of minor significance.	RSG record of a nest site within 500 m of existing access track. No significant negative effect predicted following mitigation. Construction works would be timed to avoid disturbance.	Two flights (6 birds) over the survey area during winter. Predicted mortality of 0.07 birds per year using 95 % avoidance rate. Impact predicted to be of minor significance.	No black grouse or leks identified during black grouse survey. Group of three males recorded during winter VP survey. Effects predicted to be of low magnitude and minor significance.
Blackcraig Hill Wind Farm	23 turbines: consented. Habitat loss unknown. VP surveys, winter walkover surveys, point counts and breeding bird surveys carried out during 2010-2011.	Two flights of greylag geese (4 and 7 birds) during winter VP surveys. One flock of eight domestic greylag geese during winter walkover. No flights within collision risk zone at PCH. CRM not undertaken and no significant negative effect predicted.	None recorded thus no significant negative effect predicted.	None recorded thus no significant negative effect predicted.	Two flights during winter walkovers. Low level of activity suggests site is of negligible importance thus no significant negative effect predicted.	Two flights during winter walkovers, thus no significant negative effect predicted.	None recorded thus no significant negative effect predicted.	Monitoring not undertaken due to lack of suitable habitat. Thus no significant negative effect predicted.
Dersalloch Wind Farm	23 turbines: consented. Habitat loss unknown. Surveys undertaken in 2007, 2009, 2010 and 2011 including black grouse and breeding bird	None recorded, thus no significant effect predicted.	Number of flights unknown, CRM not undertaken. Impact considered to be of moderate significance dropping to not significant	Evidence of breeding merlin within 300 m of the nearest turbine. Impact considered to be of moderate significance dropping to not significant	None recorded, thus no significant effect predicted.	None recorded, thus no significant effect predicted.	Single lekking male black grouse recorded in 2009. CRM not undertaken and no significant negative effect predicted.	Single lekking male black grouse recorded in 2009. Effects predicted to be of low magnitude and minor significance. Habitat management plan

Individual Residual Effect	Site Description	VER and Potential Effect						
		Collision risk to greylag goose	Collision risk to merlin	Disturbance or displacement to merlin	Collision risk to peregrine	Disturbance or displacement to peregrine	Collision risk to black grouse	Disturbance or displacement to black grouse
	surveys.		following mitigation.	following mitigation. Artificial nest and habitat management plan proposed.				developed in consultation with SNH.
Enoch Hill Wind Farm	19 turbines: submitted. Habitat loss of 14.23 ha. Surveys undertaken between 2011 and 2013 including VP, breeding waders, breeding raptors, black grouse, barn owl and winter walkover surveys.	Two flights recorded (1-2 individuals) during entire VP programme. CRM not undertaken and no significant negative effect predicted.	Fourteen flights (single individuals) recorded during entire VP programme. Two flights at PCH. CRM not undertaken and no significant effect predicted	Active nest in tree recorded in 2013 c.500 m from nearest proposed turbine. Disturbance considered negligible and not significant. Pre-construction breeding raptor surveys and exclusion zone proposed.	Two flights (single individuals) recorded during entire VP programme. Single incidental record of one individual at PCH. CRM not undertaken and no significant effect predicted	Data from the South Strathclyde Raptor study Group identified two nest sites within 5 km of the development; none recorded within 2 km. Disturbance considered negligible and not significant.	Four flights (nine individuals) during winter 2012/13 and one flight (four individuals) during winter 2013/14. No flights at PCH. CRM not undertaken and no significant effect predicted	Single lek identified (peak count of three males and two females in March 2013). Three satellite leks also identified. Disturbance considered low following revision of infrastructure layout and not significant. Exclusion zones during core lekking period proposed,
Keirs Hill Wind Farm	17 turbines: submitted. Habitat loss unknown. Surveys undertaken in 2011 and 2012 including VP, breeding bird, point count, black grouse, barn owl, goose roost and winter walkover surveys.	Low numbers of birds making use of loch adjacent to the Development, particularly in winter; no significant negative effect predicted.	Two flights (2 birds) recorded during breeding season and one flight (1 bird) recorded during non-breeding season. CRM not undertaken and no significant effect predicted	Two flights (2 birds) recorded during breeding season and one flight (1 bird) recorded during non-breeding season. No significant effect predicted	Three flights (3 birds) recorded during breeding season and five flights (5 birds) recorded during non-breeding season VP surveys. An additional two flights (2 birds) recorded during winter goose roost VP surveys. CRM not undertaken and no significant effect predicted.	Three flights (3 birds) recorded during breeding season and five flights (5 birds) recorded during non-breeding season VP surveys. An additional two flights (2 birds) recorded during winter goose roost VP surveys. No significant effect predicted.	No evidence of black grouse thus no significant effect predicted.	No evidence of black grouse thus no significant effect predicted.
Knockman Hill Wind Farm	Five turbines: consented. Habitat loss unknown Breeding bird surveys and VP surveys in 2006, winter walkover in 2009.	Two greylag geese recorded during spring VP surveys. CRM not undertaken and no significant negative effect predicted.	None recorded thus no significant negative effect predicted.	None recorded thus no significant negative effect predicted.	None recorded thus no significant negative effect predicted.	None recorded thus no significant negative effect predicted.	One individual recorded during winter walkover surveys in 2009. CRM not undertaken and no significant negative effect predicted.	One individual recorded during winter walkover surveys in 2009.
Sandy Knowe Wind Farm	30 turbines: submitted. Total habitat loss of 91.16 ha. VP surveys, breeding bird survey, winter walkover, breeding raptor survey, black grouse survey and woodland point counts carried out 2011-2012.	None recorded, thus no significant effect predicted.	Two flights (2 birds) recorded below PCH, thus CRM not undertaken. No significant negative effect predicted.	Two flights (2 birds) recorded; no evidence of breeding, thus no significant negative effect predicted.	One flight (1 bird) recorded below PCH, thus CRM not undertaken. No significant negative effect predicted.	One flight (1 bird) recorded during non-breeding season; no evidence of breeding, thus no significant negative effect predicted.	Six flights (7 birds) recorded. CRM not undertaken and no significant negative effect predicted.	Two leks with one male at each. Five females also observed. Effects predicted to be of major significance, reducing to negligible significance following mitigation.
South Kyle Wind Farm	50 turbines: submitted.	Three flights (99 birds). No flights within collision	Predicted mortality of 0.02 per year using 98 %	Evidence of breeding merlin c.500 m from the	Predicted mortality of 0.03 per year using 98 %	Active nest site over 2 km from nearest proposed	No evidence of black grouse flights. CRM not	Historical leks outside development area.

Individual Residual Effect	Site Description	VER and Potential Effect						
		Collision risk to greylag goose	Collision risk to merlin	Disturbance or displacement to merlin	Collision risk to peregrine	Disturbance or displacement to peregrine	Collision risk to black grouse	Disturbance or displacement to black grouse
	Total habitat loss of 125.76 ha. VP surveys, breeding bird surveys, breeding raptor surveys, wintering bird surveys, black grouse surveys carried out during 2009-2012.	risk zone at PCH, thus no CRM undertaken. No significant negative effect predicted.	avoidance rate. No significant negative effect predicted	nearest turbine. Impact considered to be of moderate significance dropping to minor significance following mitigation. Pre-construction breeding raptor surveys, exclusion zones and habitat management plan proposed.	avoidance rate. No significant negative effect predicted	turbine. Impact considered to be of minor significance.	undertaken thus no significant effect predicted.	Impact considered to be of minor significance. Habitat management plan developed in consultation with FCS, RSPB and SNH.
Twentyshilling Hill Wind Farm	Nine turbines: consented. Total habitat loss of 8.29 ha. VP surveys, winter walkover surveys, breeding bird surveys and specific surveys for black grouse, raptors and barn owl during 2010 and 2011.	Three flights (3 birds). CRM not undertaken, thus no significant negative effect predicted.	Nine flights (9 birds) recorded during VP surveys; seven were within the collision risk zone but none were at PCH. CRM not undertaken, thus no significant negative effect predicted.	No evidence of breeding merlin within 2 km of the proposed development. No significant negative effect predicted.	Three flights (3 birds) recorded during VP surveys, all below PCH. CRM not undertaken, thus no significant negative effect predicted.	No evidence of breeding peregrine thus no significant negative effect predicted.	Two flights (2 birds) within the collision risk zone thus CRM not undertaken and no significant effect predicted.	Five leks identified during species-specific surveys. Maximum of three males at two leks within proposed development area. Effect predicted to be of low magnitude and not significant. Habitat management plan proposed.
Windy Rig Wind Farm	16 turbines: submitted. Total habitat loss of 14.93 ha. VP surveys, black grouse surveys, breeding bird surveys and winter walkover surveys undertaken between August 2013 and January 2015.	No flights recorded, thus CRM not undertaken. No significant negative effect predicted.	Single flight of a single male recorded during non-breeding season VP surveys. Single female recorded in flight during winter walkover. Two flights of a male recorded during breeding bird survey. CR< not undertaken thus no significant negative effect predicted.	No nest sites or breeding activity recorded and dense heather (preferred nesting habitat) only present in small patches within survey area. No significant negative effect predicted.	Seven flights (7 birds) recorded during VP surveys. Predicted mortality of 0.02 birds per year using 98 % avoidance rate. No significant negative effect predicted.	Closest peregrine nest is >1 km from the proposed development. Some limited disturbance possible but no significant negative effect predicted.	Four flights (1-5 birds) recorded during VP surveys. CRM not undertaken and no significant effect predicted.	Three leks identified during species-specific surveys. Maximum of eight males and three females recorded across all leks during a single survey visit. Effect predicted to be of medium magnitude and significant, reducing to low magnitude and not significant following mitigation. Exclusion zones and habitat management plan proposed.
Greenburn South Opencast Coal Mine	Application area extends to a total of 440 ha. Habitat loss unknown. Breeding bird surveys and barn owl surveys in 2007, 2008 and 2009.	Species not mentioned in assessment.	Species not mentioned in assessment.	Species not mentioned in assessment.	Species not mentioned in assessment.	Species not mentioned in assessment.	Species not mentioned in assessment.	Species not mentioned in assessment.
Carsgailoch Hill Opencast Coal	Application area extends	Species not mentioned in	Species not mentioned in	Species not mentioned in	Species not mentioned in	Species not mentioned in	Species not mentioned in	Species not mentioned in

Individual Residual Effect	Site Description	VER and Potential Effect						
		Collision risk to greylag goose	Collision risk to merlin	Disturbance or displacement to merlin	Collision risk to peregrine	Disturbance or displacement to peregrine	Collision risk to black grouse	Disturbance or displacement to black grouse
Mine*	to a total of 267 ha. Habitat loss unknown. Survey programme unknown.	assessment.	assessment.	assessment.	assessment.	assessment.	assessment.	assessment.
Burnston Remainder Opencast Coal Mine*	Application area extends to a total of 467 ha. Habitat loss unknown. Black grouse surveys and walkover surveys in 2004 and 2005	No species specified in NTS. Following mitigation assessed as no adverse impact upon any valued receptors.	No species specified in NTS. Following mitigation assessed as no adverse impact upon any valued receptors.	No species specified in NTS. Following mitigation assessed as no adverse impact upon any valued receptors.	No species specified in NTS. Following mitigation assessed as no adverse impact upon any valued receptors.	No species specified in NTS. Following mitigation assessed as no adverse impact upon any valued receptors.	No species specified in NTS. Following mitigation assessed as no adverse impact upon any valued receptors.	No species specified in NTS. Following mitigation assessed as no adverse impact upon any valued receptors.
Wellhill Farm Opencast Coal Mine*	Application area extends to a total of 127 ha. Habitat loss unknown. Breeding bird survey in 2011	Species not mentioned in assessment.	Species not mentioned in assessment.	Species not mentioned in assessment.	Species not mentioned in assessment.	Species not mentioned in assessment.	Species not mentioned in assessment.	Species not mentioned in assessment.
Braehead Farm Opencast Coal Mine*	Application area extends to a total of 207 ha. Habitat loss unknown. Survey programme unknown.	Species not mentioned in assessment.	Species not mentioned in assessment.	Species not mentioned in assessment.	Species not mentioned in assessment.	Species not mentioned in assessment.	Species not mentioned in assessment.	Species not mentioned in assessment.
Netherton Opencast Coal Mine	Application area extends to a total of 413 ha. Habitat loss unknown. Breeding bird survey and crossbill survey in 2008 and 2009.	Species not mentioned in assessment.	Species not mentioned in assessment.	Species not mentioned in assessment.	Species not mentioned in assessment.	Species not mentioned in assessment.	Species not mentioned in assessment.	Species not mentioned in assessment.
Cumulative Residual Effect	Total 286 turbines. Minimum total habitat loss of 248.91 ha.	Low numbers of birds recorded within cumulative area with none recorded at PCH. Therefore **no significant cumulative effect predicted.**	Low numbers of birds recorded within cumulative area with few individuals recorded at PCH. Collision mortality not predicted to be significant at the population level; therefore **no significant cumulative effect predicted.**	There is potential for small numbers of breeding merlin to be disturbed within the cumulative area. However, following implementation of mitigation measures **no significant cumulative effect is predicted.**	Low numbers of birds recorded within cumulative area with few individuals recorded at PCH. Collision mortality not predicted to be significant at the population level; therefore **no significant cumulative effect predicted.**	There is potential for small numbers of breeding peregrine to be disturbed within the cumulative area. However, following implementation of mitigation measures **no significant cumulative effect is predicted.**	Low numbers of birds recorded within cumulative area with few individuals recorded at PCH. Collision mortality not predicted to be significant at the population level; therefore **no significant cumulative effect predicted.**	There is potential for small numbers of birds to be disturbed or displaced from leks within the cumulative area. However, mitigation measures (particularly habitat management and exclusion zones) should have an **overall positive effect in the long-term.**

*Information obtained from Non-Technical Summary due to ES not being publically available.

8.7 IMPACTS ON STATUTORY SITES

8.7.1 Under the Conservation (Natural Habitats, &c.) Regulations 1994, as amended (the Habitats Regulations) any development that may have a likely significant effect (LSE) on an SPA or Special Area of Conservation (SAC), either alone or in combination with other projects, requires an Appropriate Assessment (AA) to be carried out by the relevant competent authority, to determine whether or not the development, would have an adverse effect on the integrity of the SPA or SAC.

8.7.2 Before an AA is initiated a screening process is undertaken to determine whether any of the predicted impacts of the development will result in a LSE. This screening assessment is presented here to provide information to the competent authority to allow them to reach a decision on whether or not the development will have a LSE on any SPA and therefore whether an AA is required. Section 8.3 above lists all statutory sites within 10 km of the proposed Development Area (25 km for sites designated for goose species) designated for ornithological features.

8.7.3 Loch Ken and River Dee Marshes SPA/Ramsar site, located approximately 22.6 km to the south of the proposed Development, is the only statutory site of international importance designated for ornithological features that occurs within the search area specified above. This SPA supports internationally important overwintering populations of Greenland white-fronted goose and Icelandic greylag goose.

8.7.4 The only record of either of these species within the proposed Development Area was a single flock of 18 greylag geese flying south over Laggeran Hill (to the south of the proposed Development) on 29/01/2010. This is equivalent to just 1.6 % of the designated Loch Ken and River Dee Marshes SPA/Ramsar site population. Since only a small number of individuals were recorded outside the collision risk zone, the effects of collision were predicted to be negligible and not significant for greylag goose. Therefore, it is considered unlikely that the proposed Development will have a LSE on the SPA goose populations.

8.7.5 Bogton Loch SSSI, located approximately 9.9 km to the north-west of the proposed Development, is the only other statutory site within the search area specified above. This site is designated for its breeding bird assemblage, which includes a number of passerines of high conservation concern (those included on the UK BoCC Red-list) and, sporadically, a small colony of black-headed gulls. Black-headed gull was not recorded within the proposed Development Area, and it is considered that the SSSI is too distant for any regular connectivity to exist between passerines breeding at the SSSI and those occurring within the proposed Development Area. Therefore, it is considered unlikely that the proposed Development will have a significant effect on Bogton Loch SSSI.

8.8 SUMMARY OF RESIDUAL EFFECTS

8.8.1 Table 8.13 below summarises the predicted residual impacts on each VER during each stage of the proposed Development, following implementation of mitigation. Receptors of negligible conservation value are not considered.

Table 8.13: Potential effects on Valued Ecological Receptors (VERs) at the proposed Development.

VER	VALUE OF SITE TO THE VER	NATURE OF POTENTIAL PRE-MITIGATION EFFECT	MAGNITUDE OF POTENTIAL PRE-MITIGATION EFFECT	DURATION OF POTENTIAL PRE-MITIGATION EFFECT	SPECIFIC MITIGATION MEASURES	MAGNITUDE OF RESIDUAL EFFECT	RESIDUAL SIGNIFICANCE	LEVEL OF CERTAINTY/COMMENTS
CONSTRUCTION AND DECOMMISSIONING IMPACTS								
Red grouse	Local	Disturbance/ displacement	Low	Short-term	None required	Low	Not significant	A measurable effect on the local or regional population is considered to be highly unlikely.
Black grouse	Regional	Disturbance/ displacement	Low	Short-term	Mitigation by design. Exclusion zone around any active leks.	Low	Not significant	It is considered that lek locations will be retained and a measurable effect on the local or regional population is unlikely. However, exclusion zones will be established around any active leks.
Red kite	Local	Disturbance/ displacement	Negligible	Short-term	None required	Negligible	Not significant	A measurable effect on the local or regional population is considered to be highly unlikely.
Hen harrier	Local	Disturbance/ displacement	Negligible	Short-term	None required	Negligible	Not significant	A measurable effect on the local or regional population is considered to be highly unlikely.
Goshawk	Local	Disturbance/ displacement	Negligible	Short-term	None required	Negligible	Not significant	A measurable effect on the local or regional population is considered to be highly unlikely.
Osprey	Local	Disturbance/ displacement	Negligible	Short-term	None required	Negligible	Not significant	A measurable effect on the local or regional population is considered to be highly unlikely.
Kestrel	Local	Disturbance/ displacement	Low	Short-term	Exclusion zone around any nest sites. Installation of artificial nest boxes.	Low	Not significant	It is considered that nest sites will be retained and a measurable effect on the local or regional population is unlikely. However, exclusion zones will be established around any active nest sites, and artificial nest boxes will be provided away from turbine locations.
Merlin	Regional	Disturbance/ displacement	Moderate	Short-term	Exclusion zone around any nest sites.	Low	Not significant	It is considered that breeding territories will be retained and a measurable effect on the local or regional population is unlikely. However, exclusion zones will be established around any active nest sites.
Peregrine	Regional	Disturbance/ displacement	Low	Short-term	None required	Low	Not significant	A measurable effect on the local or regional population is considered to be highly unlikely.
Oystercatcher	Local	Disturbance/ displacement	Negligible	Short-term	None required	Negligible	Not significant	A measurable effect on the local or regional population is considered to be highly unlikely.
Golden plover	Local	Disturbance/ displacement	Negligible	Short-term	None required	Negligible	Not significant	A measurable effect on the local or regional population is considered to be highly unlikely.
Snipe	Local	Disturbance/ displacement	Low	Short-term	None required	Low	Not significant	A measurable effect on the regional or national population is considered to be highly unlikely.
Curlew	Local	Disturbance/ displacement	Negligible	Short-term	None required	Negligible	Not significant	A measurable effect on the regional or national population is considered to be highly unlikely.
Common sandpiper	Local	Disturbance/ displacement (breeding)	Low	Short-term	Exclusion zone around any nest sites.	Negligible	Not significant	A measurable effect on the regional or national population is considered to be highly unlikely.
Common gull	Local	Disturbance/ displacement	Negligible	Short-term	None required	Negligible	Not significant	A measurable effect on the regional or national population is considered to be highly unlikely.
Lesser black-backed gull	Local	Disturbance/ displacement	Negligible	Short-term	None required	Negligible	Not significant	A measurable effect on the regional or national population is considered to be highly unlikely.
Herring gull	Local	Disturbance/ displacement	Negligible	Short-term	None required	Negligible	Not significant	A measurable effect on the regional or national population is considered to be highly unlikely.

VER	VALUE OF SITE TO THE VER	NATURE OF POTENTIAL PRE-MITIGATION EFFECT	MAGNITUDE OF POTENTIAL PRE-MITIGATION EFFECT	DURATION OF POTENTIAL PRE-MITIGATION EFFECT	SPECIFIC MITIGATION MEASURES	MAGNITUDE OF RESIDUAL EFFECT	RESIDUAL SIGNIFICANCE	LEVEL OF CERTAINTY/COMMENTS
Barn owl	Local	Disturbance/ displacement	Low	Short-term	Exclusion zone around any nest sites. Maintaining suitable nest sites away from turbines.	Low	Not significant	A measurable effect on the local or regional population is considered to be highly unlikely. However, exclusion zones will be established around any active nest sites, and suitable nest sites away from turbine locations will be maintained.
Short-eared owl	Local	Disturbance/ displacement	Low	Short-term	None required.	Low	Not significant	A measurable effect on the local or regional population is considered to be highly unlikely.
Swift	Local	Disturbance/ displacement (breeding)	Negligible	Short-term	None required	Negligible	Not significant	A measurable effect on the regional or national population is considered to be highly unlikely.
Passerines	Local	Disturbance/ displacement (breeding)	Low to Negligible	Short-term	None required	Low to Negligible	Not significant	A measurable effect on the regional or national population is considered to be highly unlikely.
OPERATIONAL EFFECTS								
Greylag goose	International	Collision (non-breeding)	Negligible	Short-term to Permanent	None required	Negligible	Not significant	Collision risk to this species is considered to be negligible. A measurable effect on the local or regional population is considered to be highly unlikely.
Red grouse	Local	Disturbance/ displacement	Low	Short-term to Permanent	None required	Low	Not significant	A measurable effect on the local or regional population due to disturbance/ displacement is considered to be highly unlikely.
		Collision	Negligible	Short-term to Permanent	None required	Negligible	Not significant	Collision risk to this species is considered to be negligible. A measurable effect on the local or regional population is considered to be highly unlikely.
Black grouse	Regional	Disturbance/ displacement	Low	Short-term to Permanent	Mitigation by design. Exclusion zone around any active leks.	Low	Not significant	It is considered that lek locations will be retained and a measurable effect on the local or regional population is unlikely. However, exclusion zones will be established around any active leks.
		Collision	Negligible	Short-term to Permanent	None required	Negligible	Not significant	Collision risk to this species is considered to be negligible. A measurable effect on the local or regional population is considered to be highly unlikely.
Red kite	Local	Disturbance/ displacement	Negligible	Short-term to Permanent	None required	Negligible	Not significant	A measurable effect on the local or regional population due to disturbance/ displacement is considered to be highly unlikely.
		Collision	Negligible	Short-term to Permanent	None required	Negligible	Not significant	Collision risk to this species is considered to be negligible. A measurable effect on the local or regional population is considered to be highly unlikely.
Hen harrier	Local	Disturbance/ displacement	Negligible	Short-term to Permanent	None required	Negligible	Not significant	A measurable effect on the local or regional population due to disturbance/ displacement is considered to be highly unlikely.
		Collision	Negligible	Short-term to Permanent	None required	Negligible	Not significant	Collision risk to this species is considered to be negligible. A measurable effect on the local or regional population is considered to be highly unlikely.
Goshawk	Local	Disturbance/ displacement	Negligible	Short-term to Permanent	None required	Negligible	Not significant	A measurable effect on the local or regional population due to disturbance/ displacement is considered to be highly unlikely.
		Collision	Negligible	Short-term to	None required	Negligible	Not significant	Collision risk to this species is considered to be negligible. A measurable

VER	VALUE OF SITE TO THE VER	NATURE OF POTENTIAL PRE-MITIGATION EFFECT	MAGNITUDE OF POTENTIAL PRE-MITIGATION EFFECT	DURATION OF POTENTIAL PRE-MITIGATION EFFECT	SPECIFIC MITIGATION MEASURES	MAGNITUDE OF RESIDUAL EFFECT	RESIDUAL SIGNIFICANCE	LEVEL OF CERTAINTY/COMMENTS
				Permanent				effect on the local or regional population is considered to be highly unlikely.
Osprey	Local	Disturbance/ displacement	Negligible	Short-term to Permanent	None required	Negligible	Not significant	A measurable effect on the local or regional population due to disturbance/ displacement is considered to be highly unlikely.
		Collision	Negligible	Short-term to Permanent	None required	Negligible	Not significant	Collision risk to this species is considered to be negligible. A measurable effect on the local or regional population is considered to be highly unlikely.
Kestrel	Local	Disturbance/ displacement	Low	Short-term to Permanent	Exclusion zone around any nest sites. Installation of artificial nest boxes.	Low	Not significant	It is considered that nest sites will be retained and a measurable effect on the local or regional population is unlikely. However, exclusion zones will be established around any active nest sites, and artificial nest boxes will be provided away from turbine locations.
		Collision	Low	Short-term to Permanent	None required	Low	Not significant	Collision risk to this species is considered to be low. A measurable effect on the local or regional population is considered to be highly unlikely.
Merlin	Regional	Disturbance/ displacement	Low	Short-term to Permanent	Exclusion zone around any nest sites.	Low	Not significant	It is considered that breeding territories will be retained and a measurable effect on the local or regional population is unlikely. However, exclusion zones will be established around any active nest sites.
		Collision	Negligible	Short-term to Permanent	None required	Negligible	Not significant	Collision risk to this species is considered to be negligible. A measurable effect on the local or regional population is considered to be highly unlikely.
Peregrine	Regional	Disturbance/ displacement	Low	Short-term to Permanent	None required.	Low	Not significant	A measurable effect on the local or regional population is considered to be highly unlikely.
		Collision	Negligible	Short-term to Permanent	None required	Negligible	Not significant	Collision risk to this species is considered to be negligible. A measurable effect on the local or regional population is considered to be highly unlikely.
Oystercatcher	Local	Disturbance/ displacement	Negligible	Short-term to Permanent	None required	Negligible	Not significant	A measurable effect on the local or regional population due to disturbance/ displacement is considered to be highly unlikely.
		Collision	Negligible	Short-term to Permanent	None required	Negligible	Not significant	Collision risk to this species is considered to be negligible. A measurable effect on the local or regional population is considered to be highly unlikely.
Golden plover	Local	Disturbance/ displacement	Negligible	Short-term to Permanent	None required	Negligible	Not significant	A measurable effect on the local or regional population due to disturbance/ displacement is considered to be highly unlikely.
		Collision	Negligible	Short-term to Permanent	None required	Negligible	Not significant	Collision risk to this species is considered to be negligible. A measurable effect on the local or regional population is considered to be highly unlikely.
Snipe	Local	Disturbance/ displacement	Low	Short-term to Permanent	None required	Low	Not significant	A measurable effect on the local or regional population due to disturbance/ displacement is considered to be highly unlikely.
		Collision	Negligible	Short-term to Permanent	None required	Negligible	Not significant	Collision risk to this species is considered to be negligible. A measurable effect on the local or regional population is considered to be highly unlikely.
Curlew	Local	Disturbance/ displacement	Negligible	Short-term to Permanent	None required	Negligible	Not significant	A measurable effect on the local or regional population due to disturbance/ displacement is considered to be highly unlikely.
		Collision	Negligible	Short-term to	None required	Negligible	Not significant	Collision risk to this species is considered to be negligible. A measurable

VER	VALUE OF SITE TO THE VER	NATURE OF POTENTIAL PRE-MITIGATION EFFECT	MAGNITUDE OF POTENTIAL PRE-MITIGATION EFFECT	DURATION OF POTENTIAL PRE-MITIGATION EFFECT	SPECIFIC MITIGATION MEASURES	MAGNITUDE OF RESIDUAL EFFECT	RESIDUAL SIGNIFICANCE	LEVEL OF CERTAINTY/COMMENTS
				Permanent				effect on the local or regional population is considered to be highly unlikely.
Common sandpiper	Local	Disturbance/ displacement (breeding)	Low	Short-term to Permanent	Exclusion zone around any nest sites.	Low	Not significant	A measurable effect on the local or regional population due to disturbance/ displacement is considered to be highly unlikely.
		Collision	Negligible	Short-term to Permanent	None required	Negligible	Not significant	Collision risk to this species is considered to be negligible. A measurable effect on the local or regional population is considered to be highly unlikely.
Common gull	Local	Disturbance/ displacement	Negligible	Short-term to Permanent	None required	Negligible	Not significant	A measurable effect on the local or regional population due to disturbance/ displacement is considered to be highly unlikely.
		Collision	Negligible	Short-term to Permanent	None required	Negligible	Not significant	Collision risk to this species is considered to be negligible. A measurable effect on the local or regional population is considered to be highly unlikely.
Lesser black-backed gull	Local	Disturbance/ displacement	Negligible	Short-term to Permanent	None required	Negligible	Not significant	A measurable effect on the local or regional population due to disturbance/ displacement is considered to be highly unlikely.
		Collision	Negligible	Short-term to Permanent	None required	Negligible	Not significant	Collision risk to this species is considered to be negligible. A measurable effect on the local or regional population is considered to be highly unlikely.
Herring gull	Local	Disturbance/ displacement	Negligible	Short-term to Permanent	None required	Negligible	Not significant	A measurable effect on the local or regional population due to disturbance/ displacement is considered to be highly unlikely.
		Collision	Negligible	Short-term to Permanent	None required	Negligible	Not significant	Collision risk to this species is considered to be negligible. A measurable effect on the local or regional population is considered to be highly unlikely.
Barn owl	Local	Disturbance/ displacement	Low	Short-term to Permanent	Exclusion zone around any nest sites. Maintaining suitable nest sites away from turbines.	Low	Not significant	A measurable effect on the local or regional population is considered to be highly unlikely. However, exclusion zones will be established around any active nest sites, and suitable nest sites away from turbine locations will be maintained.
		Collision	Negligible	Short-term to Permanent	None required	Negligible	Not significant	Collision risk to this species is considered to be negligible. A measurable effect on the local or regional population is considered to be highly unlikely.
Short-eared owl	Local	Disturbance/ displacement	Low	Short-term to Permanent	None required.	Low	Not significant	A measurable effect on the local or regional population is considered to be highly unlikely.
		Collision	Negligible	Short-term to Permanent	None required	Negligible	Not significant	Collision risk to this species is considered to be negligible. A measurable effect on the local or regional population is considered to be highly unlikely.
Swift	Local	Disturbance/ displacement (breeding)	Negligible	Short-term to Permanent	None required	Negligible	Not significant	A measurable effect on the local or regional population due to disturbance/ displacement is considered to be highly unlikely.
		Collision	Negligible	Short-term to Permanent	None required	Negligible	Not significant	Collision risk to this species is considered to be negligible. A measurable effect on the local or regional population is considered to be highly unlikely.

VER	VALUE OF SITE TO THE VER	NATURE OF POTENTIAL PRE-MITIGATION EFFECT	MAGNITUDE OF POTENTIAL PRE-MITIGATION EFFECT	DURATION OF POTENTIAL PRE-MITIGATION EFFECT	SPECIFIC MITIGATION MEASURES	MAGNITUDE OF RESIDUAL EFFECT	RESIDUAL SIGNIFICANCE	LEVEL OF CERTAINTY/COMMENTS
Passerines	Local	Disturbance/ displacement (breeding)	Negligible	Short-term to Permanent	None required	Negligible	Not significant	A measurable effect on the local or regional population due to disturbance/ displacement is considered to be highly unlikely.
		Collision	Low to Negligible	Short-term to Permanent	None required	Low to Negligible	Not significant	Collision risk to this species is considered to be negligible. A measurable effect on the local or regional population is considered to be highly unlikely.

8.9 STATEMENT OF SIGNIFICANCE

8.9.1 An assessment has been made of the likely significance of effects of the proposed Development on ornithological interests. This assessment identified no significant effects as a result of the proposed Development on ornithological interests, (following EIA guidance; IEEM, 20065). Specific mitigation measures for black grouse, merlin, barn owl and kestrel are proposed to minimise the potential effects of disturbance and to ensure compliance with the Wildlife and Countryside Act (1981) as amended by the Nature Conservation (Scotland) Act (2004). Best practice guidance regarding breeding birds will be followed and an ECoW will be employed during the breeding season.

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Document history

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Checked	Emily Peaston	26/03/2015
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Client Details	
Contact	Gareth Swales
Client Name	Brockloch Rig III Ltd
Address	c/o Fred. Olsen Renewables Ltd

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A	24/03/2015	First Draft
B	30/07/2015	Second Draft
C	19/11/2015	Third Draft

BROCKLOCH RIG III

Chapter 9

Cultural Heritage and Archaeology

Contents

Glossary

Term	Definition
Above Ordnance Datum	Height relative to the average sea level at Newlyn, Cornwall UK
Historic Environment Record	Historic environment records are information services that seek to provide access to comprehensive and dynamic resources relating to the historic environment of a defined geographic area for public benefit and use. Typically, they comprise databases linked to a geographic information system (GIS), and associated reference material, together with a dedicated staffing resource
Non-designated heritage asset	A building, monument, site, place, area or landscape positively identified as having a degree of significance meriting consideration in planning decisions. Heritage assets are the valued components of the historic environment. Non-designated heritage assets are not included in any national designation.
Present Windy Standard Developments	The 'present Windy Standard Developments' refers collectively to the existing Windy Standard and the under construction Windy Standard II Wind Farms
The proposed Development	The proposed Windy Standard III Wind Farm.
The proposed Development Area	The project development area within the site boundary which is subdivided into the Meaul Hill Cluster and Waterhead Hill Cluster.
Zone of Theoretical Visibility	The area predicted to have views of a proposed development on the basis of a digital terrain model or digital surface model, which may/may not take account of landcover features.

List of Abbreviations

Abbreviation	Description
AOD	Above Ordnance Datum
ASAs	Archaeologically Sensitive Areas
DGC	Dumfries and Galloway Council
EAC	East Ayrshire Council
GDL	Garden and Designed Landscape
GIS	Geographic Information System
HER	Historic Environment Record
LB	Listed Buildings
LDP	Local Development Plan
NMRS	National Monuments Record of Scotland
PAN	Planning Advice Note
SHEP	Scottish Historic Environment Policy
SM	Scheduled Monuments
SPP	Scottish Planning Policy
ZTV	Zone of Theoretical Visibility

9.1 INTRODUCTION

9.1.1 This Chapter considers the potential impacts of the proposed Development upon cultural heritage assets. These are defined as buildings, monuments, archaeological landscapes, sites and deposits, townscapes, parks, gardens, battlefields and other features that merit consideration in the planning system because of their architectural, archaeological or historic interest. The Chapter details the baseline situation based on the results of a desk-based study and a walkover survey and the potential physical and setting impacts of the proposed Development through its construction, operation and decommissioning. The cultural heritage assessment was undertaken by CgMs Consulting.

9.1.2 ES Figure 9.3a-d in Volume 3 of the ES provides visualisations for viewpoints considered only in this Chapter. Visualisations for viewpoints common to both the Landscape and Visual Impact Assessment and the cultural heritage study are presented in ES Figure 6.31a to 6.48j in Volume 3 of the ES.

9.2 LEGISLATION AND PLANNING POLICY

Legislation

9.2.1 The Planning (Listed Buildings and Conservation Areas) (Scotland) Act 1997 provides the legislative framework relating to listed buildings and conservation areas. Section 59 of the Act places a statutory duty upon the decision maker to have special regard to the desirability of preserving the setting of listed buildings when considering whether to grant planning permission for development that will affect the setting of a listed building.

9.2.2 Section 64 of the same act requires that special attention be paid in exercise of planning functions to the desirability of preserving or enhancing the character or appearance of a conservation area.

9.2.3 The Ancient Monuments and Archaeological Areas Act 1979 provides the legislative background to the Schedule of Ancient Monuments. This provides for the control of works affecting the physical fabric of scheduled monuments but does not refer to their setting.

Planning Policy

9.2.4 Scottish Planning Policy (SPP) provides outline policy for dealing with cultural heritage in the planning process in paragraphs 135-151. It stresses that change can generally be managed to preserve the significance of assets and that this should be the aim of planning authorities. It is acknowledged that this is less readily achieved in the case of archaeology and hence where preservation in situ is not possible planning conditions should be attached that allow for appropriate recording to be undertaken.

9.2.5 Paragraph 141 reiterates the statutory requirement for decision makers to have special regard to the importance of preserving and enhancing listed buildings, their setting and any features of architectural or historic interest.

9.2.6 In relation to scheduled monuments Paragraph 145 states 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".

9.2.7 Paragraph 150 deals with undesignated archaeology and requires that where preservation in situ is not possible, developers should be required to undertake excavation and other such work before or during development.

9.2.8 Further advice is contained in Planning Advice Note PAN 2/2011: Planning and Archaeology. Sections 4-9 of the PAN, entitled 'Archaeology and Planning,' provide guidance for planning authorities, property owners, developers and others on the policy of the Scottish Government relating to archaeological sites and monuments. Overall, the guidance can be summarised:

- Policy is to protect and preserve sites and monuments and their settings in situ where feasible.
- Where this is not possible planning authorities should consider applying conditions to consents to ensure that an appropriate level of excavation, recording, analysis, publication and archiving is carried out before and/or during development.
- In consideration of applications, planning authorities should take into account the relative importance of archaeological sites. Not all sites and monuments are of equal importance. In determining planning applications that may impact on archaeological features or their setting, planning authorities may balance the benefits of development against the importance of archaeological features.

9.2.9 Section 14 of the PAN notes that when determining a planning application the desirability of preserving a monument (whether scheduled or not) and its setting is a material consideration. It reiterates that preservation in situ should be the objective but where not possible an alternative approach is recording and/or excavation followed by analysis and publication of the results.

9.2.10 Sections 15 and 16 of the PAN note that prospective developers should undertake assessment to determine whether a property or area contains, or is likely to contain, archaeological remains as part of their pre-planning application research into development potential. Where it is known, or there is good reason to believe, that significant remains exist developers should be open to modifying their plans in order to preserve remains.

9.2.11 Section 20 of the PAN notes that in many cases a desk-based assessment (for example this document) may be sufficient to allow authorities to make a planning decision. Where the judgement of the authority's archaeological advisor indicates that significant remains may exist, it is reasonable for the planning authority to request an archaeological evaluation before the application is determined. Planning authorities should require only the information necessary for them to make an informed decision on the proposal, and this should be proportionate to the importance of the potential resource. Section 22 of the PAN notes that developers should supply the results of desk-based assessments and evaluations as part of their planning applications.

9.2.12 Additional policy in relation to the historic environment is provided in Scottish Historic Environment Policy (SHEP). SHEP provides criteria for designation and guidelines for identifying the cultural significance of assets in the related annexes. This guidance was used in the assessment below in order to aid the identification of cultural significance with regard to relevant categories of asset. SHEP is currently under review but remains in force until replaced.

Local Development Plan

9.2.13 The Dumfries and Galloway Local Development Plan (LDP) was adopted in September 2014. It contains the following policies relevant to the current assessment:

"Policy HE3: Archaeology

a) The Council will support development that protects significant archaeological and historic assets, and the wider historic environment from adverse effects. In considering development proposals the Council will need to be satisfied that:

- *The development preserves or enhances the appearance, fabric or setting of the site or asset in-situ; and/or*
- *Where there is uncertainty about the location, extent or significance of these assets an agreed scheme of assessment and evaluation to inform the application is included with the proposal; and/or*
- *Due consideration has been given to the significance and value of the site or asset in relation to the long-term benefit and specific need for the development in the location proposed.*

b) Where, due to exceptional circumstances, development is to proceed and the preservation of historic assets in-situ including buildings is not possible, a scheme of mitigation involving excavation, recording, analysis, publication and archiving and any other measures appropriate to the case has been agreed with the Council".

"Policy HE4: Archaeologically Sensitive Areas

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

"Policy HE6: Gardens and Designed Landscapes

a) 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.

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

- *The development protects or enhances the significant elements of the garden or landscape in-situ; and*
- *Due consideration has been given to the significance and value of the asset in relation to the long-term benefit and specific need for the development in the location proposed.*

b) Developers will be required to submit the results of an assessment of the impact of their proposals on the sites and their settings plus details of any potential mitigation measures.

c) 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".

9.2.14 Alongside the LDP, Dumfries and Galloway Council (DGC) has produced '*Supplementary Guidance, Part 1 Wind Energy Development: Development Management Consideration'*. Section F deals with the Historic Environment and Cultural Heritage and states:

"All proposals will be assessed for their impact on the historic environment and cultural heritage. Site-specific assessments will be required to identify potential issues and effects. Proposals should identify mitigation for identified effects".

9.3 METHODOLOGY & APPROACH

Study Areas

9.3.1 The proposed Development Area extends a substantial distance from the construction footprint of the proposed Development. Therefore, study areas have been defined with reference to the turbine locations rather than the proposed Development Area to allow the assessment to focus on relevant information. The following study areas have been used:

- 2 km Study Area (ES Figure 9.1 in Volume 3 of the ES). This extends 2 km from the proposed turbines and takes in the construction footprint of the proposed Development. The construction footprint as defined here as those areas subject to ground disturbance as a result of construction operations. Information for this area has been gathered in order to identify potential physical impacts and to inform the assessment of archaeological potential. Potential impacts upon B and C-listed buildings and archaeologically sensitive areas within this study area have been considered.
- 10 km Study area (ES Figure 9.2 in Volume 3 of the ES). This extends 10 km from the proposed turbines. Information for this area has been gathered to identify potential setting impacts relating to scheduled monuments, Category A-listed buildings, conservation areas, inventory gardens and designed landscapes and inventory battlefields.

9.3.2 There is no published guidance regarding the study areas to be used in cultural heritage impact assessment. The study areas used are based on the outcome of consultation, which focussed on assets within 10 km of the proposed turbines (see below). Where consultees have raised assets outside the 10 km Study Area, these have been considered by the assessment.

Data Sources

9.3.3 The assessment has drawn on the following sources:

- Historic Scotland GIS datasets for designated assets;
- National Monuments Record of Scotland (NMRS), including aerial photography;
- Dumfries & Galloway Historic Environment Record (HER);
- National Library of Scotland; and
- Other readily available documentary sources.

9.3.4 Information from the above sources was verified and augmented by walkover survey. The location and extents of recorded assets were recorded using a consumer grade GPS handset accurate to 3 m. The survey focussed on the construction footprint of the proposed Development, but excluded areas where commercial forestry rendered survey impracticable. In addition, heritage assets in the surrounding area that were considered potentially subject to substantive setting impacts were visited.

9.3.5 Designated assets are referred to by their Historic Scotland reference numbers. For clarity, numbers relating to scheduled monuments are prefixed 'SM' and listed buildings 'LB'. Non-designated assets are referred to by their HER numbers, prefixed 'MDG'.

Consultation

9.3.6 Historic Scotland, Dumfries and Galloway Council (DGC) and East Ayrshire Council (EAC) have been consulted in order to establish their information requirements and any concerns regarding the proposed Development.

9.3.7 Historic Scotland's scoping response indicated that the assessment should focus on the following assets and requested visualisations illustrating the impact of the proposed Development upon views from specific locations, based on the relationship between the asset's significance and the surrounding landscape:

- King's Cairn (SM 1046). Two wireframe visualisations were requested. One from the King's Cairn, looking towards the smaller cairn, and one from the King's Cairn, looking towards the proposed Development Area, and particularly towards Big Meaul and Upper Hill. "*These visualisations should allow analysis of the potential cumulative impact of the proposal with the adjacent proposed windfarms of Benbrack and South Kyle."*
- Lamford Burn cairn (SM 1034*). "A wireframe visualisation should be created using a viewpoint on the cairn looking towards the proposed Development. This visualisation should also allow assessment of the potential cumulative impact of the proposal with the adjacent proposed windfarms of Benbrack and South Kyle";*
- Loch Doon Castle (SM 90203). A visualisation was requested looking towards the proposed Development from the castle.
- Craigengillan House (LB 18793) and Craigengillan Garden and Designed Landscape (GDL). A visualisation was requested from a viewpoint *"as close as possible to the house (and preferably from the driveway immediately outside the private garden of the dwelling), looking towards the proposed Development".*

9.3.8 Further consultation was undertaken with Historic Scotland as the project progressed and it was agreed (e-mail dated 31st October 2014) that, of the requested visualisations, only that for King's Cairn (SM 1046) would be necessary, as the other requested viewpoints lie outside the Zone of Theoretical Visibility (ZTV). This is presented as ES Figure 9.3a-d in Volume 3 of the ES.

9.3.9 DGC's scoping response indicated that the approach outlined in the Scoping Report was generally appropriate. It was indicated that the assessment of setting impacts should cover:

- The King's Cairn [SM 1046] and Lamford Burn Cairn [SM 1034], Holm of Daltallochan stone circle, standing stone and cross slabs [SM 1029 & 1106], that are designated as scheduled monuments;
- A selection of sites featuring in the Heritage Trails if there is inter visibility with the proposal e.g. mining remains at Woodhead [SM 5184], Cairn Avel [SM 1006], Braidenoch Hill cross slabs [SM 1105];
- Key Listed buildings falling within the ZTV;
- Key Gardens and designed landscapes falling within the ZTV.

9.3.10 Further consultation was undertaken with DGC as the project progressed and it was agreed (e-mail dated 27th October 2014) that the following visualisations would satisfy DGC's requirements:

- Wireframe from The King's Cairn (SM 1046). Presented here as ES Figure 9.3a-d in Volume 3 of the ES.
- Photomontage from A713 between Dalmellington and Carsphairn, at the western limit of the Water of Deugh Archaeologically Sensitive Area (ASA). LVIA Viewpoint 3 (ES Figure 6.33a-f in Volume 3 of the ES).
- Photomontage from Garryhorn core path, illustrating view from Bardennoch – Garryhorn ASA. LVIA Viewpoint 6 (ES Figure 6.36a-f in Volume 3 of the ES).
- Photomontage from Carsphairn heritage trail from Bennan, north of Bardennoch Hill, illustrating view from Bardennoch – Garryhorn ASA and representative of view from Cairn Avel (SM 1006). LVIA Viewpoint 8 (ES Figure 6.38a-f in Volume 3 of the ES).

9.3.11 It was agreed that visualisations from Braidenoch Hill cross slabs (SM 1105), Lamford Burn cairn (SM 1034) and Knockgray (MDG 25538) would not be required as they fall outwith the ZTV and that visualisations would not be required for the monuments at Holm of Daltallochan (SM 1029 & 1106) as the turbines will also be barely visible from this area.

9.3.12 East Ayrshire Council indicated in their scoping response that the potential impacts upon *"Craigengillan Garden and Designed Landscape and its associated listed buildings, the A-listed and Scheduled Loch Doon Castle, Donald's Isle Scheduled Monument and Dalnean Hill Scheduled Monument"* were of particular interest to them. As discussed above, Loch Doon Castle lies outwith the ZTV, as do Donald's Isle and Dalnean farmstead. The potential impact upon Craigengillan GDL has been assessed. Further consultation was undertaken with East Ayrshire Council as the project progressed and the above approach was agreed (e-mail dated 8th January 2015).

Assessment of Significance

9.3.13 The following methodology has been used to assess the significance of both physical and setting impacts upon cultural heritage assets.

9.3.14 Sensitivity has been determined on the basis of designation and in the case of undesignated assets, with reference to the criteria provided in Annex 1 of Scottish Historic Environment Policy for the determination of national importance for scheduling. Sensitivity to impacts reflects the level of importance of the asset as presented below (Table 9.1 below).

Table 9.1: Sensitivity Criteria

Sensitivity	Criteria
High	Internationally and nationally important designated assets (world heritage sites, scheduled monuments, Category A-listed buildings, IGDLs and inventory battlefields) or assets meeting the criteria for national importance. Some conservation areas are of national importance.
Medium	Heritage assets of regional importance comprising Category B and C listed buildings, conservation areas and undesignated cultural heritage assets and historic buildings of regional importance.
Low	Undesignated cultural heritage assets and historic buildings of local importance

9.3.15 The magnitude of change has been assessed with reference to the degree of change in the asset's cultural significance (Table 9.2 below). The cultural significance of an asset can be characterised by reference to one or more characteristics defined in Scottish Historic Environment Policy, namely:

- Intrinsic – those inherent in the asset;
- Contextual – those relating to the asset's place in the landscape or in the body of existing knowledge;
- Associative – more subjective [considerations] of the associations of the asset, including with current or past aesthetic preferences.

9.3.16 The cultural significance of each asset potentially affected has been described and the degree to which the overall cultural significance of the asset is affected is used to arrive at a magnitude of predicted change as set out below. When considering impacts upon setting, reference has been made to relevant Historic Scotland guidance.

Table 9.2: Magnitude Criteria

Magnitude	Description
Major	Total loss or major alteration to key elements of the asset or its setting, such that post-development cultural significance of the asset will be fundamentally changed.
Medium	Partial loss or alteration to one or more key elements of the asset or its setting, such that post-development cultural significance of the asset will be materially changed.
Minor	Minor shift away from the baseline conditions resulting in the asset's cultural significance being slightly diminished.
Negligible	Appreciable change from baseline conditions leaving the asset's significance unchanged.

9.3.17 The predicted significance of the impact was determined through a standard method of assessment based on professional judgement, considering both sensitivity and magnitude of change and guided by the criteria in Table 9.3 below. 'Major' and 'Moderate/Major' impacts are considered significant in the context of the EIA Regulations.

Table 9.3: Significance Matrix

SIGNIFICANCE MATRIX			
MAGNITUDE OF CHANGE			
High	Moderate	Moderate/Major	Major
Medium	Minor/Moderate	Moderate	Moderate/Major
Low	Minor	Minor/Moderate	Moderate
Negligible	Negligible/Minor	Minor	Minor/Moderate
	Low	Medium	High
			SENSITIVITY OF RECEIVING ELEMENT

9.4 BASELINE CONDITIONS

Scheduled Monuments

9.4.1 There are no scheduled monuments within the proposed Development Area.

9.4.2 There is one scheduled monument within the 2km study area: **The King's Cairn and cairn to the west of Water of Deugh (SM1046)**. This scheduling takes in two cairns, The King's Cairn being the larger of the two. It is a round chambered cairn of the Bargrennan type. It has been robbed of stone and was excavated in 1928, exposing two chambers on a north-west/south-east axis. It is up to 19 m across and is approximately 1 m high. The smaller cairn is located 330 m to the south-west and is 10 m across and 0.7 m high. Both cairns are located in clearings in commercial forestry, on the western side of the valley of the Water of Deugh.

9.4.3 There are eleven scheduled monuments within the 10 km study area. These are detailed below.

9.4.4 **Lamford Burn cairn (SM 1034)** was described in 1976 as a circular cairn 14 m across and up to 2 m high. However, in 2004 it suffered substantial damage as a result of unauthorised excavations. This had left little of the cairn undisturbed, a survey on behalf of Historic Scotland recorded that the cairn's "*central area and main body of the cairn had been stripped to subsoil with a scattering of disturbed stone and turf recast over the site and tracked flat by the excavating machine.*" The cairn is located on a gentle west facing slope approximately 4 km to the west of the nearest proposed turbine.

9.4.5 **Braidenoch Hill cross slabs (SM 1105)** comprise two cross-incised slabs, one broken though complete and one a fragment. These lie on the south-west slope of Braidenoch Hill, adjacent to an old 'packman's road'. They are located approximately 9 km to the south of the nearest proposed turbine.

9.4.6 **Cairn Avel (SM 1006)** is a long cairn, a large part of which has been lost to stone-robbing. Nevertheless the eastern end survives to a height of approximately 3 m. The cairn is located on the northern slopes of Bardennoch Hill, approximately 7.5 km to the south of the nearest proposed turbine.

9.4.7 **Donald's Isle, Loch Doon (AM 8616)** comprises the site of a medieval settlement located on an island on Loch Doon. According to Historic Scotland, the *"monument is now usually submerged, due to the level of the loch being artificially raised, and is only visible at times of extreme low water."* Donald's Isle lies approximately 8 km to the south-west of the nearest proposed turbine.

9.4.8 **Holm of Daltallochan cross slab (SM 1106)** is a cross-incised slab set on end in a farm garden. It is traditionally thought to have been moved to its current location from the Cairn of Daltallachan, which lay approximately 600 m to the north. The slab is located approximately 5.9 km to the south of the nearest proposed turbine.

9.4.9 **Holm of Daltallochan stone circle and standing stone (SM 1029)** comprises a possible stone circle of 13 boulders of varying size arrayed in a 'crude oval' measuring 24 x 20 m and a standing stone (1.2 m high) located approximately 120 m to the east-south-east. The monuments are located in pasture and are situated approximately 5.8 km to the south of the nearest proposed turbine.

9.4.10 **Loch Doon Castle (SM 90203)** and **Loch Doon Castle original site (SM 8619)** respectively comprise the rebuilt remains of Loch Doon Castle and its original site on the now submerged Castle Island. The castle dates from the 13th century and has an extremely unusual eleven-sided curtain wall. A tower added in the 16th century has not been included in the re-erected remains. The castle lies approximately 9.6 km to the south-west of the nearest proposed turbine. As well as being scheduled, it is a Property in Care.

9.4.11 **Woodhead lead mines and smelter (SM 5184)** consists of the remains of a complex of lead mines and a smelter, of mid-19th century date. There are extensive underground workings whilst on the surface there is a smelter, workers' housing and waste heaps. It is located approximately 7 km to the south-west of the nearest proposed turbine.

9.4.12 **Craigengillan cairn (SM 2238)** is a circular cairn approximately 25 m in diameter and 3 m high. It has been damaged by forestry ploughing and lies within an extensive forestry plantation approximately 7.5 km to the south-east of the nearest proposed turbine.

9.4.13 **Dalmellington motte (SM 3009)** is a well preserved circular motte. It is approximately 10 m high and 20 m in diameter. It is situated in Dalmellington, on a terrace to the south of Muck Water. The motte lies approximately 9.7 km to the north-west of the nearest proposed turbine.

9.4.14 Also considered, following EAC's scoping response, is the scheduled **Dalnean farmstead and field-system (SM 4390)**. This is a medieval or later settlement and field system, the footings of buildings and related enclosures survive along with rig and furrow. It is located on Dalnean Hill approximately 11.2 km to the west of the nearest proposed turbine.

Listed Buildings

9.4.15 There are no listed buildings within the proposed Development Area or the 2 km study area.

9.4.16 **Craigengillan (LB 18793)** and its associated buildings were raised in consultation responses and hence have been considered. Craigengillan is a Category A listed building. At its core is an 18th century house that was enlarged in the early 19th century and later romanticized with the addition of crow-stepped gables. A glazed Gothic arcaded porch and a tall battlemented tower were added, possibly by David Hamilton. The supplementary listing information notes that the interior by Jansen of Paris is 'exceptional'. Adjacent to the house are its stables, which are also Category A-listed (LB 18793). The house and stables are located in the associated inventory designed landscape approximately 9.5 km to the west of the nearest proposed turbine.

Inventory Gardens and Designed Landscapes

9.4.17 There are no Inventory Gardens and Designed Landscapes within the proposed Development Area or the 2 km study area.

9.4.18 There is one Inventory Gardens and Designed Landscapes (GDL) within the 10 km Study Area: Craigengillan. This is a complete and unfragmented estate landscape, started by the McAdam family in the 16th century, who held it for the subsequent 400 years. The designed element dates from the late 18th/early 19th century and includes the Category A-listed house and stables, formal gardens, a walled garden, a Japanese garden and extensive policy woodland. The GDL is located approximately 9 km to the west of the nearest proposed turbine.

Other Designated Heritage Assets

9.4.19 There are no conservation areas or inventory battlefields within the 10 km Study Area. None have been raised by consultees.

9.4.20 There is one Archaeologically Sensitive Area (ASA) within the 2 km Study Area, The Water of Deugh. This is located approximately 2 km to the west of the nearest proposed turbine. It takes in an extensive area of land between the A713 and the Water of Deugh, which is mostly given over to rough grazing. Within this ASA there are multi period remains.

9.4.21 A second ASA, Bardennoch, was raised during consultation. This takes in an extensive area of grazing land on Bardennoch Hill within which there are multi-period remains. It lies approximately 5.1 km to the south of the nearest proposed turbine.

Non-Designated Heritage Assets

9.4.22 The HER contains 40 entries relating to the 2 km Study Area (ES Figure 9.1 in Volume 3 of the ES). These include the scheduled King's Cairn and two nearby funerary cairns, clustered on the western side of the Water of Deugh (MDG11, MDG15 & MDG17), and two findspots of prehistoric artefacts, but are otherwise dominated by post-medieval agricultural features, in particular sheep rees, recorded from the First Edition Ordnance Survey map. Rees date to the 18th or 19th century and were enclosures built to shelter or contain sheep. These agricultural features are generally located near burns. They are of local importance.

9.4.23 Two of the HER records relate to natural features that have no bearing upon the archaeological potential of the area. A possible road (MDG1578) was recorded on Polwhat Rig in 1953, but this has not been corroborated and similarly has no bearing on the archaeological potential of the proposed Development.

9.4.24 The current baseline study has identified five marker cairns on Waterhead Hill, two of which appear on the First Edition Ordnance Survey map (surveyed 1850-1). These most probably date to the 19th century and are of very limited local importance.

Archaeological Potential

9.4.25 Almost all of the proposed Development lies over 400 m AOD. Land at this altitude has, throughout history, been unsuited for settlement or cultivation and archaeological features are correspondingly rare in such

locations. When present, archaeological features generally focus on water-courses, in the case of settlement, or prominent locations, in the case of prehistoric burial cairns. The records held by the HER for the 2 km Study Area appear to follow this general trend and relate to sheep rees and similar features of post-medieval date. In such marginal landscapes archaeological assets will frequently survive as upstanding features that may be identified by survey either in the course of the current study or by the Ordnance Survey in the 19th century. Consequently the HER is likely to present an accurate representation of the distribution of heritage assets in the area, reflecting the marginal nature of the land and its general unsuitability for cultivation and settlement throughout history.

9.4.26 The greater part of the proposed Development Area is covered by commercial forestry that was planted in the latter part of the 20th century. No survey work is known to have been undertaken in advance of the tree-planting and it must be assumed that any archaeological features that were present within the forestry would have been heavily disturbed by forestry ploughing.

9.4.27 It is concluded that the proposed Development Area has relatively low archaeological potential and the potential for unrecorded archaeology to be present within the proposed Development's construction footprint is negligible, given that the proposed Development is sited away from water courses, which have historically been the focus of human activity in the area, and that much of it falls within areas that have been subject to forestry ploughing, which will have heavily disturbed any archaeological features present.

9.5 ASSESSMENT OF CONSTRUCTION IMPACTS

Predicted Impacts

9.5.1 No previously recorded heritage assets lie within the construction footprint of the proposed Development. The closest asset to the proposed Development is a marker cairn located approximately 70 m from T17. It is concluded that there is no potential for impacts upon previously recorded assets.

9.5.2 The proposed Development lies in an area with low archaeological potential and the potential for previously unrecorded assets to be present within the proposed Development's construction footprint is considered to be negligible. It is concluded that there is negligible potential for previously recorded heritage assets to be affected by construction.

9.5.3 There is potential for the setting of heritage assets to be affected for a short term during the construction phase. Such impacts would be very similar to those potentially associated with the operational phase (discussed below) and have not been considered separately.

Proposed Mitigation

9.5.4 No construction impacts upon previously recorded heritage assets have been identified and it is considered that there is negligible potential for previously unrecorded heritage assets to be affected. Therefore no mitigation is proposed in relation to construction impacts.

Residual Impacts

No construction impacts have been identified.

9.6 ASSESSMENT OF OPERATIONAL IMPACTS

Predicted Impacts

9.6.1 **Lamford Burn cairn (SM 1034)** comprises the severely truncated remains of a Bronze Age burial cairn. When scheduled, it measured approximately 14 m in diameter and was 2 m high. However it was badly truncated in 2004, when a substantial part of it was removed. This damage has substantially compromised its significance, almost completely removing its intrinsic and contextual value as an example of its kind with the potential to yield archaeological data that might inform understanding of the cairn itself and of other less well-preserved examples. It has likewise compromised its contextual value as a well-preserved early element of a multi-period landscape. A little contextual value remains as it is possible to appreciate that the cairn was probably built with reference to views west down the Lamford Burn and possibly the landscape beyond. The cairn may have been intended to be prominent when viewed from the lower ground to its west, but in its current condition this cannot be appreciated as the cairn is not generally visible in the wider landscape. It is concluded that views west from the cairn make a limited contribution to its significance.

9.6.2 The cairn is located approximately 4 km to the west of the nearest proposed turbine. It lies outwith the ZTV and hence views from it will be unaffected. The ZTV indicates that it will be possible to see a turbine from the road to the west and south of the cairn. Although the cairn may once have been prominent in the view from the west views it is no longer so and as such these views no longer contribute to the appreciation of its significance. Given the limited visibility of the proposed Development and its distance from the cairn, it is concluded that the proposed Development will not change the cairn's significance or the degree to which this may be appreciated on the ground. It is concluded that the proposed development will have no impact upon the cairn.

9.6.3 **The King's Cairn** scheduling **(SM 1046)** takes in two cairns. The King's Cairn is the larger of the two. It is a round chambered cairn of the Bargrennan type, up to 19 m across and approximately 1 m high. It has been robbed of stone and was excavated in 1928, exposing two chambers on a north-west/south-east axis. The smaller cairn is located 330 m to the south-west and is 10 m across and 0.7 m high.

9.6.4 Both cairns are located in clearings in commercial forestry, on the western side of the valley of the Water of Deugh. Consequently, they may only be seen from short distances and there are no views from or between them. The alignment of the King's Cairn appears to reference the alignment of the river below, a frequent feature of Bargrennan-type cairns. It may be assumed that in their original condition the cairns were prominent features when viewed from their immediate surroundings and were intended to overlook and be seen from the valley to the east.

9.6.5 The cairns' significance derives from their intrinsic value as an example of their kind with the potential to yield further archaeological information, despite their denuded condition. The cairns also have some contextual value as they are early elements of a multi-period landscape, though this has been substantially compromised by the surrounding forestry. The forestry divorces the cairns from their surroundings and has removed associated features; a third cairn (MDG17) that was located nearby has been destroyed. It therefore prevents an appreciation of the relationship between the cairns and the design of the King's Cairn and the Water of Deugh.

9.6.6 Based on published plans, the surrounding forestry is scheduled to be felled between 2016-2020, though this may be subject to variation. This will allow the relationship between the cairns and the Water of Deugh to be appreciated by affording views from the cairns to the valley to the east; views along the valley will not be possible because of bends to the north and south of the cairns. Given the condition of the two cairns and the distance between them, it is unlikely that they will be intervisible or that they will be visible from the valley. The felling of the forestry will reveal the valley below and its afforested eastern slopes. On the skyline the turbines of Windy Standard II will be visible. The closest of which will be approximately 3.4 km to the east. The turbines of the existing Windy Standard Wind Farm are visible beyond. The open views will only be available temporarily as it is proposed to restock the surrounding area with sitka spruce. Consequently, the cairns will be increasingly divorced from their surroundings as the trees grow and the relationship between them will cease to be legible.

9.6.7 Under current conditions, the proposed Development will be screened from view from the cairns. However, following felling the proposed turbines will be visible to the south-east and north-east (**ES Figure 9.3a in Volume 3 of the ES**). The closest of the Waterhead Hill Cluster turbines will be approximately 1.7 km away, whilst the closest of the Meaul Hill Cluster will be approximately 2.5 km away. The foreground of the affected views will be occupied by the brash left behind by felling, the middle distance by the valley of the Water of Deugh and its forested eastern slopes with the turbines appearing on the skyline. The Meaul Hill Cluster turbines will stand in front of the northern turbines of Windy Standard II and the proposed Development will appear as a contiguous extension of Windy Standard II's southern cluster. Following restocking, the valley will be gradually obscured from view as will the turbines. Ultimately, the turbines will be screened from view by trees.

9.6.8 The intrinsic value of the cairns will be unchanged by the proposed Development. The impact of the turbines upon the cairns' contextual value will change greatly during the proposed Development's lifespan. Under current conditions the proposed Development will have no impact as it will be screened from view by forestry. Following felling, the turbines will be clearly visible, introducing large modern features into the background of the views from the cairns to the valley. This will contrast with the rural character of the views, and hence affect the sense of place but, given that the affected views already contain turbines and extensive areas of commercial forestry, this contrast will be limited. The scale and movement of the turbines will distract from the view into the valley from the cairns. Following restocking, the valley will be obscured from view relatively quickly and the relationship between the cairns and the valley will cease to be legible. Any adverse impact associated with the turbines will cease at this point as the affected views will cease to contribute to the cairns' contextual value. Ultimately, the proposed Development will be screened from view. It is concluded that the proposed Development will have an overall impact of **low magnitude** upon the cairns, as it will preserve their intrinsic value, but for a relatively short time, during the period between the felling of forestry and restocking, it is considered that there will be a change of **medium magnitude**. The cairns are scheduled and therefore of high sensitivity. Given the short-lived nature of the impact and the dynamic character of the landscape, it is concluded that this will result in an adverse effect of **moderate** significance. This is not significant.

9.6.9 **Braidenoch Hill cross slabs (SM 1105)** lie outwith the ZTV. There are no views of them from the wider landscape that are relevant to their significance that will be affected by the proposed Development. The slabs' setting will be unchanged by the proposed Development and there will be no impact. They are not considered further.

9.6.10 **Cairn Avel (SM 1006)** is a long cairn, a large part of which has been lost to stone-robbing. Nevertheless the eastern end survives to a height of approximately 3 m. The cairn is located in rough grazing on the northern slopes of Bardennoch Hill. Although robbed, the cairn retains intrinsic value as an example of its kind and a still impressive element of a multi-period landscape. Its proximity to other relict features, such as abandoned farmsteads, illustrates the changing history of land use in the valley and therefore contributes to its contextual value. Views north over the Garryhorn Burn allow an appreciation of the relationship of the cairn with the surrounding landscape, as the cairn appears to have been aligned with the burn and the valley as a whole and the view takes in the area that was probably farmed by the cairn's builders, implying that the cairn was intended to be prominent when viewed from this area. The cairn's remains are prominent when viewed from its immediate surroundings and this allows an appreciation of its original prominence in the landscape. Within the valley scattered buildings and areas of woodland are visible, whilst in the distance there are areas of forestry. A line of pylons runs through the valley and in the distance, depending on weather conditions, Wether Hill wind farm may be seen; the closest turbine being 13 km to the east of the cairn. To the north is the impressive form of Cairnsmore of Carsphairn and Beninner.

9.6.11 Up to six of the proposed turbines will be visible from the cairn and the surrounding area, with the nearest being approximately 7.5 km to the north. The turbines will be seen on the horizon beyond Dodd Hill. The turbines will not affect the legibility of the relationship between the cairn and the surrounding landscape and other heritage assets, as they will not interfere with views between the cairn and the valley below. Given their distance from the cairn, the potential for them to distract from the view over the valley is very limited. It is concluded that whilst they will constitute a noticeable change in the setting of the cairn this will not affect the cairn's significance. The magnitude of change will be **negligible** and the significance will be **minor/moderate**. This is not significant.

9.6.12 **Donald's Isle, Loch Doon (SM 8616)** lies outwith the ZTV. There are no views of it from the wider landscape that are relevant to its significance that will be affected by the proposed Development. Its setting will be unchanged by the proposed Development and there will therefore be no impact. It is not considered further.

9.6.13 **Holm of Daltallochan cross slab (SM 1106)** is a cross-incised slab set on end in a farm garden. It is traditionally thought to have been moved to its current location from the Cairn of Daltallachan, which lay approximately 600 m to the north. The slab is located approximately 5.9 km to the south of the nearest proposed turbine. The northern part of the garden is occupied by an area of woodland. Consequently, whilst the slab is located within the ZTV, which indicates up to two turbines will be visible; there would in practice be no intervisibility with the proposed turbines under current conditions. There is no reason to expect that the trees will be clear-felled and it is therefore concluded that there is no potential for an impact, but visualisations supplied for the nearby Landscape and Visual Viewpoints 4 (ES Figure 6.34a-e in Volume 3 of the ES and demonstrate that turbine visibility from this area will be very limited.

9.6.14 **Holm of Daltallochan stone circle and standing stone (SM 1029)** comprise a possible stone circle of 13 boulders of varying size arrayed in a 'crude oval' measuring 24 x 20 m and a standing stone (1.2 m high) located approximately 120 m to the east-south-east. Both stand in pasture. The possible stone-circle surrounds a mound and Burl (1976) described it as 'unconvincing' whilst the Ordnance Survey in 1978 considered that it could not *"be classified with any certainty. The stones, as stated, vary greatly in size and shape and though all appear artificially placed they rest without any apparent regard for grading, orientation or visual effect.*" It is considered that the possible stone circle may have some intrinsic value as a source of archaeological information. It is so poorly understood that its relationship with the surrounding landscape is unknown, though its proximity to the standing stone may add a limited degree of contextual value. The standing stone has intrinsic value as an example of its kind and as a part of a multi-period landscape. Views of the surrounding farmland and the proximity of other contemporary features therefore give it some contextual value.

9.6.15 The nearest of the proposed turbines is located 5.8 km to the north and the ZTV indicates that up to three turbines will be visible from the vicinity of the stones. In practice visibility will be restricted to the blades of the turbines, this will result in a barely perceptible change in the setting of the stones. It is concluded that there would be no impact.

9.6.16 **Loch Doon Castle (SM 90203)** and **Loch Doon Castle original site (SM 8619)** lie outwith the ZTV. There are no views of them from the wider landscape that are relevant to their significance that will be affected by the proposed Development. Consequently, their setting will be unchanged by the proposed Development and there will be no impact upon them and they are not considered further.

9.6.17 **Woodhead lead mines and smelter (SM 5184)** form an extensive industrial complex, the scheduled area measuring approximately 800 m x 450 m. The ZTV indicates that the proposed Development will be visible from the very edge of the scheduled area. The significance of the complex relates to its intrinsic value as a relict industrial landscape and, to a lesser degree, its isolated hillside location as this contributes to the mines' sense of place. Views to the more distant landscape do not contribute to the asset's significance. Consequently, glimpses of the proposed turbines at a minimum distance of 7 km from the edges of the complex have no potential to adversely affect the scheduled monument. It is concluded that there will be no change to the mines' baseline significance, hence there will be no impact and it is not considered further.

9.6.18 **Dalmellington motte (SM 3009)** lies outwith the ZTV. There are no views of it from the wider landscape that are relevant to its significance which will be affected by the proposed Development. The motte's setting will be unchanged. There will therefore be no impact upon it and it is not considered further.

9.6.19 **Dalnean farmstead and field-system (SM 4390)** lies outwith the ZTV. There are no views of it from the wider landscape that are relevant to its significance that will be affected by the proposed Development. The setting of the asset will be unchanged. There will be no impact upon it and it is not considered further.

9.6.20 **Craigengillan (LB18793)** and **Craigengillan stables (LB18794)** are located outwith the ZTV. The area around them likewise lies outside the ZTV**.** Consequently, there are no views of them that contribute to their significance that will be affected and it is considered that their setting will be unchanged. Therefore there will be no impact upon them. They are not considered further. The potential impact upon the Craigengillan inventory designed landscape is assessed below.

9.6.21 **Craigengillan GDL** takes in the complete Craigengillan estate, established by the McAdam family in the 16th century. The designated area is extensive, taking in the area between the River Doon in the east and Auchenroy and Auldcraigoch Hills in the west, Dalmellington Moss in the north and Loch Doon to the south. The landscape is varied within the designated area, which may be considered as two distinct but related parts. The first is the core designed landscape. At the heart of this is Craigengillan itself (LB18793), the earliest parts of

which date to 1765. Around this are formal gardens, which exploit a natural amphitheatre, and comprise lawns, shrubberies, an informal woodland garden and an Edwardian Japanese water garden, all joined by a network of paths. To the north and east of the house are further lawns and the walled kitchen garden. To the northeast of the house are two areas of parkland, House Park and Dalfarson Park. To the south is Ness Glen, through which runs the Ladies' Walk, which exploits the natural gorge to spectacular effect. All but one of the listed buildings associated with the designed landscape lie within this core. A thick band of woodland separates the core from the moorland and rough grazing that constitute the remaining part of the designated area. The ground here rises westwards and in the north-western corner of the GDL is the distinct form of Auchenroy Hill. An important feature in this part of the landscape are the dykes; Craigengillan hosted a school of drystone walling in the 19th century teaching a construction method devised by the engineer John McAdam. The other principal manmade features in this area relating to the GDL are Bogton Loch and Wee Berbeth Loch.

9.6.22 Craigengillan's significance relates to the quality of its design, in particular its exploitation of natural landscape features, its completeness, its association with the McAdam family, its architectural, horticultural, arboricultural and silvicultural quality and its contribution to the local landscape. These facets relate predominantly to the core landscape, with the exception of its completeness and associative value which also relate to the outer part of the estate; Craigengillan is comparatively rare in that the non-core part of the estate remains un-fragmented and the dykes present in this area have particular associative value.

9.6.23 The proposed Development lies approximately 8.8 km to the east of the GDL's eastern boundary. The core designed landscape lies outwith the ZTV, with theoretical visibility being restricted to the higher parts of the estate, namely Auchenroy Hill in the north and the area around Shear Hill, Carwaur and Little Shalloch in the south. From these elevated locations, the proposed turbines will be visible, depending on weather conditions, on the horizon at a minimum distance of 10 km, from some locations they will appear in front of the Windy Standard II turbines. The ZTV indicates that up to nine turbines will be visible from Auchenroy Hill, at a minimum distance of 12.5 km; up to 18 turbines will be visible from the Carwaur and Little Shalloch areas, at a minimum distance of 10 km.

9.6.24 There is no indication that the affected views were incorporated historically into the design of Craigengillan and the areas of the GDL that fall within the ZTV offer limited opportunity for views into the core designed landscape. The turbines will not therefore affect an appreciation of the design quality. Nor will it affect the appreciation of its architectural, horticultural, arboricultural and silvicultural qualities. Given the turbines' distance and location on the far horizon the proposed Development will not affect the contribution of Craigengillan to the local landscape. It is concluded that the proposed Development will result in a change of **negligible** magnitude. Craigengillan is of **high sensitivity** and it is concluded that this will constitute an impact of **minor/moderate** significance. This is not significant.

9.6.25 The **Water of Deugh ASA** takes in an extensive area of moorland within which there is the scheduled Lamford Burn cairn, two cup and ring-marked stones, and a scattering of medieval or later agricultural features, comprising two farmstead, a possible shieling and field systems. The features present, with the exception of the farmsteads, which are still occupied, are very slight and have minimal presence in the landscape. The various features are not related to each other in terms of history or function. This, in conjunction with the scattered nature of the remains, results in there being no sense of a cohesive palimpsest or relict landscape being present. DGC's Archaeologically Sensitive Areas Technical Advice Note (2013, 7) states that this area *"recognises multi-period remains featuring in a heritage trail promoted by Carsphairn Heritage Group'* and that *'the area was indicated on the sensitivity map to highlight the existence of the recreational trail in the area."* It is concluded that the ASA does not have any significance in its own right. The setting of the ASA therefore makes no contribution to significance. Based on its designation, the ASA is considered to be of regional importance and hence of **medium** sensitivity.

9.6.26 The ZTV indicates that the proposed turbines will be visible from most of the ASA. In the higher, eastern half of the ASA up to 20 of the proposed turbines will be seen in combination with the existing Windy Standard Wind Farm turbines and Windy Standard II turbines at a distance of approximately 2-3 km. From within the western half predicted visibility is more limited (**LVIA Viewpoint 3 see ES Figure 6.33a-f in Volume 3 of the ES**). From much of this area the proposed turbines will not be visible or restricted to less than four turbines, but from some areas up to 12 turbines will be visible at a distance of 3-5 km. The proposed turbines will be seen in isolation except in the immediate vicinity of the Lamford Burn where they will be seen in combination with the existing Windy Standard Wind Farm and Windy Standard II (the present Windy Standard Developments).

9.6.27 Whilst the turbines will be visible from within Water of Deugh ASA this will not affect the appreciation of the assets contained within it or the relationships between them. It is therefore concluded that this will represent a **negligible** change to the setting of the ASA. The ASA is considered to be of **medium** sensitivity and this will represent an effect of **minor** significance. This is not significant.

9.6.28 **Bardennoch ASA** takes in an extensive area of land, comprising pasture and rough grazing, to the south and west of Carsphairn. Within the ASA there are the scheduled Cairn Avel, Braidenoch cross slabs, Holm of Daltallochan stone circle, standing stone and cross slab and Waterhead lead mines and a range of undesignated features including Carsphairn itself, a pack road which was also part of the medieval pilgrims way leading to Whithorn, medieval and later farmsteads and field systems. The features present are relatively well-preserved and form a cohesive palimpsest landscape that may be relatively easily appreciated on the ground. The ASA therefore takes in a landscape that has intrinsic value because of its perceptible chronological depth and the density and range of assets present. Views of the surrounding area do not contribute to the appreciation of this significance. Based on its designation, the ASA is considered to be of regional importance and hence of **medium** sensitivity.

9.6.29 The ZTV indicates that the proposed turbines will be visible from much of the ASA, either in isolation or in combination with Windy Standard II. Visibility will be restricted to blades seen sweeping over the skyline from the lowest parts of the ASA around Carsphairn at a minimum distance of approximately 5.4 km (**LVIA Viewpoints 4 & 5**), whilst from higher parts of the ASA, such as Bardennoch Hill, turbines will be seen on the distant skyline (**LVIA Viewpoints 6 & 8**). From these locations, up to 18 turbines will be visible to varying degrees at a distance of over 7km. Visibility will be weather dependent.

9.6.30 The proposed Development will not interfere with the appreciation of the ASA's significance. The proposed turbines will lie well outside the ASA and will not affect the visibility of the individual components of the palimpsest landscape or the degree to which relationships between them can be appreciated. It is therefore concluded that this will represent a **negligible** change to the setting of the ASA. The ASA is considered to be of **medium** sensitivity and this will represent an effect of **minor significance**. This is **not significant**.

Proposed Mitigation

9.6.31 Operational effects have been assessed as being of minor or lesser significance and no mitigation is proposed.

Residual Impacts

9.6.32 The proposed Development will have a minor/moderate effect upon the scheduled King's Cairn and Cairn Avel, Craigengillan GDL and a minor effect on the Water of Deugh and Bardennoch ASAs. These effects are **not significant** and will cease upon decommissioning, except at King's Cairn, where the effect will cease sooner, when the proposed development is screened by forestry.

9.7 ASSESSMENT OF DECOMMISSIONING IMPACTS

Predicted Impacts

9.7.1 Impacts are considered similar to construction and therefore no decommissioning effects are predicted.

9.8 ASSESSMENT OF CUMULATIVE IMPACTS

Predicted Impacts

9.8.1 This section considers cumulative operational impacts resulting from the addition of the proposed Development to wind farms within 35 km that are operational, under construction, consented or in planning (ES Figure 6.6 in Volume 3 of the ES). SPP (Scottish Planning Policy 2014, 71) defines cumulative impact as:

"Impact in combination with other development. That includes existing developments of the kind proposed, those which have permission, and valid applications which have not been determined."

Consequently, schemes at scoping have not been considered in the cumulative impact assessment.

9.8.2 Cumulative impacts have been considered as three scenarios:

Scenario 1: The proposed Development with operational wind farms and those under construction. The wind farms considered are identified in Table 9.4 below.

Scenario 2: Scenario 1 plus consented wind farms. The windfarms considered are identified in Table 9.5 below.

Scenario 3: Scenario 2 plus wind farms in planning. The windfarms considered are identified in Table 9.6 below.

Table 9.4: Scenario 1 wind farms – operational and under construction wind farms

Name	Status	Approx. distance from Windy Standard III (km)
Bankend Rigg	Operational	30
Hadyard Hill	Operational	30
Hagshaw Hill incl. extension	Operational	34
Hare Hill	Operational	9
Mark Hill	Operational	35
Torrs Hill	Construction	15
Wether Hill	Operational	14
Windy Standard II	Construction	1.5
Windy Standard	Operational	2

Table 9.5: Scenario 2 wind farms – consented wind farms

Name	Status	Approx. distance from Windy Standard III (km)
Afton	Approved	4
Andershaw Forest	Approved	34
Blackcraig Hill	Approved	23
Dersalloch	Approved	15
Galawhistle (Spireslack)	Approved	26
Hare Hill Extension	Approved	11
Knockman Hill	Approved	21
Knockshinnoch	Approved	17
Sanqhuar	Approved	13
Sunnyside	Approved	23
Tralorg	Approved	34
Twentyshilling Hill	Approved	19
Upper Ingleston Farm	Approved	23
Whiteside Hill	Approved	13

Table 9.6: Scenario 3 wind farms in planning

Name	Status	Approx. distance from Windy Standard III (km)
Ashmark Hill	Submitted	7.5
Benbrack	Submitted	6
Blackwood	Submitted	35
Fowler Farm	Submitted	67
Garleffan	Submitted	15
Glenmount	Submitted	13
Glentaggart	Submitted	33
Hadyard Hill Extension	Submitted	30
High Cumnock	Submitted	15
Keirs Hill	Submitted	16
Kennoxhead	Submitted	29
Leadhills	Submitted	31
Lethans	Submitted	16
Linfairn	Submitted	19
Loch Urr	Submitted	21
Longburn	Submitted	11
Margree Forest	Submitted	17
Mochrum Fell	Submitted	28
Penbreck & Carmacoup	Submitted	30
Pencloe	Submitted	4
Polquhairn	Submitted	15
Quantans Hill	Submitted	7.5
Sanquhar 'Six'	Submitted	14
South Kyle	Submitted	4
Spango	Submitted	25
Ulzieside	Submitted	19
Windy Rig	Submitted	5

9.8.3 In order to keep the Chapter focussed on potentially significant impacts, cumulative impact has only been considered where impacts of minor/moderate or greater significance have been identified: King's Cairn, Cairn Avel and Craigengillan GDL. Many of the schemes identified above are a substantial distance from these assets and consequently have no potential to result in a significant cumulative impact. As such, professional judgement has been exercised and only those schemes with potential to impact upon these assets have been considered.

Scenario 1

King's Cairn

9.8.4 Under Scenario 1, the proposed turbines will be seen in front of the turbines of the present Windy Standard Developments (**ES Figure 9.3a in Volume 3 of the ES**). They will be seen as a parts of a single wind farm. The addition of the proposed Development will increase the number of wind turbines visible from the King's Cairn, but will not result in any additional or greater impact upon the significance of the cairns than in isolation. It is concluded that the cumulative effect will be **moderate**.

Cairn Avel

9.8.5 Under Scenario 1, the proposed Development will not be seen in combination with any other wind farms. Depending on weather conditions it might be seen in succession with Wether Hill, which is approximately 13 km from the cairn. Given the degree of separation between the proposed Development and Wether Hill, and their distance from the cairn, it is considered that the cumulative effect will be no greater than the proposed Development taken in isolation and hence the cumulative effect will be **minor/moderate**.

Craigengillan GDL

9.8.6 Under Scenario 1, the proposed turbines will be seen in front of the present Windy Standard Developments from Auchenroy Hill and the area of Shear Hill, Carwaur and Little Shalloch. They will have the appearance of a single wind farm in views that do not contribute to the significance of the GDL. Consequently, the addition of the proposed Development to the Scenario 1 schemes will increase the number of wind turbines visible from the non-core part of the Craigengillan GDL, but will not result in any additional or greater impact upon its significance. It is concluded that the cumulative effect will be **minor/moderate** (also see Chapter 6: Landscape and Visual Assessment, of the ES).

Scenario 2

King's Cairn

9.8.7 Under Scenario 2, forestry permitting, it will be possible to see the turbines of Afton wind farm beyond those of the present Windy Standard Developments, at a distance of approximately 7.1 km (**ES Figure 9.3a in Volume 3 of the ES**). The addition of the proposed Development would increase the number of turbines visible, but would have no greater or additional impact upon the significance of the cairns than in isolation. It is concluded that the cumulative effect will be **moderate**.

Cairn Avel

9.8.8 Under Scenario 2, the proposed Development will not be seen in combination with any other wind farms from Cairn Avel and the surrounding area.

Craigengillan GDL

9.8.9 Under Scenario 2, Dersalloch wind farm would be seen in succession with the proposed Development from the higher parts of Craigengillan, comprising Auchenroy Hill and the area of Shear Hill, Carwaur and Little Shalloch. The Dersalloch turbines would be approximately 2 km from Auchenroy Hill; the proposed Development will be approximately 12 km from Auchenroy Hill and there would be approximately 170° between the turbines of the two schemes. The addition of the proposed Development would increase the number of turbines visible from the GDL, but would not have a greater or additional impact and it is concluded that the cumulative effect will be **minor/moderate** (also see Chapter 6: Landscape and Visual Assessment, of the ES).

Scenario 3

King's Cairn

9.8.10 Under Scenario 3, forestry permitting, the proposed Development would be seen in combination with the Scenario 1 and 2 turbines and those of the South Kyle scheme and in succession with those of the Benbrack scheme (**ES Figure 9.3a-d in Volume 3 of the ES**). The nearest of the South Kyle turbines would be approximately 1 km away and the turbines would be seen to the north-east and north-west of the cairns. The nearest of the Benbrack turbines would be 1 km away and would be seen to the west and north-west of the cairns. The proposed Development's Meaul Hill Cluster would lie beyond South Kyle's Petillery Hill Cluster. The Waterhead Cluster turbines would be clearly visible to the south of the cairns. Turbines would occupy approximately 270° of views from the cairns. The view west along the valley would remain clear of turbines.

9.8.11 The addition of the proposed Development to the Scenario 3 turbines would therefore increase the number of turbines visible from the cairns and the Waterhead Cluster turbines would increase the proportion of the view from the cairns subtended by turbines by approximately 45°. The presence of a large number of turbines in views from the cairns will affect their sense of place, giving the impression of the cairns' being in a single large wind farm. However, the cairns' sense of place is already greatly compromised by on-going forestry operations that dominate their setting; under current conditions the cairns are surrounded by a mature forestry plantation and, in future, will be surrounded by a post-felling landscape strewn with brash and, subsequently, covered by forestry. All of the turbines lie outwith the valley and hence the view from the cairns to the valley, which is likely to have been a significant factor in their siting, will remain readily appreciable until it is blocked by the surrounding forestry. It is therefore concluded that the addition of the proposed Development to the Scenario 3 schemes would, for a short period, have a moderate/major cumulative effect, which would be significant, but for most of its operational lifespan the cumulative effect would be **moderate (not significant)** because of the forestry surrounding the cairns, which will initially divorce the cairns from their surrounding topography and ultimately will screen the proposed Development and the cumulative schemes from view.

Cairn Avel

9.8.12 Under Scenario 3, the proposed Development would be seen in combination with:

- 18 of the proposed Quantans Hill wind turbines, the closest of which would be approximately 3.3 km to the north-east of the cairn;
- approximately 28 of the proposed South Kyle turbines, the closest of which will be approximately 9.6 km to the north of the cairn;
- up to 18 of the proposed Benbrack wind turbines, the closest of which would be approximately 7.9 km to the north-west of the cairn.

9.8.13 The proposed Benbrack turbines would be a similar distance from the cairn as those of the proposed Development, whilst those of South Kyle would be slightly further away. The three developments would together occupy an extensive part of the skyline seen from the cairn and would probably tend to be perceived as a single wind farm.

9.8.14 The proposed Quantans Hill wind turbines would be seen in combination with those of the proposed Development. The intervening landform and the fact that the Quantans Hill development is substantially closer to the cairn than the proposed Development would result in their being perceived as separate wind farms.

9.8.15 The addition of the proposed Development to the proposed South Kyle and Benbrack wind farms would increase the number of turbines visible from the cairn, but this would not result in a greater or additional effect in terms of the change to the cairn's significance than would result from the proposed Development in isolation. The cumulative effect of the addition of the proposed Development to the proposed South Kyle and Benbrack wind farms is considered to be of **minor/moderate** significance. This is not significant.

9.8.16 Quantans Hill in isolation would have a low magnitude impact upon the setting of Cairn Avel. This would result from its location, above the valley that the cairn was probably built with reference to, and its proximity to the

cairn; Quantans Hill would tend to distract from elements of the cairn's surroundings that are relevant to its significance. It is considered that the proposed Quantans Hill wind farm would have an effect of moderate significance, the effect of the proposed Development alone is considered to be of minor/moderate significance. The addition of the proposed Development to Quantans Hill would increase the number of turbines visible form the cairn but would not have any greater impact in terms of the cairn's significance. It is concluded that the addition of the proposed Development to Quantans Hill would result in a cumulative effect of **moderate** significance. This is not significant.

Craigengillan GDL

9.8.17 Under Scenario 3, the proposed Development would be seen from high ground within Craigengillan GDL in combination with the proposed Windy Standard Developments, Benbrack and South Kyle and in succession with Dersalloch, Glenmount and Keirs Hill. Such views would only be visible from outside the core designed landscape and are not relevant to the significance of the GDL. It is concluded that the addition of the proposed Development to the Scenario 3 schemes would result in **a minor/moderate** cumulative effect **(not significant)**.

9.9 FURTHER SURVEY AND MONITORING

9.9.1 No further survey or monitoring is proposed.

9.10 SUMMARY OF IMPACTS

9.10.1 The predicted impacts of the proposed Development and the related mitigation are summarised in Table 9.7.

Table 9.7: Summary of Impacts and Mitigation

Impact	Significance	Mitigation	Significance of Residual Impact
Potential for disturbance of previously unrecorded heritage assets. The likelihood of this occurring is considered to be negligible.	Unknown	None proposed	Unknown – negligible potential for such an impact to occur.
Operational (setting) impact upon King's Cairn scheduled monument. The impact will be temporary, ending when surrounding forestry screens the valley of the Water of Deugh from view.	Moderate	None proposed	Moderate
Operational (setting) impact upon Cairn Avel scheduled monument	Minor/moderate	None proposed	Minor/moderate
Operational (setting) impact upon Craigengillan GDL.	Minor/moderate	None proposed	Minor/moderate
Cumulative operational impact upon King's Cairn scheduled monument. The impact will be temporary, ending when surrounding forestry screens the valley of the Water of Deugh from view.	Moderate	None proposed	Moderate (All Scenarios)
Cumulative operational impact upon Cairn Avel scheduled monument.	Minor/moderate	None proposed	Minor/moderate (Scenarios 1 & 2)
Cumulative operational impact upon Craigengillan GDL.	Minor/moderate	None proposed	Minor/moderate (All Scenarios)

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Author	Katherine Arthur	25/01/2015
Checked	Andrew Picken	25/01/2015
Approved	Kelly Wyness	03/12/2015

Client Details	
Contact	Gareth Swales
Client Name	Brockloch Rig III Ltd
Address	c/o Fred. Olsen Renewables Ltd

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Chapter 10

Hydrology, Geology and Hydrogeology

Contents

Glossary

Term	Definition
Aquifer	A geological formation, group of formations or part of a formation that can store and transmit water in significant quantities.
Baseflow	The component of the river flow that is derived from groundwater sources rather than surface run-off. The Base Flow Index (BFI) value provided by the Flood Estimation Handbook (FEH) is a measure of the proportion of a catchments long-term runoff that derives from stored sources.
Buffer area	An area which protects the watercourses from pollutants and sediment from the adjacent land.
Groundwater	Water located beneath the ground surface in soil pore spaces and in the fractures of rock formations.
Headwaters	A tributary stream of a river close to or forming part of its source. Normally wet flushes, bogs or springs at the head of first-order streams.
Hydrological regime	The statistical pattern of a river's constantly varying flow rate.
Hydromorphology	Term used in river basin management to describe the hydrological and geomorphological processes and attributes of rivers, lakes, estuaries and coastal waters.
Overland flow	Water passing rapidly over or through the surface layer of soil.
Peak flow	The maximum flow recorded during a high flow event.
Peat	A largely organic substrate formed of partially decomposed plant material
Precipitation	Deposition of moisture including dew, hail, rain, sleet and snow.
Present Windy Standard Developments	The 'present Windy Standard Developments' refers collectively to the existing Windy Standard and the under construction Windy Standard II Wind Farms.
Private water supply	Any water supply which is not provided by a water company and is not connected to mains supply. Most private water supplies are situated in more remote, rural parts of the country and may just serve one property or several properties through a network of pipes.
Return period	Is a measure of the rarity of an event: the longer the return period, the rarer the event.
Riparian zone	Land immediately adjoining the aquatic zone and influenced by it.
Runoff	Surface runoff is the flow of water over the surface that can result due to the surrounding soils lacking the capacity to infiltrate further water or due to the surface water flowing off infrastructure such as access tracks and hardstandings.
Sedimentation	The tendency for particles in suspension to settle out of the fluid in which they are entrained.
Standard percentage runoff	The percentage of rainfall that is likely to contribute to runoff. For example, an SPR value of 50 % would suggest that half of the rainfall during an event will contribute to runoff.
Surface water catchment	The area from which runoff would naturally discharge to defined point of a river.
The proposed Development	The proposed Windy Standard III Wind Farm.
The proposed Development Area	The project development area within the site boundary which is subdivided into the Meaul Hill Cluster and Waterhead Hill Cluster (see ES Figure 1.2 in Volume 3 of the ES).
Topography	The physical features of a geographical area.
Water resources	The supply of groundwater and surface water in a given area.

List of Abbreviations

Abbreviation	Description
AOD	Above Ordnance Datum
BFI	Base Flow Index
BGS	British Geological Society

Abbreviation	Description
CAR	Controlled Activities (Scotland) Regulations
CEMP	Construction Environmental Management Plan
DGC	Dumfries and Galloway Council
DTM	Digital Terrain Model
EAC	East Ayrshire Council
ECoW	Ecological Clerk of Works
ES	Environmental Statement
FEH	Flood Estimation Handbook
GIS	Geographical Information System
GFT	Galloway Fisheries Trust
GWDTEs	Groundwater dependent terrestrial Ecosystems
PAN	Planning Advice Notes
PMP	Peat Management Plan
PWS	Private Water Supplies
RBMP	River Basin Management Plan
SAAR	Standard Average Annual Rainfall
SEPA	Scottish Environmental Protection Agency
SNH	Scottish Natural Heritage
SPP	Scottish Planning Policy
SPR	Standard Percentage Runoff
SSSI	Site of Special Scientific Interest
SUDS	Sustainable Urban Drainage Systems
TWI	Topographic Wetness Index

10.1 INTRODUCTION

10.1.1 This Chapter of the Environmental Statement (ES) assesses the impacts on the hydrological, geological and hydrogeological environment at Windy Standard III Wind Farm (the proposed Development) and the potential impacts resulting from the construction, operation and ultimate decommissioning of the proposed turbines and associated infrastructure. This assessment and associated Technical Appendices were undertaken by Natural Power Consultants (Natural Power) Hydrology and Geotechnical Teams.

10.1.2 This Chapter details the existing baseline conditions in terms of the hydrological, geological and hydrogeological conditions present within the Planning Application Boundary (see ES Figure 10.1 in Volume 3 of the ES). The assessment covers the construction, operation and decommissioning phases of the proposed Development and identifies elements which have the potential to influence the existing baseline conditions.

10.1.3 Effects on hydrology, geology and hydrogeology may also result in secondary effects on habitats (peat and groundwater dependant ecosystems (GWDTE)) or species. Effects on ecological (non-avian) receptors are considered in Chapter 7: Ecology of this ES, with further effects on peat and geotechnical considerations provided in Technical Appendix 10.3: Peat Stability Assessment in Volume 4 of the ES.

10.1.4 The assessment is also supported by the following Technical Appendices:

- Technical Appendix 10.1: Peat Management Plan in Volume 4 of the ES;
- Technical Appendix 10.2: Borrow Pit Search Report in Volume 4 of the ES;
- Technical Appendix 10.3: Peat Stability Assessment in Volume 4 of the ES; and
- Technical Appendix 10.4: Watercourse Crossing Assessment in Volume 4 of the ES.

10.1.5 Accompanying figures to this assessment are contained in Volume 3: ES Figures.

10.1.6 Hydrological, geological and hydrogeological considerations have influenced the design of the proposed Development and these are considered in Chapter 3: Design Evolution and Alternatives, of the ES.

10.2 SCOPE OF ASSESSMENT

Project Interactions

10.2.1 The proposed Development will introduce physical changes which have the potential to alter the hydrological characteristics within the Planning Application Boundary. During the construction phase and to a lesser extent during the operational phase potential sources of pollution will be present. Hydrological surveys have been undertaken to establish the existing on-site baseline conditions and associated areas downstream to assess the potential effect of the proposed Development on the identified receptors, the significance of these effects on the receptors and the potential for mitigation to reduce the significance of the identified effects.

Site Area

10.2.2 The proposed Development would be located adjacent to the existing Windy Standard Wind Farm and the under construction Windy Standard II Wind Farm (the present Windy Standard Developments). Existing infrastructure and tracks associated with the present Windy Standard Developments will be utilised wherever it is practical to do so. The proposed Development would be located in an upland area comprising a combination of open moorland habitat with rocky outcrops and commercial forestry with varied relief within Carsphairn Forest. The proposed Development Area is subdivided into two clusters centred in the north around Meaul Hill (the Meaul Hill Cluster) and the south around Waterhead Hill and Upper Hill (the Waterhead Hill Cluster).

10.2.3 A topographic high is reached in the south on Waterhead Hill of 530 m Above Ordnance Datum (AOD) with all areas of the infrastructure for the proposed Development noted to be above 400 m AOD. The southern zone is located on top of an east west trending ridge with development along the summit and on the north facing slope. The northern zone is spread over a smaller hill – Meaul Hill - to the north.

10.2.4 The hydrological study area is larger in extent than the actual site and includes the lower reaches of watercourse catchments that are present within the Planning Application Boundary. The extent of the catchments are shown in ES Figure 10.1 in Volume 3 of the ES which outlines the extent of the study area. Designated sites and relevant developments are considered from the perspective of assessing any potential hydrological linkages or cumulative effects.

Scoping and Consultation

10.2.5 The scoping and consultation responses relating to the water environment are summarised in Table 10.1 below:

Table 10.1: Consultation Response

Organisation	Comment	Responses
Scottish Environmental Protection Agency (SEPA)	Groundwater dependent terrestrial Ecosystems (GWDTE) should be mapped. Rocks, tracks and trenches within 100 m and borrow pits or foundations within 250 m of GWDTE should be reconsidered. If infrastructure is within these buffer zones likely impact will require further assessment.	Paragraph 10.5.28 refers to the GWDTE assessment which has been carried out in Chapter 7: Ecology, of the ES.
	Where avoidance is impossible details of impacts on wetlands and peatlands should be minimised and mitigated and provided in the ES or planning submission. In particular impacts should include those from drainage and pollution. Mitigation proposals should also be detailed within a Construction Environmental Management Document.	Paragraphs 10.6.10 to 10.6.53 detail mitigation measures which will be included in the Construction Environmental Management Plan (CEMP) (see Technical Appendix 4.1: Draft Construction Environmental Management Plan and Technical Appendix 10.3: Peat Stability Assessment in Volume 4 of the ES
	It is now best practice to produce a Peat Management Plan (PMP) within the ES setting out how surplus peat will be managed within the site. Scoping response sets out the information that SEPA would expect to see included within the PMP. It is expected that the PMP would be in accordance with Guidance on the Assessment of Peat Volumes, Reuse of Excavated Peat and Minimisation of Waste and SEPA's Regulatory Position Statement - Developments on Peat.	Technical Appendix 10.1: Peat Management Plan in Volume 4 of the ES provides this.
	Works near water should be avoided, including burns, lochs and groundwaters. Engineering activities such as watercourse crossings and diversions should be avoided unless there is no practicable alternative. Where crossings cannot be avoided, those that do not affect the bed and banks of watercourses should be used. Refer to guidance Construction of River Crossings Good Practice Guide.	Paragraphs 10.6.8 and 10.6.9 and Technical Appendix 10.4: Watercourse Crossing Assessment in Volume 4 of the ES addresses these points.
	All proposed watercourse engineering activities, in the water should be included in the ES, these should be detailed systematically and accompanied by watercourse dimensions, photographs and location maps. All activities should be justified with mitigation included where necessary. If flood risk is an issue this should be addressed at the planning stage. Refer to SEPA Good Practice Guidance Construction of River Crossings.	Paragraphs 10.6.8 and 10.6.9 and Technical Appendix 10.4: Watercourse Crossing Assessment in Volume 4 of the ES provides these.
	A Construction Environmental Management Document is key to managing implementation of the schedule of mitigation and it is recommended that the principles of such a document are set out in the ES.	CEMP mitigation measures are set out in Paragraphs 10.6.10 to 10.6.53.
	Impacts of borrow pits, including dust, and impact on water should be appraised. Refer to relevant Planning Advice Note (PAN) 50.	An assessment of effects is provided in Tables 10.14 and 10.15 of this Chapter. Borrow Pit Search Report is provided in Technical Appendix 10.2: in Volume 4 of the ES.
	Flood risk from all sources should be assessed in line with Scottish Planning Policy. If necessary a flood risk assessment should be carried out.	Paragraphs 10.5.31 to 10.5.42 respond to this.
The Scottish Government	Applicants to consult with SEPA with respect to the Controlled Activities (Scotland) Regulations 2011 (as amended) (CAR).	Technical Appendix 10.4: Watercourse Crossing Assessment in Volume 4 of the ES outlines the CAR requirements.
	The ES should identify the location and propose mitigation in relation to private water supplies within the catchments impacted by the scheme, including any modifications to site design and layout.	Paragraphs 10.5.454 to 10.6.47 respond to this.
	The assessment should address the effects of the proposed development across all stages on: Hydrology, Water Quality and Quantity, and Flood Risk.	An assessment of effects is provided in Tables 10.14 and 10.15.
	Long term average monthly rainfall figures to be included. This is to provide an understanding of the high rainfall often experienced at proposed wind farm sites.	Paragraphs 10.5.2 to 10.5.4 include this.
	Impacts on watercourses, lochs, groundwater, other water features and sensitive receptors are to be assessed. Measures to prevent erosion, sedimentation or discolouration will be required, accompanied by monitoring and contingency plans.	Assessment of effects provided in Tables 10.14 and 10.15 and mitigation measures are provided in Paragraphs 10.6.10 to 10.7.53

Organisation	Comment	Responses
	Applicant to refer to SEPA policy on groundwater (http://www.sepa.org.uk/planning/groundwater.aspx) to identify potential risks.	Paragraphs 10.5.38 to 10.5.56 respond to this.
	Schemes to be designed to avoid crossing watercourses. Where this is not possible, bridges are preferred to culverts.	Paragraphs 10.6.8 and 10.6.9 and Technical Appendix 10.4: Watercourse Crossing Assessment in Volume 4 of the ES addresses this.
	Protection and enhancement of the water environment as part of developments and green networks (as per Scottish Planning Policy).	Paragraphs 10.5.52 to 10.7.51 respond to this.
	ES to incorporate a peak risk slide assessment in accordance with the Scottish Government Best Practice Guide for Developers (http://www.scotland.gov.uk/Publications/2006/12/21162303/0). The assessment should also address the pollutions risks to and environmental sensitivities of the water environment.	Technical Appendix 10.3: Peat Stability Assessment in Volume 4 of the ES provides this.
Scottish Natural Heritage	Applicant expected to undertake a peat stability assessment.	Technical Appendix 10.3: Peat Stability Assessment in Volume 4 of the ES addresses this.
RSPB Scotland	Peat mitigation design to avoid construction and operations impact on deep peat soils.	Technical Appendix 10.3: Peat Stability Assessment in Volume 4 of the ES and Table 10.11 of this Chapter addresses this.
Scottish Water	Records indicate that there are no Scottish Water water abstraction sources which are designated as Drinking Water Protected Areas under the Water Framework Directive that may be affected. No Scottish Water drinking water sources and assets should be affected.	Paragraph 10.5.44 confirms this.

Effects to be assessed

10.2.6 The greatest risk of the proposed Development affecting the hydrological, geological and hydrogeological environment will occur during the construction phase, with effects reduced during the operational and decommissioning phases. Taking this into account the following issues will be addressed during all phases of development of the wind farm:

- Changes to existing drainage patterns;
- Effects on baseflow;
- Effects on run-off rates;
- Effects on erosion and sedimentation;
- Effects on groundwater and surface water quality;
- Effects on groundwater levels;
- Effects on water resources;
- Effects on impediments to flow;
- Flood risk;
- Pollution risk;
- Effects on local geology; and
- Effects on hydrological integrity of peat bodies. Effects on the stability of peat are assessed in Technical Appendix 10.3: Peat Stability Assessment in Volume 4 of the ES.

Issues Scoped out of Assessment

10.2.7 Effects arising from the decommissioning of the proposed Development have been scoped out since they involve similar, but smaller scale processes to those employed during construction. Despite this similarity the results of decommissioning (i.e. the removal of the proposed Development) are taken into account in assessing ongoing and operational effects where appropriate.

10.3 POLICY CONTEXT

10.3.1 The assessment takes into account the requirements of the Water Framework Directive (2000/60/EC) (WFD). The WFD aims to protect and enhance the quality of surface freshwater (including lakes, rivers and streams), groundwater, groundwater dependent ecosystems, estuaries and coastal waters. Historically, a range of inconsistent European legislation covered different aspects of water management but the WFD aims to introduce a holistic approach which will result in greater protection to the hydrological environment.

10.3.2 The key objectives of the WFD relevant to this assessment are:

- To prevent deterioration and enhance aquatic ecosystems; and
- To establish a framework of protection of surface freshwater and groundwater.

10.3.3 The WFD resulted in The Water Environment and Water Services (Scotland) Act 2003, which gave Scottish Ministers powers to introduce regulatory controls over water activities in order to protect, improve and promote sustainable use of Scotland's water environment. These regulatory controls previously, in the form of The Water Environment (Controlled Activities) (Regulations) Scotland 2005, were superseded by The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended) or CAR, which came into force in March 2014. Taking into account the key objectives of the WFD, it is an offence to undertake the following activities without a CAR authorisation:

- Discharges to all wetlands, surface waters and groundwaters (replacing the Control of Pollution Act 1974);
- Disposal to land (replacing the Groundwater Regulations 1998);
- Abstractions from all wetlands, surface waters and groundwaters;
- Impoundments (dams and weirs) of rivers, lochs, wetlands and transitional waters; and
- Engineering works in inland waters and wetlands.

National Legislation and Policy

10.3.4 The assessment takes into account the following legislation and policy:

- The Water Environment and Water Services (Scotland) Act 2003;
- The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended);
- Flood Risk Management (Scotland) Act 2009;

- The Water Supply (Water Quality) (Scotland) Regulations 2001;
- Private Water Supplies (Scotland) Regulations 2006;
- Part IIa of the Environment Protection Act 1990;
- Waste Management Licensing Regulations 1994;
- Pollution Prevention and Control Regulations (Scotland 2000);
- Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2000 and Amendment Regulations 2008; and
- Scottish Planning Policy (2014).

Regional Policy

10.3.5 The following regional policies are also taken into account during the assessment:

- SEPA Policies:
  - No. 19 Groundwater Protection Policy for Scotland;
  - No. 41 Development at Risk of Flooding: Advice and Consultation;
  - No. 54 Land Protection Policy; and
  - No. 61 Control of Priority & Dangerous Substances & Specific Pollutants in the Water Environment.
- Dumfries and Galloway Local Development Plan 2014

Other Guidance and Best Practice

10.3.6 Table 10.2 below lists other key guidance and best practice documentation which has been considered as part of this assessment.

Table 10.2: Guidance and Best Practice

TOPIC	SOURCE OF INFORMATION
Scottish Government Planning Advice Notes (PAN's)	• PAN 50: Controlling the Environmental Effects of Surface Mineral Workings; • PAN 51 Planning (revised 2006), Environmental Protection and Regulation; • PAN 1/2013 Environmental Impact Assessment; • PAN 61 Planning and Sustainable Urban Drainage Systems; and • PAN 79 Water and Drainage.
SEPA Pollution Prevention Guidelines (PPG's)	• PPG1 General Guide to the Prevention of Water Pollution; • PPG2 Above Ground Oil Storage Tanks; • PPG4 The Disposal of Sewage where no Mains Drainage is Available; • PPG5 Works in, Near or Liable to Affect Watercourses; • PPG6 Working at Construction and Demolition Sites; • PPG8 Safe Storage and Disposal of Used Oil; and • PPG21 Polluting Incident Response Planning.
SEPA Position Statements (Published)	• WAT-PS-06-02 Culverting of Watercourses; • WAT-PS-07-02 Bank Protection; and • WAT SG- 78 Sediment Management Authorisation.
Construction Industry Research and Information Association (CIRIA)	• CIRIA C692 Environmental Good Practice on Site (third edition); • CIRIA C697 Sustainable Urban Drainage Systems Design Manual (2011 reprint with errata); • CIRIA C532 Control of Water Pollution from Construction Sites; • CIRIA C648 Control of Water Pollution from Linear Construction Projects; and • CIRIA C689 Culvert Design and Operation Guide.
Other Guidelines	• SNH and Scottish Renewables Joint Publication, (2015) Good Practice During Wind Farm Construction Version 3 • FCE, SNH, (2010), Floating Roads on Peat; • Scottish Renewables, Joint Publication (2012), Development of Peatland: Guidance on the Assessment of Peat Volumes, Reuse of Excavated Peat and the Minimisation of Waste; • SEPA, The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended), A Practical Guide, Version 7.2, March 2015; • River Crossings and Migratory Fish: Design Guidance, A Consultation Paper, The Scottish Executive; • WAT-SG-23: SEPA (2008), Engineering in the Water Environment, Good Practice Guide - Bank Protection Rivers and Lochs, Version 1; • WAT-SG-25:SEPA (2008), Engineering in the Water Environment, Good Practice Guide, Construction of River Crossings, Version 1; • WAT-SG-26: SEPA (2010), Engineering in the Water Environment, Good Practice Guide, Sediment Management, Version 1; • WAT-SG-31: SEPA, (2006) Special Requirements for Civil Engineering Contracts for the Prevention of Pollution, Version 2; • SEPA Land Use Planning Guidance Note 4 (2014): Planning Guidance on On-Shore

TOPIC	SOURCE OF INFORMATION
	Windfarm Developments, Version 7; and • SEPA Land Use Planning Guidance Note 31 (2014): Guidance on Assessing the Impacts of Development Proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems, Version 2.

10.4 METHODOLOGY

Overview

10.4.1 The assessment has involved the following:

- Consultation with relevant statutory and non-statutory bodies as part of the scoping exercise;
- Detailed desk studies and site visits to establish conditions of the area;
- Evaluation of the potential effects of the proposed Development and the effect that these could have on the current site conditions;
- Identification of embedded good practice measures to avoid and mitigate against any identified adverse effects resulting from the proposed Development;
- Evaluation of the significance of these effects by consideration of the potential embedded mitigation measures, taking into account the sensitivity of the baseline features of the site, the potential magnitude of these effects and the probability of these effects occurring; and
- The residual significance of the potential effects following the consideration of additional mitigation measures.

Baseline Assessment

10.4.2 A desktop survey to establish the baseline was undertaken in order to;

- Describe surface water hydrology, including watercourses, springs and waterbodies;
- Identify existing catchment pressures (e.g. point source and diffuse pollution issues);
- Identify all private drinking water abstractions and public water supplies within 3 km of the site;
- Identify all flooding risks;
- Describe the hydromorphological conditions of watercourses;
- Collect information relating to recreational and fisheries resources;
- Collate hydrological flow and flooding data for the immediate area and main downstream watercourses;
- Collect soil, geological and hydrogeological information;
- Confirm surface water catchment areas and watersheds; and
- Confirm the extent and nature of peat deposits across the site (Technical Appendix 10.3: Peat Stability Assessment in Volume 4 of the ES).

Published information consulted for the baseline is outlined in Table 10.3 below.

Table 10.3: Baseline Information Sources

Topic	Sources of Information
Topography	5 m contour data derived from Digital Terrain Model (DTM) data
Designated Nature and Conservation Sites	In-house Designated Site database
	SNHi Sitelink website (http://www.snh.org.uk/snhi/)
Solid and Superficial Geology	BGS Digital Data provided at www.emapsite.com Borehole Records, The British Geological Society,
Soils and Peat	Macaulay Institute, Soil Survey of Scotland, Carrick – Sheet 8 & Part of Girvan – Sheet 7 and Ayr, Sheet 14 and part of 13, 1:63,360 Provisional Soil Maps, 1962 and 1965
Climate	SEPA (Drumjohn) rainfall gauge Flood Estimation Handbook (FEH) CD-ROM
Surface Water Hydrology	1:10,000 OS Raster Data 1:50,000 OS Raster Data Flood Estimation Handbook (FEH) CD-ROM
Flooding	Indicative River and Coastal Flood Map (SEPA) http://map.sepa.org.uk/floodmap/map.htm
Water Quality	SEPA, River Basin Management Plans, Web Mapping Application, http://gis.sepa.org.uk/rbmp/ SEPA, The river basin management plan for the Scotland river basin district 2009 – 2015
Water Resources	Private water supply information provided by Dumfries and Galloway Council and East Ayrshire Council
Hydrogeology	Scotland's Environment Web Interactive Map, http://www.environment.scotland.gov.uk/get-interactive/map-view/ SEPA, 2004, Vulnerability of the Groundwater in the Uppermost Aquifer, SEPA 2004 SEPA, 2004, Bedrock Aquifer Map SEPA, 2004, Superficial Aquifer Map SEPA, River Basin Management Plans, Web Mapping Application, http://gis.sepa.org.uk/rbmp/

Field Survey Techniques

10.4.3 A field survey was undertaken between the 23rd and the 26th of June 2014 to carry out the preliminary 100 m grid peat depth assessment in line with current guidance. The weather during the peat depth assessment was overcast with frequent rain showers. A further field survey was undertaken on the 26th of November 2014 to help determine the hydrological characteristics of the proposed Development. The purpose of the field survey was to gain an understanding of the hydrology, topography, soils and geography of the site. A survey of the proposed watercourse crossings required for the site access track was also undertaken. The weather conditions during the field survey were dry and cold with light rainfall the previous day (on the 25th of November 2014).

Effects Evaluation

10.4.4 The significance of the potential impacts of the proposed Development have been defined by taking into account two main factors; the sensitivity of the receiving environment and the potential magnitude should that effect occur. The approach is based on guidance outlined in Scottish Natural Heritage (SNH) Guidance - A Handbook

on Environmental Impact Assessment[1]. The SNH Guidance has been adopted by Natural Power based on experience of carrying out impact assessments for a range of proposed onshore wind developments.

10.4.5 The sensitivity of the receiving environment i.e. its baseline quality as well as its ability to absorb the effect without perceptible change is defined in Table 10.4 below.

Table 10.4: Definition of Sensitivity of the Receiving Environment

Sensitivity	DEFINITION
High	International importance. High quality and rarity, regional or national scale and limited potential for substitution/replacement. National importance. Receptor with a high quality and rarity, local scale and limited potential for substitution/replacement or receptor with a medium quality and rarity, regional or national scale and limited potential for substitution/replacement.
Medium	Regional importance. Receptor with a medium quality and rarity, local scale and limited potential for substitution/replacement or receptor with a low quality and rarity, regional or national scale and limited potential for substitution/replacement.
Low	Local importance. Receptor 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.

10.4.6 The magnitude of impact includes the timing, scale, size and duration of the potential impact. For the purposes of this assessment the magnitude of impact criteria area defined in Table 10.5 below.

Table 10.5: Magnitude of Impact

Magnitude	Criteria	Definition
High	Results in loss of attribute.	Fundamental (long term or permanent) changes to geology, hydrology, water quality and hydrogeology.
Medium	Results in effect on integrity of attribute or loss of part of attribute.	Material but non-fundamental and short to medium term changes to the geology, hydrology, water quality and hydrogeology.
Low	Results in minor effect on attribute.	Detectable but non-material and transitory changes to the geology, hydrology, water quality and hydrogeology.
Negligible	Results in effect on attribute but of insufficient magnitude to affect the use/integrity.	No perceptible changes to the geology, hydrology, water quality and hydrogeology.

[1] Scottish Natural Heritage (2009), A Handbook on Environmental Impact Assessment, Guidance for Competent Authorities, Consultees and others involved in the Environmental Impact Assessment Process in Scotland, 3rd Edition

10.4.7 Assuming the successful implementation of best practice and design mitigation measures the sensitivity of the receiving environment together with the magnitude of the effect defines the significance of the effect as outlined in Table 10.6 below.

Table 10.6: Significance of Effect

SIGNIFICANCE MATRIX			
MAGNITUDE OF CHANGE			
High	Moderate	Moderate/Major	Major
Medium	Minor/Moderate	Moderate	Moderate/Major
Low	Minor	Minor/Moderate	Moderate
Negligible	Negligible/Minor	Minor	Minor/Moderate
	Low	Medium	High
			SENSITIVITY OF RECEIVING ELEMENT

10.4.8 Potential effects are therefore concluded to be Major, Moderate, Minor or Negligible. Effects considered as being Major or Moderate/Major are considered significant in terms of the Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2000 and Amendment Regulations 2008).

Limitations to Assessment

10.4.9 The fieldwork carried out was a standard reconnaissance level walkover survey covering all of the main hydrological features. Due to the geographical extent of the Planning Application Boundary and associated study area (outlined in ES Figure 10.1 in Volume 3 of the ES), as well as forestry cover it was not practical to traverse the whole site. However, various representative locations and features such as watercourses, peat bodies and geological information were assessed and this information interpreted for areas not visited.

10.4.10 Private water supply information has been provided by Dumfries and Galloway Council (DGC) and East Ayrshire Council (EAC). Additional private water supply sources on-site are considered unlikely due to the remoteness of the proposed Development. However it is possible that there are non-potable supplies, such as for livestock, which were not identified by the local authority.

10.4.11 The assessment of effects has been made on the basis of the current layout (see ES Figure 1.2 in Volume 3 of the ES), with the assumption that the detailed design will not result in the movement of infrastructure into areas of higher impact as presented within the buffers provided in ES Figure 10.1 in Volume 3 of the ES.

10.4.12 The information presented in this assessment is based on desk studies and site investigations. There is the potential that further constraints may be identified during the pre-construction detailed design stage. Should further constraints be identified these will be assessed and appropriately mitigated prior to construction.

10.5 BASELINE CONDITIONS

Context

10.5.1 This subsection presents the information gathered on the existing topographical, hydrological, geological and hydrogeological (including peat) conditions within the study area which are outlined within ES Figure 10.1 in Volume 3 of the ES.

Climate

10.5.2 The standard average annual rainfall (SAAR) for the Planning Application Boundary has been derived from the FEH CD-ROM[2] as ranging from 1851 – 1877 mm. To put this into context, rainfall in Scotland varies from under 800 mm a year on mainland eastern Scotland in areas such as Fife to over 3000 mm on the mainland Western Highlands.

10.5.3 Rainfall data from February 2002 – December 2014 was obtained from SEPA from their rain gauge at Drumjohn National Grid Reference (NGR) NX 52494 97541, which is approximately 4.6 km south west of the Planning Application Boundary. Based on the data collected, as shown in Chart 10.1 below the average yearly rainfall for Drumjohn is 1788 mm.

10.5.4 The chart shows that the highest rainfall volumes are experienced during January, October, November and December.

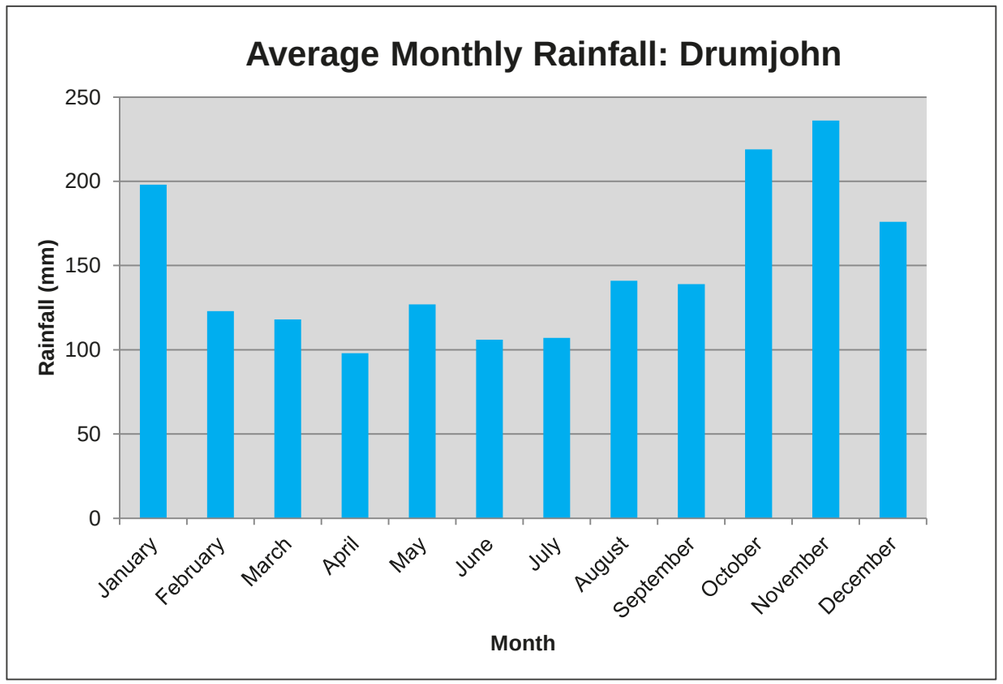

Chart 10.1: Average Monthly Rainfall Data: Drumjohn

Designated Sites

10.5.5 There are no designated sites within the Planning Application Boundary. There is one designated site within 5 km of the Planning Application Boundary that is of relevance to hydrology:

- Loch Doon Site of Special Scientific Interest (SSSI) is designated for its population of Artic Charr (Salvelinus alpinus). The SSSI is approximately 3.7 km west of the Planning Application Boundary and over 8 km from the nearest turbine. The SSSI is located on the opposite side of the A713 and is not located in the same catchment as the watercourses draining the site and is therefore not hydrologically connected and therefore has not been considered further.

[2] Centre for Ecology and Hydrology (2009), Flood Estimation Handbook (version 3), CD-ROM

Surface Water Hydrology

10.5.6 Hydrologically, the Planning Application Boundary lies within the catchment of the Water of Deugh, which includes the tributary catchments of Polwhat Burn, Lone Stand, Shalloch Burn, Bow Burn and several small unnamed tributaries. The Water of Deugh lies to the west of the proposed Development and flows south to Kendoon Loch before finally discharging into Carsfad Loch at NGR NX 60717 86604.

10.5.7 These catchments are discussed in detail in the following paragraphs, and accompanied by the following ES Figures (which can be found in Volume 3 of the ES):

- ES Figure 10.1: Hydrological Characteristics (Overview) in Volume 3 of the ES;
- ES Figure 10.1A: Hydrological Characteristics (Meaul Hill and Waterhead Hill Cluster) in Volume 3 of the ES;
- ES Figure 10.2: Flow Accumulation and Direction in Volume 3 of the ES;
- ES Figure 10.3: Topographic Wetness Index in Volume 3 of the ES; and
- ES Figure 10.4: Groundwater Flooding Potential in Volume 3 of the ES.

10.5.8 The hydromorphology has been qualitatively assessed in line with Annex V of the WFD for river continuity, morphological conditions and structure of the riparian zone.

Water of Deugh Catchment

10.5.9 The Water of Deugh originates approximately 3.5 km east of the nearest existing turbine of the existing Windy Standard Developments on the north-eastern slopes of Windy Standard hill (698 m AOD). The Water of Deugh is a major watercourse which is fed by a network of burns and streams. The Water of Deugh flows roughly south through Kendoon Loch to form a confluence with the Water of Ken immediately North of Kendoon Power Station (NGR NX 60430 87600). The Water of Ken continues south through a series of reservoirs to join the River Dee approximately 40 km south-south east of the proposed Development at NGR NX 73247 64792. The River Dee drains into the Irish Sea at Kirkcudbright Bay at NGR NX 66617 46197 approximately 55 km to the south of the proposed Development.

10.5.10 The watercourses which drain within the Planning Application Boundary are tributary channels of the Water of Deugh. The watercourses on the site are typical upland watercourses, situated in heavily vegetated riparian zones. Bed material encountered during the site survey ranged from watercourses with peat and vegetation to beds of cobbles and small boulders.

10.5.11 Photographs 10.1 to 10.4 below provide examples of the site watercourses within the Water of Deugh catchment.

10.5.12 Watercourses or their tributary catchments, all of which are sub-catchments to the Water of Deugh, within the Planning Application Boundary are the Polwhat Burn, Lone Strand, Shalloch Burn and Bow Burn and several minor unnamed tributary burns.

Polwhat Burn

10.5.13 Polwhat Burn runs south east to north west to the north and north east of the Meaul Hill Cluster through Carsphairn Forest. It also drains the under construction Windy Standard II site to the east and south. Polwhat Burn originates from Dugland Hill to the east and south east of the proposed Development and is fed by a network of burns and streams. It is around 5 km in length and discharges into the Water of Deugh at NGR NS 57397 03796.

10.5.14 The tributaries of Polwhat Burn are typical small upland watercourses situated in mature forestry plantation with widths varying between 0.2 m and 0.3 m and depths measuring 0.1 m to 0.2 m. The Polwhat Burn itself is

characteristic of larger upland streams, set within a v-shaped valley 5 m to 20 m deep with a narrow floodplain in places. At the time of the survey the water level was relatively low but flattened vegetation on the banks indicate the capacity for higher and faster flows. Bedload is comprised of gravel and cobbles, with occasional boulders, sub-angular in form. The wider catchment is characterised by mature plantation forestry with typically widely spaced (40 m) drainage ditches created to lower the water table in order to establish trees. Such features alter the drainage regime leading to higher levels of runoff into receiving watercourses. Photograph 10.1 a) and b) show the typical morphology of the Polwhat Burn.

Photograph 10.1 a) Wider view of Polwhat Burn valley taken from NGR NS 58480 03180

Photograph 10.1 b) Channel characteristics of Polwhat Burn, taken from NGR NS 58500 03190

Shalloch Burn

10.5.15 Shalloch Burn and its tributaries drain the southern side of Meaul Hill and the north eastern sections of Waterhead Hill and Upper Hill of the proposed Development. Shalloch Burn flows south and then west from the proposed Development for approximately 4.5 km before discharging into the Water of Deugh at NGR NS 55716 01223.

10.5.16 The valley sides are often steep in places and generally vegetated, although there is evidence of erosion shown by exposed soils. The channel is incised and meandering reaching 3 m to 6 m wide and the bedload is made up of sub-angular to sub-rounded gravel, cobbles and boulders. Inflow channels within the catchment are typically 0.5 m to 2 m wide and 0.4 m – 1 m deep with similar bedload to that seen in the main Shalloch Burn channel. Smaller upland tributaries are also present measuring 0.3 m to 1 m wide and 0.5 m to 0.6 m deep, and are typically underlain with bedrock and medium sized sub-rounded rocks on moderate to steep slopes. Some channels are vertically incised. As seen in the other tributary catchments, Shalloch Burn is also fed by a network of forestry drainage ditches. Photographs 10.2 a) and b) below show the typical morphology of the Shalloch Burn.

Photograph 10.2 a) Wider view of Shalloch Burn valley taken from NGR NS 56239 01146

Photograph 10.2 b) Channel characteristics of Shalloch Burn, taken from NGR NS 56240 01161

Bow Burn

10.5.17 Tributaries of Bow Burn drain the south eastern flank of the Waterhead Hill and Upper Hill sections of the proposed Development. These originate in areas of open saturated ground and flow through an area of forestry plantation before discharging into the Bow Burn, which flows south west towards the Water of Deugh at NGR NX 55411 97733.

10.5.18 The Bow Burn has a water width of between 6 m to 8 m with the entire watercourse valley reaching up to 25 m across and 10 m high. Bedload is composed of unsorted coarse gravel, cobbles and boulders, sub-angular to sub-rounded in form. The bedload composition suggests that the Bow Burn can channel powerful flows when in spate. Photographs 10.3 a) and b) show the typical morphology of the Shalloch Burn.

Photograph 10.3 a) Bow Burn, looking upstream from NGR NS 58786 00325

Photograph 10.3 b) Bow Burn, looking downstream from NGR NS 58786 00325

Example of Minor Watercourses

10.5.19 Several unnamed minor watercourse drain the Western slopes of Waterhead Hill to join the Water of Deugh. These small channels display similar characteristics to Lone Stand, with very low flows and a heavy vegetated channel. At the time of the site visit the water was very shallow with a depth of less than 0.1 m and the channels measured less than one metre wide. Photograph 10.4 below shows the typical channel morphology of an Unnamed Minor Watercourse.

Photograph 10.4 View of Unnamed Minor Watercourse, looking upstream from NGR NS 57093 03595.

Hydrological Regime

Effects of Forestry

10.5.20 The forestry within the Planning Application Boundary was planted in the early 1970s, and there are large areas of closed canopy which help attenuate peak flows[3]. It can be concluded that due to the age (circa 40-44 years) and density of the forestry, flows are likely to have reduced since the initial installation of the drainage channels and subsequent maturation of the forestry[4].

10.5.21 In felled areas within the Shalloch Burn and Polwhat Burn catchments where drainage channels have not degraded and/or become blocked, it is possible that the peak flow responses may increase due to the reduction in the volume of precipitation being intercepted by the closed canopy forestry. There are felled areas comprising of exposed forestry drainage ditches on steep slopes within the Shalloch Burn and Polwhat Burn sub catchments. It is likely that the exposed areas will provide localised pathways for concentrating peak flows during periods of heavy rainfall.

Flow Estimation

10.5.22 Peak flows have been estimated for the key catchments described above using the FEH Rainfall Runoff Method for a range of return periods, with the results presented in Table 10.7 below. Catchment descriptors were derived from the FEH CD ROM[5] and FEH Handbook and are inserted into the Flood Modeller Suite (formerly known as iSIS) programme[6] and this calculates the peak flows for the specified return period.

10.5.23 The table also presents low flows (Q95) for the site catchments. The Q95 is the flow which is exceeded 95 % of the year and is a measure of the annual low flow, generated from the Low Flows 2 program[7].

Table 10.7: Estimated low flow and peak runoff rates for site catchments

Catchment Name	Area (km2)	Q95 (m3/s)	Estimated Peak Runoff (m3/s) for Stated Return Periods						
			2 (QMED)	5	10	25	50	100	200
Polwhat Burn	4.48	0.022	6.07	8.90	10.81	13.57	16.00	18.36	21.23
Shalloch Burn	5.84	0.032	8.14	11.90	14.49	18.22	21.50	24.68	28.56
Bow Burn	17.04	0.070	19.07	28.20	34.18	42.85	50.48	57.88	66.91

10.5.24 Base Flow Index (BFI) and Standard Percentage Runoff (SPR) data for the site catchments was also taken from the FEH-CD ROM. The BFI is a measure of the proportion of a catchment's long-term runoff that derives from stored sources, with the BFI ranging from 0.1 in relatively impermeable clay catchments to 0.99 in highly permeable catchments. The SPR values represent the percentage of rainfall that is likely to contribute to runoff.

10.5.25 The BFI for the site catchments range from 0.230 to 0.344 indicating that around a quarter to a third of the catchment's long term runoff is derived from stored sources. The SPR for the site catchments ranges from 50.88 % to 59.73 % indicating that around half of the rainfall during a rainfall event contributes to runoff. The BFI and SPR values show that the site is located on relatively slowly permeable catchments.

10.5.26 ES Figure 10.2 in Volume 3 of the ES provides information on the flow direction of the surface runoff within the Planning Application Boundary. Flow accumulation is calculated in ArcGIS and is based on the 5 m resolution DTM of the area occupied by the site. The flow accumulation represents the volume of water that would flow into each 5 m cell of the DTM, assuming that all water becomes runoff and there was no interception, evapotranspiration or infiltration. The volume of accumulation is represented in greyscale with higher flow accumulations being darker in shade to areas with lower flow accumulation. This ES Figure clearly illustrates the influence of topography on the accumulation and direction of surface water runoff across the site.

10.5.27 ES Figure 10.3 in Volume 3 of the ES also provides information on how the topography influences the surface saturation of the peat and soils across the site. The analysis of the DTM derived a topographic wetness index (TWI). The TWI is a dimensionless index, defined by the equation: In (a/tan b) where a = area draining through a point from an upslope contributing area and tan b is the local slope angle. The index provides results on the hydrological similarity of peat. All points with the same value of the index are assumed to respond in a similar hydrological manner. High index values will tend to saturate first and will therefore indicate potential subsurface or high surface runoff areas.

10.5.28 As shown in ES Figure 10.3 in Volume 3 of the ES, the TWI for the site has identified those areas where water will accumulate on site and result in saturation of the surrounding peat. The highest values (18 plus) in the TWI form linear channels or where areas have a tendency to become saturated are shown in blue and drier areas where there may be less tendency for the ground to saturate are shown in orange and red. The dark blue linear

[3] Robinson, M., Moore, R.E., Nisbet, T.R., and Blackie, J.R., (1998) From moorland to forest: the Coalburn catchment experiment, Institute of Hydrology Report 133

[4] Holden, J., Chapman, P. J., and Labadz, J. C. (2004) Artificial drainage of peatlands: hydrological and hydrochemical process and wetland restoration. Progress in Physical Geology 28, 1, pp 95 -123.

[5] Institute of Hydrology (1999) Flood Estimation Handbook CD ROM, Centre for Ecology and Hydrology, Version 3

[6] Halcrow/HR Wallingford (2004), ISIS Hydrological Software Package, CD-ROM

[7] Wallingford HydroSolutions (2007), Low Flows – UK Best Practice Low Flow Estimation, CD-ROM

channels are considered to show achievable flow rates that are likely to occur throughout the year or during extreme rainfall events. The lighter blue areas are likely to represent areas of the site where the topography allows the accumulation and saturation of peat and soils from subsurface or surface means during prolonged and/or intense rainfall events. The results of the TWI suggest that the area of greatest flow accumulation and saturation of peat/soils occur within the riparian corridors of the mapped watercourses and potential flush zones. These conditions are considered to be conducive to supporting GWDTE. Whilst it is recognised that other areas of the site are likely to become saturated, it is expected that any saturation will be dependent upon climatic conditions such as the intensity and duration of rainfall.

10.5.29 Information on groundwater flooding is provided in paragraphs 10.6.38 to 10.6.40 but the mapping shows that the majority of the infrastructure is located away from areas mapped as showing groundwater flooding potential. ES Figure 10.4: Groundwater Flooding Potential in Volume 3 of the ES shows the groundwater flooding is most likely to occur at the base of slopes and along river valleys. These areas generally coincide with areas of higher TWI (above 15). The hydrogeological conditions at the proposed Development are discussed in paragraphs 10.5.58 to 10.5.61 and it is expected that the hydrogeological conditions of the underlying bedrock described in those paragraphs is not conducive to supporting GWDTE (see Chapter 7: Ecology, of the ES). Groundwater flow within the superficial geology is likely to be inhomogenous due to the varying permeability of the mapped superficial deposits, namely peat underlying the site. It is expected that the hydrogeological conditions of the superficial deposits do not significantly limit the movement of groundwater within the valleys of the watercourses but movement may be restricted in the summit and plateau areas across the site. Therefore, the hydrogeological conditions within the superficial aquifers along the riparian corridors and valleys of watercourses may be conducive to supporting GWDTE due to the good hydraulic connectivity. However, it is expected that the water level within the superficial deposits along the summits and plateaus areas of the site are likely to be ombrotrophic and therefore primarily susceptible to changes in intensity and duration of rainfall.

10.5.30 Further information and an assessment of effects on GWDTE is presented in Chapter 7: Ecology, of the ES. Chapter 7 outlines the hydrological measures which will be taken to protect identified GWDTE.

Flood Risk

10.5.31 The assessment has been carried out in accordance with Scottish Planning Policy (SPP)[8]. The document states that *"Planning authorities must take the probability of flooding from all sources – (coastal, fluvial (watercourse), pluvial (surface water), groundwater, sewers and blocked culverts) and the risks involved into account when preparing development plans and determining planning application."*

10.5.32 The Flood Risk Management (Scotland) Act[9] set in place a statutory framework for delivering a sustainable and risk-based approach to managing flooding. The main elements of flood risk management relevant to this assessment is assessment of flood risk as well as undertaking structural and non-structural flood management measures.

10.5.33 As outlined in the following paragraphs the relevant factors for assessing flood risk have been taken into account in this assessment with measures to mitigate and sustainably manage the flood risk within the Planning Application Boundary provided in paragraphs 10.7.5 to 10.7.53 below.

10.5.34 A review of SEPA's Indicative River and Coastal Flood Map[10] indicates that small pockets of the upper reaches of Shalloch Burn are at risk from the flood inundation envelope (10% (1 in 10) or greater probability of flooding in any given year).

[8] Scottish Government (2014), Scottish Planning Policy

[9] Scottish Government (2009), The Flood Risk Management (Scotland) Act 2009

[10] Scottish Environment Protection Agency (2011), Interactive Flood Map - http://go.mappoint.net/sepa/, accessed 22/01/2015

10.5.35 As highlighted above, all potential sources of flooding must be considered for any development. A summary of the potential sources of flooding is presented below.

Fluvial Flooding Sources

10.5.36 Flood information available on the SEPA Flood Map indicates that areas of the upper reaches of Shalloch Burn are at high risk of surface water flooding (10% (1 in 10) probability of flooding in any given year). These are located along the two existing tracks to the north of Waterhead Hill running west-south west to east-north east. All other stretches of river and surface water identified as at risk of flooding are located downstream of the Planning Application Boundary and/or proposed infrastructure.

Coastal Flooding Sources

10.5.37 The proposed Development is located approximately 40 km to the nearest coast and due to this distance along with the topographical position, approximately 250 mAOD at the site entrance and 530 mAOD within the Planning Application Boundary it will not be affected by tidal flooding.

Groundwater Flooding Sources

10.5.38 Flooding can also result from high groundwater levels if the water table rises above the surface level. Groundwater flooding can occur in a variety of geological settings including river valleys with thick deposits of alluvium and river gravels. Groundwater flooding happens in response to a combination of already high groundwater levels (usually during mid- or late-winter) and intense or unusually lengthy storm events. Such flooding also often lasts much longer than flooding caused by a river over-flowing its banks.

10.5.39 Groundwater flooding is often associated with the shallow unconsolidated sedimentary aquifers that overlie non-aquifers. Such aquifers are susceptible to flooding as the storage capacity within these deposits is often limited and direct rainfall recharge can be relatively high, subsequently increasing the water levels within the groundwater and providing a good hydraulic connection with adjacent river networks. The data presented in ES Figure 10.4 in Volume 3 of the ES shows the potential for groundwater flooding within the Planning Application Boundary. The British Geological Society (BGS) dataset has identified three classes of groundwater flooding susceptibility including a) Potential for groundwater flooding to occur at surface; b) Potential for groundwater flooding of property situated below ground level; and c) Limited potential for groundwater flooding to occur. As shown on Figure 10.4 in Volume 3 of the ES groundwater levels at the proposed Development vary within the Planning Application Boundary and it is expected that the topography and the superficial deposits are fundamental to influencing groundwater flooding. The areas with limited potential for groundwater flooding are located along the riparian corridors of the watercourses, potentially as a result of the superficial deposits having greater hydraulic properties to allow the movement of groundwater. The areas of increased potential for groundwater flooding appear to occur further upgradient but still within the valleys of the watercourses. It is expected that the mixed or lower permeability of the underlying superficial deposits in these locations restricts groundwater movement, which can subsequently result in the rising of the water table during prolonged or intense rainfall events.

10.5.40 Groundwater flooding is difficult to predict as it rarely follows a consistent pattern. The response time between rainfall and groundwater flooding is also relatively long.

Flooding From Artificial Drainage Systems

10.5.41 There is evidence of artificial drainage associated with the commercial forestry works within the Shalloch Burn and Polwhat Burn sub-catchments within the Planning Application Boundary. There is the potential that this could cause some localised flooding by increasing runoff rates to the main watercourses within the catchments. However at the time of the site visits there was limited to no flow within any of the artificial drainage channels and very little standing water.

Other Sources of Flooding

10.5.42 There is the potential for overland flow to occur due to the dominance of slowly permeable peat and/or peaty soils underlying the site.

Water Quality

10.5.43 Two watercourses have been classified under SEPA's River Basin Management Plans (RBMP)[11]. The RBMP are one of the requirements of the WFD and are the plans designed for improving and protecting the water environment. The details of the watercourses that are within or downstream of the Planning Application Boundary and are classified under the RBMP classification scheme are provided in Table 10.8 below.

Table 10.8: RBMP classification of Watercourses within the vicinity of the site

River	Current Ecological Status (2013)	Reasons for Classification based on pressures in the Catchment	Targeted Ecological Status (in line with first, second and third RBMP) 2015	2021	2027
Water of Deugh	Poor (Ecological Potential)	• Flow is heavily regulated by an impoundment and abstraction as part of the Galloway Hydro Scheme. This can cause barriers to fish migration and disruption of natural flow patterns. • Intensive forestry land use within the catchment and along the banks introducing limiting nutrients into watercourse. Forestry has also altered the natural morphology of channels. • As detailed in paragraph 10.5.46 below the Water of Deugh is an important brown trout fishery therefore based on the above information Water of Deugh is considered to have Very High sensitivity to changes in water quality.	Bad	Bad	Good
Bow Burn	Moderate (Ecological Potential)	• Flow is regulated by an impoundment and abstraction from the watercourse. This can cause barriers to fish migration and disruption of natural flow patterns. • Forestry land use within catchment and along the banks introducing limiting nutrients into watercourse. • The Bow Burn is a tributary of the Water of Deugh which supports good fish stocks, therefore it is considered to have Very High sensitivity to changes in water quality.	Bad	Bad	Good

Source: SEPA RBMP Interactive Mapper

Water Resources

10.5.44 Scottish Water was contacted during the scoping exercise and a response was received. Scottish Water records indicate that there are no Scottish Water water abstraction sources, which are designated as Drinking Water Protected Areas under the Water Framework Directive that may be affected.

10.5.45 DGC and EAC were contacted about the presence of Private Water Supplies (PWS) both within the Planning Application Boundary and within a 3 km buffer.

10.5.46 It was confirmed that there are 17 properties within the 3 km search area and that they had no record of any PWS within the Planning Application Boundary. The information on these supplies has been presented within Table 10.9 below, with the locations also presented in ES Figure 10.1 in Volume 3 of the ES.

Table 10.9: Private water Supplies within the 3 km of the Planning Application Boundary

Property ID	PWS ID	Property Name	Type of Supply	Domestic (D)/ Agricultural (A)	Property within catchment occupied by proposed infrastructure	Distance from Infrastructure (km)
1	A	Brownhill	Groundwater Spring	D and A	Yes	4.8
2	B	Waterhead	Surface Watercourse	Unknown	Yes	4.6
3	C	Netherbow	Surface Watercourse	D	Yes	2.2
3	D	Knockengorroch Taigh- Na Sithidhean	Groundwater Spring	D and A	Yes	2.9
4						
5	E	House at Brockloch Forest	Groundwater Well	D and A	No	4.77
6		Brockloch Cottage				
7		Four Winds				
8		Brockloch Farm				
9	F	Woodhead	Groundwater Spring	D	No	5.2

[11] Scottish Environment Protection Agency (2011), Interactive River Basin Management Plan Map – http://gis.sepa.org.uk/rbmp/, accessed 21/01/2015

Property ID	PWS ID	Property Name	Type of Supply	Domestic (D)/ Agricultural (A)	Property within catchment occupied by proposed infrastructure	Distance from Infrastructure (km)
10	Uninhabited	Knockower	Groundwater Well	Currently not in use	No	4.9
11	G	Stroma	Groundwater Spring	D and A	No	4.5
12		Drumjohn				
13	H	Lamford	Groundwater Spring	D	No	6.5
14	I	Meadowhead	Groundwater Spring	D and A	No	5.5
15	J	Bridgend	Groundwater Spring	D and A	No	5.6
16		Holm of Daltallochan				
17	K	Lagwyne	Groundwater Spring	D and A	Yes	6.1
18	L	Lamloch	Surface Watercourse	D and A	No	5.6

Source: Dumfries and Galloway Council and East Ayrshire Council

10.5.47 A site visit for the Windy Standard Developments was undertaken in April 2013 in order to confirm the source locations of the PWS. It should be noted that during the survey the Knockower property (10) was found to be uninhabited, therefore it was not possible to identify the source location which was not in use. Five PWS have been considered further as a result of the properties being located within the same catchment occupied by wind farm infrastructure. These supplies are: Brownhill (D), Bridgend (E), Taigh- Na-Sithidhean, Knockengorroch (H), Knockengorroch (I) and Waterhead, Carsphairn (Q). Paragraphs 10.6.58 - 10.6.61 below provide more information on the hydrogeological characteristics of the site and surrounding area. Based on this information it is likely that the hydrogeological catchments are constrained by the same topographic controls as the surface water catchments. Therefore, any properties not located within the catchments occupied by wind farm infrastructure have not been considered further.

Fisheries and Recreation

10.5.48 The upper reaches of the Water of Deugh have been identified as important fisheries which support good populations of wild brown trout and coarse fish. The Water of Deugh is part of the Galloway Hydro scheme, which has brought changes to the hydromorphological characteristics and fisheries across sections of the catchment. The Galloway Fisheries Trust (GFT) aims to restore and maintain the aquatic biodiversity within the river by means of responsible and sustainable approaches. One example is a successful salmon hatchery programme which has been implemented and runs annually on the River Dee.

Soils and Peat

10.5.49 The distribution of soils across the Planning Application Boundary is dependent upon land use, geology, topography and hydrological regime of the area. Information on the Planning Application Boundary soils has been provided by the Hutton Institute, specifically from Sheets 7 and 77[12]. Table 10.10 below provides a summary of the soils present within the Planning Application Boundary.

Table 10.10: Summary of Soil Types

Soil Association	Parent Material	Component Soils	Area of Soil Association Present (Km²)
Organic soils	Organic deposits	Blanket peat (incorporating hill peat)	12.84
Ettrick	Drifts derived from lower palezoic greywackes and shales	Peaty podzols, peaty gleys and peat	1.97
		Peaty gleys, peat	0.46
		Organic and mineral soil	0.29

10.5.50 The above soils information indicates that blanket peat and hill peat dominate within the Planning Application Boundary. The soils within the Planning Application Boundary are typically imperfectly or poorly drained.

10.5.51 Peat is a soft to very soft, highly compressible, highly porous organic material that can consist of up to 90 – 95 % water, with 5 – 10 % solid material[13]. Unmodified peat consists of two layers; a surface acrotelm which is usually 10 – 30 cm thick, highly permeable and receptive to rainfall. Decomposition of organic matter within the acrotelm occurs aerobically and rapidly. The acrotelm generally has a high proportion of fibrous material and often forms a crust in dry conditions.

10.5.52 A second layer, or catotelm, lies beneath the acrotelm and forms a stable colloidal substance which is generally impermeable. As a result the catotelm usually remains saturated with little groundwater flow. Peat is thixotropic, meaning that the viscosity of the material decreases when stress is applied. The thixotropic nature of peat may be considered less important where the peat has been modified through artificial drainage or natural erosion and is drier, but will be significant when the peat body is saturated.

10.5.53 Due to the distribution of peat and peaty soils within the Planning Application Boundary a peat depth and peat slide risk assessment has been carried out. There are a number of drainage and geotechnical issues to constructing and operating developments on such environments.

10.5.54 Technical Appendix 10.3: Peat Stability Assessment in Volume 4 of this ES provides details on the methodologies adopted to complete the peat slide risk assessment with the Table 10.11 below and following information providing a summary of the peat depths recorded during field surveys.

Table 10.11: Summary of Recorded Peat Depths

Peat Depth Range (m)	Results	% of Points
0 < 0.5	528	48
0.5 – 1.0	333	30
1.0 – 1.5	158	14
1.5 – 2.0	61	5
2.0 – 2.5	20	2
>2.5	11	1

[12] Macaulay Institute, Soil Survey of Scotland, Carrick – Sheet 8 & Part of Girvan – Sheet 7 and Ayr, 1:63,360 Provisional Soil Map 1968, and Nithsdale and Lowther Hills Sheet 78 and part of Sheet 77, New Galloway and Glen Trool, 1:50 000 Soil Maps, 1985

[13] J. Warburton, J. Holden and A.J.Mills, (2004), Hydrological controls of surficial mass movements in peat, Earth-Science Reviews, 67, 139 – 156

Peat Depth Range (m)	Results	% of Points
TOTAL	1,111	100

10.5.55 The peat depths within the Planning Application Boundary are predominantly less than 1 m. 8 % of the peat depth probes were recorded as greater than 1.0 m.

Geology

10.5.56 The following geological information has been obtained from digital data available from the British Geological Survey[14]. The 1:50,000 scale BGS digital map indicates that the proposed Development is underlain almost entirely by sedimentary wacke and mudstone of the Leadhills Super Group. This supergroup was formed in the Ordovician and consists of poorly sorted sediments in a fine clay matrix. At the Waterhead Hill Cluster proposed Development Area, the bedrock comprises the Kirkcolm Formation, consisting of Ordovician sandstone and siltstone in a turbidite sequence. A small sill is also present within the vicinity of the summit of Upper Hill. This is part of the Southern Midland Valley Felsite Sills formed in the Devonian and Silurian from intrusions of silica-rich magma.

10.5.57 The superficial deposits consist primarily of Quaternary peat deposits with the deepest deposits recorded at the Meaul Hill Cluster proposed Development Area. Discrete areas of poorly sorted Quaternary till and alluvium are also present along small sections of present day watercourses.

Hydrogeology

10.5.58 Groundwater information has been recorded using published data sources and from observations made during the field surveys.

10.5.59 The aquifer classification map from the Scottish Environment website[15] shows that the site has low aquifer productivity. The site is underlain by Ordovician wacke, which has a consolidated clay matrix. Virtually all water flow is through fractures and other discontinuities including weathered zones.

10.5.60 The Planning Application Boundary is partially covered by peat or peat rich soils, which also forms a minor aquifer. Groundwater within such peat aquifers is generally perched on the less permeable basement they overlie. The peat aquifers, together with the weathered bedrock zone are likely to provide base flow to the local surrounding watercourses.

10.5.61 In lower lying areas of lesser relief the water table generally occurs at or just below the surface. This is demonstrated by the presence of areas of saturated ground within the Planning Application Boundary.

Modifying Influences

10.5.62 Information regarding climate change was obtained from the UK Climate Projections (UKCP09) website[16]. The UKCP09 is a climate analysis tool which features comprehensive projections for different regions of the UK. Climate information was taken for the area of West Scotland based on a high emissions scenario. According to these predictions winter mean temperature will increase by 1.1°C and summer mean temperature will increase by 1.4°C by the 2020's. It is also predicted that annual precipitation will decrease by 1.1 % with an increase in winter mean precipitation of 5 % and a decrease in summer precipitation of 3 % by the 2020's.

10.5.63 Warmer and wetter winters suggest less snow and more rain. This will create increased risk for flood events, and issues with water quality as less precipitation will be held in its frozen state during the winter season. If climate predictions are correct, summer months will become dryer. This will create pressure on the needs of water abstractions and on sensitive ecosystems that rely on aquatic habitats. Evidence also suggests that although the summer months will have an average decrease in rainfall, summer storms will be more frequent and intense. This may lead to more extreme flow values during and immediately following such events, with consequential flooding and water quality issues. This is of key importance for the hydrological environment during summer construction periods.

10.5.64 It is suggested that increased temperatures in the summer could also increase evapotranspiration and potentially cause dessication of peat[17]. The dessication could result in the peat being more susceptible to erosion due to increased intensity in summer storms and increased rainfall during the winter months.

10.5.65 As peat and peat dominant soils are composed of vegetation remains they contain a high proportion of carbon compared to other soils. Thus the process that forms peat effectively locks away atmospheric carbon. It is believed that loss of peatland could lead to the release of carbon into the atmosphere contributing to greenhouse gas concentrations which are believed to be one of the main drivers of climate change.

10.6 EFFECT EVALUATION

Basis of Assessment

10.6.1 The proposed Development site is located in Dumfries and Galloway and is an extension of the existing Windy Standard Wind Farm and Windy Standard II (the present Windy Standard Developments).

10.6.2 The proposed Development will comprise of 20 turbines, forestry felling, external transformer housing, widening of existing public road junction, site tracks, crane pads, foundations, underground electricity cables, 2no. permanent anemometer masts, extension of use of consented operations and control building and temporary construction and storage compounds, 4 borrow pits, on-site concrete batching plant and associated works/infrastructure and Health and Safety sign posting. There will be up to four borrow pits associated with the proposed Development and further details can be found in Technical Appendix 10.2: Borrow Pit Search Report in Volume 4 of the ES. The associated infrastructure from the present Windy Standard Developments will be utilised where practicable and possible.

10.6.3 Typically the construction phase will involve a period of earthworks, track construction and excavations for forming turbine bases. Following this, the turbine bases and infrastructure will be installed and finally the turbines will be transported to site and erected.

10.6.4 The total permanent landtake of the proposed Development will be approximately 12.3 ha (0.123 km^2), with an additional temporary landtake of approximately 1 ha (0.01 km^2) that will be reinstated following construction.

Mitigation by Design

10.6.5 A summary of the hydrological influences on the project layout are given below with full details of the project design provided in Chapter 3: Design Evolution and Alternatives, of the ES. Due to the nature of the environment occupied by the proposed Development it is imperative that the design and infrastructure helps maintain or even improve the local hydrology. Poor design of development infrastructure can result in significant implications to the hydrological environment with secondary effects on peat stability and ecology.

10.6.6 The findings of the peat depth and Peat Stability Assessment (Technical Appendix 10.3: Peat Stability Assessment in Volume 4 of the ES), show that the infrastructure has as far as possible, taking into accounts other constraints, been sited outside areas of deeper peat. The peat depths within the Planning Application Boundary are predominantly shown to be in a moderate shallow range (0.75 m) when considering the discrete turbine and access track areas only.

[14] Geology of Britain Viewer, http://mapapps.bgs.ac.uk/geologyofbritain/home.html. accessed 21/11/2014

[15] http://www.environment.scotland.gov.uk/get-interactive/map-view/, accessed 09/08/2015

[16] Defra (2009), UK Climate Projections 09, http://ukclimateprojections.defra.gov.uk/content/view/12/689/, accessed 25/01/2015

[17] The Scottish Government (2008), The Scottish Soil Framework: A Consultation Document

10.6.7 The hydrological desktop study and site visits have identified a typical upland hydrological environment, with a significant number of hydrological pathways and features associated with it. A series of buffer distances have been adopted to help reduce effects of the proposed Development on the hydrological environment. A 50 m buffer was implemented for all identified natural hydrological features.

Table 10.12 confirms that all turbines associated with the proposed Development are located outside the buffer limits. Distances were calculated using functionalities provided within the ArcGIS package. Watercourses are linear features that were identified from aerial photography, OS 1:10,000 raster data as well as any additional features identified during the site visit. A blanket buffer of 50 m was established for such features.

Table 10.12: Distance of Turbines from Identified Hydrological Features

Turbine ID	Turbine Distance from Watercourses (50 m Buffer)
1	370
2	179
3	294
4	531
5	165
6	162
7	228
8	228
9	132
10	247
11	262
12	129
13	253
14	212
15	165
16	373
17	305
18	224
19	248
20	327

10.6.8 The design of the infrastructure has also meant that the associated access tracks are located greater than 50 m from natural hydrological features. However, where access necessitates essential watercourse crossing, construction features have been limited in these buffers as far as possible, for example, minimising tracks running parallel to watercourses and trying to avoid track junctions being constructed in these zones. The exceptions to this are where access tracks have to cross watercourses or when other constraints have resulted in the tracks having to infringe upon the edges of the buffers of ephemeral headwater drainage channels.

10.6.9 Proposed watercourse crossings associated with a total of 9 km of new access track required as part of the proposed Development will be minimised to three in total. With the exception of the identified watercourse crossings, no areas of infrastructure are located within the adopted 50 m buffers.

Mitigation

10.6.10 A number of planning, design and construction proposals have been identified during the assessment. Full details of the assumed best practice construction management and mitigation measures will be provided in a CEMP which would be prepared post consent as part of the conditions discharge process a draft is available in Technical Appendix 4.1: Draft Construction Environmental Management Plan in Volume 4 of the ES. A summary of the measures included within the CEMP are described below and have been assumed to be part of the proposals when the residual effects and their significance are reported. Any further mitigation, specific to the proposed Development, but still considered best practice is also provided in further detail in the following paragraphs.

10.6.11 A number of the mitigation measures described in the following paragraphs can also be adopted during the operational phase of the proposed Development. To avoid duplication of text, the reference to what stage the measures can be adopted is provided in the following paragraphs.

General Site Pollution Control

10.6.12 A specific CEMP will ensure that best practice measures are put in place and activities carried out in such a manner as to prevent or minimise effects on the surface and groundwater environment (see Technical Appendix 4.1: Draft Construction Environmental Management Plan in Volume 4 of the ES). The CEMP will be prepared prior to commencement of construction but will include information as follows:

- *Drainage* – all runoff derived from construction activities and site infrastructure will not be allowed to directly enter the natural drainage network. All runoff will be adequately treated via a suitably designed drainage scheme with appropriate sediment and pollution management measures. The proposed Development is situated in an upland hydrological area and it is imperative that the drainage infrastructure is designed to accommodate storm flows based on a 1 in 200 year event + climate change to help maintain the existing hydrological regime.
- *Storage* – all soil/peat stockpiles as well as equipment, materials and chemicals will be stored well away from any watercourses. Chemical, fuel and oil stores will be sited on impervious bases with a secured bund.
- *Vehicles and Refuelling* – standing machinery will have drip trays placed underneath to prevent oil and fuel leaks causing pollution. Where practicable, refuelling of vehicles and machinery will be carried out in designated areas, on an impermeable surface, and well away from any watercourse.
- *Maintenance* – only emergency maintenance to construction plant will be carried out within the Planning Application Boundary, in designated areas, on an impermeable surface well away from any watercourse or drainage, unless vehicles have broken down necessitating maintenance at the point of breakdown, where special precautions will be taken.
- *Welfare Facilities* – on-site welfare facilities will be adequately designed and maintained to ensure all sewage is disposed of appropriately. This may take the form of an on-site septic tank with soakaway, or tankering and off-site disposal depending on the suitability of the site for a soakaway and prior agreement with SEPA.
- *Cement and Concrete* – fresh concrete and cement are very alkaline and corrosive and can be lethal to aquatic life. The use of wet concrete in and around watercourses will be avoided and carefully controlled.
- *Monitoring Plan* – all activities undertaken as part of the proposed Development will be monitored throughout the construction phase. Such monitoring will be to ensure environmental compliance. Water quality monitoring will also occur throughout each phase of the proposed Development and will help to maximise the effectiveness of mitigation measures whilst monitoring effects on the hydrological environment.
- *Contingency Plans* – plans will ensure that emergency equipment is available on site i.e. spill kits and absorbent materials, advice on action to be taken and who should be informed in the event of a pollution incident.
- *Training* – All relevant staff personnel will be trained in both normal operating and emergency procedures, and be made aware of highly sensitive areas on site.

10.6.13 Further details regarding the pollution prevention and mitigation measures that will be adopted during the construction and operation of the proposed Development are detailed in the following paragraphs.

Runoff and Sediment Management

10.6.14 The following measures will be adopted to appropriately attenuate and treat runoff during construction and operation of the proposed Development.

10.6.15 The site drainage system will convey water away from construction activities as well as proposed Development infrastructure. However, due to the nature of the works on site and the negligible infiltration and storage capacity of the underlying peat and bedrock there is significant potential for sediment and other pollutants to become entrained in the surface runoff.

10.6.16 To reduce this potential it will be ensured that prior to the commencement of work and during construction that figures showing site drainage and hydrologically sensitive areas are regularly checked to review potential for runoff and ponding of water within the Planning Application Boundary to ensure that runoff patterns are well known.

10.6.17 The drainage systems installed within the Planning Application Boundary will also have sediment management measures incorporated into their design to help reduce or wholly mitigate effects on the hydrological environment. The type of sediment management will depend on the volume of construction activities occurring in particular areas within the Planning Application Boundary. For all of the suggested control measures regular inspection and maintenance is necessary, particularly after prolonged heavy rainfall.

10.6.18 Straw bales and/or silt traps will be installed within the Planning Application Boundary drainage system. Silt traps could take the form of terram fences or clean stone. However, the ability of the silt traps to successfully treat runoff will be dependent upon the permeability of the terram geotextile material and the size and source of the clean stone.

10.6.19 The ability of the straw bales and silt traps to effectively treat runoff will depend upon the volume of runoff within the drainage channel, the type of material used and the frequency of monitoring and replacement of the measures.

10.6.20 If required, flocculents could also be used to treat runoff. Flocculents are very effective at removing suspended sediment from water but they can also have effects on water chemistry. As such, it is recommended that SEPA are consulted prior to the use of flocculents.

Pumping and Dewatering of Excavations

10.6.21 All pumping operations e.g. removal of water from turbine base excavations, will be carried out in line with best practice and where necessary in line with the requirements of The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended)[18] prior to the works being undertaken. Suitable measures to minimise the impact of the pumped water on the hydrological environment shall be taken. These measures shall include, but are not limited to, the following techniques.

10.6.22 Due to the expected low permeability of the site soils it is expected that the potential for groundwater ingress would be low. The ingress of surface water into the excavations will be minimised through the use of upgradient drainage measures e.g. cut-off ditches. It is recognised that water can still enter the excavation and would need to be removed. This can be achieved by allowing the water to gravity drain to a designated area before being pumped from the excavation to a predesigned settlement lagoon or other suitable silt treatment area. The settlement lagoons would attenuate and treat runoff before discharging back into the natural drainage network.

10.6.23 Due to the peat and peaty soils on site the throughput rate of runoff within the settlement treatment areas would be reduced to give longer settlement time within the excavations and settlement tanks. If required, a series of settlement lagoons or other silt treatment measures can be deployed to allow maximum settlement of sediment during the construction period.

10.6.24 The treated water from the settlement lagoons or other silt treatment measures will not be discharged directly into watercourses but directed onto vegetated surfaces where appropriate. Any sediment within the treated water will be deposited amongst the rough surface vegetation, away from sensitive habitats or watercourses.

10.6.25 To reduce the likelihood of erosion channels being formed by the discharge from the sediment treatment outfalls it is recommended that the water is discharged at a slow rate, or spread evenly across a surface. For discharge onto rough vegetation to be effective the discharge must be spread efficiently and the vegetation, soils and topography be carefully considered to determine an appropriate discharge location. For example, filtering the water through a length of pipe with multiple discharge points will allow attenuation as well as diffuse dispersion, thus reducing the erosive potential of the runoff.

10.6.26 The discharge can also utilise silt traps, straw bales or other attenuation measures. The utilisation of such measures could help to prevent the formation of erosion channels.

10.6.27 To maximise the efficiency of the settlement measures e.g. Siltbusters or other holding lagoons or tanks, the sediment sludge that collects at the base will be removed as required.

Storage of Fuels/Chemicals and Bunding Arrangements

10.6.28 Throughout the construction and to a lesser extent during the operational phase of the proposed Development a number of oils and chemicals will be used. Such materials will be used and stored in a safe manner to ensure that the surface and groundwater environment is not adversely affected.

10.6.29 The following measures will be adopted to protect the surface and groundwater environment from the inappropriate storage and use of substances hazardous to the environment:

- All equipment, materials and chemicals to be stored away from any watercourses. Chemicals, fuel and oil will be stored in tanks of sufficient strength and structural integrity to ensure that it is unlikely to burst or leak in ordinary use. They will also be sited on impervious bases within a secured bund of 110 % of the storage capacity;
- Where oil is stored in a bunded area, oil residue can build up. This residue build up will reduce the storage capacity of the bund and will be removed regularly. The residue will be disposed of by a specialist contractor;
- Locks shall be fitted to all fuel storage tanks or containers and there shall be a nominated trained person to oversee the refuelling and delivery to ensure there is no spillage; and
- Standing machinery to have drip trays placed underneath to prevent oil and fuel leaks causing pollution. Where practicable refuelling of vehicles and machinery will be carried out at a central designated area, on an impermeable surface, which will be located at least 50 m away from any watercourses.

Refuelling

10.6.30 A fuel bowser will be used for refuelling on the access tracks or hardstanding. The bowser driver shall be responsible for ensuring that refuelling of mobile plant does not take place within 50 m of a watercourse. The bowser driver will receive extra training on spill prevention and response.

10.6.31 The refuelling bowser shall be equipped with a mobile spillage control kit containing oil absorbent booms and mats. All site personnel will be trained in their use as part of the site induction training or toolbox talks. Special attention will be paid to spillage control at watercourses.

10.6.32 Oil booms will be provided and maintained downstream of the works at all watercourse locations that the access track crosses for the duration of the construction period to act as a defence against the unlikely event of an oil or fuel spillage.

Vehicle Maintenance and Management

10.6.33 All plant used during the construction of the proposed Development will be in suitable condition and fit for purpose to carry out the works and will be maintained as per manufacturers guidelines.

[18] Scottish Environment Protection Agency (2011), The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended): A Practical Guide, Version 7.2 March 2015

10.6.34 Maintenance of construction plant to be carried out in designated areas, on an impermeable surface away from any watercourse or drainage. Only if vehicles have broken down will maintenance be permitted out with a designated area, and this would only be carried out after implementing special precautions. Such precautions include, but are not limited to:

- Ensure that drip trays are placed underneath vehicle during maintenance;
- As a precautionary measure, ensure that straw bales or entrapment matting are placed downstream of the maintenance area;
- All heavy construction plant will be inspected daily by the operating personnel and any defects or issues resolved immediately prior to starting works. All heavy construction plant shall be issued with spill-kits. Should a spillage occur, larger spill kits shall also be positioned at various areas within the Planning Application Boundary which will be highlighted to all operatives during the site induction; and
- Standing machinery and plant will have drip trays placed underneath to prevent oil and fuel leaks causing pollution. Where practicable refuelling of vehicles and machinery will be carried out at a central designated area, on an impermeable surface, which will be located at least 50 m away from any watercourses.

Concrete Works

10.6.35 Concrete would be required for the construction of the wind turbine foundations. The following section provides best practice measures that are required to be implemented to prevent detrimental effects to the hydrological environment.

10.6.36 Care will be taken to ensure that the transportation of concrete to the turbine and building foundations uses best practice measures. Freshly mixed concrete and/or dry cement powder will not be allowed to enter any watercourse. This will be ensured by:

- Locating turbines and concrete batching or wash out areas at least 50 m from watercourses;
- Concrete wagons will only be permitted to wash-out into specifically designed wash-out areas and predetermined at agreed locations site wide;
- The drivers will be informed at their site induction of the location of the designated wash-out areas and issued with a location map;
- Loads will be managed and assessed with regards to the size of vehicle and ground conditions whilst keeping at appropriate speed limits to avoid spillage.
- Tools and equipment will not be cleaned in watercourses. Should it be necessary to clean tools and equipment on site, this will be done in the predetermined wash-out areas.
- A designated concrete wash out will be constructed within the Planning application Boundary at a location agreed with the relevant consultees to ensure protection of watercourses. The design and construction of these wash out areas will be agreed with SEPA; and
- Wash out areas will be continually monitored and findings recorded to ensure effluent levels do not spill over into the environment.

Site Drainage

10.6.37 The following section discusses the conventional site drainage measures that can be installed during the construction and operation of the proposed Development.

10.6.38 Surface drainage ditches will be installed alongside tracks only where necessary. The length, depth and gradient of individual drains will be minimised to avoid intercepting large volumes of diffuse overland flow and generating high velocity flows during storm events. Sediment traps, settlement ponds and buffer strips will be incorporated into the drainage system as necessary and will serve the dual purpose of attenuating peak flows, by slowing the flow of runoff through the drainage system, and allowing sediment to settle before water is discharged from the drainage system[19].

10.6.39 As well as utilising sediment traps, structures such as v-notched weirs and/or check dams will be installed within the drainage channels. Such structures will throttle the flow within the channel, thus reducing erosive potential of any runoff and allowing sediment and/or pollutants to settle.

10.6.40 Access tracks crossing slopes will disrupt surface flow that consequently will collect in drains constructed upslope of the tracks. Cross-drains and or waterbars will be constructed at regular intervals to conduct this surface flow below or across the track where it will be discharged back into the drainage system, although all efforts will be made to segregate this runoff from more silty runoff originating from track surfaces and other exposed construction areas, thus reducing the silt load and volume discharging to all silt treatment areas. Regular discharge points will limit the concentration of surface runoff and the diversion of flows between catchments. Such cross drains need to be strong enough to withstand the expected traffic loadings[19].

10.6.41 During storm events there is likely to be some ponding on the uphill side of tracks, as percolation alone is unlikely to be able to accommodate surface flows. To minimise this ponding, small diameter cross drains or perforated pipes (similar to plastic pipe field drains) would be incorporated into the track base at regular intervals to allow more flow to pass through the track and maintain the current flow regime. It is recommended that such pipes are surrounded by free draining material that is wrapped in a separator geotextile. The number of pipes and associated dimensions will be dependent upon the width of the flush/boggy area and the hydrological regime[20].

10.6.42 Prior to track construction, site operatives will identify flush areas, depressions or zones which may concentrate water flow. These sections will be spanned with plastic pipes to help maintain hydraulic conductivity under the road, and reduce water flow over the road surface during heavy precipitation.

10.6.43 Due to the poor permeability of the surrounding peat, peaty soils and bedrock, it is also recommended that drains and/or cut-off drains are installed on the upstream/upgradient sides of the turbine foundations, crane hardstandings, and other excavations required within the Planning Application Boundary. The purpose of this will be to help reduce the volume of surface water runoff entering the excavations and minimise any subsequent contamination.

10.6.44 The constructed drainage system will not discharge directly to any natural watercourse, but will discharge to buffer strips, trenches or SUDS measures, preferably on flatter, lower lying ground. These buffers will act as filters and will minimise sediment transport, attenuate flows prior to discharge and maximise infiltration back into the soils and peat.

10.6.45 Drainage from the construction compound, welfare facilities, borrow pits and concrete wash out areas will be collected and treated separately from the main site drainage, as the runoff from these areas is more likely to be contaminated and therefore will require treatment. Appropriate treatment, such as oil interceptors and treatment for high alkalinity, will be installed.

10.6.46 As discussed in the Mitigation By Design section above, three new watercourse crossings will be required as part of the construction and subsequent operation of the proposed Development (see Technical Appendix 10.4: Watercourse Crossing Assessment in Volume 4 of the ES). The crossings will be appropriately designed so that they do not alter the natural drainage, hinder the passage of aquatic fauna and can accommodate flow for a 1:200yr + climate change event. All watercourse crossings will be designed with edge upstands or bunds e.g. straw bales, sandbags or silt fences to prevent sediment laden runoff from construction plant movement from

[19] Scottish Natural Heritage, Scottish Environmental Protection Agency (2015), Good Practice During Windfarm Construction, v3

[20] Forestry Civil Engineering and Scottish Natural Heritage (2010), Floating Roads on Peat: A Report into Good Practice in Design, Construction and Use of Floating Roads on Peat with particular reference to Wind Farm Developments in Scotland

directly entering watercourses. Relevant CAR Authorisation from SEPA will be sought for construction of the crossings that are required over watercourses that are displayed on the 1:50,000 OS Landranger maps.

Welfare Facilities/Foul Water

10.6.47 The following measures will be adopted for the design of the foul water drainage system:

- Any sewage associated with the temporary construction compound and welfare facilities will be collected in appropriately sized interceptor tanks and shall be located at the construction compound. All wash basins, toilets and shower areas shall also be connected to an interceptor tank; and
- The interceptor tanks and the tanks within any site portable toilets, which shall be situated not less than 50 m from any watercourse, will be emptied regularly by a suitably licensed contractor. Sewerage from these facilities will be disposed off site in accordance with waste management legislation.

Sustainable Water Management

10.6.48 To reduce the impact of the proposed Development on the natural hydrological regime, the site design will aim to mimic the greenfield runoff response at source through the use of sustainable drainage practices.

10.6.49 As detailed in the SEPA guidance document (SEPA 2011) under General Binding Rule 10, Sustainable Urban Drainage Systems (SUDS) should be taken into consideration as part of the water management:

"If the surface water run-off is from areas constructed after 1 April 2001, the site must be drained by a Sustainable Urban Drainage System (SUDS). If the surface water run-off is from a construction site operated after 1 April 2007, the site must be drained by a SUD system or equivalent. The only exceptions are if the run-off is from a single dwelling and its curtilage, or if the discharge is to coastal water."

10.6.50 SUDS are used to attenuate rates of runoff from development sites and can also have water purification benefits. The implementation of SUDS as opposed to conventional drainage systems provides several benefits by:

- Reducing peak flows to watercourses and potentially reducing risk of flooding downstream;
- Reducing the volumes and frequency of water flowing directly to watercourses;
- Improving water quality by removing pollutants;
- Reducing potable water demand through rainwater harvesting; and
- Replicating natural drainage patterns, including the recharge of groundwater so that base flows are maintained.

10.6.51 Whilst it is understood that the scope for SUDS measures is limited as a result of the hydrological environment it is recommended that the installed drainage measures adopt the principles highlighted above.

Emergency Water Management Measures

10.6.52 As previously mentioned a significant volume of oils and chemicals will be stored on site during the construction phase and to a lesser extent the operational phase. Site traffic will also be present in significant numbers during the construction phase of the proposed Development, with traffic volumes significantly reduced during wind farm operation.

10.6.53 The appropriate storage of oils, chemicals and maintenance of site plant has been discussed above. However, despite these measures, accidents can happen and these can have significant impacts upon the quality of the surface and groundwater environment. The following emergency procedures can be implemented to ensure that the surface and groundwater environment is protected during wind farm construction and operation:

- All relevant on-site staff to be trained in both normal operating and emergency procedures, and be made aware of highly sensitive areas on site. The staff training and implementation of site procedures will be overseen by the Infrastructure Contractor to ensure that these measures are carried out effectively to minimise the risk of a pollution incident;
- Contingency plans that ensure that emergency equipment is available on site (i.e. spill kits and absorbent materials), and that advice is provided on actions to be taken and who would be informed, in the event of a pollution incident;
- Contingency planning procedures must be regularly reviewed to include changes to site operations that were not foreseen during design;
- The procedures set out in site contingency plans need to be prepared in conjunction with the assessment of the risk of a pollution incident occurring and the measures to be taken to minimise pollution. The location of the procedures will be publicised and it is essential that they are set out clearly so that they can easily be understood and acted upon; and
- The emergency procedures can include the following:
  - Containment measures;
  - Emergency discharge routes;
  - List of appropriate equipment and clean-up materials;
  - Maintenance schedule for equipment;
  - Details of trained staff, location, and provision for 24-hour cover;
  - Details of staff responsibilities;
  - Notification procedures to inform the relevant environment protection authority;
  - Audit and review schedule;
  - Telephone numbers of statutory and local water company; and
  - List of specialist pollution clean-up companies and their telephone numbers.

Receptor Sensitivity

10.6.54 On the basis of the baseline surveys and available information, Table 10.4 above identifies the sensitivity of receptors as outlined in Table 10.13 below with justification for their categorisation.

Table 10.13: Receptor Sensitivity

Receptor	Sensitivity	Comment
Surface Water		
Water Quality		
Water of Deugh (inc associated tributaries)	High	Water of Deugh is classed as having bad ecological potential as part of SEPAs RBMP. Tributaries aiming for Good ecological potential by 2027 as part of SEPAs RBMP. Rivers support fish populations which are dependent on good water quality.
Bow Burn	Medium	Bow Burn is classed as having Moderate ecological potential as part of SEPAs RBMP. Tributaries aiming for Good ecological potential by 2027 as part of SEPAs RBMP. Rivers support fish populations which are dependent on good water quality.
Fisheries and Recreation		

Receptor	Sensitivity	Comment
Water of Deugh (inc associated tributaries)	Medium	The catchment has excellent salmon and trout fisheries, with species dependent upon good water quality. The watercourse offers good fishing but is also a spawning ground for salmon and trout.
Flooding	Medium	The proposed Development infrastructure is located outside fluvial flood risk zones identified on SEPA flood map. Some areas of the proposed Development are underlain by slowly permeable and/or saturated peat with potential for extensive pluvial flooding. Landtake of infrastructure has the potential to increase response to peak flow events by increasing the volume of runoff entering artificial drainage and watercourses.
Water Resources		
Private Water Supplies	Medium	Private supplies are located between 1.6 km and 5.8 km from nearest proposed Development infrastructure. Potential for contaminants associated with proposed Development construction and operation to leach into surrounding bedrock and affect the quality and quantity of water serving the supplies.
Soils, Geology and Hydrogeology		
Site soils and peat	Medium	Underlying soils have been heavily altered by artificial drainage for existing forestry. However boggy areas and peat are present within the Planning Application Boundary.
Geology	Low	Geology is typical of wider area with no designated sites of geological interest located within the study area which is outlined in ES Figure 10.1 in Volume 3 of the ES.
Hydrogeology and groundwater	Medium	Bedrock aquifers are vulnerable to pollution as a result of groundwater flow dominated by natural joints and fissures. Groundwater flow in cracks and joints offers little attenuation to pollutants. Some of the private water supplies rely on groundwater as a source.

Predicted Construction Effects

10.6.55 The potential for effects on the hydrological environment is greatest during the construction phase due to the high levels of activity on-site and when there is greatest change to the existing environment. Taking into account the mitigation and management measures discussed in paragraphs 10.7.12 to 10.6.53 the following paragraphs discuss the potential effects that can still occur during the construction of the proposed Development.

10.6.56 The evaluation of construction effects is provided in Table 10.14 below. The table assumes the successful implementation of the mitigation measures provided in paragraphs 10.7.12 to 10.7.53.

Pollution Incidents

10.6.57 During the construction phase, a number of potential pollutants will be present onsite, including oil, fuels, chemicals, unset cement and concrete, waste and waste water from construction activities and staff welfare facilities. The majority of these potential pollutants will be located or stored within the construction compound, which is located in the catchment of Shalloch Burn. In addition, there is the potential for contamination of the hydrological and peatland environment caused by spillages along the access tracks and construction areas.

Erosion and Sedimentation

10.6.58 Soil and peat erosion and sediment generation may occur in areas where the ground has been disturbed, particularly where surface runoff has been concentrated. Drainage ditches are particularly prone to this problem, due to the high velocities of surface water runoff passing through the drainage network. Considerable sediment generation is expected where the ground has been excavated for the proposed Development infrastructure.

10.6.59 Sediment transport in watercourses can result in high turbidity levels which can impact on the water quality, particularly affecting the ecological potential of the watercourses. High turbidity in watercourses can reduce the light and oxygen levels in the watercourses, while sediment deposition can smother plant life and spawning grounds. Sediment deposition can also reduce the flood storage capacity of the watercourses and block culverts, resulting in an increased flood risk.

10.6.60 Forestry felling will expose soils within the catchments of Shalloch Burn and Polwhat Burn. The removal of closed canopy will result in reduced levels of interception and transpiration of precipitation. As such, felling has the potential to increase the volume of runoff entering watercourses, with increased soil erosion and sedimentation.

10.6.61 As a result of the felling and construction operations, all catchments with new and upgraded infrastructure present are vulnerable to erosion and sedimentation.

Acidification

10.6.62 Tree removal also can increase nitrogen mineralisation and nitrification, which can promote nitrate leaching and enhance acidity in waters draining some soils. The effect can last between two to five years after felling, depending upon the rate at which vegetation re-establishes. The filling of trenches with fresh brash could accentuate the effect by promoting leaching below the rooting zone.

Increase in Runoff

10.6.63 Turbine bases, hardstanding areas and access tracks will act as impermeable areas, restricting the natural movement of water within the hydrological environment, potentially resulting in increased rates of runoff into the onsite sub catchments to the Water of Deugh catchment.

10.6.64 In the areas which are to be felled, localised runoff responses have the potential to increase due to the reduction in precipitation being intercepted by the closed canopy forestry. The effects on runoff will be dependent upon the extent of forestry management and the felling techniques adopted. Felling and extraction would also be planned to minimise the number of drain crossings and reduce any increases in runoff.

10.6.65 Localised increases could cause issues for downstream flood storage capacity and/or pollution incidents. Increases in the volume of runoff entering watercourses could also cause erosion and sedimentation, therefore having detrimental effects on surface water hydrology and fishery resources.

Modification of Surface Drainage Patterns

10.6.66 The interception of diffuse overland flow by the proposed Development infrastructure and associated drainage may disrupt the natural drainage regime of the area, concentrating flows and potentially diverting flows from one catchment to another. This may have implications on flood issues downstream of the proposed Development as well as depriving peat of surface flows that can help maintain hydrological continuity between peat bodies.

Impediments to Surface Water Flow

10.6.67 The construction of watercourse crossings may restrict flow in the various channels and reduce hydraulic capacity, resulting in an increase in flood risk, and promotion of erosion and sedimentation. In addition, poorly designed watercourse crossings may impede the migration of fish and mammal movement in the riparian corridor.

Modification of Groundwater Flow and Levels

10.6.68 Deep excavations, such as those required for the turbine foundations are likely to disrupt the shallow groundwater systems within the peat and bedrock geology. Due to the poor permeability of the underlying peat and peaty soils groundwater ingress is expected to be minimal. Surface water ingress will be minimised utilising upgradient cut-off drains or other drainage measures. The installation of cut-off drains has the potential to lower local groundwater levels within the surrounding peat and/or peat dominated soils.

10.6.69 Access tracks are likely to bisect hydrogeological units in the peat, interrupting shallow groundwater flow. Cut and fill tracks also have the potential to disrupt existing sub-surface drainage networks as a result of the removal or compression of the peat and/or peat dominated soils. The removal or compression of the peat/peat soils will result in an alteration to the existing hydrological regime that will cause the build-up of water on the upslope side of construction and the reduction in water on the downslope side. This build-up of water can cause ponding which can increase the shear stress on the peat. Drying out of peat on the downslope site could cause desiccation of the peat which will make it more susceptible to erosion.

10.6.70 In areas where there is a concentration of access tracks and drainage, there is the potential for more widespread lowering of the water table, resulting in the indirect and long-term impact on the future restorability and functionality of adjacent peat as well as affecting the overall integrity of peatland environments. Modifications to the hydrogeological regime could also have influences on GWDTE as well as the quality and quantity of water serving the surrounding private water supplies. Further information on the assessment of effects of the proposed Development on GWDTE are presented in Chapter 7: Ecology, of the ES.

Peat Instability

10.6.71 Peat slides do occur naturally, however, because of the remote nature of most peatlands, the frequency of natural events may be under reported. As a result, peatslides and their causes are poorly understood, although it is recognised that they are the result of multiple causes.

10.6.72 A peatslide occurs when a portion of the peat mass becomes detached and flows downhill, usually as blocks of solid peat rafted upon a slurry of semi-liquid peat. A peatslide may have a significant effect on river water quality and ecology, particularly fish stocks. The land affected by peatslides usually re-vegetates quite rapidly, although the original balance of vegetation species is unlikely to be re-established as a consequence of the changes in local topography and drainage patterns. Where peat habitats or future restoration have been identified, peat instability can have serious and detrimental effects.

10.6.73 A Peat Stability Assessment can be found in Technical Appendix 10.3: Peat Stability Assessment in Volume 4 of the ES. A geotechnical engineer would normally be employed onsite during construction to undertake advance inspection, carry out regular monitoring and provide advice whilst work is ongoing. The creation and management of a geotechnical risk register will form an important aspect of the development of the proposed Development.

Compaction of Soils

10.6.74 The movement of construction traffic within the Planning Application Boundary is likely to cause compaction in the peat, leading to changes in both the hydrological and hydrogeological regime. The impacts of compaction are likely to be highly localised but will damage the vegetation, and result in a reduction in the soil permeability and rainfall infiltration, thereby increasing the potential for flood risk and erosion as well as increasing the risk of peatslide. Increasing the potential for flood risk and erosion or a peatslide event could also have direct effects on surface water quality and fisheries, as well as reducing the potential for enhancement/restoration of peat.

Assessment of Construction Effects

10.6.75 Table 10.14 below identifies the likely construction effects on the identified receptors and their significance assuming the successful implementation of best practice and mitigation measures provided in paragraphs 10.7.12 - 10.6.53 above. The assessment is based on the criteria outlined in paragraphs 10.5.4 - 10.5.8 above.

Table 10.14: Assessment of Construction Effects

Potential Effects	Identified Receptor(s)	Sensitivity	Magnitude of Effect	Significance of Effects Post Mitigation
Surface water				
Water quality				
Pollution incidents Erosion and sedimentation Acidification Increase in Runoff Modifications to Surface Drainage Pattern Impediments to Surface Water Flow Peat Instability	Water of Deugh	High	Negligible	**Minor/Moderate**
	Bow Burn	Medium	Negligible	**Minor**
	Lone Stand	Medium	Negligible	**Minor**
	Polwhat Burn	Medium	Negligible	**Minor**
	Shalloch Burn	Medium	Negligible	**Minor**
Fisheries and Recreation				
Pollution incidents Erosion and Sedimentation Acidification Increase in Runoff Modifications to Surface Drainage Patterns Impediments to Surface Water Flow Peat Instability	Water of Deugh (inc associated tributaries)	High	Negligible	**Minor/Moderate**
Flooding				

Potential Effects	Identified Receptor(s)	Sensitivity	Magnitude of Effect	Significance of Effects Post Mitigation
Increase in runoff Modifications to Surface Drainage Patterns Impediments to Surface Water Flow Compaction of Soil	On site watercourses (inc associated tributaries)	Medium	Negligible	**Minor**
Water Resource				
Pollution incidents	Brownhill	Medium	Low	**Minor/Moderate**
Modifications to Surface Drainage Patterns	Bridgend	Medium	Negligible	**Minor**
Impediments to Surface Water Flow	Taigh- Na-Sithidhean,	Low	Negligible	**Negligible/Minor**
Modification of Groundwater Flows and Levels	Knockengorroch	Low	Negligible	**Negligible/Minor**
Compaction of Soil	Waterhead, Carsphairn	Low	Negligible	**Negligible/Minor**
Soils, Geology and Hydrogeology				
Soils and Peat				
Pollution incidents Modification to Surface Drainage Patterns Impediments to Surface Water Flow Modifications of Groundwater Flows and Levels Peat Instability Compaction of Soil	Site Soils and Peat	Medium	Low	**Minor/Moderate**
Geology				
Disruption to local geological features from deep turbine excavation and other excavation required for construction	On site Geology	Low	Low	**Minor**
Hydrogeology				
Pollution incidents Acidification Modifications to Surface Drainage Patterns	Underlying groundwater aquifers	Medium	Low	**Minor/Moderate**
Modification of Groundwater Flows and Levels	Groundwater within peat	Medium	Low	**Minor/Moderate**

Potential Effects	Identified Receptor(s)	Sensitivity	Magnitude of Effect	Significance of Effects Post Mitigation
Peat Instability Compaction of Soil				

Predicted Ongoing and Operational Effects

10.6.76 The effects of the proposed Development are expected to be substantially lower during the operational phase. The following paragraphs discuss the potential effects that are predicted to occur during the operational phase of the proposed Development.

Pollution Incidents

10.6.77 The potential risk of pollution is substantially lower during operation than during construction because of the decreased levels of activity in the operational phase. The majority of potential pollutants will have been removed when construction is complete; however, lubricants for turbine gearboxes, transformer oils and possible fuel leaks from maintenance vehicles will remain.

Erosion and Sedimentation

10.6.78 Levels of erosion and sedimentation during operation will be much lower than construction as there will be no excavations or bare exposed ground. Some erosion and sedimentation is still possible on site tracks and drainage ditches as a result of scouring during extreme rainfall events. Similarly there could be some erosion and sedimentation around new stream crossings as watercourses reach new equilibrium.

Modification of Surface Drainage Patterns

10.6.79 Modification of surface runoff will occur as a result of the construction of the new infrastructure associated with the proposed Development. The operational effects are likely to result in changes to volume and/or changes to runoff rate.

10.6.80 Site tracks and associated drains will intercept some overland flow, interrupting the natural drainage regime by concentrating flows and potentially diverting them from one catchment to another. Poorly designed site tracks and associated drainage could allow surface water to travel through a catchment much faster than if it were to travel as diffuse overland flow. This could result in an increase in runoff rates, peak flows and influence response times during storm events. The permanent landtake for the proposed Development will be approximately 12.3 ha (0.123 km2), with an additional temporary landtake of approximately 1 ha (0.01 km2) (13.3 ha (0.133 km2) in total).

Impediments to Surface Water Flows

10.6.81 During the operational phase impediments to flows can generally occur as a result from blockages to watercourse crossing, ditches and watercourses resulting from vegetation and erosion debris.

Modifications of Groundwater Flow and Levels

10.6.82 Tracks and their drainage as well as turbine foundations and hardstandings will potentially alter the water table within the upslope and downslope peat and upper bedrock aquifers, which can also have implications for the long term functionality of peatland environments. Backfilled cable trenches can also provide preferential flow pathways for groundwater.

Peat Instability

10.6.83 It is recognised that natural peat failure may still occur during the operational phase of the proposed Development. However, there is also the potential for the construction activities to increase the risk of peat slide during this phase. For example, the construction of tracks parallel to the slope can result in the removal of peat

that subsequently increases the upslope pressure on the exposed peat face. Changes in the hydrological connectivity of the peat could result in the build-up of water upslope that could subsequently fail over a period of time. The risk of instability during operation will be addressed through the implementation of appropriate mitigation during construction and an ongoing appraisal of peat slide will be carried out within the Planning Application Boundary throughout the operation of the proposed Development.

10.6.84 Full details of the measures that can be implemented to mitigate effects on the stability of peat are provided in Technical Appendix 10.3: Peat Stability Assessment in Volume 4 of the ES. The creation and management of a geotechnical risk register will form an important aspect of the site development.

Compaction of Soils

10.6.85 The compaction of soils/peat is likely to be significantly reduced during the operational phase as a result of less heavy traffic movement. However, the construction of floating roads that are not properly maintained could result in long term settlement of the soils/peat that could also cause secondary effects to groundwater movement and peat stability.

Assessment of Predicted Operational and Ongoing Effects

10.6.86 Table 10.15 below identifies the likely construction effects on the identified receptors and their significance assuming the successful implementation of the best practice and mitigation measures provided in paragraphs 10.7.12. – 10.7.53. The assessment is based on the criteria outlined in paragraphs 10.5.4. – 10.5.8 above.

Table 10.15: Assessment of Operational and Ongoing Effects

Potential Effects	Identified Receptor(s)	Sensitivity	Magnitude of Effect	Significance of Effects Post Mitigation
Surface water				
Water quality				
Pollution incidents	Water of Deugh	High	Negligible	**Minor/Moderate**
Erosion and sedimentation	Bow Burn	Medium	Negligible	**Minor**
Acidification	Lone Stand	Medium	Negligible	**Minor**
Increase in Runoff	Polwhat Burn	Medium	Negligible	**Minor**
Modifications to Surface Drainage Pattern	Shalloch Burn	Medium	Negligible	**Minor**
Impediments to Surface Water Flow				
Peat Instability				
Fisheries and Recreation				
Pollution incidents Erosion and Sedimentation Acidification Increase in Runoff Modifications to Surface Drainage Patterns Impediments to Surface Water Flow Peat Instability	Water of Deugh (inc associated tributaries	High	Negligible	**Minor/Moderate**
Flooding				
Increase in runoff Modifications to Surface Drainage Patterns Impediments to Surface Water Flow Compaction of Soil	On site watercourses (inc associated tributaries)	Low	Negligible	**Negligible/Minor**
Water Resources				
Private Water Supplies				
Pollution incidents	Brownhill	Medium	Negligible	**Minor**
Acidification	Bridgend	Medium	Negligible	**Minor**
Modifications to Surface Drainage Patterns	Taigh- Na-Sithidhean,	Low	Negligible	**Negligible/Minor**
Impediments to Surface Water Flow	Knockengorroch	Low	Negligible	**Negligible/Minor**
Modification of Groundwater Flows and Levels	Waterhead, Carsphairn	Low	Negligible	**Negligible/Minor**
Compaction of Soil				
Soils, Geology and Hydrogeology				
Soils and Peat				
Pollution incidents Modification to Surface Drainage Patterns Impediments to Surface Water Flow Modifications of Groundwater Flows and Levels Peat Instability Compaction of Soil	Site Soils and Peat	Medium	Negligible	**Minor**
Geology				
Disruption to local geological features from deep turbine excavation and other excavation required for construction	On site Geology	Low	Negligible	**Negligible/Minor**
Hydrogeology				
Pollution incidents Modifications to Surface Drainage Patterns	Underlying groundwater aquifers	Medium	Negligible	**Minor**

Potential Effects	Identified Receptor(s)	Sensitivity	Magnitude of Effect	Significance of Effects Post Mitigation
Modification of Groundwater Flows and Levels Peat Instability Compaction of Soil	Groundwater within peat	Medium	Negligible	**Minor**

Predicted Cumulative Effects

10.6.88 The application of a hydrological catchment methodology enables a logical evaluation of the potential for cumulative effects of the hydrological environment.

10.6.89 As shown in Table 6.2: Cumulative Wind Farms from Chapter 6: Landscape and Visual Assessment, of the ES, there are six existing/consented wind farms within a radius of 5 km of the proposed Development, however only three of these wind farms are within the same surface water catchment (Water of Deugh catchment) as the proposed Development.

10.6.90 The three wind farms which are\would be located within the catchment of the Water of Deugh are;

- The Existing Windy Standard Wind Farm; and
- Windy Standard II Wind Farm which is currently under construction; and
- South Kyle Wind Farm which is proposed and within the planning stage.

10.6.91 The construction and subsequent operation of the three schemes as well as the proposed Development has the potential to cumulatively affect the water quality, flooding and fisheries interests associated with the Water of Deugh, Kendoon Loch and Water of Ken. However, taking into account that construction of these developments would not be concurrent and assuming the successful implementation of detailed mitigation (following best practice) and monitoring plans it is expected that any cumulative effects would be of **minor significance**.

Monitoring

10.6.92 A programme of surface water quality monitoring will be finalised post consent, prior to construction. A breakdown of the proposed monitoring methodologies has been provided to take into account sensitivities of the on-site and downstream environments.

10.6.93 The details of any required monitoring should be discussed and agreed with SEPA, and DGC prior to commencement. The extent and the frequency of the monitoring will be proportionate to the level of activity on site during the construction, operation and decommissioning of the proposed Development. Appropriate monitoring is important to:

- Provide reassurance that established in-place mitigation measures are effective and that the proposed Development is not having any significant adverse impact upon the environment;
- Indicate whether further investigation is required and, where pollution is identified, the need for additional mitigation measures to prevent, reduce or remove any impacts on the water environment; and
- Understand the long term effects of the proposed Development on the natural environment.

10.6.94 A baseline surface water monitoring programme will be undertaken prior to the commencement of construction works. The establishment of a baseline is very important as it provides a suite of parameters against which to compare samples taken during the proposed Development's lifetime, and with which to assess any impacts and the requirement for any appropriate remedial measures. However, due to the variance in climatic conditions, recording like for like water quality prior to and during construction is likely to be unusual. Therefore, it is also recommended that control sites, situated outside the area affected by the proposed Development infrastructure are also established at the time.

10.6.95 It is also recommended that a suitably qualified Ecological Clerk of Works (ECoW) is employed throughout the construction of the proposed Development. The appointed consultant can provide advice to the contractors about how environmental effects can be minimised, and what methods can be employed to reduce effects on water quality, the peat and associated habitats.

10.6.96 Monitoring should be undertaken throughout construction of the proposed Development. The monitoring will help to identify areas where infrastructure is having a negative effect on peat and peaty soils and utilise the appropriate methods to prevent further deterioration and/or promote further enhancement.

10.6.97 The monitoring methodologies detailed below are designed to monitor the effects of the proposed Development on the quality of the hydrological environment. It is also recommended that a suitably qualified geotechnical engineer is appointed to monitor the risk of peatslide that could have secondary effects on water quality.

10.6.98 It is also recommended that all construction management and water management techniques are agreed prior to construction. The techniques would be agreed following consultation with SEPA, and DGC.

10.6.99 The monitoring programme will be site-specific and tailored so as to provide a meaningful and pragmatic indication of the state of the water environment. A summary of the elements associated with the monitoring programme are provided below:

- Periodic and ad-hoc sampling and analysis of surface water during construction in order to complement the programme of visual inspection. Periodic analysis enables monitoring of trends in levels of critical parameters so that deviations from the norm can be identified and actioned;
- Regular visual inspection of surface water management features such as culverts and receiving watercourses in order to establish whether there are increased levels of suspended sediment, erosion or deposition. It is likely that there will be an ongoing need to maintain these structures, for example by the removal of debris, to ensure they continue to function as designed;
- Regular visual inspection of watercourses during construction and decommissioning stages, particularly during periods of high rainfall, in order to establish that levels of suspended solids have not been increased by on-site activities; and
- Additional monitoring as required as a condition of discharge consents, abstraction licences or other environmental regulation.

Residual Effects

10.6.100 The Chapter has identified that there will be no significant effects from the proposed Development on the hydrological, hydrogeological and geological environment and therefore it can be concluded that no residual effects will take place.

10.7 SUMMARY

10.7.1 An assessment has been carried out of the likely impacts of the proposed Development on the hydrological, hydrogeological and geological environment. The assessment has considered site preparation, construction and operation of the proposed Development.

10.7.2 The potential effects on the surface waters, groundwater, peat, designated sites and private water supplies that have been considered are:

- Pollution Incidents;
- Erosion and sedimentation;
- Changes to water resources i.e. private water supplies;
- Modification of surface water and groundwater flows;

- Modification of natural drainage patterns;
- Impediments to flow and flood risk;
- Peat instability; and
- Compaction of soils.

10.7.3 Following the identification and assessment of the key receptors, taking into account the potential effects listed above, a comprehensive suite of mitigation and best practice measures has been incorporated into the design, including extensive buffer areas. In addition a site specific CEMP as well as detailed design of infrastructure and associated mitigation will be implemented to protect the groundwater and surface water resources from pollution and minimise changes to the hydrological environment.

10.7.4 The impact assessment has taken into account the hydrological regime, highlighting that the principal effects will occur during the construction. Assuming the successful design and implementation of mitigation measures the significance of construction effects on all identified receptors is considered to be of minor or no significance. The assessment of predicted ongoing and operational effects has also determined that the significance of effects on all receptors to be of minor/moderate minor or no significance. The assessment of predicted ongoing and operational effects has also determined that the significance of effects on all receptors to be of minor or no significance.

10.7.5 The impact assessment has taken into account the hydrological regime, highlighting that the principal effects will occur during the construction. Assuming the successful design and implementation of mitigation measures the significance of construction effects on all identified receptors is considered to be of minor or no significance. The assessment of predicted ongoing and operational effects has also determined that the significance of effects on all receptors to be of minor/negligible significance.

10.7.6 The significance of effects on the site hydrological, hydrogeological and geological conditions are **not significant** under the terms of Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2000 and Amendment Regulations 2008.

10.7.7 Table 10.16 below summarises the potential impacts of the proposed Development.

Table 10.16: Summary of Potential Impacts of the proposed Development.

Likely Significant Impact	Mitigation Proposed	Means of Implementation	Outcome/Residual Impact
Construction			
Detrimental impacts to on-site and downstream water quality Detrimental effects to on-site and downstream fisheries as a result of changes to water quality Increases to on-site and downstream flood risk as a result of poor construction practices (including poor construction of watercourse crossings)	Appropriate drainage design that incorporates sediment management measures to attenuate and treat runoff from construction activities. Appropriate storage and handling of potential pollutants. Refuelling of construction plan in designated areas. Adoption and agreement on emergency measures should significant effects occur.	Preparation of site specific CEMP prior to construction. Hydrological elements of the CEMP can include, but not limited to the following: A Drainage Management Plan; Watercourse crossing assessment (detailed design prior to construction); Water quality monitoring programme (prior to and during construction (see Technical Appendix 4.1: Draft Construction Environmental Management Plan).	**Minor/Moderate**
Disruption to private water supplies as a result of introducing contaminants to hydrogeological pathways as well as altering existing flow patterns	Appropriate storage and handling of potential pollutants. Refuelling of construction plan in designated areas. Adoption and agreement on emergency measures should significant effects occur. Identification and confirmation of all private water supply sources during the detailed design stage prior to construction. If required, carry out water sampling of supplies prior to and during construction to ascertain effects of construction on water quality.	Preparation of site specific CEMP prior to construction. Hydrological elements of the CEMP can include, but not limited to the following: A Drainage Management Plan; Private water supply management plan (including emergency pollution response plan) Water quality monitoring programme (prior to and during construction) (see Technical Appendix 4.1: Draft Construction Environmental Management Plan).	**Minor/Moderate**
Degradation of peat or peat dominated soils as a result of interrupting surface and sub-surface drainage pathways	Appropriate drainage design that incorporates sediment management measures to attenuate and treat runoff from construction activities. Measures will be designed to encourage water retention within peat/soils. Identification of subsurface hydrological pathways prior to construction. Appropriate design of watercourse crossings in areas of flushes.	Preparation of site specific CEMP prior to construction. Hydrological elements of the CEMP can include, but not limited to the following: Drainage Management Plan (designed to maintain drainage pathways); Water quality monitoring programme (including groundwater level monitoring in peat or peat dominated soils) (see Technical Appendix 4.1: Draft Construction Environmental Management Plan).	**Minor/Moderate**
Increase risk of peat slide	Adoption of a geo-	Geotechnical Risk	**Minor/Moderate**

Likely Significant Impact	Mitigation Proposed	Means of Implementation	Outcome/Residual Impact
risk assessment as a result of poor construction and management of peat stockpiles	technical risk register. Appropriate storage and re-use of peat /soils in line with current best practice guidelines and site conditions.	Register	
Operation			
Detrimental impacts to on-site and downstream water quality through degradation of proposed Development infrastructure and poor storage of materials	Appropriate drainage design that incorporates sediment management measures to attenuate and treat runoff from wind farm infrastructure. Appropriate storage and handling of potential pollutants. Adoption of a long term monitoring programme to monitor degradation of infrastructure (including the removal of blockages from watercourse crossings).	Operational drainage and monitoring plan (designed prior to construction). Plan can detail the appropriate monitoring methods, including: Visual monitoring and completion of checklists signed off by SEPA; Regular water quality monitoring for a period post construction to determine potential long terms effects of wind farm on water quality. Private water supply management plan (including emergency pollution response plan).	**Minor/Moderate**
Detrimental effects to on-site and downstream fisheries as a result of changes to water quality (as described above)			
Increases to on-site and downstream flood risk as a result of degradation of infrastructure and/or poor maintenance/monitoring of infrastructure			
Long term disruption of private water supplies as a result of changes to hydrogeological regime as well as poor storage and handling of chemicals			
Long term degradation of peat as a result of interrupting surface and sub-surface drainage pathways. Disruption of drainage patterns can cause pooling and/or desiccation of peat	Appropriate drainage design that incorporates sediment management measures to attenuate and treat runoff from wind farm infrastructure. Appropriate re-use and management of waste peat in line with principles of best practice guidance and site conditions.	Peat reuse and management plan	**Minor**
Increase risk of peatslide as a result of desiccation or wetting of peat. Risk	Appropriate drainage design that incorporates sediment management	Geotechnical Risk Register	**Minor**
can also increase due to settlement of infrastructure that disrupts hydrological pathways	measures to attenuate and treat runoff from proposed Development infrastructure. Long term monitoring of peat/soils to determine any issues with stability.		

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Author	Matthew Lambert	23/01/2015
Checked	Emily Peaston	20/02/2015
Approved	Euan Hutchison	25/03/2016

Client Details	
Contact	Gareth Swales
Client Name	Brockloch Rig III Ltd
Address	c/o Fred. Olsen Renewables Ltd

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A	23/01/2015	First Draft
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BROCKLOCH RIG III

Chapter 11

Noise

Contents

Glossary

Term	Definition
Above Ordnance Datum	Height relative to the average sea level at Newlyn, Cornwall UK
Decibel	The decibel (dB) is a logarithmic unit used in acoustics to quantify sound levels relative to a 0 dB reference (a sound pressure level of 2*10-5 Pa). The ‘A’ signifies A-weighting which is a frequency response function that applies an international weighted scale of sound levels in each frequency band (octave band or third octave band) providing a good correlation

Term	Definition
	with the sensitivity of the human ear which is less sensitive to very high and very low frequencies.
LAeq	LAeq is an A-weighted, equivalent sound level. A widely used noise parameter describing a sound level with the same Energy content as the varying acoustic signal measured. LAeq, 12hr is an A-weighted equivalent sound pressure level in dB measured over a period of time (12 hours).
LA90	LA90 is the noise level exceeded for 90% of the measurement period, A-weighted and calculated by Statistical Analysis.
LA90, 10min	LA90, 10min is the noise level exceeded for 90% of the measurement period (the measurement period being a ten minute period), A-weighted and calculated by Statistical Analysis.
Lidar	Lidar provides hub height and turbine mounted accurate wind measurement, for wind energy and meteorological applications
Noise Emission	The noise energy emitted by a source (e.g. a wind turbine).
Noise Immission	The sound pressure level detected at a given location (e.g. nearest dwelling).
Octave Band	Range of frequencies between one frequency (f0*2-1/2) and a second frequency (f0*2+1/2). The quoted centre frequency of the octave band is f0.
The proposed Development	The proposed Windy Standard III Wind Farm.
The proposed Development Area	The project development area within the site boundary which is subdivided into the Meaul Hill Cluster and Waterhead Hill Cluster.

List of Abbreviations

Abbreviation	Description
AOD	Above Ordnance Datum
COPA	Control of Pollution Act
dB(A)	A-weighted Decibel
DGC	Dumfries and Galloway Council
DMRB	Design Manual for Roads and Bridges
DTI	Department of Trade and Industry
ECDU	Energy Consents and Deployment Unit
EHO	Environmental Health Officer
ETSU	Energy Technology Support Unit
FDS	Field Data Sheets
IOA GPG	Institute of Acoustics Good Practice Guide
ISO	International Organisation for Standardization
kWh	Kilowatt Hour
MW	Megawatt
PAN	Planning Advice Note

11.1 INTRODUCTION

11.1.1 Wind farms have the potential to create noise during their construction, operational and decommissioning phases. This Chapter summarises the findings of the construction (also representative of the decommissioning phase) and operational noise assessments, included in full in Technical Appendices 11.1 and 11.2 respectively.

11.2 POLICY, LEGISLATION & GUIDANCE

11.2.1 The methods of assessment used the following combination of guidance and assessment methodologies:

- Planning Advice Note (PAN) 1/2011: 'Planning and Noise'[1];
- Web Based Renewables Advice: 'Onshore Wind Turbines' (last updated December 2013)[2];
- ETSU-R-97 'The Assessment and Rating of Noise from Wind Farms'[3];
- ISO9613: 1996 'Acoustics – Attenuation of Sound During Propagation Outdoors Part 2: General Method of Calculation'[4];
- Institute of Acoustics 'A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise' (IOA GPG)[5];
- Institute of Acoustics (IOA) Bulletin March/April 2009 'Prediction and Assessment of Wind Turbine Noise';
- BS5228-1: 2009+A1:2014 'Code of Practice for Noise and Vibration Control on Construction and Open Sites - Noise'[6];
- Guidelines for Environmental Noise Impact Assessment (Institute of Environmental Management & Assessment, 2014) (IEMA noise guidelines); and
- Local Policy (see Chapter 2: Planning and Policy Context, of the ES).

11.2.2 The above documents are discussed in detail within Technical Appendices 11.1: Construction and Decommissioning Noise Assessment and 11.2: Operational Noise Assessment in Volume 4 of the ES, where relevant.

11.2.3 In October 2014 IEMA published *'Guidelines for Environmental Noise Impact Assessment'.* The guidance document provides a framework for noise impact assessment and makes suggestions for factors which may be considered within noise assessments. At time of writing the guidance has not been endorsed by Government or the Institute of Acoustics.

11.2.4 In relation to wind farms, the guidance states (in Para 7.64):

"In certain cases, there is government endorsed guidance which defines what are considered to be acceptable noise thresholds e.g. ETSU-R-97 for wind turbines, below which the government states that the situation is acceptable. This does not mean, however, that there would be no effect (consequences) and it is important to acknowledge any impact (change in noise level) that is identified even if the government limit or guideline value is not exceeded."

11.2.5 The guidance also discusses the noise sensitive receptors which may be considered in an assessment e.g. schools, hospitals, places of worship, as well as broader categories such as wildlife sites and 'open air amenities', which might include sites of special historic interest and nationally designated footpaths.

11.3 ASSESSMENT METHODOLOGY

Study Area

11.3.1 Prior to the commencement of the noise assessment, initial desktop noise modelling was undertaken using the 'WindFarm' software in order to identify suitable locations at which to monitor background noise. An initial wind turbine layout was input into the 'WindFarm' software and, using noise data for a candidate turbine representative of the type that could be installed within the proposed Development Area, 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. Some additional assessment locations outside of the 35dB contour were included in order to allow for any changes in design of the scheme and also to cover the closest sensitive receptors in all directions.

11.3.2 The noise monitoring and assessment locations for the construction and operational noise assessments are shown on ES Figures 11.1 and 11.2 in Volume 3 of the ES, respectively.

11.3.3 There are a number of operational, consented and proposed wind farms located in the vicinity of the proposed Development, these include:

- The Existing Windy Standard Wind Farm;
- The under construction Windy Standard II Wind Farm;
- The consented Afton Wind Farm;
- The proposed South Kyle Wind Farm;
- The proposed Quantans Hill Wind Farm;
- The proposed Benbrack Wind Farm
- The proposed Pencloe Wind Farm; and
- The proposed Windy Rig Wind Farm.

11.3.4 The wind farms detailed above have been considered as part of the cumulative noise assessment.

Scoping and Consultation

11.3.5 The Scoping Response issued by the Energy Consents and Deployment Unit (ECDU) contained information specifically relating to noise. A summary of the information and the actions taken to address the requests is given in Table 11.1 below.

11.3.6 Direct consultation was undertaken with Dumfries and Galloway Council's (DGC) Environmental Health Officer (EHO) to agree the approach to the noise assessment and the proposed noise monitoring locations. The EHO was invited but not able to attend the installation of equipment at the monitoring locations. Details of the installed noise monitoring locations were sent to the EHO post-installation to agree the final installed monitoring and assessment locations. The EHO at DGC responded to the consultation by phone and agreed with the methodology and noise monitoring locations. A number of subsequent attempts by phone and email were made to consult the EHO following the background noise assessment in order to further discuss the assessment but no response was received.

11.3.7 The details of each of the installed noise monitoring locations along with an explanation of each of the kit locations are detailed in Technical Appendix 11.2: Operational Noise Assessment in Volume 4 of the ES. Details

[1] Available online from: http://www.gov.scot/Publications/2011/02/28153945/0 (Last accessed 08/01/2016)

[2] Available online from: http://www.gov.scot/Resource/0044/00440315.pdf (Last accessed 08/01/2016)

[3] Energy Technology Support Unit for the Department of Trade and Industry (September 1996). ETSU-R-97 'The Assessment and Rating of Noise from Wind Farms'

[4] Available online from: http://www.persona.uk.com/barnfield/Core_docs/G/G7.pdf (Last accessed 08/01/2016)

[5] Available online from: http://www.ioa.org.uk/sites/default/files/IOA%20Good%20Practice%20Guide%20on%20Wind%20Turbine%20Noise%20-%20May%202013.pdf (Last accessed 08/01/2016)

[6] British Standards Institute (2014). BS5228-1: 2009+A1:2014 'Code of practice for noise and vibration control on construction and open sites - Noise'

of the consultation responses are provided in the Annex 2 of Technical Appendix 11.2: Operational Noise Assessment in Volume 4 of the ES and summarised below in Table 11.1.

Table 11.1 Summary of Consultee Response

Consultee	Summary of Response	Where & How Addressed
ECDU	Noise predictions should be carried out to evaluate the likely impacts of airborne noise from the wind turbines and associated construction activities including noise from blasting or piling activities which may affect local residents, during construction, operational and decommissioning stages of the project. The applicant should be aware of the guidance produced by ETSU on behalf of the Department of Trade and Industry (DTI) titled "The Assessment and Rating of Noise from Wind Farms". Cumulative noise effects should also be considered in assessing the specific circumstances prevailing at the proposed development site.	Construction noise assessed using BS5228-1:2009+A1:2014 guidance, as detailed in Technical Appendix 11.1: Construction and Decommissioning Noise Assessment in Volume 4 of the ES. Operational Noise Assessment undertaken as agreed with DGC and in line with ETSU-R-97 and current good practice, as detailed in Technical Appendix 11.2: Operational Noise Assessment in Volume 4 of the ES.
DGC	The EHO agreed with the assessment methodology and proposed noise monitoring locations.	Construction Noise Assessment undertaken in line with BS5228 as detailed in Technical Appendix 11.1: Construction and Decommissioning Noise Assessment in Volume 4 of the ES. Operational Noise Assessment undertaken as agreed with DGC and in line with ETSU-R-97 and current good practice, as detailed in Technical Appendix 11.2: Operational Noise Assessment in Volume 4 of the ES.

Construction Noise Assessment Methodology

11.3.8 The construction and decommissioning noise assessment has been undertaken using guidance contained in the recently updated (February 2014) BS5228: Part 1 2009+A1:2014, and the calculation methodology in ISO9613:1996, together with noise data for appropriate construction plant.

11.3.9 BS5228-1:2009+A1:2014 provides useful guidance on practical noise control. Part 1 provides recommendations for basic methods of noise control including sections on community relations, training, occupational noise effects, neighbourhood nuisance and project supervision. The annexes provide information on noise sources, mitigation measures and their effectiveness.

11.3.10 The BS5228-1:2009+A1:2014 document also contains sound power level data for a variety of construction plant. The data tabulated in the guidance document was obtained from field measurements of actual plant operating on construction and open sites in the United Kingdom.

11.3.11 The assessment locations used in the construction noise assessment are detailed in Table 11.2 below and shown on ES Figure 11.1 in Volume 3 of the ES. The term 'assessment location' refers to the edge of the amenity area which reflects the closest point to the proposed Development. The construction noise assessment locations are the closest receptors to the construction activities (for example new access tracks).

Table 11.2 Construction Noise Assessment Locations

Receptor	Easting (m)	Northing (m)	Elevation (mAOD)
H1- Moor Cottage	256963	603528	320
H2- Brownhill	255900	602600	298
H3- Waterhead	254530	599230	250
H4 – Netherbow	255465	597861	236

11.3.12 Prior to construction activities taking place there would be a requirement for timber felling and extraction. Ordinarily felling activities are not assessed for noise, however given the inclusion of felling within the construction management plan for the proposed Development, the potential noise impacts from all activities have been assessed to provide a worst case scenario.

11.3.13 The assessment has been based on a construction period of approximately 15 months. The construction process would be undertaken in several successive phases. During each stage 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. In view of this, the plant has been modelled operating at the closest point to each receptor for a given activity in each construction phase whereas in reality only certain plant would be working at the closest point. The hours of operation are anticipated to be 07:00 to 19:00 weekdays and Saturdays 07:00 to 13:00 for this phase.

11.3.14 For the purposes of this assessment the construction programme has been split into nine phases:

- Phase 0 - involves timber felling and extraction;
- Phase 1 - involves soil handling and distribution of hardcore required for the construction of the site compound(s);
- Phase 2 - construction of the temporary site compound(s), borrow pit construction, removal of soil and importation of hardcore material;
- Phase 3 - construction of the site tracks, borrow pit activity, soil handling, concrete batching and mixing and distribution of hardcore material;
- Phase 4 - construction of the crane hardstandings, borrow pit activity, soil handling, concrete batching and mixing and distribution of hardcore material;
- Phase 5 - construction of the turbine foundations which involves borrow pit activity, concrete batching and mixing, soil handling and distribution of hardcore material;
- Phase 6 - delivery and erection of the wind turbines;
- Phase 7 – upgrading of existing substation involving concrete batching and mixing and distribution of hardcore material; and
- Phase 8 – decommissioning.

11.3.15 During construction the total daily vehicle movement numbers would vary each month, peaking in phase 5 during construction of turbine foundations. There would be a number of abnormal loads bringing equipment to the site that may require special measures, such as police escorts for vehicles carrying wind turbine components.

11.3.16 For off-site traffic movements it is possible to determine the percentage increase required in existing traffic movements in order to cause a significant impact, based on the procedure outlined in the Design Manual for Roads and Bridges (DMRB) which states:

"The Designer should identify whether any of the following conditions are met:

ii) Traffic volumes on the existing roads or new routes will increase by at least 25% or decrease by 20% either during construction or when the project is completed. This change in traffic volume is equivalent to a 1 dB(A) change in noise level, which is the minimum change that can be detected by the human ear in the short term (e.g. on opening of a project);"

11.3.17 The impact of increased traffic movements on the A713 road has been assessed based on a 5 dB(A) change threshold. If a change of 5 dB or more is predicted, a significant increase is deemed to occur. Based on the DMRB procedure construction traffic movements would need to increase existing traffic movements by 125 % to result in a 5 dB increase in traffic noise.

11.3.18 The noise-generating equipment assessed for each construction phase is detailed in Technical Appendix 11.1: Construction Noise Assessment in Volume 4 of the ES, which shows actual noise data measured at 10 m from the noise source. Using the data contained in these tables the noise levels for phases 0-8 have been calculated.

11.3.19 The assessment assumes there would be no requirement for piling activities and that all blasting work at the borrow pits would be undertaken by a specialist contractor who would assume responsibility for blast design and implementation. To protect the amenity of local residents, the construction noise activities can be controlled under The Control of Pollution Act 1974 (COPA)[7] which is specifically concerned with the control of noise pollution. In particular Section 60, Part III of the COPA refers to the control of noise on construction sites. It provides legislation by which a local authority can control noise from construction sites to prevent noise disturbance occurring. In addition, it recommends that guidance provided by BS5228 be implemented to ensure compliance with Section 60.

11.3.20 Issues relating to construction noise are addressed in detail within Technical Appendix 11.1: Construction Noise Assessment in Volume 4 of the ES.

Operational Noise Assessment Methodology

11.3.21 ETSU-R-97 provides a robust basis for determining noise limits for proposed wind farm developments and these limits should not be breached. Consequently, the test applied to operational noise is whether or not the calculated wind farm noise levels at nearby noise sensitive properties lie below the noise limits derived in accordance with ETSU-R-97.

11.3.22 Limits differ between quiet daytime and night-time periods. The quiet daytime criteria applies to 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.

11.3.23 Night-time periods are defined as 23:00 to 07:00 with no differentiation made between weekdays and weekends.

11.3.24 ETSU-R-97 recommends that wind farm noise for the quiet daytime periods should be limited to 5 dB(A) above the prevailing background or a fixed minimum level 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.

11.3.25 In this case there are a low number of noise sensitive receptors located close to the proposed Development which would lean towards a higher limit (only two houses predicted to be within 35 dB(A), one of which is financially involved with the proposed Development; the next three closest properties are predicted to be lower than 30 dB). None of the closest properties are located within the prevailing downwind direction (to the north east of the proposed Development) and so for the majority of the time they would experience levels significantly less than those predicted; again this would support a limit towards the higher end of the scale. The proposed Development would also provide over 60 MW additional capacity. Having regard to the scale of development originally envisaged by ETSU-R-97 as justifying a 40 dB limit, the proposed Development represents a very significant amount of increased in power output which would indicate a higher limit is appropriate. These factors lead to the conclusion that a higher fixed minimum limit for receptors close to the proposed Development would be appropriate and is consistent with noise conditions applied for the under construction Windy Standard II.

11.3.26 For night-time periods the recommended limits are 5 dB(A) above prevailing background or a fixed minimum level of 43 dB $L_{A90,10min}$, whichever is higher.

11.3.27 The exception to the setting of both the quiet daytime and night time fixed minimum limit being where a property occupier has a financial involvement with the wind farm development. In that case the fixed minimum limit can be increased to 45 dB $L_{A90,10min}$ or the prevailing background noise L_{A90} plus 5 dB, whichever is the greater for both the quiet daytime and night-time periods.

11.3.28 The aim of the noise assessment is therefore to derive the ETSU-R-97 noise criteria and demonstrate that the proposed Development can meet the criteria. Nevertheless, depending on the levels of background noise, the satisfaction of the criteria can, at times, lead to a situation whereby at some locations under some conditions and for a certain proportion of the time, the noise associated with the proposed Development may be audible; although, if it is within the noise criteria set out above it is deemed to be at an acceptable level.

11.3.29 It is understood that Moor Cottage is owned by the developer and so any occupier would be financially involved with the proposed Development. Therefore the higher fixed minimum limits detailed in Section 11.3.27 above have been used for that receptor.

11.3.30 The proposed Development is located within a rural location where existing background noise levels are considered to be moderate. The predominant noise sources in the area are noise from streams/rivers (dominant at a number of receptors), wind induced noise (wind passing through vegetation and around buildings), distant and local road traffic noise, agricultural and forestry related noise and birdsong.

11.3.31 The noise survey to determine the baseline background noise environment at noise sensitive receptors neighbouring the proposed Development was undertaken in accordance with the guidance contained within ETSU-R-97.

11.3.32 Background noise monitoring was undertaken at five properties selected, and agreed with the EHO at DGC as being representative of the noise sensitive receptors located closest to the site. The measurement locations were selected on the basis of preliminary noise predictions which indicated that for a wind condition of 10 ms^{-1} at 10 m above ground level, these properties would be the most sensitive. The same five sensitive receptors were chosen as assessment locations.

11.3.33 The assessment locations used in the operational noise assessment are detailed in Table 11.3 below and shown on ES Figure 11.2 in Volume 3 of the ES. Please note the distances to the nearest proposed Development 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).

Table 11.3 Operational Noise Assessment Locations

Receptor	Easting (m)	Northing (m)	Elevation (mAOD)	Approximate Distance to Nearest

[7] Available online from: http://www.legislation.gov.uk/ukpga/1974/40 (Last accessed 23/01/2015)

				Turbine
H1 – Moor Cottage	256963	603528	320	798
H2 – Brownhill	255900	602600	298	1,642
H3 – Waterhead	254530	599230	250	2,357
H4-Knockengorroch	255533	597111	227	3,085
H5 - Netherbow	255465	597861	236	2,454

11.3.34 Background noise monitoring was undertaken over the period 21 October 2014 to 23 December 2014 at five monitoring locations.

11.3.35 The sound level meters were set to log the L_{A90} and L_{Aeq} noise levels over the required ten minute intervals continuously over the deployment period. Simultaneous wind speed/direction data were recorded on two ZephIR Lidars, which were each located within one of the proposed turbine clusters. The wind data collected at 120 m and 100 m was used to calculate wind speeds at the maximum proposed hub height (121 m). These hub height wind speeds were then standardised to a height of 10 m in accordance with current good practice. The wind data from the closest ZephIR to each noise sensitive receptor was used in order to assess the conditions that would be experienced by the closest turbines to each receptor.

11.3.36 Wind speed/direction data and rainfall data were collected over the same time scale, and averaged over the same ten minute periods, as the noise data to allow analysis of the measured background noise as a function of wind speed and wind direction.

11.3.37 The noise meters were calibrated on deployment. Calibration and battery changes took place at approximately fortnightly intervals. The IOA GPG states that for calibration drift greater than 0.5 dB but less than 1 dB results may still be valid, but should be corrected by the amount of calibration drift where such corrections would result in lower noise levels. The maximum positive calibration drift recorded during the noise survey was <0.5 dB (as detailed in the Field Data Sheets (FDS) included in Annex 3 of Technical Appendix 11.2: Operational Noise Assessment in Volume 4 of the ES) therefore no correction has been applied to the noise data.

11.3.38 Due to the proximity of a number of operational, consented and proposed wind farms to the proposed Development, cumulative turbine noise has been predicted at the closest receptors as detailed above and an assessment has been undertaken to determine whether the schemes could operate concurrently.

11.3.39 Further information on the cumulative noise assessment can be found in Section 7 of Technical Appendix 11.2: Operational Noise Assessment in Volume 4 of the ES.

11.3.40 Sound power level data provided by manufacturers was used to predict turbine noise at the selected receptors (defined as the assessment locations). The candidate turbines modelled for the cumulative schemes in the area are detailed in Section 7 of Technical Appendix 11.2: Operational Noise Assessment in Volume 4 of the ES.

11.3.41 Noise levels arising from the operation of the proposed Development as well as cumulative wind farms were predicted using the propagation model contained within Part 2 of International Standard ISO 9613-2, Acoustics – Attenuation of sound during propagation outdoors. The noise source data used in the model consists of the octave band sound power output data for the candidate wind turbine(s). 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 10°C.

11.3.42 Wind data was monitored on the Site using two ZephIR Lidars. Wind shear was accounted for by using data collected at 120 m and 100 m to calculate wind speeds at the maximum proposed hub height (121 m) which was standardised to a height of 10 m. The highest proposed hub heights were used to provide a worst case scenario. Further information on the wind shear calculation methodology is contained in Technical Appendix 11.2: Operational Noise Assessment in Volume 4 of the ES.

11.3.43 In line with current good practice, 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 noise sensitive receptors. Details of the analysis are contained in Technical Appendix 11.2: Operational Noise Assessment in Volume 4 of the ES.

11.3.44 In line with the recommendations included in Section 3.1.21 of the IOA GPG, the polynomial background curve for the low speed conditions has been flatlined (where applicable) at the lower wind speeds where the derived minimum occurs.

11.3.45 The IOA GPG recommends that no fewer than 200 valid data points should be recorded in each of the quiet daytime and night time periods, with no fewer than 5 valid data points in any 1 ms-1 wind speed bin. This can be reduced to 100 data points and 3 per 1 ms^{-1} bin for filtered datasets. The number of data points measured in each wind speed bin for each receptor are detailed on Figures A1.2a - A1.2e of the operational noise assessment report contained within Technical Appendix 11.2: Operational Noise Assessment in Volume 4 of the ES. If there were insufficient data points measured per wind speeds during daytime and night time periods these data points have been excluded from the assessment and as detailed in Table 5.3 of the operational noise assessment report contained within Technical Appendix 11.2: Operational Noise Assessment in Volume 4 of the ES.

11.3.46 The exact model(s) of turbine to be used at the proposed Development would be the result of a future tendering process should planning permission be granted. Achievement of the noise limits determined by this assessment would be one of the key determining factors in the final choice of turbine(s) for the proposed Development. This planning application has considered different turbine design envelopes for each of the two turbine clusters proposed. This noise assessment was based upon potential candidate turbine(s) which are considered typical of the type of turbine(s) which could be installed at the site (the Siemens SWT-3.2-113 and SWT-2.3-82). Predictions of wind turbine noise in the tables below have been made based upon sound power level data for installed or candidate turbines for each of the cumulative schemes and a noise prediction model that was considered to provide a realistic impact assessment. The cumulative schemes included in the assessment and the turbines modelled for each scheme are detailed in Section 7 of Technical Appendix 11.2: Operational Noise Assessment in Volume 4 of the ES.

11.3.47 Issues relating to operational noise such as Amplitude Modulation and Low Frequency Noise are also addressed in detail within the operational noise assessment report (Technical Appendix 11.2: Operational Noise Assessment in Volume 4 of the ES).

Assessment Criteria

Construction Noise

11.3.48 BS5228-1:2009+A1:2014, Appendix E Part E.3.2 sets criteria 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 around the proposed Development Area, the Daytime Category A noise threshold values are applicable for all properties. This was deemed the most appropriate due to the rural location of the noise sensitive receptors and in order to provide a worst-case scenario. This category has been utilised to assess the significance of the construction and decommissioning impacts during each of the key construction phases. 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 2.2.8 of the Construction Noise Report (Technical Appendix 11.1: Construction and Decommissioning Noise Assessment in Volume 4 of the ES).

11.3.49 The criteria for determining the significance of construction noise effects are provided in Table 11.4 below.

Table 11.4 Construction Noise Significance Criteria

Consultee	Significance Level	
	Not Significant	Significant
Category A Daytime (07:00 – 19:00) and Saturdays (07:00 to 13:00)	≤65dB $L_{Aeq, 12\ hr}$	>65dB $L_{Aeq, 12\ hr}$

11.3.50 The impact of increased traffic movements on the A713 road has been assessed based on a 5 dB(A) change threshold. If a change of 5 dB or more is predicted, a significant increase is deemed to occur.

Operational Noise

11.3.51 ETSU-R-97 does not define significance criteria, but describes a framework for the measurement of wind farm noise and gives indicative noise levels thought to offer a reasonable degree of protection to wind farm neighbours, without placing unreasonable restrictions on proposed wind farm development. Achievement of ETSU-R-97 derived noise limits ensures that wind turbine noise would meet current Government guidance. The characteristics of wind turbine noise are discussed in ETSU-R-97 and where considered in the setting of the noise limits that the document recommends. Whilst audibility is not a criteria in ETSU-R-97, the satisfaction of the ETSU-R-97 derived limits can lead to a situation whereby, at some locations under some wind conditions and for a certain proportion of the time, the wind turbine noise will be audible at the nearest dwellings.

11.3.52 In terms of the EIA Regulations, the terminology of significance used 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 not significant. Any breach of the ETSU-R-97 derived noise limits is deemed to result in a significant effect.

11.3.53 For the purposes of this assessment, residential properties are considered to be sensitive receptors. The final choice of monitoring and assessment locations was agreed with the EHO at DGC.

11.4 BASELINE CONDITIONS

11.4.1 Table 11.5 below provides a summary of the range of background noise levels measured during the monitoring period. Background noise data recorded during periods of rainfall (including the preceding 10 min period in line with IOA GPG) have been excluded from the dataset, as well as when noise levels were atypical (for example, when a resident was using a hedge cutter).

Table 11.5: Summary of Background Noise Levels (dB(A))

Receptor	Quiet Daytime $L_{A90, 10\ min}$	Night-time $L_{A90, 10\ min}$
H1 – Moor Cottage	28.5-49.4	28.3-51.5
H2 – Brownhill	33.6-54.4	33.4-53.2
H3 – Waterhead	36.5-60.6	36.3-52.3
H4 – Knockengorroch	25.7-48.2	25.1-53.2
H5 – Netherbow	30.6-50.0	30.7-53.9

11.4.2 Upon comparison of the background noise levels recorded at the monitoring locations for other proposed wind farms nearby (for example South Kyle, Benbrack and Quantans Hill) it was found that the levels recorded during this survey were consistently higher for the same locations. As river noise was found to dominate at all monitoring locations it is considered that raised river levels may have led to increased background noise levels during the survey period. It is not possible to determine whether the river noise levels are representative compared to those that may occur at other times of year at these receptors although the average highest rainfall volumes are experienced during January, October, November, and December (see Chapter 10: Hydrology, Geology and Hydrogeology, of the ES). To rely upon background noise data would potentially lead to unrepresentative background noise plus 5 dB noise limits, the noise assessment detailed in Section 6 of Technical Appendix 11.2: Operational Noise Assessment in Volume 4 of the ES (and the cumulative assessment detailed in Section 7) has instead adopted fixed minimum ETSU-R-97 limits. As such the assessment is deemed conservative as the proposed Development has been assessed against the minimum noise limits appropriate for the proposed Development.

Information Gaps

11.4.3 At the current design stage, the assessment assumes there would be no requirement for piling activities during the construction works, and also that excavation of material from the borrow pits would be carried out using standard quarrying techniques, which may include blasting and mechanical excavation. However, all blasting work would be undertaken by a specialist contractor who would assume responsibility for blast design and implementation. The extent of any blasting requirement cannot be determined until site tests are completed, and therefore the potential impact associated with blasting has not been assessed as part of the construction noise assessment.

11.5 ASSESSMENT OF EFFECTS

Construction Noise

Table 11.6: Construction Year Traffic Movements

Road	Twelve hour traffic flow estimations in the construction year				5dB level change assessment (based on 125% increase)
	All, without construction traffic	Construction traffic only	All, with construction traffic	125% increase Threshold	
A713	3811	96	3907	4763.75	<125% Not Significant Increase
A713	1670	96	1766	2087.5	<125% Not Significant Increase
A713	3811	96	3907	4763.75	<125% Not Significant Increase
A713	1345	96	1441	1681.25	<125% Not Significant Increase
A713	1254	96	1343	1567.5	<125% Not Significant Increase
A713	1785	96	1874	2231.25	<125% Not Significant Increase
A713	3499	96	3588	4373.75	<125% Not

					Significant Increase

11.5.1 Based upon the above information the estimated traffic levels for the A713 road are below these thresholds and as such **No Significant** effects are anticipated.

Table 11.7: Predicted Construction Noise Effects (Phases 1-7)

Location	Significance for Each Phase								
	Phase 0	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
H1 - Moor Cottage	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant
H2 - Brownhill	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant
H3 - Waterhead	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant
H4 - Netherbow	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant

11.5.2 As detailed Table 11.7 above, the predicted levels at all receptors are below the 65 dB Category A Threshold of BS5228 and the effect would therefore be **Not Significant**.

11.5.3 It should be noted that the proposed construction phases are temporary and short-term and are therefore unlikely to give rise to any long-term effects. In practice 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 constantly operating at the closest point to each receptor.

Operational Noise

11.5.4 Tables 11.8 and 11.9 below detail the prevailing background noise levels, relevant criteria and predicted wind turbine noise levels for ETSU-R-97 quiet daytime hours and ETSU-R-97 night-time hours. The tables also show the exceedance level which is the difference between the predicted turbine noise level and noise criterion at a given wind speed. A negative exceedance level indicates satisfaction of the noise criteria.

Table 11.8: ETSU-R-97 Compliance Table – Quiet Daytime

Location		Wind Speed (ms^{-1}) as standardised to 10m height											
		1	2	3	4	5	6	7	8	9	10	11	12
Moor Cottage (H1)	Noise Limit : ETSU-R-97	45	45	45	45	45	45	45	45	45	45	45	45
	Predicted Wind Turbine	-	-	-	30.2	35	39.5	40	40	40.4	40.4	40.4	40.
	Exceedance Level L_{A90}	-	-	-	-	-	-5.5	-	-	-4.6	-4.6	-4.6	-
Brownhill (H2)	Noise Limit : ETSU-R-97	40	40	40	40	40	40	40	40	40	40	40	40
	Predicted Wind Turbine	-	-	-	24.8	30	34.7	35	35	35.7	35.7	35.7	35.
	Exceedance Level L_{A90}	-	-	-	-	-	-5.3	-	-	-4.3	-4.3	-4.3	-
Waterhead (H3)	Noise Limit : ETSU-R-97	40	40	40	40	40	40	40	40	40	40	40	40
	Predicted Wind Turbine	-	-	-	15.6	22	26.7	27	27	27.8	27.8	27.8	27.
	Exceedance Level L_{A90}	-	-	-	-	-	-	-	-	-	-	-	-
Knockengorroch (H4)	Noise Limit : ETSU-R-97	40	40	40	40	40	40	40	40	40	40	40	40
	Predicted Wind Turbine	-	-	-	15.3	22	27.1	28	28	28.2	28.2	28.2	28.
	Exceedance Level L_{A90}	-	-	-	-	-	-	-	-	-	-	-	-
Netherbow (H5)	Noise Limit : ETSU-R-97	40	40	40	40	40	40	40	40	40	40	40	40
	Predicted Wind Turbine	-	-	-	16.5	23	28.3	29	29	29.4	29.4	29.4	29.
	Exceedance Level L_{A90}	-	-	-	-	-	-	-	-	-	-	-	-

Table 11.9: ETSU-R-97 Compliance Table – Night time

Location		Wind Speed (ms^{-1}) as standardised to 10m height											
		1	2	3	4	5	6	7	8	9	10	11	12
Moor Cottage (H1)	Noise Limit : ETSU-R-97	45	45	45	45	45	45	45	45	45	45	45	45
	Predicted Wind Turbine	-	-	-	30.	35.	39.	40.	40.	40.	40.	40.	40.
	Exceedance Level L_{A90}	-	-	-	-	-	-	-	-	-	-	-	-
Brownhill (H2)	Noise Limit : ETSU-R-97	43	43	43	43	43	43	43	43	43	43	43	43
	Predicted Wind Turbine	-	-	-	24.	30.	34.	35.	35.	35.	35.	35.	35.
	Exceedance Level L_{A90}	-	-	-	-	-	-	-	-	-	-	-	-
Waterhead (H3)	Noise Limit : ETSU-R-97	43	43	43	43	43	43	43	43	43	43	43	43
	Predicted Wind Turbine	-	-	-	15.	22.	26.	27.	27.	27.	27.	27.	27.
	Exceedance Level L_{A90}	-	-	-	-	-	-	-	-	-	-	-	-
Knockengorroch (H4)	Noise Limit : ETSU-R-97	43	43	43	43	43	43	43	43	43	43	43	43
	Predicted Wind Turbine	-	-	-	15.	22.	27.	28.	28.	28.	28.	28.	28.
	Exceedance Level L_{A90}	-	-	-	-	-	-	-	-	-	-	-	-
Netherbow (H5)	Noise Limit : ETSU-R-97	43	43	43	43	43	43	43	43	43	43	43	43
	Predicted Wind Turbine	-	-	-	16.	23.	28.	29.	29.	29.	29.	29.	29.
	Exceedance Level L_{A90}	-	-	-	-	-	-	-	-	-	-	-	-

11.5.5 Predicted wind turbine immission levels and measured background noise levels indicate that for receptors neighbouring the proposed Development, wind turbine noise would meet the quiet daytime and night-time noise criteria proposed within ETSU-R-97.

11.5.6 If the proposed Development receives consent, further data would be obtained from the supplier for the final choice of turbine model to demonstrate compliance with the noise limits derived in this report.

Micrositing

11.5.7 A calculation has been undertaken to predict the possible impact of micro-siting the wind turbines within the proposed Development. If the turbines are relocated 50 m in any direction from the proposed turbine coordinates (detailed in Technical Appendix 11.2: Operational Noise Assessment in Volume 4 of the ES), compliance with ETSU-R-97 limits would still be achieved.

11.5.8 It should be noted that the need to include a concave ground profile correction and/or a barrier correction may change depending on the final location of the turbines (following micro-siting) and the final turbine hub height. Nevertheless, turbine noise levels would have to meet the noise limits established in this report regardless of any increases in noise propagation caused by topography. If the proposed Development receives consent, the need to apply a concave slope/barrier correction would need to be considered by the Applicant prior to the final selection of a turbine model for the proposed Development.

11.6 ASSESSMENT OF CUMULATIVE EFFECTS

11.6.1 Due to the proximity of a number of operational, consented and proposed wind farms to the proposed Development a cumulative assessment was undertaken to determine whether the schemes could operate concurrently whilst meeting the appropriate noise limits. Due to the logarithmic way in which noise levels are measured and expressed, where the predicted noise from two schemes is more than 10 dB different their cumulative impact is negligible. The closest wind farms to the proposed Development were reviewed, and those

which had the potential to be within 10 dB of the proposed Development noise predictions have been assessed here. The wind farms included in the cumulative assessment in addition to the proposed Development are:

- The existing Windy Standard Wind Farm;
- The consented Windy Standard II Wind Farm;
- The consented Afton Wind Farm;
- The proposed South Kyle Wind Farm;
- The proposed Quantans Hill Wind Farm;
- The proposed Benbrack Wind Farm;
- The proposed Pencloe Wind Farm; and
- The proposed Windy Rig Wind Farm.

11.6.2 Further details of the cumulative noise assessment are contained in Section 7 of Technical Appendix 11.2: Operational Noise Assessment in Volume 4 of the ES.

11.6.3 Details of the wind turbine locations (and candidate turbines) used in this assessment were taken from relevant planning submissions for the schemes and are included in Annex 8 and shown on Figure A1.5 of Technical Appendix 11.2: Operational Noise Assessment in Volume 4 of the ES.

11.6.4 For assessment locations where the predicted wind turbine noise from a specific scheme operating independently can be demonstrated to be 10 dB below the total ETSU-R-97 noise limits at the closest receptor to the neighbouring development then that distant wind farm would have a negligible impact on the ability of the closer wind farm to meet its limits (the '10 dB rule). As stated in IOA GPG Section 5:

"If an existing wind farm has permission to generate noise levels up to ETSU-R-97 limits, planning permission noise limits set at any future neighbouring wind farm would have to be at least 10 dB lower than the limits set for the existing wind farm to ensure there is no potential for cumulative noise impacts to breach ETSU-R-97 limits"

11.6.5 Therefore using the '10 dB rule' it is possible to scope out the impact of certain wind farms at receptors as detailed below:

- The proposed Development is predicted to be greater than 10 dB below the noise limits at H3 Waterhead, H4 Knockengorroch, and H5 Netherbow. The proposed Development would therefore have a negligible impact at these receptors and no further cumulative assessment is required at these receptors.
- The closest property between Quantans Hill Wind Farm and the proposed Development is Knockengorroch. Wind turbine noise predictions as presented in the Quantans Hill Environmental Statement show that at Knockengorroch, Quantans Hill would be 10 dB below the noise limits and so would have a negligible impact at the proposed Development receptors therefore no further cumulative assessment is required.
- Due to the relative distances, the proposed Development would be greater than 10 dB below the noise limits conditioned at the closest receptors to the consented Afton Wind Farm, would have a negligible impact on the ability of the Afton Wind Farm to meet its noise limits and therefore no further cumulative assessment is required.
- The closest noise receptor between the proposed Benbrack Wind Farm and the proposed Development is H3 Waterhead. As detailed above the proposed Development is predicted to be greater than 10 dB below the noise limits at H3 Waterhead. The proposed Development would therefore have a negligible impact at this receptor and no further cumulative assessment is required at H3 – H5. However, as Benbrack Wind Farm has the potential to be within 10 dB of the noise limits at H2 Brownhill (depending on whether financially involved limits were used), for completeness it has therefore been included in the cumulative noise predictions at H1 Moor Cottage and H2 Brownhill.
- Due to the relative distances, wind turbine noise predictions show that Pencloe would be greater than 10 dB below the noise limits at the closest receptors to the proposed Development. The proposed Development would also be greater than 10 dB below the noise limits at the closest receptors assessed for Pencloe Wind Farm. Therefore there would be a negligible impact and so no further cumulative assessment is required.
- Due to the relative distances, wind turbine noise predictions show that Windy Rig would be greater than 10 dB below the noise limits at the closest receptors to the proposed Development. The proposed Development would also be greater than 10 dB below the noise limits at the closest receptors assessed for Windy Rig Wind Farm. Therefore there would be a negligible impact and so no further cumulative assessment is required.

11.6.6 In summary, the requirement for a cumulative assessment has been scoped out at H3 – H5.

11.6.7 At H1 Moor Cottage and H2 Brownhill following consideration of the operational, consented and proposed wind farms in the area the following scenarios have therefore been assessed:

- Cumulative Scenario 1 - the proposed Development operating concurrently with the existing Windy Standard Wind Farm and consented Windy Standard II Wind Farm. In this scenario a 40 dB(A) daytime fixed minimum limit and a 43 dB(A) night time fixed minimum limit would apply at H2 Brownhill; and
- Cumulative Scenario 2 – the proposed Development operating concurrently with the existing Windy Standard Wind Farm, the consented Windy Standard II Wind Farm, the proposed South Kyle Wind Farm and the proposed Benbrack Wind Farm. In this scenario a 45 dB(A) fixed minimum limit for both daytime and night time would apply at H2 Brownhill.

11.6.8 Tables 11.10 and 11.11 below show the calculated cumulative wind turbine noise immission levels for Cumulative Scenario 1. Tables 11.12 and 11.13 below show the calculated cumulative wind turbine noise immission levels for Cumulative Scenario 2.

Table 11.10: ETSU Cumulative Scenario 1 - ETSU-R-97 Compliance Table - Quiet Daytime

Location		Wind Speed (ms^{-1}) as standardised to 10m height											
		1	2	3	4	5	6	7	8	9	10	11	12
Moor Cottage (H1)	Noise Limit : ETSU-R-97	45	45	45	45	45	45	45	45	45	45	45	45
	Predicted Cumulative Wind Turbine Noise L_{A90}	-	-	-	33.2	37.5	41.3	42.6	42.9	42.9	42.9	42.9	42.9
	Exceedance Level L_{A90}	-	-	-	-11.8	-7.5	-3.7	-2.4	-2.1	-2.1	-2.1	-2.1	-2.1
Brownhill (H2)	Noise Limit : ETSU-R-97	40	40	40	40	40	40	40	40	40	40	40	40
	Predicted Cumulative Wind Turbine Noise L_{A90}	-	-	-	28	32.3	36.1	37.4	37.6	37.6	37.6	37.6	37.6
	Exceedance Level L_{A90}	-	-	-	-12	-7.7	-3.9	-2.6	-2.4	-2.4	-2.4	-2.4	-2.4

Table 11.11: ETSU Cumulative Scenario 1 - ETSU-R-97 Compliance Table – Night time

Location		Wind Speed (ms^{-1}) as standardised to 10m height											
		1	2	3	4	5	6	7	8	9	10	11	12
Moor Cottage (H1)	Noise Limit : ETSU-R-97	45	45	45	45	45	45	45	45	45	45	45	45
	Predicted Cumulative Wind Turbine Noise L_{A90}	-	-	-	33.2	37.5	41.3	42.6	42.9	42.9	42.9	42.9	42.9
	Exceedance Level L_{A90}	-	-	-	-11.8	-7.5	-3.7	-2.4	-2.1	-2.1	-2.1	-2.1	-2.1
Brownhill (H2)	Noise Limit : ETSU-R-97	43	43	43	43	43	43	43	43	43	43	43	43
	Predicted Cumulative Wind Turbine Noise L_{A90}	-	-	-	28	32.3	36.1	37.4	37.6	37.6	37.6	37.6	37.6
	Exceedance Level L_{A90}	-	-	-	-15	-10.7	-6.9	-5.6	-5.4	-5.4	-5.4	-5.4	-5.4

Table 11.12: ETSU Cumulative Scenario 2 - ETSU-R-97 Compliance Table - Quiet Daytime

Location		Wind Speed (ms^{-1}) as standardised to 10m height											
		1	2	3	4	5	6	7	8	9	10	11	12
Moor Cottage (H1)	Noise Limit : ETSU-R-97	45	45	45	45	45	45	45	45	45	45	45	45
	Predicted Cumulative Wind Turbine Noise L_{A90}	-	-	-	35.4	39.2	42.9	44.4	44.8	44.8	44.8	44.8	44.8
	Exceedance Level L_{A90}	-	-	-	-9.6	-5.8	-2.1	-0.6	-0.2	-0.2	-0.2	-0.2	-0.2
Brownhill (H2)	Noise Limit : ETSU-R-97	45	45	45	45	45	45	45	45	45	45	45	45
	Predicted Cumulative Wind Turbine Noise L_{A90}	-	-	-	34.9	38.1	41.6	43.3	44.1	44.1	44.1	44.1	44.1
	Exceedance Level L_{A90}	-	-	-	-10.1	-6.9	-3.4	-1.7	-0.9	-0.9	-0.9	-0.9	-0.9

Table 11.13: ETSU Cumulative Scenario 2 - ETSU-R-97 Compliance Table – Night time

Location		Wind Speed (ms^{-1}) as standardised to 10m height											
		1	2	3	4	5	6	7	8	9	10	11	12
Moor Cottage (H1)	Noise Limit : ETSU-R-97	45	45	45	45	45	45	45	45	45	45	45	45
	Predicted Cumulative Wind Turbine Noise L_{A90}	-	-	-	35.4	39.2	42.9	44.4	44.8	44.8	44.8	44.8	44.8
	Exceedance Level L_{A90}	-	-	-	-9.6	-5.8	-2.1	-0.6	-0.2	-0.2	-0.2	-0.2	-0.2
Brownhill (H2)	Noise Limit : ETSU-R-97	45	45	45	45	45	45	45	45	45	45	45	45
	Predicted Cumulative Wind Turbine Noise L_{A90}	-	-	-	34.9	38.1	41.6	43.3	44.1	44.1	44.1	44.1	44.1
	Exceedance Level L_{A90}	-	-	-	-10.1	-6.9	-3.4	-1.7	-0.9	-0.9	-0.9	-0.9	-0.9

11.6.9 The assessment (shown in tabular form in Tables 11.10 to 11.13 above (and Figures A1.6a-d in Technical Appendix 11.2) shows that the predicted cumulative wind turbine noise immission levels meet the ETSU-R-97 derived noise limits for both cumulative scenarios under all conditions and at all locations for both quiet daytime and night-time periods.

11.7 MITIGATION

Construction Noise

11.7.1 At this stage of the project, the assessment is based on a worst-case scenario, as a detailed construction programme is not available. Careful consideration would be given to the type of plant to be used during construction and the contractors would inform the residents when particularly noisy activities are likely to take place to ensure any disruption is kept to a minimum.

11.7.2 Good site practices can be implemented to minimise the potential effects. Section 8 of BS 5228-1: 2009+A1:2014 recommends a number of simple control measures as summarised below.

11.7.3 Generally, construction activities would be confined to the periods 07:00 - 19:00 weekdays and Saturdays 07:00 - 13:00. However, there may be the requirement for extended operating hours to minimise traffic disruptions during the movement of abnormal loads and during large concrete pours. The principal contractor would:

- Keep local residents informed of the proposed working schedule, where appropriate, including the times and duration of any abnormally noisy activity that may cause concern;
- Ensure site work continuing throughout 24 hours of a day shall be programmed, when appropriate, so that haulage vehicles would not arrive at or leave the proposed Development between 19.00 and 07.00 hours, with the exception of abnormal loads that would be scheduled to avoid significant 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;
- Ensure regular maintenance of all equipment used on Site, including maintenance related to noise emissions;
- Ensure that vehicles are 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 would be provided.

Operational Noise

11.7.4 Throughout the site design process the layout of the proposed Development was repeatedly reviewed to optimise its turbine numbers and locations, subject to a wide range of constraints identified during the design process, including noise and landscape. The site design process therefore satisfactorily minimised any increase in ambient noise levels at two levels: firstly through several iterations of site specific design and secondly, at a higher level, through the use of ETSU-R-97 itself.

11.7.5 The exact model of 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 turbines for the Site. Predictions of wind turbine noise for the proposed Development have been based upon sound power level data candidate wind turbines and a noise prediction model that can be considered to provide a realistic impact assessment.

11.8 RESIDUAL EFFECTS

11.8.1 Predicted wind farm construction noise levels are below the assessment criteria at all receptors, for all construction phases. Due to the background noise levels construction noise is likely to be audible at the closest residential receptors for certain periods during the construction phase. There would be **No Significant** effects.

11.8.2 Predicted cumulative wind farm operational noise levels at all residential properties lie below the ETSU-R-97 quiet daytime and night-time criterion curves. At some locations, under some wind conditions and for a certain proportion of the time wind farm noise may be audible; however, it would be at an acceptable level in relation to the ETSU-R-97 guidelines. There would be **No Significant** effects.

11.9 SUMMARY

11.9.1 The guidance contained in BS5228-1:2009+A1:2014 – Part 1 was used to assess the likely construction noise effects of the proposed Development.

11.9.2 Predicted construction and decommissioning noise levels compared with the Category A criteria outlined in Section E.3 of BS5228: Part 1 2009+A1:2014 indicate for all receptors the construction and decommissioning noise levels would result in **No Significant Effects**. The predicted noise levels for all activities, at all receptors are below the guidelines considered acceptable within BS5228.

11.9.3 To protect the amenity of local residents, the construction noise activities can be controlled under The Control of Pollution Act 1974 (COPA) which is specifically concerned with the control of noise pollution. In particular Section 60, Part III of the COPA refers to the control of noise on construction sites. It provides legislation by which a local authority can control noise from construction sites to prevent noise disturbance occurring. In addition, it recommends that guidance provided by BS5228 be implemented to ensure compliance with Section 60.

11.9.4 Predicted operational noise levels indicate that for dwellings neighbouring the proposed Development, wind turbine noise would meet the Noise Criteria proposed within ETSU-R-97.

11.9.5 There are a number of operational, consented and proposed wind turbines located in the vicinity of the proposed Development and therefore a cumulative assessment was undertaken. Predicted cumulative operational noise levels indicate that for dwellings neighbouring the proposed Development, cumulative wind turbine noise would meet the Noise Criteria proposed within ETSU-R-97; therefore, the operational noise effects are deemed **Not Significant.**

11.10 CONCLUSIONS

Construction Noise

11.10.1 For all receptors the construction and decommissioning noise levels would not result in a significant impact. The predicted noise levels for all activities, at all receptors are below the guidelines considered acceptable within BS5228.

Operational Noise

11.10.2 There are a number of operational, consented and proposed wind turbines located in the vicinity of the proposed Development Area and therefore a cumulative assessment was undertaken. Predicted cumulative operational noise levels and measured background noise levels indicate that for dwellings neighbouring the proposed Development, cumulative wind turbine noise would meet the Noise Criteria proposed within ETSU-R-97; therefore, the operational noise effects are deemed **Not Significant**.

11.11 REFERENCES

- Scottish Natural Heritage, Scottish Environmental Protection Agency, Scottish Renewables & Forestry Commission Scotland) (2010). Good Practice During wind Farm Construction.
- Scottish Environmental Protection Agency (2014). Land Use Planning System, SEPA Guidance Note 4, Scottish Environmental Protection Agency.

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Author	James Anderson	23/11/2015
Checked	Marie Scaife	25/11/2015
Approved	Emily Peaston	25/11/2015

Client Details	
Contact	Gareth Swales
Client Name	Brockloch Rig III Ltd
Address	c/o Fred. Olsen Renewables Ltd

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BROCKLOCH RIG III

Chapter 12

Forestry

Contents

Glossary

Term	Definition
Environmental	Environmental Impact Assessment (EIA) is a means of drawing together, in a systematic

Term	Definition
Impact Assessment	way, an assessment of the likely significant environmental effects arising from a proposed development
Environmental Statement	A document reporting the findings of the EIA and produced in accordance with the EIA Regulations.
Forest Plan	Forest Plan describes the woodlands, places them in context with the surrounding area and identifies issues that are relevant to the woodland or forest. FPs describe how the long-term strategy would meet the management objectives of the owner, the criteria of the UK Forestry Standard and the UK Woodland Assurance Standard (UKWAS) under which the woodlands would be managed, if certificated.
Site of Special Scientific Interest	SSSIs are protected areas that represent the UK's very best wildlife and/or geological sites.
The proposed Development	The proposed Windy Standard III Wind Farm.
The proposed Development Area	The project development area within the site boundary which is subdivided into the Meaul Hill Cluster and Waterhead Hill Cluster.

List of Abbreviations

Abbreviation	Description
DGA	DGA Forestry LLP
DGC	Dumfries and Galloway Council
DGFWS	Dumfries and Galloway Forestry and Woodland Strategy
EIA	Environmental Impact Assessment
ES	Environmental Statement
FISA	Forest Industry Safety Accord
FP	Forest Plan
ha	Hectare
LTR	Long Term Retentions
MB	Mixed Broadleaves
MW	Mixed Woodland
MtC	Million Tonnes of Carbon
NR	Natural Reserves
NPF3	Third National Planning Framework
OC	Other Conifers
OL	Other Land
OG	Open Ground
SFS	Scottish Forestry Strategy
SNH	Scottish Natural Heritage
SPP	Scottish Planning Policy
SS	Sitka Spruce
SS/OC	Sitka Spruce/Other Conifers

Abbreviation	Description
SSSI	Sites of Special Scientific Interest
UKWAS	UK Woodland Assurance Standard
WB	Wind Blow
WTR	Water

12.1 INTRODUCTION

12.1.1 This Chapter of the Environmental Statement (ES) describes forestry aspects of the proposed Windy Standard III (hereafter referred to as 'the proposed Development'). This was prepared by DGA Forestry LLP (DGA). Forests are dynamic and continually undergoing change due to normal felling and restocking by the forest managers and natural events. This ES Chapter therefore describes the proposed Development plans for felling, restocking and forest management practices, and the process by which these were derived. The effects of forest felling and restocking are assessed in the relevant chapters of this ES such as Chapter 6: Landscape and Visual Assessment, Chapter 7: Ecology and Chapter 10: Hydrology, Geology and Hydrogeology, of the ES.

12.1.2 The proposed Development lies mainly within the existing commercial forestry plantations of the Carsphairn Forest Block (as shown in ES Figure 12.1 in Volume 3 of the ES). The forestry is privately owned and managed. The forestry proposals have been developed to:

- Identify areas of forest to be removed for the construction and operation of the proposed Development;
- Identify those areas which may or may not be replanted as part of the proposed Development;
- Identify the extent of any woodland loss and compensatory planting requirement; and
- Propose management practices for the forestry works.

12.1.3 In general throughout this Chapter data labelled 'baseline' refers to the current crop composition and the existing felling and restocking plans without any modification as a result of the proposed Development and the data labelled 'windfarm' refers to the forestry plans incorporating the proposed Development.

12.2 LEGISLATION AND POLICY CONTEXT

National Legislation and Policy

12.2.1 The Scottish Forestry Strategy (SFS)[1] provides the wider context and Scottish Ministers' vision for multi-benefit woodland management and expansion focussing on the key themes of climate change, timber, business development, community development, access and health, environmental quality and biodiversity. It sets out a vision that acknowledges the central role that the forestry resource will play in the culture, environment and economy of Scotland. The SFS informs other policies and guidance about woodland expansion and removal in Scotland.

12.2.2 The SFS set the following targets:

- 25 % woodland cover in Scotland by the second half of this century;
- A woodland creation target of 10,000 hectares (ha) per year over the period 2012 - 2022; and
- The forestry sector delivering annual carbon savings of 0.6 million tonnes of carbon (MtC) by 2010, 0.8 MtC by 2015 and 1.0 MtC by 2020.

12.2.3 The Scottish Land Use Strategy[2] sets out a strategic framework for getting the best out of Scotland's land resources. It looks at the potential of the land and the ways in which it is used, both now and in the future. Principles of sustainable land use are central to its vision for the future. With specific reference to forestry, the strategy seeks to identify more closely which types of land are best for tree planting in the context of other land-based objectives, and promote good practice and local processes in relation to tree planting so as to secure multiple benefits. This would be achieved by a partnership approach through Forestry and Woodland strategies to be developed by the local authorities.

12.2.4 The Scottish Planning Policy (SPP)[3], issued in June 2014, includes a section on woodlands (paragraphs 216 - 218). This refers to the Scottish Government's Control of Woodland Removal Policy[4] which is discussed in more detail below. The SPP states that woodland removal should only be permitted where it would achieve significant and clearly defined additional public benefits. It further states that where woodland is removed in association with development, developers will generally be expected to provide compensatory planting and that the acceptability of woodland removal, in the context of the Control of Woodland Removal Policy, should be taken into account in determining planning applications.

12.2.5 Scotland's Third National Planning Framework (NPF3)[5], issued in June 2014, recognises woodlands and forestry are an economic resource, as well as an environmental asset (paragraph 4.2). It further supports the continued expansion of Scotland's woodland and forestry resource (paragraph 4.23). A key action (paragraph 6.10) is a commitment to create on average 10,000 ha per annum of new woodland from 2015.

12.2.6 In parallel with the SFS and other national policies on woodland expansion there is a strong presumption against permanent woodland removal unless it addresses other environmental concerns. In Scotland such woodland removal is dealt with under the Scottish Government's Control of Woodland Removal Policy.

12.2.7 The purpose of the policy is to provide direction for decisions on woodland removal in Scotland. The policy document lays out the background to the policy, places it into the current policy and regulatory context and discusses the principles, criteria and process for managing the policy implementation. The following paragraphs summarise the policy relative to the proposed Development.

12.2.8 The principal aims of the policy include:

- To provide a strategic framework for appropriate woodland removal; and
- To support climate change mitigation and adaptation in Scotland.

12.2.9 The guiding principles behind the policy include:

- There is a strong presumption in favour of protecting Scotland's woodland resources; and
- Woodland removal should be allowed only where it would achieve significant and clearly defined additional public benefits. In appropriate cases a proposal for compensatory planting may form part of this balance.

12.2.10 Woodland removal, without a requirement for compensatory planting, is most likely to be appropriate where it would contribute significantly to:

- Enhancing priority habitats and their connectivity;
- Enhancing populations of priority species;
- Enhancing nationally important landscapes, designated historic environments and geological Sites of Special Scientific Interest (SSSI);
- Improving conservation of water or soil resources; or
- Public safety.

12.2.11 The consequences of the policy are stated as:

- Minimising the inappropriate loss of woodland cover in Scotland;
- Enabling appropriate woodland removal to proceed with no net loss of woodland related public benefits other than in those circumstances detailed in the policy; and

[1] Forestry Commission Scotland (2006): The Scottish Forestry Strategy. Forestry Commission, Edinburgh.

[2] The Scottish Government (2011): Scottish Land Use Strategy. Edinburgh.

[3] Scottish Government (2014): Scottish Planning Policy (SPP). Edinburgh.

[4] Forestry Commission Scotland (2009): The Scottish Government's Policy on Control of Woodland Removal. Forestry Commission Scotland, Edinburgh.

[5] Scottish Government (2014): National Planning Framework 3 (NPF3). Edinburgh.

- Facilitating achievement of the Scottish Government's woodland expansion ambition in a way that integrates with other policy drivers (such as increasing sustainable economic growth, tackling climate change, rural/community development, renewable energy and biodiversity objectives).

12.2.12 Addressing the requirements can be met through changes to forest design; increasing designed open space; changing the woodland type; changing the management intensity; or completing off site compensatory planting.

Regional Policy

12.2.13 The Dumfries and Galloway Forestry and Woodland Strategy (DGFWS)[6] supports national policies whilst integrating with other Dumfries and Galloway Council (DGC) strategies and plans. It provides a framework for guiding forestry and woodland practice within Dumfries and Galloway. It is intended to guide both woodland creation and the restructuring and management of existing forests and woodlands, to maximise the benefits for the local economy, communities and environment. The strategy supports Scottish Ministers' desire to see an expansion in woodland cover, delivering multiple benefits across the country.

12.2.14 The DGFWS forms Supplementary Guidance to the Local Development Plan; supersedes the Dumfries and Galloway Indicative Forestry Strategy Technical Paper No. 4; the Forestry Strategy Diagram, which forms part of the Dumfries and Galloway Structure Plan (approved 1999); and the Galloway and Langholm/Lockerbie Local Forestry Framework (2000). It does not supersede the *'Landscape Design Guidance for Forests and Woodlands in D&G'* (SNH/DGC 1998).

12.2.15 In paragraph 4.32 the DGFWS recognises that the region has attracted a lot of interest from wind energy developers and that many afforested areas are also potentially suitable locations for windfarms. It states that integrating wind energy developments into wooded areas can have advantages in that the visual impacts of infrastructure may be screened or softened by planting whilst contributing to overall forest design objectives.

12.2.16 This has resulted in a policy within the DGFWS (page 23): LAN 9 *"Work with emerging guidance on integrating wind energy developments within forest landscapes."*

12.2.17 Under the of Theme of *"Woodlands, Forestry and Climate Change"* one of the key policy objectives, of the DGFWS, is to encourage effective development of renewable energy from forests in the form of biomass woodfuel and the integration of appropriate renewable energy schemes within forests and woodlands.

12.2.18 Paragraph 6.13, of the DGFWS, states there may be potential within some of the existing forested areas for the siting of windfarms; however this needs to be balanced against the loss of trees and carbon emissions from their construction. Both the Local Development Plan and the Wind Energy Supplementary Guidance emphasise the need for replacement planting of woodland lost as a result of development.

12.2.19 Paragraph 6.14, of the DGFWS, identifies that the access and transportation needs of both the timber industry and windfarm construction should be planned for in a comprehensive and inclusive manner.

12.2.20 This has resulted in a policy within the DGFWS: DRE 2 (page 39): *"Develop effective local guidance and practice to minimise woodland loss from renewable energy developments."* The DGFWS goes on to state in Paragraph 8.5 that locating windfarms or turbines within woodland or productive forests can lead to a loss of woodland cover and refers specifically to the Scottish Government's policy on The Control of Woodland Removal.

[6] Dumfries and Galloway Council (2014): The Dumfries and Galloway Forestry and Woodland Strategy. Dumfries.

12.3 ASSESSMENT METHODOLOGY

Forestry Study Area

12.3.1 The Forestry Study Area, as shown on ES Figure 12.1 in Volume 3 of the ES, extends to 3,478.83 ha. The Forestry Study Area is located within the Carsphairn Forest Block in Dumfries and Galloway and is primarily used as a commercial forestry plantation.

Baseline Characterisation

12.3.2 The majority of the woodlands were planted in the early 1970's with subsequent replanting as areas have been felled and then restocked (see ES Figure 12.2 in Volume 3 of the ES). The planting consists primarily of Sitka spruce and other commercial conifers, with small areas of broadleaf woodland and unplanted land (see Table 12.1 below and ES Figure 12.3 in Volume 3 of the ES). Detailed information on the composition of the woodlands is provided in the Baseline Conditions section below. The first rotation crops are mature and as a result there is an ongoing felling and restock programme (see ES Figure 12.4 and 12.5 in Volume 3 of the ES).

12.3.3 One of the original key objectives of the Forestry Commission was forest expansion, in both State and private forests, to produce a strategic reserve of timber and consequently a limited range of species was planted. More recently, greater emphasis has been placed on developing multi-purpose forests, which require a restructuring of age and species in existing woodlands. Restructuring is achieved through the forest planning process. It is expected that there would be changes to the age class and species structure during the next 30 years irrespective of whether or not the proposed Development proceeds. The incorporation of the proposed Development into the forest would result in further and earlier restructuring of the crops to meet these objectives.

12.3.4 Restructuring presents forest managers with many challenges and opportunities, particularly in relation to the management of potential catastrophic windblow. The Forest Plan process allows forest managers to review and revise proposals in a structured way to take account of such external factors. The inclusion of a windfarm within the forest is an example of one such external factor. The current guidelines require diversification of species and woodland types as part of the forest planning process, specifically an increase in the proportion of broadleaf woodland, other conifers and open ground.

Forest Plans

12.3.5 A Forest Plan (FP) relates to individual forests or groups of woodlands. It describes the woodlands, places them in context with the surrounding area and identifies issues that are relevant to the woodland or forest. FPs describe how the long-term strategy would meet the management objectives of the owner, the criteria of the UK Forestry Standard[7] and the UK Woodland Assurance Standard (UKWAS)[8] under which the woodlands would be managed, if certificated.

12.3.6 The FP involves a scoping exercise whereby the 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 FP. The FP covers all aspects, such as conservation, archaeology, landscape and the local community in addition to forestry and silvicultural considerations. Restructuring of age class and species are important factors in this process to ensure proposals meet the current standards. The Windfarm Forest Plan is prepared along the same principles with the relevant site information being provided by other members of the Project Team.

[7] Forestry Commission (2011) The UK Forestry Standard: The Government's Approach to Sustainable Forestry, Forestry Commission, Edinburgh.

[8] UKWAS (2012): The UK Woodland Assurance Standard Third Edition, UKWAS, Edinburgh.

Development of the Windfarm Forest Plan

Introduction

12.3.7 Existing crop information was provided by the forest managers. Information comprised existing species, planting year, yield class, felling and restocking plans. A site inspection was undertaken in early 2015 to verify the data and, in particular, to update information provided by the forest managers. The information was also updated with recent amendments made by the forest managers. Information from aerial photographs was incorporated including more accurate mapping of species, open ground and management boundaries.

12.3.8 The turbines and associated infrastructure of the proposed Development were amalgamated with the existing forestry data to construct the forestry proposals. The location of turbines and infrastructure is heavily influenced by site constraints and technical considerations e.g. wind capture, gradients, etc. The final location of turbines and infrastructure takes the various constraints existing on the site into consideration. Environmental constraints, together with any land management requirements, associated with the construction of the proposed Development have also been incorporated into the forestry proposals where appropriate.

Felling Plan

12.3.9 The windfarm felling programme was largely driven by technical constraints. Areas of forestry would require to be felled to accommodate the construction and operation of the proposed Development. Typically a minimum area of about 1.54 ha (equivalent to a 70 metre radius circle) would be required to be felled for each turbine; a 10 m buffer around each item of infrastructure, in addition to the area required for the infrastructure; and a 50 m corridor for access roads.

12.3.10 In the case of the proposed Development further felling is proposed for forest management and wind yield purposes in addition to the felling required for the infrastructure. In older woodlands such as Carsphairn Forest there is a risk of windblow in the remaining crop when parts of the stands are removed for new tracks or turbine keyholes. In these areas the crops would be felled to a windfirm boundary at the time of construction. Where the crops are younger, only the area necessary to accommodate the turbine, track or other infrastructure and provide the relevant buffer zone would be felled at the time of construction.

12.3.11 Felling required for a development can be divided into two categories. Firstly, that required during the construction phase of the development, which for the purposes of this assessment, has been anticipated as 2018. Secondly, felling required during the operational period of the proposed Development. In this case all the felling would take place during the construction period.

12.3.12 The existing woodlands were assessed to identify the crops which would require to be felled for a number of reasons:

- The presence of turbines, access roads or other infrastructure;
- For turbine technical considerations and turbine performance;
- Environmental considerations such as forest landscape design; and
- Forest management purposes, for example to reduce the risk of subsequent windblow; to reduce coupe fragmentation; to ensure access for future forest operations or to integrate with the existing FP.

12.3.13 The windfarm felling plan (ES Figure 12.6 in Volume 3 of the ES) shows which woodlands within the Forestry Study Area would be felled as a result of the proposed Development and when this felling would take place.

12.3.14 In modifying the felling plan, a number of points were taken into account as detailed below:

- Fragmentation of coupes was minimised as much as possible in the felling design;
- Felling coupe shapes were modified to ensure that access for future harvesting operations was maintained;
- This involved both advancing and delaying the felling of parts or the whole of certain coupes; and
- Coupe shapes and edges were modified to follow good practice.

Restocking Plan

12.3.15 The windfarm restocking plan (ES Figure 12.7 in Volume 3 of the ES) would show which woodlands would be restocked and when this restocking would be carried out as a result of the proposed Development. The majority of the areas to be felled for the proposed Development would be restocked as per the existing FP apart from the areas detailed below:

- Land required for the proposed Development infrastructure subject to the buffer zones/keyholes described above. However, the opportunity would be taken through the implementation of the plan to reduce the buffer zones where possible during restocking;
- Land to be left unplanted for wind resource protection and turbine performance purposes; and
- Land left unplanted for forest management or forest design purposes.

12.3.16 In modifying the restocking plan, a number of points were taken into account as detailed below:

- Fragmentation of coupes was minimised as much as possible in the restocking design;
- Coupe shapes were modified to ensure that access for future forestry operations, principally harvesting, would be maintained; and
- Coupe shapes and edges were modified to follow good practice.

12.3.17 Species composition was also considered, taking into account existing restocking plans, the proposed Development operational objectives, landowner objectives and forestry policies.

12.3.18 It is planned to utilise the open ground associated with the proposed Development infrastructure, such as tracks, for forest design purposes as management boundaries. This would reduce the amount of other designed open ground required within the restocking plan, reducing the loss of woodland area.

12.3.19 The forestry proposals have been assessed by each of the separate environmental disciplines / consultants as part of the Environmental Impact Assessment (EIA) process and the effects are reported in individual chapters of this ES and supporting separate Technical Appendices.

12.4 BASELINE CONDITIONS

Age Class Structure

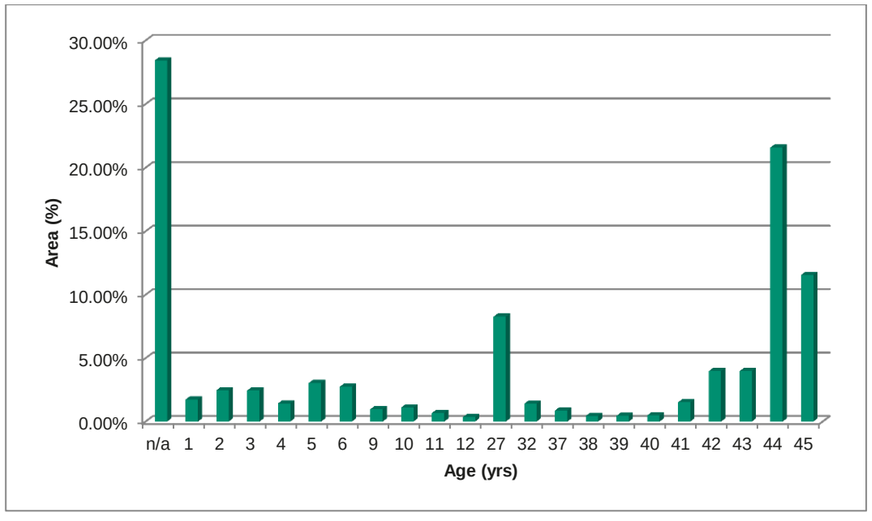
12.4.1 The age class structure of the woodlands within the Forestry Study Area, as at November 2014, is shown in ES Figure 12.2 located in Volume 3 of the ES. The data are summarised in Table 12.1 and illustrated in Chart 12.1 below. The majority of the woodlands were planted in the early 1970's, but there has been continuous planting, felling and restocking during the lifespan of the forest. The age class structure is therefore very diverse and reflects the nature of ongoing commercial forestry plantations. The unplanted land consists of open ground as part of the forest design or unplantable areas such as rocky outcrops or exposed areas.

Table 12.1: Baseline Age Class Structure

Age	Area (ha)	Area (%)
n/a	989.32	28.44 %
1	60.69	1.74 %
2	85.87	2.47 %
3	85.27	2.45 %
4	49.83	1.43 %
5	105.87	3.04 %
6	95.28	2.74 %
9	34.00	0.98 %

Age	Area (ha)	Area (%)
10	38.66	1.11 %
11	23.81	0.68 %
12	12.03	0.35 %
27	287.74	8.27 %
32	49.05	1.41 %
37	30.57	0.88 %
38	15.59	0.45 %
39	15.94	0.46 %
40	17.05	0.49 %
41	52.73	1.52 %
42	138.44	3.98 %
43	138.29	3.98 %
44	750.77	21.58 %
45	402.05	11.56 %
Totals	3,478.83	100.00 %

Chart 12.1: Baseline Age Class Structure



12.4.2 Many woodlands established in the mid to late 1900's were planted in large contiguous blocks, often over a limited number of years and with a limited range of species. Such woodlands develop poor structural diversity, especially on upland sites. Restructuring the age class and species of such forests would yield both forest management and environmental benefits.

12.4.3 The current recommendations contained within the UK Forestry Standard are for a minimum interval between felling adjacent coupes of 8 - 15 years in the uplands and 7 - 15 years in the lowlands. There can be implications from such a strategy, which involves both advancing and delaying felling, on crop stability and financial returns. For forest planning purposes the target interval between felling adjacent coupes is taken as 7 years or at least 2 m in crop height. It is recognised that in large even-aged plantations, especially in the uplands, restructuring age class structure to meet this target may take more than one rotation. The restructuring process is already underway within the Forestry Study Area.

Species Composition

12.4.4 The current species composition of the woodlands within the Forestry Study Area is shown in ES Figure 12.3 in Volume 3 of the ES and illustrated in Table 12.2 and Chart 12.2 below. The wide range of species and mixtures present in a forest can mask the overall structure of the woodland. The crops have therefore been summarised into a number of broad woodland categories as described below:

- Primary conifer species: comprised of Sitka spruce, either pure or in mixtures where Sitka spruce is expected to be the final crop species;
- Secondary conifer species: comprised of other conifer species and mixtures or other crops which contribute to biodiversity;
- Mixed broadleaves: this includes both native broadleaves and other mixed broadleaf woodland; and
- Open ground.

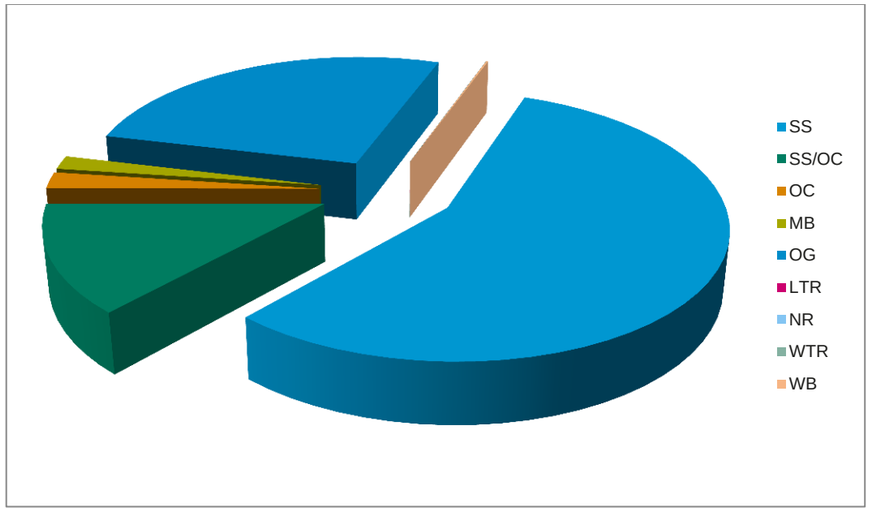
12.4.5 The main species are commercial conifers, principally Sitka spruce, which, either as pure blocks or in mixtures with other conifers, accounts for approximately 69.49 % of the total area. Other conifers account for another 2.04 % while broadleaves form a very small component of the woodlands at 1.67 %. Open ground accounts for 26.66 %.

Table 12.2: Baseline Species Composition

Species	Abbreviation	Area (ha)	Area (%)
Sitka spruce	SS	1,953.49	56.15 %
Sitka spruce/other conifers	SS/OC	464.19	13.34 %
Other conifers[9]	OC	70.95	2.04 %
Mixed broadleaves	MB	58.23	1.67 %
Open ground	OG	927.47	26.66 %
Water	WTR	0.06	0.00 %
Wind Blow	WB	4.45	0.13 %
Total		3,478.83	100 %

[9] Other conifers include Japanese Larch, Lodgepole Pine, Norway Spruce and Hybrid Larch (see ES Figure 12.3 in Volume 3 of the ES.

Chart 12.2: Baseline Species Composition



12.4.6 The species composition, in particular the low broadleaf woodland presence and the high proportion of Sitka spruce reflects the period when the woodlands were planted. Such woodlands tended to lack species diversity.

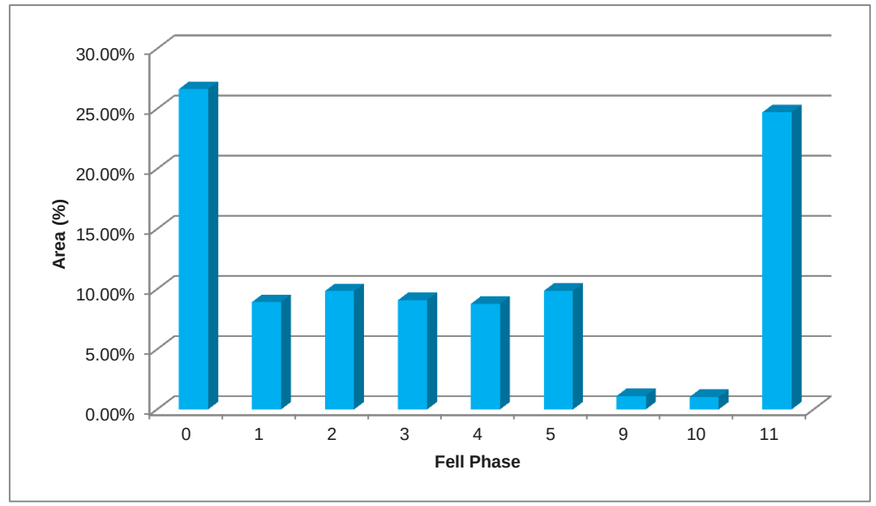
Baseline Felling Plan

12.4.7 The baseline felling plan has been prepared by the forest managers and takes into account recent amendments. The baseline felling plan takes into account the requirement to restructure the age class of even aged forests as described in paragraphs 12.4.2-12.4.3. The draft baseline felling programme is illustrated in ES Figure 12.4 in Volume 3 of the ES and presented in Table 12.3 and Chart 12.3 below. The data is summarised in 5-year bands as per standard practice.

Table 12.3: Baseline Felling Plan

Fell Phase	Area (ha)	Area (%)
No Felling	926.86	26.64 %
Fell Phase 1: 2012-2016	310.53	8.93 %
Fell Phase 2: 2017-2021	342.21	9.84 %
Fell Phase 3: 2022-2026	315.98	9.08 %
Fell Phase 4: 2027-2031	305.63	8.79 %
Fell Phase 5: 2032-2036	342.94	9.86 %
Long Term Retentions	39.09	1.12 %
Natural Reserves	35.94	1.03 %
Outside Plan Period	859.65	24.71 %
Total	3,478.83	100 %

Chart 12.3: Baseline Felling Plan



12.4.8 A large proportion of the forest has been designated as being felled Outside Plan Period. These areas are younger crop recently replanted, whose prospective felling year lies outside of the current FP period.

12.4.9 There are numerous areas within the Forest Study Area which have been designated as Natural Reserves. These are areas which are considered of high conservation interest or potential and are managed by minimum intervention unless alternative management has higher conservation or biodiversity value.

12.4.10 Some areas of crop in the baseline felling plan have been assigned a delayed felling period by the forest managers. These areas are Long Term Retentions (LTR), which are crops to be retained beyond their age of economic or silvicultural maturity for conservation and biodiversity purposes. These woodlands would otherwise be managed as normal and would in due course be felled and replanted. The identification of Long Term Retentions is part of the requirements of UKWAS and the UK Forestry Standard.

12.4.11 The draft baseline felling programme is designed to provide the required separation between felling coupes, where possible. This may take more than one rotation to achieve, especially in the uplands where windfirm boundaries between felling coupes are limited.

Baseline Restocking Plan

12.4.12 The baseline restocking plan as detailed in the FP is illustrated in ES Figure 12.5 in Volume 3 of the ES and outlined below in Table 12.4 and Chart 12.4 below.

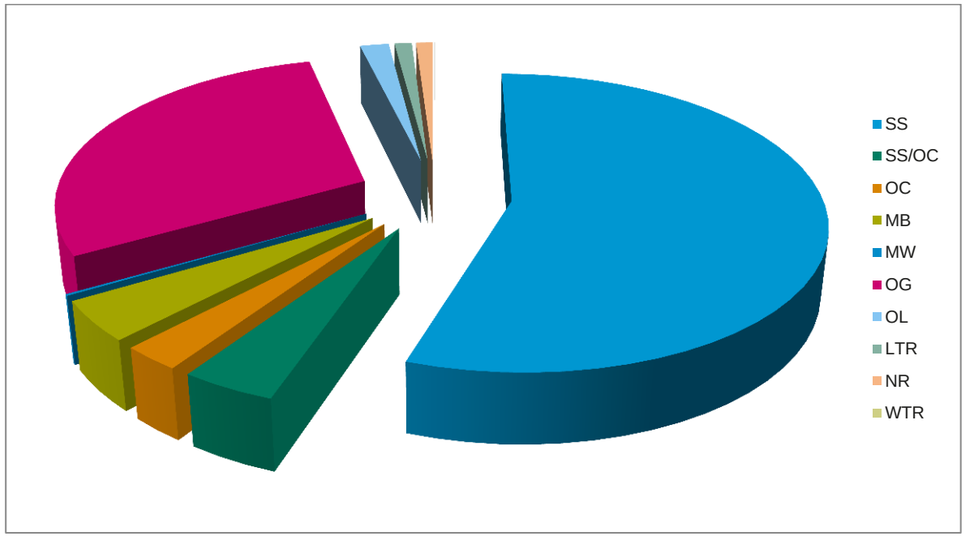
Table 12.4: Baseline Restocking Plan

Species	Abbreviation	Area (ha)	Area (%)
Sitka spruce	SS	1,923.78	55.30 %
Sitka spruce/other conifers mix	SS/OC	146.85	4.22 %
Other conifers[10]	OC	92.50	2.66 %
Mixed broadleaves	MB	151.15	4.34 %

[10] Other conifers include Hybrid Larch and Lodgepole Pine (see ES Figure 12.5 in Volume 3 of the ES).

Species	Abbreviation	Area (ha)	Area (%)
Mixed woodland	MW	6.20	0.18 %
Open ground	OG	1,024.84	29.46 %
Other land	OL	61.33	1.76 %
Long term Retentions	LTR	36.85	1.06 %
Natural Reserves	NR	35.26	1.01 %
Water	WTR	0.06	0.00 %
Totals		3,478.83	100.00 %

Chart 12.4: Baseline Restocking Plan

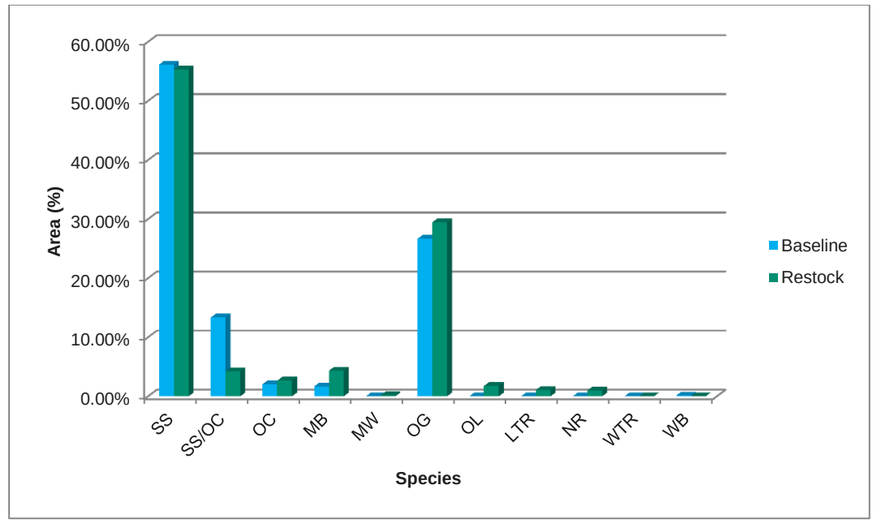


12.4.13 The draft restocking proposals illustrate how the forest would be structured at the end of the FP period if the entire plan was implemented. Table 12.5 and Chart 12.5 below compare the baseline current species composition and the baseline restocking species composition at the end of the plan period without the effect of the proposed Development.

Table 12.5: Baseline Species Comparison

Species	Abbreviation	Baseline Current Area (%)	Baseline Restock Area (%)	Difference (%)
Sitka spruce	SS	56.15 %	55.30 %	-0.85 %
Sitka spruce/other conifers	SS/OC	13.34 %	4.22 %	-9.12 %
Other conifers	OC	2.04 %	2.66 %	0.62 %
Mixed broadleaves	MB	1.67 %	4.34 %	2.67 %
Mixed woodland	MW	0.00 %	0.18 %	0.18 %
Open ground	OG	26.66 %	29.46 %	2.80 %
Other land	OL	0.00 %	1.76 %	1.76 %
Long term Retentions	LTR	0.00 %	1.06 %	1.06 %
Natural Reserves	NR	0.00 %	1.01 %	1.01 %
Water	WTR	0.00 %	0.00 %	0.00 %
Wind blow	WB	0.13 %	0.00 %	-0.13 %
Total		100.0 %	100.0 %	

Chart 12.5: Baseline Species Comparison



12.4.14 The changes between the current species composition and that contained within the revised baseline restocking plan are discussed below (all figures relate to the % of the Forestry Study Area):

- The proportion of primary conifer crops (Sitka spruce and Sitka spruce/other conifers) decreases by 9.97 %;
- The area of secondary conifers increases by 0.62 %;
- The proportion of designed open ground / other land increases by 4.56 %; and
- The proportion of broadleaf / native woodland increases by 2.67 %.

12.4.15 The majority of these changes reflect the nature of proposed Development Area, the management objectives and the need to meet current guidelines e.g. the inclusion of designed open ground and a minimum proportion of broadleaves.

12.4.16 The net effect is a reduction in the proportion of commercial conifers in favour of broadleaf woodland and open ground. Generally the proportion of conifer species would be expected to decline in a forest undergoing restructuring to meet current standards.

12.5 WINDFARM FOREST PLAN

Introduction

12.5.1 The effect of the proposed Development on the structure of the woodlands has been compared against the baseline current species and the revised FP felling and restocking plans. This has concentrated on amendments to the felling plan, species composition and the restocking design required to accommodate the proposed Development.

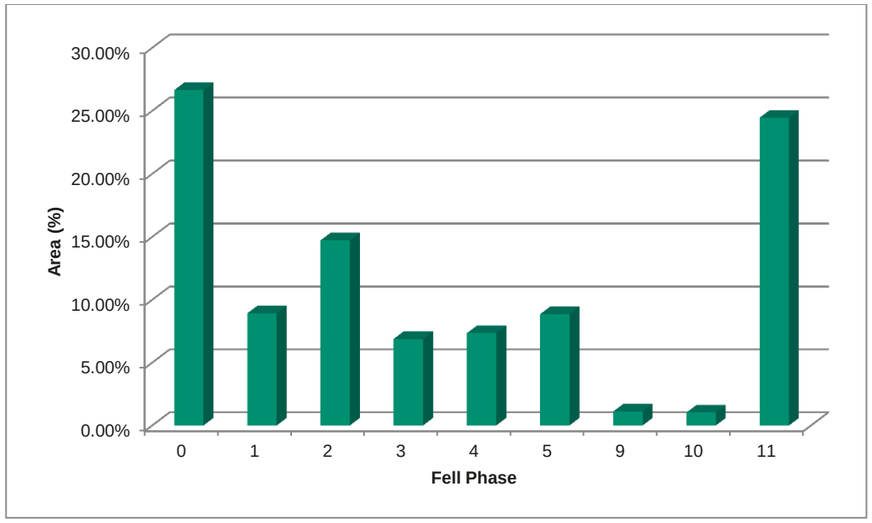
Windfarm Felling Plan

12.5.2 The proposed windfarm felling plan is shown in ES Figure 12.6 in Volume 3 of the ES and summarised in Table 12.6 and Chart 12.6 below.

Table 12.6: Windfarm Felling Plan

Fell Phase	Area (ha)	Area (%)
No Felling	926.86	26.64 %
Fell Phase 1: 2012-2016	310.53	8.93 %
Fell Phase 2: 2017-2021	512.25	14.72 %
Fell Phase 3: 2022-2026	239.62	6.89 %
Fell Phase 4: 2027-2031	255.60	7.35 %
Fell Phase 5: 2032-2036	308.10	8.86 %
Long Term Retentions	39.05	1.12 %
Natural Reserves	35.94	1.03 %
Outside Plan Period	850.87	24.46 %
Totals	3,478.83	100.00 %

Chart 12.6: Windfarm Felling Plan

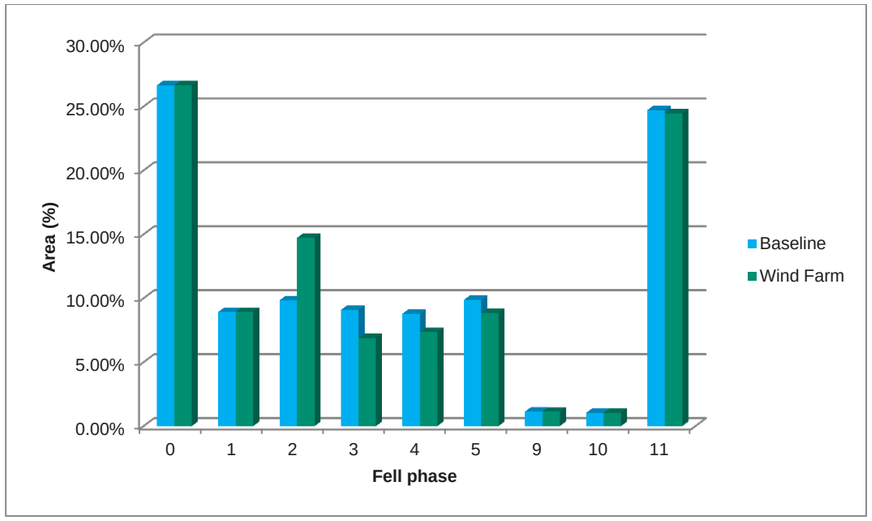


12.5.3 The baseline and proposed Development felling data are compared in Table 12.7 and Chart 12.7 below. The effects on timber volumes are discussed later in this report.

Table 12.7: Comparison of Baseline and Windfarm Felling Plans

Fell Phase	Baseline (%)	Wind Farm (%)	Difference
No Felling	26.64 %	26.64 %	0.00 %
Fell Phase 1: 2012-2016	8.93 %	8.93 %	0.00 %
Fell Phase 2: 2017-2021	9.84 %	14.72 %	4.89 %
Fell Phase 3: 2022-2026	9.08 %	6.89 %	-2.20 %
Fell Phase 4: 2027-2031	8.79 %	7.35 %	-1.44 %
Fell Phase 5: 2032-2036	9.86 %	8.86 %	-1.00 %
Long Term Retentions	1.12 %	1.12 %	0.00 %
Natural Reserves	1.03 %	1.03 %	0.00 %
Outside Plan Period	24.71 %	24.46 %	-0.25 %
Totals	100.00 %	100.00 %	

Chart 12.7: Comparison of Baseline and Windfarm Felling Plans



12.5.4 There would be an increase in the felling programme during the Phase 2 period (2017 – 2021) of 4.89 % or 170.04 ha due to the windfarm felling plan. This is balanced out by reductions in the felling programme for subsequent periods, specifically Fell Phases 3, 4 and 5.

12.5.5 The increase is due entirely to the advanced felling of plantations for construction and operation of the windfarm.

Windfarm Restocking Plan

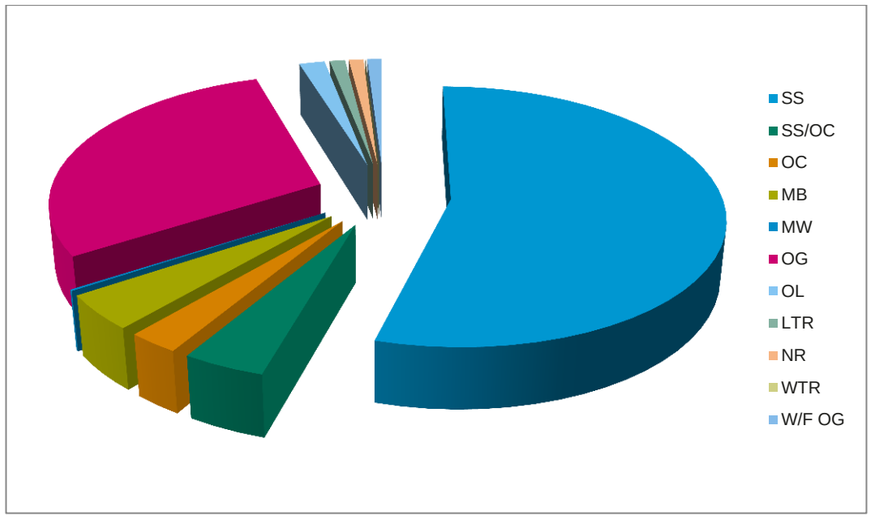
12.5.6 The draft baseline restocking plan has been amended to integrate the proposed Development infrastructure into the forest design and to take account of the site conditions. The windfarm restocking plan is shown in ES Figure 12.7 in Volume 3 of the ES and summarised in Table 12.8 and Chart 12.8 below. The data labelled 'Windfarm Open Ground' (W/F OG) refers to areas of crops which would be felled but not replanted for the proposed Development.

Table 12.8: Windfarm Restocking Plan

Species	Abbreviation	Area (Ha)	Area (%)
Sitka spruce	SS	1,894.47	54.46 %
Sitka spruce/other conifers mix	SS/OC	147.15	4.23 %
Other conifers[11]	OC	92.39	2.66 %
Mixed broadleaves	MB	151.42	4.35 %
Mixed woodland	MW	6.20	0.18 %
Open ground	OG	1,019.15	29.30 %
Other land	OL	61.33	1.76 %
Long term retentions	LTR	36.85	1.06 %
Natural reserves	NR	35.26	1.01 %
Water	WTR	0.06	0.00 %
Windfarm open ground	W/F OG	34.53	0.99 %
Totals		3,478.83	100.00 %

[11] Other conifers include Hybrid Larch and Lodgepole Pine

Chart 12.8: Windfarm Restocking Plan



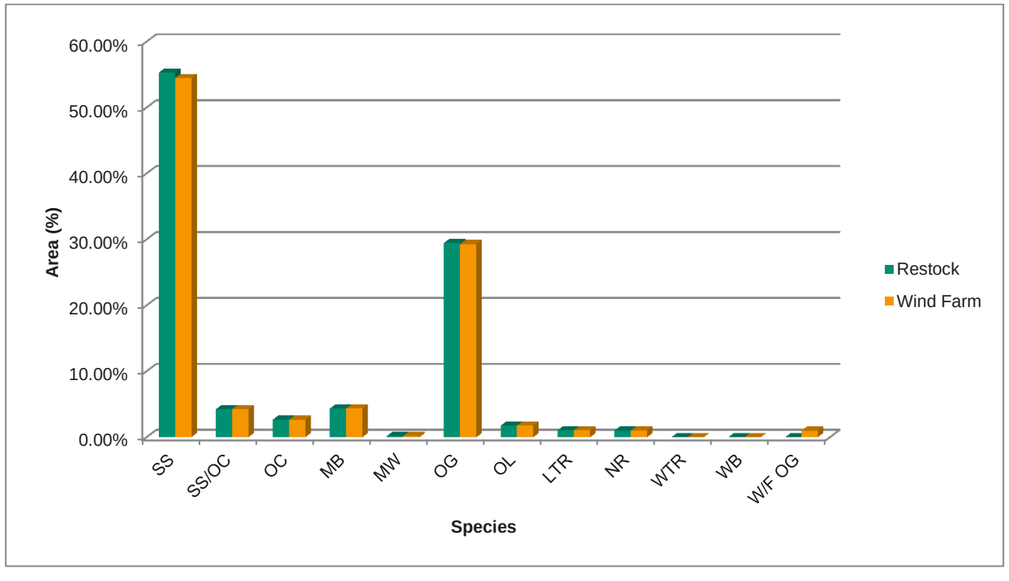
12.5.7 The windfarm restocking plan would largely follow the baseline plan with only minor amendments to rationalise coupe boundaries in certain locations.

12.5.8 The baseline and windfarm restocking data have been analysed to assess the effect the construction of the proposed Development would have on the species composition of the forest. These data are presented in Table 12.9 and Chart 12.9 below. For comparison purposes the current species data is also included in this table. The data are shown as a percentage of the Forestry Study Area.

Table 12.9: Comparison of Baseline and Windfarm Restocking Plans

Species	Abbreviation	Baseline Restocking	Windfarm Restocking	Difference
Sitka spruce	SS	55.30 %	54.46 %	-0.84 %
Sitka spruce/other conifers	SS/OC	4.22 %	4.23 %	0.01 %
Other conifers[12]	OC	2.66 %	2.66 %	0.00 %
Mixed broadleaves	MB	4.34 %	4.35 %	0.01 %
Mixed woodland	MW	0.18 %	0.18 %	0.00 %
Open ground	OG	29.46 %	29.30 %	-0.16 %
Other land	OL	1.76 %	1.76 %	0.00 %
Long term retentions	LTR	1.06 %	1.06 %	0.00 %
Natural reserves	NR	1.01 %	1.01 %	0.00 %
Water	WTR	0.00 %	0.00 %	0.00 %
Wind blow	WB	0.00 %	0.00 %	0.00 %
Windfarm open ground	W/F OG	0.00 %	0.99 %	0.99 %
Totals		100 %	100 %	

Chart 12.9: Comparison of Baseline and Windfarm Restocking Plans



[12] Other conifers include Hybrid Larch and Lodgepole Pine.

12.5.9 The changes in the structure of the woodlands are discussed below. The changes refer to a comparison of the windfarm restocking plan against the baseline restocking plan:

- There would be a decrease in the area of primary conifer crops. This would decrease by 0.83 % in the windfarm restocking plan compared to the baseline restocking plan;
- The proportion of secondary conifer crop remains the same;
- The proportion of broadleaf/native woodland would increase by 0.01 %; and
- The total proportion of unplanted land, including open ground, other land and windfarm open ground would increase from 31.22 % in the baseline restocking plan to 32.05 % under the windfarm restocking plan. This represents an increase of 0.83 % (equivalent to 28.87 ha) due to crops being felled and not replanted for the proposed Development.

12.5.10 As a result the stocked area of woodland within the Forestry Study Area would decrease under the windfarm restocking proposals by 0.83 % (28.87 ha). The Developer is committed to providing compensatory planting for this net loss as per the Scottish Government's Control of Woodland Removal Policy.

12.5.11 Detailed planting prescriptions are provided in Section 12.7: Forestry Management Practices of this Chapter.

12.6 TIMBER HARVESTING VOLUMES

12.6.1 The volume of timber to be harvested during the period of the proposed Development operation is shown in Table 12.10 below. This is compared with the volume, which would have been harvested as a result of the felling proposals contained within the existing plans. It should be noted that these volumes refer only to timber to be harvested from the Forestry Study Area.

Table 12.10: Timber Harvesting Volumes

Period		Baseline		Windfarm		Variance	
From	To	M3	%	M3	%	M3	%
2012	2016	57,309	4.0 %	57,309	4.1 %	0	0.0 %
2017	2021	170,704	12.1 %	229,458	16.3 %	58,754	34.4 %
2022	2026	157,209	11.1 %	124,063	8.8 %	-33,146	-21.1 %
2027	2031	176,628	12.5 %	153,005	10.9 %	-23,623	-13.4 %
2032	2036	190,874	13.5 %	171,228	12.2 %	-19,645	-10.3 %
Outside Plan Period		620,053	43.8 %	625,922	44.6 %	5,869	0.9 %
Natural Reserves		43,089	3.0 %	43,072	3.1 %	-17	0.0 %
Totals		1,415,866	100 %	1,404,057	100 %	-11,809	-0.8 %

12.6.2 These data have been derived from the data information provided by the forest owner / manager, updated as necessary, and Forestry Commission Yield Models. It is based on a number of assumptions including accuracy of the yield class data provided by the forest managers.

12.6.3 The default yield table used has been the Sitka spruce non-thin 2 m initial planting spacing model. This species was used as it forms the largest proportion of the conifer crops. It has been assumed that that there would be no volume harvested from any crop with less than 100 m^3 / ha. In mixtures the proportion of the individual species is uncertain and therefore yield class has been based on what is assumed to be the dominant species.

12.6.4 Due to the proposed Development, the timber harvesting from part of the forest is advanced compared with the baseline. As a result, while there is an increase in the volume of timber harvested during the construction phase of the windfarm, there is a projected decrease of 11,809 m^3 (0.8 %) over the life of the windfarm compared with the baseline. This is due entirely to the advanced felling of plantations before they reach maturity yielding a lower volume of timber per ha.

12.6.5 The timber from the baseline felling plan would, as it stands at present, all be despatched via internal forest haul roads to the A713 an agreed route for timber traffic (see Chapter 14: Traffic and Transport, of the ES.

12.7 FORESTRY MANAGEMENT PRACTICES

12.7.1 Forestry management practices and responsibility for their implementation would be agreed with the forest managers prior to commencement of construction of the proposed Development. It is however anticipated that forestry management practices would consist of the following.

Conventional Harvesting

12.7.2 It is anticipated that the majority of crops would be of sufficient tree size and standing volume that they would be harvested conventionally. It is assumed timber operations would be undertaken with conventional low ground pressure harvesting and forwarding equipment to minimise ground disturbance during the forestry operations.

12.7.3 Stemwood down to 7 cm or below would be removed from site and sold into the timber markets. The harvester would maximise timber recovery, wherever possible, by cutting a fuelwood product; this would result in the maximum timber volume being recovered to ensure the volume used in the brash mats is kept to a minimum. On wetter ground it is anticipated the harvester would build stronger brash mats to ensure there would be minimal damage to the soil structure by the forwarder during extraction.

12.7.4 It is anticipated the harvester would generally follow the ploughing direction on the site and would harvest all the trees in an 18 m zone around the machine. Typically, the branches and tops of the trees (brash) would be placed in front of the harvester in the direction of the machine travel. The harvester would lay the brash forming a mat at 90 degrees to the plough furrows and the direction of travel of the machine. This would form the running surface for the forestry machines and would minimise ground damage.

12.7.5 Lop and top resulting from such felling would generally be left in 'brash mats' created by the harvesting machines and would be used to aid extraction of the timber to roadside. These linear features are generally spaced approximately 10-15 m apart, with the intervening land being largely free of brash. Such brash mats would be left on site as per current industry practice. The material within the brash mats decomposes over a number of years and, where replanting is carried out, provides nutrition for the next rotation.

Removal of Unmerchantable Crops

12.7.6 Small areas of younger crops would need to be cleared to create the turbine keyholes and access track. It is proposed that such unmerchantable crops would be removed by various methods described below. The exact methodology would be finalised nearer the time of construction taking into account the growth of the trees in the interim period and any developments in the markets for small diameter timber or chipped material.

12.7.7 In areas of premature crop clearance, where little or no merchantable timber would be recovered, whole tree harvesting of young trees could be carried out depending on terrain and ground conditions. The material would be felled, either by harvesting machine or manually; extracted to roadside using conventional equipment; chipped using mobile chippers; and sold into the biomass markets. Its suitability would depend on site conditions, the availability of equipment and markets.

12.7.8 In areas where trees are very small or ground conditions unsuitable it could be more economical or viable to fell the crop manually using scrub cutters or chainsaws. This methodology would be more appropriate in the lower yield class areas where tree growth is slow or where ground conditions are more difficult.

12.7.9 Alternatively, where roadlines pass through younger plantations trees could be cleared mechanically using excavators and other equipment. In such cases the extent of clearance would be minimised and the exact location would not be finalised until such time as all micrositing of infrastructure has been completed.

Restocking Methodology

12.7.10 It is assumed restocking would be carried out to current standard practice, guidelines and in accordance with the UK Forestry Standard and UKWAS as a minimum, where applicable. Methodology would vary depending on the type of restocking being carried out. The exact planting requirements would be agreed with the forest managers in advance of planting.

12.7.11 On commercial conifer areas it is anticipated methodology would normally include:

- Site preparation by appropriate cultivation and drainage;
- Manual planting;
- Subsequent follow-up establishment operations such as the replacement of failures, weeding and protection measures until the crops are satisfactorily established; and
- It is anticipated replanting would be carried out with the conifer species identified in the restocking plan at the minimum density of 2,500 trees per hectare.

12.7.12 Native broadleaf woodland planting would be carried out in accordance with the following criteria:

- At least 75 % species native to the locality and appropriate to the site;
- Up to 25 % open ground;
- Plant density to be a minimum of 1,600 stems per hectare; and
- Variable planting density would be acceptable depending on ground conditions.

12.7.13 Methodology would include, but not be limited to, the following:

- Site preparation by machine mounding where the site is suitable, otherwise by hand cultivation;
- Drainage where necessary and / or appropriate;
- Manual planting; and
- The principal species would be downy and silver birch with small components of other species such as rowan, hazel, grey willow, goat willow, alder and woody shrubs as appropriate.

12.7.14 Restocking would be carried out within 12 to 20 months of the felling date so as to allow the planting to avoid conflict with the most active part of the wind farm operations.

Forestry Residues

12.7.15 The SEPA guidance document WST-G-027, *'Management of Forestry Waste'* [13] highlights that all waste producers have a statutory duty to adopt the waste hierarchy as per the Waste (Scotland) Regulations 2011 amended Section 34 of the EPA 1990 (duty of care). This places a specific duty on any person who produces, keeps or manages (controlled) waste to take all such measures available to them to apply the waste hierarchy in Article 4 (1) of the revised Waste Framework Directive (rWFD), that is:

- (a) prevention;
- (b) preparing for re-use;
- (c) recycling;
- (d) other recovery, including energy recovery; and
- (e) disposal, in a way which delivers the best overall environmental outcome.

[13] SEPA (2013): SEPA Guidance Notes WST-G-027 "Management of Forestry Waste".

12.7.16 Further guidance is contained in LUPS-GU27, *'Use of Trees Clear Felled to Facilitate Development on Afforested Land*[14] .

12.7.17 A hierarchy of uses for forestry materials is proposed, derived from the waste hierarchy contained within the regulations, summarised as follows:

- Prevention via the production of timber products and associated materials for use in timber and other markets;
- The re-use of materials on site for a valid purpose, where such a use exists e.g. road construction;
- There is no valid re-cycling use for forestry residues;
- Other recovery via collection and use as biomass for energy recovery or other markets, where not included above; and
- Where no valid on or off site use can be found for the material, disposal would be in a way that is considered delivers the best overall environmental outcome.

12.7.18 Where no valid on or off site use or other disposal method can be found for the material it should be regarded as waste and treated accordingly. Disposal of timber residues as waste in or on land requires a landfill permit or a waste exemption licence and should be considered the option of last resort.

12.7.19 As such, a Section of the Construction Method Statement (CMS) regarding the handling, storage and disposal of Forestry Waste would be prepared in accordance with recommended guidance described above.

12.8 AFTERCARE WORKS

12.8.1 Aftercare establishment works would include, but are not limited to, the following:

- The woodlands would be beaten up (replacement of failures) to ensure satisfactory stocking levels by year 5;
- The woodlands would be weeded as necessary to ensure satisfactory establishment by year 5;
- The woodlands would be protected against pine weevils by management inspections and remedial treatment as necessary;
- The woodlands would be protected against browsing damage from wild and domestic animals;
- The woodlands would be protected against fire;
- Fertiliser would be applied as necessary to ensure satisfactory establishment and growth; and
- Other works to be carried out as reasonably required ensuring satisfactory establishment of the woodlands.

Standards and Guidelines

12.8.2 All forestry operations would be carried out in strict accordance with current good practice and guidelines. This would include, but not be limited to:

- UK Forestry Standard Guidelines (Forestry Commission 2011)[15]; and
- Forest Industry Safety Accord (FISA) Safety Guides.[16]

12.8.3 All operations would be carried out in accordance with current relevant legislation including, but not limited to, Health and Safety at Work Act.

[14] SEPA (2014): LUPS-GU27 "Use of Trees Cleared to Facilitate Development of Afforested Land".

[15] Forestry Commission (2011): UK Forestry Standard Guidelines. Forestry Commission, Edinburgh.

[16] Forest Industry Safety Accord (2014): FISA Safety Guides (various). Edinburgh.

12.9 SUMMARY

12.9.1 The total Forestry Study Area extends to 3,478.83 ha and is comprised of privately owned and managed woodlands.

12.9.2 The species composition of the forests would change only slightly as a result of the proposed Development forestry plans. In particular the area of primary conifer species would decrease from 59.52 % of the Forestry Study Area to 58.69 % as a result of the proposed Development plans.

12.9.3 The proportion of secondary conifer species would remain the same.

12.9.4 The proportion of broadleaf woodland would increase under the proposed Development plans by 0.01%.

12.9.5 The total proportion of open ground would increase from 31.22 % to 32.05 % due to the incorporation of the proposed Development infrastructure into the forest.

12.9.6 There would be a small net loss of woodland area. The overall area of stocked woodland would decrease by 28.87 ha (0.83 %) of the Forestry Study Area as a result of the proposed Development forestry plans.

12.9.7 There would be a change in the pattern of timber harvesting with felling programmes being advanced compared with the baseline. As a result the total volume of timber to be harvested over the period would decrease by 11,809 m^3 (0.8 %).

12.9.8 It is recognised that, without mitigation, there would be a small net loss of commercial woodland area as a result of the proposed Development equivalent to 28.87 hectares (0.83 % of the Forestry Study Area).

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Author	Emily Peaston	20/01/2015
Checked	Marie Scaife	02/03/2015
Approved	Euan Hutchison	25/03/2016

Client Details	
Contact	Gareth Swales
Client Name	Brockloch Rig III Ltd
Address	c/o Fred. Olsen Renewables Ltd

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Chapter 13

Aviation, EMI, Existing Infrastructure and Shadow Flicker

Contents

Glossary

Term	Definition
Environmental Statement	A document reporting the findings of the EIA and produced in accordance with the EIA Regulations.
The proposed Development	The proposed Windy Standard III Wind Farm
The proposed Development Area	The project development area within the site boundary which is subdivided into the Meaul Hill Cluster and Waterhead Hill Cluster

List of Abbreviations

Abbreviation	Description
ANO	Air Navigation Order
ATC	Air Traffic Control
BR3	Brockloch Rig III
CAA	Civil Aviation's Directorate of Airspace

Abbreviation	Description
CB	Citizen's Band
CMS	Construction Method Statement
EIA	Environmental Impact Assessment
ES	Environmental Statement
GIS	Geographical Information System
GPA	Glasgow Prestwick Airport
JRC	Joint Radio Company
MoD	Ministry of Defence
NATS	National Air Traffic Services
NERL	National Air Traffic Service En Route Plc.
TTA	Tactical Training Areas

13.1 INTRODUCTION

13.1.1 In the design of the proposed Development consideration has been given to the potential for impact upon aviation, Ministry of Defence (MoD) interests, communication operations and existing site infrastructure. This Chapter of the ES assesses such potential impacts and demonstrates the consulting process undertaken and outlines mitigation where it is deemed necessary.

13.1.2 This assessment was undertaken using two main desktop study methods, GIS searches using published constraints data and consultation with statutory bodies and network operators. Aviation consultants Osprey have also been carrying out assessments and providing advice on potential impacts and mitigation measures.

13.1.3 The areas that were covered in this assessment included:

- ATC and defence radar;
- Military low flying activities;
- Low flying near Aerodromes;
- Microwave communications & mobile phone networks;
- Television broadcast interference;
- Radio broadcast interference;
- Private network communications;
- Buried physical infrastructure within the site boundary (i.e. pipelines, cables etc).

13.1.4 The initial feasibility assessment found that; without a mitigation strategy in place the proposed Development could be constrained by both civil (radar) and military (low flying) activities. It was found there was potential for a number of turbines to be detected by Glasgow Prestwick Airport (GPA) radar and National Air Traffic Services (NATS) radar systems at Lowther Hill and Great Dun Fell. However, it was considered that with careful site design there was potential to avoid the turbines being detected, particularly for those that are border-line.

13.1.5 Consequently, relevant bodies (MoD, NATS, and GPA) have been consulted with to determine if there could be any potential impact upon their assets in the proposed Development Area. Due to the nature of the consultation process that has been undertaken, and the nature of the assets themselves it is not appropriate to assess the issues arising in this Chapter of the ES in accordance with the methodology identified in Chapter 5: EIA Process, of the ES (sensitivity x magnitude = significance). Where a response of "no objection" has been received from the consultee it has been assumed that, with respect to the EIA regulations, the impact is considered to be not significant, rendering a further assessment of magnitude and sensitivity unnecessary. Where a response other than "no objection" has been received, these issues are considered individually in the following parts of this Chapter.

13.2 MILITARY AVIATION

13.2.1 The proposed Development is located within Low Fly Area 16 and the Tactical Training Areas (TTA). It lies on the edge of an area considered high priority for low flying operations and wind turbine applications could raise considerable and significant concerns. However, there is also considerable operational (the existing Windy Standard Wind Farm) and consented (Windy Standard II and Afton) turbine development within the immediate locality of the proposed Development meaning the proposed Development Area could potentially already be sterilised from a low flying exercise point of view.

13.2.2 The MoD provided a scoping response (see Technical Appendix 3.2: Scottish Government Final Scoping Opinion in Volume 4 of the ES which accompanies Chapter 3: Design Evolution and Alternatives, of the ES) stating that they had no objection to the proposal. In the interests of air safety, the MoD however requests that *"all Cardinal turbines are fitted with 25 candela omni-directional red lighting and infrared aviation lighting with an optimized flash pattern of 60 flashes per minute of 200ms to 500ms duration at the highest practicable point. Each other alternate perimeter turbine should be fitted with 25 candela omni-directional red lighting or infrared*

aviation lighting with an optimised flash pattern of 60 flashes per minute of 200ms to 500m duration at the highest practicable point".

13.2.3 Further consultation was carried out with the MoD after design freeze, where it was confirmed that they had no objection to the proposed Development but that they required *"25cd or IR lighting (with a combination of both on the perimeter turbines) is fitted to those turbines below 150m. For those above 150m, CAA Article 219 expresses the requirements for "en-route" structures (i.e. those away from the vicinity of a licensed aerodrome) and dictates the statutory requirement to provide aviation warning lights for structures of a height of 150 meters or more"* (see Technical Appendix 13.1: Further Consultation with the MoD in Volume 4 of the ES).

13.2.4 There will be ongoing dialogue with the MoD throughout the development process to ensure that it is kept up to date with layout revisions, turbine specifications and lighting requirements.

13.3 AIR TRAFFIC – CIVIL AVIATION

The CAA

13.3.1 The Civil Aviation's Directorate of Airspace (CAA) has provided a Scoping Opinion (see Technical Appendix 3.2: Scottish Government Final Scoping Opinion in Volume 4 of the ES which accompanies Chapter 3: Design Evolution and Alternatives, of the ES). CAA provided a response which suggests consultation with other bodies and states the need for turbines to be charted on aviation maps following consent. The Applicant would comply with any such requirement to liaise with the Defence Geographic Centre to facilitate this.

13.3.2 Discussions are also underway with the CAA with regards to the aviation lighting requirements. Brockloch Rig 3 (BR3) will work with the CAA and other relevant consultees to agree a suitable lighting pattern where required. In addition to this it must be noted that RenewableUK (RUK) has been requested by the CAA to provide a Briefing Note on Onshore Aviation Lighting[1] which takes into consideration the likelihood that onshore wind turbines with a tip height in excess of 150 m will be greater in the future as a result of the need to reduce costs through turbine optimisation and site selection, via larger rotors on taller hub heights. As a part of the Briefing Note, RUK has reviewed the current plethora of aviation lighting references for onshore and offshore projects in the UK and UK Continental Shelf (UKCS), including CAA, Ministry of Defence (MOD), Maritime and Coastguard Agency (MCA) and RUK documents. The Briefing Note provides recommendations with regards to aviation lighting for turbines with a tip height in excess of 150 m and provides suggested next steps. Natural Power on behalf of BR3 has responded to the draft Briefing Note and will continue to work with RUK on this matter in the future.

13.3.3 There will be ongoing dialogue with the CAA throughout the development process to ensure that it is kept up to date with layout revisions and turbine specifications.

NATS and NATS en Route

13.3.4 In relation to National Air Traffic Services (NATS), reference has been made to the National Air Traffic Service En Route Plc. (NERL) Self-Assessment Maps and the initial assessment carried out by Osprey. Given that it had been identified there was potential to impact on NATS radar systems, NATS were commissioned to carry out a Pre-Planning Assessment of the proposed Development (see Technical Appendix 13.2: NATS TOPA Pre-Planning Assessment and 13.3: NATS TOPA Pre-Planning Assessment Update Response in Volume 4 of the ES).

13.3.5 The NATS Pre-Planning Report confirmed they expected:

- No impact is anticipated on NATS's radar.
- No impact is anticipated on NATS's navigation aids.
- No impact is anticipated on NATS's radio communications infrastructure.
- No impact is anticipated on any airport to which NATS provides a safeguarding service.
- The proposed Development has been examined by technical and operational safeguarding teams. No impact is anticipated.

Glasgow Prestwick Airport

13.3.6 Glasgow Prestwick Airport (GPA) has stated with their scoping response (see Technical Appendix 3.2: Scottish Government Final Scoping Opinion in Volume 4 of the ES which accompanies Chapter 3: Design Evolution and Alternatives, of the ES):

"*Having assessed the turbine co-ordinates Glasgow Prestwick Airport conclude that some of the turbines within this development will be detected by our primary surveillance radar. Given the critical location of the development (on the approach to runway 30) and the existing clutter that is already detected by our radar in this area it is extremely likely Glasgow Prestwick Airport will object to the proposal.*

Glasgow Prestwick Airport would encourage the developer to engage with us regarding a possible solution at the earliest opportunity."

13.3.7 A meeting was held between Natural Power and GPA at the GPA control tower on the 22nd August 2014 to discuss the impact of the proposed Development on the operations of GPA and potential mitigation measures.

13.3.8 It was concluded that while there would be a significant impact on the GPA radar and the proposed Development is just on the extremities of the 30 km critical impact zone, there is a proposed mitigation solution which is very nearly finalised which would be a suitable remedy for the impacts of the proposed Development.

13.3.9 GPA are therefore confident that a mitigation solution will be available for the proposed Development. GPA also suggested that prior to submission of the planning application they could write a letter to confirm discussions have taken place and that mitigation is available and that we have a Memorandum of Understanding type document in place. A copy of this letter is available in Technical Appendix 13.4: GPA Cooperation Letter in Volume 4 of the ES.

13.3.10 With regards aviation lighting of the 177.5 m turbines GPA stated "*Aviation lighting would not be a concern for us at GPA as the Wind farm is located so far away. We are only really interested in ensuring lighting on obstacles which are generally within 15km that would infringe our OLS."*

13.3.11 There will be ongoing dialogue with GPA throughout the development process to ensure that it is kept up to date with layout revisions and turbine specifications and to implement the appropriate mitigation to overcome any outstanding objection.

13.4 MICROWAVE FIXED LINKS

13.4.1 Fixed microwave links are direct line-of-sight communication links between transmitting and receiving dishes placed on masts generally located in prominent locations that vary in length from a few kilometres to over 70 km. They are used for the transmission of information to broadcasting masts for TV, radio and mobile telephone networks. There are no fixed microwave links within the proposed Development Area (see ES Figure 13.1 in Volume 3 of the ES).

13.4.2 An initial Scoping Opinion issued by Ofcom (see Technical Appendix 3.2: Scottish Government Final Scoping Opinion in Volume 4 of the ES which accompanies Chapter 3: Design Evolution and Alternatives, of the ES) suggested use of the BBC online tool for assessing potential impact upon TV reception. However, this function is no longer available. It has already been demonstrated that the proposed infrastructure does not directly impact microwave links present in the area and is not expected to interfere with TV reception. In light of the responses received it is therefore considered that the potential impact of the proposed Development on microwave fixed links and TV reception will not be significant.

[1] RenewableUK, Briefing Note to the Civil Aviation Authority re Configurations for Onshore Aviation Lighting to Meet the Requirements of the Air Navigation Order Article 219, January 2016.

13.4.3 Atkins Limited (ATKINS) has commented that it has no objection (see Technical Appendix 3.2: Scottish Government Final Scoping Opinion in Volume 4 of the ES which accompanies Chapter 3: Design Evolution and Alternatives, of the ES). Data available at the time of design indicates that there are two microwave links that cross the proposed Development Area but that the design of the proposed Development has avoided any direct impacts upon such links.

13.5 OTHER RADIO COMMUNICATION NETWORKS

13.5.1 The Joint Radio Company (JRC) has confirmed there are no issues (see Technical Appendix 3.2: Scottish Government Final Scoping Opinion in Volume 4 of the ES which accompanies Chapter 3: Design Evolution and Alternatives, of the ES) with respect to radio link infrastructure operated by Scottish Power and Scotia Gas Networks. JRC does not foresee any potential problems based on known interference scenarios and data provided.

13.5.2 BT has stated that the proposed Development should not cause interference to BT's current and planned radio networks (see Technical Appendix 3.2: Scottish Government Final Scoping Opinion in Volume 4 of the ES which accompanies Chapter 3: Design Evolution and Alternatives, of the ES).

13.5.3 ATKINS has confirmed (see Technical Appendix 3.2: Scottish Government Final Scoping Opinion in Volume 4 of the ES which accompanies Chapter 3: Design Evolution and Alternatives, of the ES) that the proposed Development should cause no interference to UHF Radio Scanning Telemetry communications used by its client.

13.5.4 It is not anticipated that there would be any interference with radio transmission and reception, including domestic radio service, Citizen's Band (CB) and services communications due to the low frequency of the signals. Where turbines with low metal content in the blades are used, as is envisaged for the proposed Development, there is little evidence of adverse interactions.

13.5.5 In light of the above it is therefore considered that there will be no significant impacts with respect to radio communication networks.

13.6 PUBLIC RIGHTS OF WAY

13.6.1 Scotways has confirmed there are no known Public Rights of Way across the proposed Development Area. The Dumfries and Galloway Core Paths Maps have also been consulted and again these maps show there to be no Core Paths within the proposed Development Area. There is however, a path that follows the forestry tracks to the south of the Waterhead Hill Cluster. The existing main access track into Carsphairn Forest including for the operations traffic for the existing Windy Standard Wind Farm and the construction and future operations traffic for Windy Standard II crosses. This main access track is also proposed to be used for access to the proposed Development Area during both construction and operation of the proposed Development.

13.6.2 For Health and Safety reasons, access across the proposed Development Area, including the main access route, would be managed during the construction phase. Any temporary restrictions on passage through the proposed Development Area would be appropriately sign posted and if necessary, temporary diversions put in place. The details of which would be agreed pre-construction with the local planning authority and presented in a Construction Method Statement (CMS).

13.6.3 During the operational period, sign posts will be erected next to the access tracks to direct personnel to the relevant infrastructure onsite. This is for health and safety purposes to allow navigation across the site in the case of an emergency.

13.6.4 The core path itself would not be negatively impacted upon during construction but the temporary effect upon the use of these paths during construction would be affected. Because of the existing use and management of the access road which cross the path, the additional impact of the proposed Development during the construction phase is judged to be of **Low magnitude** impact with the path being of **Medium sensitivity**; the effect of which would be of **Minor/Moderate**, and therefore not significant in EIA terms. During the operational phase the additional impact of the proposed Development is judged to be of **Negligible magnitude** impact with the path being of **Medium sensitivity**; the effect of which would be of **Minor significance**, and therefore not significant in EIA terms (also see Chapter 6: Landscape and Visual Assessment, of the ES). Any effects would be temporary and any potential diversions will be managed and presented in the CMS post consent. Furthermore, the access across the proposed Development would be improved with the introduction of the proposed access tracks which would be maintained throughout the operational lifetime of the proposed Development.

13.6.5 It is also noted that a Core Path exists to the West of the proposed Meaul Hill Cluster, however this is outwith the Planning Application Boundary (see ES Figure 13.1 in Volume 3 of the ES) and therefore would not be affected by the proposed Development.

13.7 WATER SUPPLY

13.7.1 Scottish Water has confirmed that there are no Scottish Water water abstraction sources which are designated as Drinking Water Protected Areas under the Water Framework Directive, in the area that may be affected by the proposed Development and therefore, Scottish Water drinking water sources and assets should not be affected.

13.8 BURIED INFRASTRUCTURE AND OVERHEAD ELECTRICITY NETWORKS

13.8.1 A desk based review, using online tool "Linesearch before U dig"[2] of the proposed Development area indicated that there would be no assets, as listed in the search facility's database that would be directly affected by the proposed Development.

13.8.2 Line search before U dig provides a single point of contact for all enquiries relating to the apparatus owned and/or operated by the Asset Owners protected by LinesearchbeforeUdig, including underground and overhead transmission/distribution electricity networks, transmission/distribution gas networks, oil pipelines, and fibre optic networks.

13.9 SHADOW FLICKER

13.9.1 Wind turbines are tall structures which can cast long shadows when the sun is low in the sky. Given a conjunction of certain meteorological conditions (clear skies, enough wind for the turbines to be rotating and a low angle of the sun in the sky), observers close to a wind farm could experience a phenomenon commonly known as "shadow flicker", where the rotating turbine blades pass between the sun and the observer creating an intermittent shadow. It is, however, part of the nature of long shadows that they pass any particular point relatively quickly and the effect, if present, lasts a short period of time, due to the movement of the sun across the sky. They are generally only observed in the period after dawn and before sunset as the sun is rising and setting.

13.9.2 A technical paper by A D Clarke[3] (the Clarke Report) indicates that dwellings situated within ten times the diameter of the wind turbine rotor could potentially experience annoyance from shadow flicker and reflectivity and therefore recommends a separation distance between the nearest turbine and properties of at least 10 rotor diameters.

13.9.3 The turbines under consideration for use at the proposed Development have a maximum rotor diameter of 113 m making the separation recommended by Clarke between the property and the nearest turbine 1130 m. The closest dwellings to the turbines at the proposed Development are Brown Hill which lies c1750 m from the

[2] Available online: http://www.linesearchbeforeudig.co.uk/# (last accessed 08/01/2015)

[3] A.D. Clarke 'A Case of Shadow Flicker/Flashing: Assessment and Solution', Technology Policy Unit, Open University, Walton Hall, Milton Keynes, UK

nearest turbine in the Meaul Hill Cluster and the properties Waterhead, Darnscaw and Nether Bow which are ~2.4 km from the nearest turbine in the Waterhead Hill Cluster. The proposed Development therefore meets the requirements of the Clarke Report and it is not considered necessary that further assessment for the occurrence of shadow flicker is carried out.

13.10 SUMMARY

In conclusion, the proposed Development largely avoids direct impacts on aviation issues and existing infrastructure with the exception of its potential impact on the GPA Radar, for which GPA objects to the proposal. However, it is anticipated that this issue can be overcome by the Applicant through the application of a mitigation solution identified by GPA.

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Author	Craig Galloway	20/01/2015
Checked	David Wright	14/08/2015
Approved	David Wright	14/08/2015

Client Details	
Contact	Gareth Swales
Client Name	Brockloch Rig III Ltd
Address	c/o Fred. Olsen Renewables Ltd

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Chapter 14

Traffic and Transport

Contents

Glossary

Term	Definition
Environmental Statement	A document reporting the findings of the EIA and produced in accordance with the EIA Regulations.
The proposed Development	The proposed Windy Standard III Wind Farm.

List of Abbreviations

Abbreviation	Description
AADT	Average Annual Daily Traffic
AIL	Abnormal Indivisible Load
CMS	Construction Method Statement
ES	Environmental Statement
HGV	Heavy Goods Vehicle
IEA	Institute of Environmental Assessment
IHT	Institute of Highways and Transportation
LGV	Light Goods Vehicle
PAN	Planning Advice Note
SPP	Scottish Planning Policy
TMP	Traffic Management Plan
VPD	Vehicles Per Day

14.1 INTRODUCTION

14.1.1 This Chapter of the Environmental Statement (ES) assesses the effects due to transport and access resulting from the construction, operation and decommissioning of the proposed Development.

14.1.2 Traffic generated would almost entirely be limited to vehicle movements relating to the construction phase and decommissioning phases. During the operation of the proposed Development, traffic would be minimal since much of the operation would be automatic.

14.1.3 Construction traffic required to deliver the proposed Development falls into three broad categories, namely Abnormal Indivisible Loads (AIL), Heavy Goods Vehicles (HGV) and Light Goods Vehicles (LGV), and this assessment considers the effects due to these three types of traffic.

14.1.4 The construction phase is expected to last approximately 15 months, from site mobilisation through to installation and commissioning of the turbines, ending with site re-instatement and demobilisation.

14.1.5 Turbine components, electrical equipment, materials for track construction, concrete or the raw materials for concrete (cement, sand and aggregate), steel for turbine foundations and electrical cabling would all need to be transported to the site using the public road system (see Chapter 4: Description of Development, of the ES).

14.2 APPROACH TO ASSESSMENT

14.2.1 The general approach to the assessment of effects outlined in Chapter 5: EIA Process, of the ES and required by The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2000 as amended has been followed.

14.2.2 Baseline conditions have been established through use of available traffic survey data. Potential effects have been identified and assessed, and where relevant, mitigation measures identified.

14.2.3 The significance of potential effects has been assessed in light of recognised thresholds of significance from published guidance, as discussed below.

Guidance

14.2.4 The transport and traffic issues described in the following planning advice and guidance documents have been taken into account in this assessment:

- Scottish Planning Policy (SPP), The Scottish Government;
- Planning Advice Note (PAN) 75: Transport and Planning (2005), The Scottish Government;
- Transport Assessment Guidance (2012), Transport Scotland;
- Guidelines for the Environmental Assessment of Road Traffic 1993, Institute of Environmental Assessment (IEA); and
- Guidelines for Traffic Impact Assessment of Road Traffic (1994), Institute of Highways and Transportation (IHT).

14.2.5 Much of the above guidance deals principally with developments that generate significant increases in travel as a direct consequence of their function, e.g. retail parks. As mentioned above, any abnormal traffic generated by the proposed Development would almost entirely be limited to vehicle movements relating to the construction and decommissioning phases. However, in providing the information required in an ES, this Chapter addresses the local short-term transport impacts of the proposed Development during construction and therefore, addresses the issues that would be assessed within a formal transport assessment.

14.2.6 The key difference is that the wider environmental impacts of increased traffic flows have not been considered, since the duration of effects is temporary.

Consultation

14.2.7 The scoping opinion received from The Scottish Government outlined the requirements for assessment of transport, traffic and roads. The following comments were made:

''The Environmental Statement should provide information relating to the preferred route options for delivering the turbines etc. via the trunk road network. The Environmental Impact Assessment should also address access issues, particularly those impacting upon the trunk road network, in particular, potential stress points at junctions, approach roads, borrow pits, bridges, site compound and batching areas etc.

Where potential environmental impacts have been fully investigated but found to be of little or no significance, it is sufficient to validate that part of the assessment by stating in the report:

- *The work has been undertaken, e.g. transport assessment;*
- *What this has shown i.e. what impact if any has been identified; and*
- *Why it is not significant".*

14.2.8 The full Scoping Opinion request submitted to and Report received back from the Scottish Government is presented in Technical Appendix 3.1: Windy Standard III Scoping Opinion Request and 3.2: Scottish Government Final Scoping Opinion in Volume 4 of the ES which accompanies Chapter 3: Design Evolution and Alternatives, of the ES.

14.3 TRAFFIC AND TRANSPORT ASSESSMENT METHODOLOGY

14.3.1 The increase in traffic numbers has been calculated by comparing predicted vehicle numbers with existing traffic numbers on the public roads used to access the site. The increases have been expressed as percentages, and their significance assessed in terms of recognised criteria detailed below.

14.3.2 The assessment proceeds via the following steps:

a. Screening;

b. Assess magnitude of effects;

c. Assess the sensitivity of the receptors;

d. Combine magnitude of effect and sensitivity of receptor in to a single significance of effect;

e. If significance is elevated, review opportunities to mitigate the effects.

Screening Test

14.3.3 The Institute of Environmental Assessment (IEA) Guidelines suggest that two broad rules of thumb can be used as a screening process to delimit the scale and extent of the assessment. These are:

- **Rule 1** - Include highway links where traffic flows would increase by more than 30 % (or the number of HGVs would increase by more than 30 %)
- **Rule 2** - Include any other specifically sensitive areas where traffic flows would increase by 10 % or more. (IEA Guidelines Paragraph 3.20 defines sensitive area as including "*accident blackspots, conservation areas, hospitals, links with pedestrian flows etc*.")

14.3.4 Where the predicted increase in traffic flow is lower than these thresholds, the significance of the effects can be stated to be so low as not to warrant further assessment.

14.3.5 These guidelines are intended to be used for the assessment of the environmental impact of road traffic associated with major new developments. The assessment is therefore more pertinent to the operational phase of the proposed Development than the construction phase. However, they are used here to assess the short term transport flow during construction.

14.3.6 The matrix shown in Table 14.1 below has been used for traffic assessment.

Table 14.1: Significance criteria

Rule 1	Rule 2	Further assessment required
Yes	Yes	Yes
Yes	No	Yes
No	Yes	Yes
No	No	No

Magnitude of Effect

14.3.7 The magnitude of traffic effects is a function of the existing traffic volumes, the percentage increase due to the proposals, the changes in type and the temporal distribution of traffic. The criteria for the magnitude of change due to the increase in traffic volumes are outlined in Table 14.2 below.

Table 14.2: Definitions of 'magnitude' of change

Magnitude	Criteria	Percentage Increase
High	Total loss or major alteration to key elements/features of the baseline conditions	>90 %
Medium	Partial loss or alteration to one or more key elements/features of the baseline conditions	60-90 %
Low	Minor shift away from baseline conditions	30-60 %
Negligible	Very slight change from baseline conditions	<30 %

Assessment of Sensitivity

14.3.8 When judging upon the sensitivity of the road to the proposed temporary increase in traffic movements associated with the proposed Development construction, a variety of considerations were taken into account including classification of the road, proximity of schools, housing and local amenities and existing traffic management (e.g. roundabouts, passing places, etc.).

14.3.9 The sensitivity of the roads used for this project have been assessed in accordance with the IEA Guidelines and although not providing specific criteria for evaluating sensitivity, for the purpose of this assessment, a scale of 'low', 'medium' and 'high' has been used.

14.3.10 The assessment has considered three categories of receptors, which consist of:

- Public road network and road users;
- Local settlements along the proposed access route(s); and
- Road structure.

14.3.11 The effects on the proposed route and surrounding communities have been assessed with regards to severance, driver and pedestrian delay, safety, pedestrian amenity and fear and intimidation, in line with the IEA Guidelines. The effects of factors such as noise and ecological impact are assessed in Chapter 11: Noise and Chapter 7: Ecology, of the ES respectively.

14.3.12 The categories of receptor and assessment criteria are shown in Table 14.3 below.

Table 14.3: Receptor Grouping and Sensitivity Criteria

Receptor	Low	Medium	High
1. Public Road Network and Users	Major highways with no junctions, such as motorways, or a road network with suitable capacity to absorb an increase in traffic.	Road networks with some capacity to absorb an increase in traffic.	Road network with little or no capacity to absorb an increase in traffic.
2. Local Settlements	Local settlements with no requirement for direct pedestrian access to the road.	Local settlements with adequate pedestrian provisions.	Local settlements with narrow or no pedestrian provisions, near to sensitive locations such as hospitals, retirement homes, schools, places of worship, public open spaces and tourist attractions.
3. Road Structure	Major highways or roads with no obvious physical defects.	Regional highways or roads with some minor physical defects.	Local roads with some physical defects or local roads, infrequently maintained with re-occurring physical defects.

Assessment of Significance

14.3.13 The magnitude and sensitivity can be combined to synthesise the level of significance of the effect. Further details are given in Chapter 5: EIA Process, of the ES and are described in Table 14.4.

Table 14.4: Significance matrix

SIGNIFICANCE MATRIX			
MAGNITUDE			
High	Moderate	Moderate/Major	Major
Medium	Minor/Moderate	Moderate	Moderate/Major
Low	Minor	Minor/Moderate	Moderate
Negligible	Negligible/Minor	Minor	Minor/Moderate
	Low	Medium	High
			SENSITIVITY

Note: Only **Major** and **Moderate/Major** significances are considered here to be significant in terms of the EIA Regulations

14.4 STUDY AREA AND ROUTES TO SITE

14.4.1 ES Figure 14.1 in Volume 3 of the ES shows the geographic location of the proposed Development in relation to the road network. The key roads in the study area are also shown diagrammatically in ES Figure 14.2 in Volume 3 of the ES.

14.4.2 ES Figure 14.1 in Volume 3 of the ES illustrates the road network around and leading to the proposed Development, and two potential transport routes for reaching the proposed site (a "northern'' route and a "southern" route). The preferred route for the major component deliveries (i.e. the northern route) is as follows:

- Approach along A77 trunk road from the north;
- Leave the A77 south east of Ayr on to A713;
- Follow A713 for approximately 30 km until reaching Brockloch, north west of Carsphairn Village;
- Leave the A713 and continue on the proposed Development's access track.

14.4.3 The majority of turbines are currently imported into the UK; at this stage the delivery port has not been confirmed however it is expected that the Port of Ayr will be used. The final decision on port selected will depend on commercial availability and will be chosen in consultation with the turbine manufacturers and statutory consultees.

14.4.4 It is noted that other commercial traffic to the site (HGV and LGV) as well as site operative's cars, may also use these roads.

14.4.5 The southern route which has been identified for use by non-abnormal HGV deliveries, LGV's and cars is as follows:

- Approach along A713 from the south;
- Follow A713 for approximately 45 km until reaching site entrance at Brockloch;
- Leave the A713 and continue on the proposed Development's access track.

14.4.6 As well as the routes identified above, other roads within the area may be used during the construction and operation of the proposed Development. Where possible for LGV's and cars, routes other than the A713 would be discouraged. If other routes are used, the number and frequency of additional traffic on these routes is expected to be negligible. For HGV's delivering goods to site, the Traffic Management Plan (TMP) will specify use of the A713 and AIL deliveries will follow the route as shown in ES Figure 14.1 in Volume 3 of the ES.

14.5 BASELINE CONDITIONS

Road Description

A77

14.5.1 The A77 is part of the trunk road network, stretching for approximately 100 km from Junction 8 of the M77 at Fenwick, East Ayrshire to Stranraer, Dumfries and Galloway and is the main route from Ayr to the south west of Scotland, passing through Maybole, Girvan, Ballantrae and Cairnryan before reaching Stranraer. The A77 falls under the control of Transport Scotland and is managed and maintained by Scotland Transerv, which took over the maintenance contract from the 1st April 2013, succeeding Amey which previously held the contract. The majority of the A77 is a single carriageway with a small section of dual carriageway, approximately 27 km long, from Fenwick to Whitletts roundabout north east of Ayr.

14.5.2 Due to the high capacity of the A77 any increase in traffic caused by the proposed Development is expected to have negligible impact and thus has not been assessed further.

A713

14.5.3 The A713 is a generally well maintained single carriageway road running for approximately 80 km from Ayr to Castle Douglas, Dumfries and Galloway and is an agreed haulage route for timber transport.

14.5.4 **A713 (north)**: The section of the A713 utilised for access from the north to the proposed Development is approximately 30 km from the A77/A713 junction at Bankfield Roundabout to Brockloch, which lays approximately 5 km North West of the village of Carsphairn. This section of road passes through two populated areas on route, namely Patna and Dalmellington. The route has previously been used for the delivery of wind turbine components and further use is proposed by other consented projects within the area.

14.5.5 **A713 (south)**: The section of the A713 utilised for access from the south is approximately 45 km long, from the A75 at Castle Douglas to the site entrance outside Carsphairn. This route passes through several small villages and hamlets, the largest being St John's Town of Dalry.

Traffic on the Network

14.5.6 Data for the baseline traffic counts on the A713 were taken from the Department for Transport's online traffic count database. The locations considered are shown in ES Figure 14.1 and 14.4 in Volume 3 of the ES.

Table 14.5: Annual Average Daily Traffic for 2013 (latest records)

Location	Description of location	Coordinates of location	Annual Average Daily Traffic (Total Traffic)	Annual Average Daily Traffic (AADT) (HGV Traffic)
1	A713 (Ayr Hospital)	NS 36430 18500	3605	206
2	A713 (Patna)	NS 41750 11200	3605	206
3	A713 (Dalmellington)	NS 49300 04200	1513	157
4	A713 (Carsphairn)	NX 54800 95350	1203	142
5	A713 (St John's Town of Dalry)	NX 60900 83300	1130	124
6	A713 (Mosscroft)	NX 65000 75500	1633	152
7	A713 (Castle Douglas)	NX 74280 64760	3334	165

14.5.7 Broad comments from the traffic data are as follows:-

- Moving east along the A713, the traffic flows diminish from around 4000 vehicles per day (VPD) near Ayr to around 1000 VPD near New Galloway. This is to be expected, as traffic from the more intensely developed areas north west and south east of the study area arrives at the various destinations along the A713, or turns off at successive junctions.
- Similarly, the traffic volumes near Dumfries diminish moving north towards the site for the same reason.
- There is a relatively consistent level of HGV traffic along the A713 from the A77 to the A75. This demonstrates that the entirety of the A713 experiences reasonably high levels of baseline HGV traffic, likely due to the timber wagons highlighted in Paragraph 14.5.3.

14.6 TRAFFIC GROWTH

14.6.1 The traffic figures detailed in Table 14.5 above show the flow of traffic for 2013 and have not been adjusted for potential increases in baseline traffic conditions from 2013 to 2018, the proposed year of construction. For this assessment, the figures detailed will be used in their unaltered form. This is a conservative approach, as it will over-estimate the percentage increases in traffic flows due to the proposed Development.

Traffic Movements

14.6.2 The traffic movements to and from the proposed Development have been detailed in Table 14.8 below. It is important to note that each vehicle travelling to the site will generate two "vehicle movements"; one movement to the proposed Development and one movement away from the proposed Development i.e.:

1 delivery to the proposed Development = 2 vehicle movements

Construction Period

14.6.3 A programme of construction activities has been included in Chapter 4 of the ES.

14.6.4 Vehicles and equipment would be delivered to site at the commencement of the relevant construction phase and would remain on site until work relating to that stage was completed. Such equipment would include cranes for erecting the turbines and excavators for cable installation and foundation excavation. An indicative list of the equipment needed is given in Chapter 4: Description of Development, of the ES.

14.6.5 Most vehicles used during the construction activities would be below the width requirement for wide loads, with the exception of the turbine deliveries (nacelle, tower sections and blades) and possibly the main and tailing cranes that would be used for the erection of the turbines. The local roads authority and local constabulary may consider a police escort necessary for some abnormal loads, depending on conditions on the proposed access route and the size of the loads. The cranes are likely to require only a single journey along the public highway to and from the proposed Development. Road axle weights would not exceed regulated levels unless agreed with the relevant authorities.

14.6.6 Indicative HGV traffic loads for the various phases of the construction operations are as follows:

- **Site Tracks, Construction Compound and Crane Pads (Earthworks):** It is envisaged that the road stone for the site tracks and construction compound would come from on-site borrow pits and if required additional borrow pit potential search areas and would be transported around site using dump trucks. The dump trucks would be delivered to site where they would remain until the end of the construction period. Up to 4 dump truck deliveries would therefore be required. It is anticipated that up to 5 excavators could be on-site: excavating stone, excavating for tracks, placing of stone for tracks and crane pads, excavating foundation, back filling foundations and reinstatement works.
- **Turbine and Transformer Foundations:** Based upon a typical foundation design, and assuming in worst case concrete is not batched on-site, approximately 2000 concrete wagon deliveries would be required for all turbines. Each turbine foundation would also require 5 articulated trailer loads of steel reinforcements giving a total of up to 100 additional deliveries.
- **Turbine Delivery and Erection:** For the size of turbines being considered for the site, blades would need to be transported one per trailer load and towers would be delivered in up to four separately transported sections. Nacelles and hubs would be delivered one per trailer. Between one and two curtain trailers for items that would be fitted within the turbines would also be required. Together these movements could constitute up to 240 deliveries to the site (480 movements). Some 10 further low loader deliveries would be required for the transformers and ancillary electrical equipment (20 movements). Crane delivery would require up to approximately 46 movements to site. The main crane would require approximately 10 vehicles for delivery (a total of 20 movements), and the two smaller, tailing cranes up to 5 vehicles each for delivery (a total of 20 movements). One erection team would be likely to be operating at any one time.
- **Cable Installation:** Approximately 27 low loader deliveries (54 movements) would be needed to transport the necessary cabling to site for on-site cabling requirements. A further 461 deliveries (992 movements) would be required for sand used for bedding the cable trenches.
- **Transport of site personnel:** Approximately 20-40 car/van journeys per day would be required for the relevant personnel employed in the construction of the proposed Development and any small deliveries.

Operational Period

14.6.7 Limited traffic movements would be necessary on an irregular basis throughout the operational life of the proposed Development which would consist almost entirely of cars or vans servicing the turbines, with the exception of infrequent major maintenance events that would require mobilisation of crane(s) and, in the case of unforeseen component failure, possible single turbine component deliveries.

Decommissioning Period

14.6.8 All turbine components would be removed from the site and potentially the upper levels of the foundations. Traffic movements would therefore comprise the same unusual loads as for the construction period but less ordinary HGV movements since much of the foundation would be likely to remain in the ground. The method of decommissioning would be agreed with the relevant planning authority as outlined in Chapter 4: Description of Development, of this ES.

14.7 GENERATION OF TRAFFIC MOVEMENTS

14.7.1 The increase in traffic movements that would be generated by the proposed Development have been assessed against the traffic flow figures from the A713 until reaching site.

14.7.2 The construction of the proposed Development is estimated to lead to around 3209 deliveries (6418 movements) by HGVs and 4315 deliveries (8630 movements) of light personnel and delivery vehicles over the proposed 15 month period (see Table 14.8). An over-simplified way of assessing the increased traffic would be to divide the total number of vehicle movements by the number of construction months, but as the chart below shows, the average daily flow of traffic generated by the construction would vary over the suggested time period. Therefore the distribution of traffic has been calculated in relation to the proposed construction programme, taking account of the division of different construction activities. For the purpose of this assessment, traffic flows in month 10 have been used, as these reflect the highest predicted increases throughout the construction period.

14.7.3 Prior to the construction phase of the proposed Development there is a requirement for clearance of forestry to enable construction phase activities to commence. Due to the development of the wind farm, the normal forestry extraction timetable would be condensed, thus increasing the number of forestry vehicles on the public road during the construction phase. The increased forestry traffic flow as a direct result of the proposed Development has been assessed along with the wind farm construction traffic to determine the impact on traffic flows on the public road network.

14.7.4 The forestry extraction figures provided by DGA Forestry, included in Technical Appendix 14.1: Forestry Extraction Figures in Volume 4 of the ES, show the vehicle movements over 5 year felling periods. The construction of the wind farm falls within the 2017-2021 felling period and in consultation with DGA Forestry an agreed average monthly figure has been used in this assessment to determine the impact on traffic flows.

14.8 ASSIGNMENT OF TRAFFIC TO NETWORK

14.8.1 Other than the turbine deliveries it is not possible to identify the traffic route for every vehicle wishing to reach the proposed Development; however noting the location of quarries for supply of ready-mix concrete it is assumed that all the HGV traffic (excluding those associated with turbine deliveries) will come from either the north or the south, along the A713. For the purpose of this assessment, and to show a worst case scenario, an over prediction of traffic has been assigned to each route. Firstly it has been assumed that 100 % of predicted non-AIL HGV daily traffic (80 % of total HGV daily traffic) and 100 % of AADT will come from the south. Secondly it has been assumed that 100 % of predicted daily HGV traffic (including AIL's) and 100 % of AADT will come from the north. These assumptions are shown diagrammatically in ES Figure 14.5 in Volume 3 of the ES. These assumptions should lead to the traffic assessment being an overestimate of the impact on the road sections identified by the proposed routes. It is expected that a further reduction in impact will be seen as a result of many of the personnel that would be working on-site staying locally and some of the smaller deliveries and construction plant could come from local suppliers.

14.8.2 This assessment assumes that all the stone for access tracks and crane hardstandings will be sourced from onsite borrow pits or if required additional borrow pit potential search areas. This assumption is based on experience gained from the previous developments and through the identification of new borrow pit areas for the proposed Development.

14.8.3 As stated above, it is also assumed that ready-mix concrete will be utilised for turbine foundations. However onsite batching will also be considered and used if suitable, which would reduce the vehicle movements stated in Table 14.8 below.

Average daily vehicle movements over a typical 15 month construction period

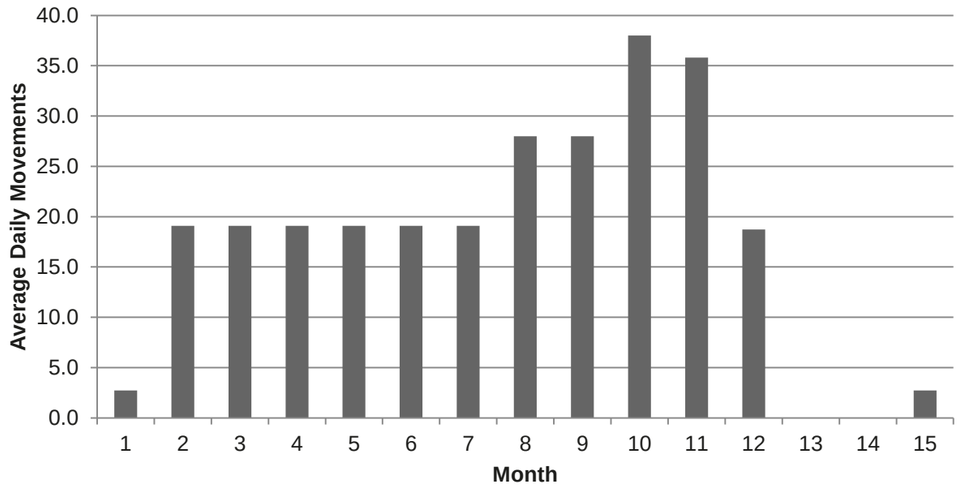

Table 14.8: Predicted vehicle movements during the construction period

Activity	Month															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
Heavy Goods Vehicles Movements (including abnormal loads)																
Wind Farm Timber Extraction	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	510
Mobilisation to site	60									46						106
Access and site tracks	Stone sourced from onsite borrow pits will be utilised for tracks and crane hardstandings															0
Crane Hard-Standing																0
Turbine foundations		420	420	420	420	420	420	420	420	420	420					4200
Substation	Existing substation will be used															0
Cabling								196	196	196	194	194				976
Turbine transformers										14	14	12				40
Turbine deliveries										160	160	160				480
Demob / Site clearance												46			60	106
Monthly Totals	94	454	454	454	454	454	454	650	650	870	822	446	34	34	94	6418
Light Vehicle Movements (car, minibuses and small van deliveries)																
	458	678	678	678	678	678	678	678	678	458	458	458	458	458	458	8630
Monthly Totals	552	1132	1132	1132	1132	1132	1132	1328	1328	1328	1280	904	492	492	552	

Average Daily Movements (assumes 5 working days per week)	25.1	51.5	51.5	51.5	51.5	51.5	51.5	60.4	60.4	60.4	58.2	41.1	22.4	22.4	25.1
Average Daily HGV Movements (assumes 5 working days per week)	4.3	20.6	20.6	20.6	20.6	20.6	20.6	29.5	29.5	39.5	37.4	20.3	1.5	1.5	4.3

14.9 IMPACT OF CONSTRUCTION TRAFFIC

Impact on the A713 during Construction

14.9.1 Table 14.9 below shows the increase in traffic for location 1 to 7 when using baseline traffic information for 2013 and the estimated daily traffic flow for the proposed Development.

Table 14.9: Estimated daily traffic increases on the A713 (Location 1 - 7) (see ES Figure 14.1 in Volume 3 of the ES)

	Calculated Traffic flow (2013)	Estimated traffic increase	Increased Traffic flow	% increase	Calculated HGV flow (2013)	Estimated HGV increase	Increased HGV flow	% increase
Location 1	3605	61	3666	1.7	206	40	246	19.4
Location 2	3605	61	3666	1.7	206	40	246	19.4
Location 3	1513	61	1574	4.0	157	40	197	25.5
Location 4	1203	61	1264	5.1	142	40	182	28.2
Location 5	1130	61	1191	5.4	124	32	156	25.8
Location 6	1633	61	1694	3.7	152	32	184	21.1
Location 7	3334	61	3395	1.8	165	32	197	19.4

14.9.2 Assessing against the sieving criteria in Table 14.1 above (Screening Test) for all locations, neither Rule 1 nor 2 is breached as the increase in HGV traffic is no greater than 30 % and overall traffic flows are no greater than 10 % in sensitive areas. Accordingly the overall significance of impact on the route at all locations is **Negligible/Minor**. Therefore a more detailed assessment is not warranted.

Operational Period

14.9.3 Through the operational life of the proposed Development there would be irregular and limited traffic movements consisting almost entirely of cars or vans that would be required for the service and maintenance of the site. The number of vehicle movements during operation is infrequent and of a very low number such that the magnitude of their impact is considered to be negligible, leading to **Negligible Significance**, when assessed using the significance criteria. The developer would encourage the wind farm operators to be aware of any local road sensitivities. During any major repair works required (e.g. to one of the turbines) cranes and HGV vehicles may need to visit site. Due to the low number of vehicle required this would still be considered to be of **Negligible Significance**.

Decommissioning Period

14.9.4 The HGV traffic intensity using the public roads during the decommissioning period is likely to be similar to that shown for the decommissioning phase for the operational project, with all turbine components including blades, nacelles and towers being removed from the site. As mentioned, it is likely that the bulk of the foundations would be left in situ, with only the upper parts being removed from the site, the ordinary HGV traffic to and from the site will be less than during the construction period. The decommissioning would be likely to take place over a similar time period shown. Baseline traffic flows on all of the affected roads may have altered by the end of the 25 year lifetime of the proposed Development leading to the possibility of a different impact on the roads for HGV traffic. It is envisaged that the decommissioning would result in lesser impacts than those identified for this assessment and would thus have a **Negligible Significance**. Decommissioning would be managed in accordance to a decommissioning plan to be agreed with relevant parties at the time.

14.10 CUMULATIVE IMPACT ASSESSMENT

14.10.1 Other development in the areas served by the roads assessed herein may generate their own construction, operational and decommissioning traffic (new urban development, shopping centres, quarries, forestry, etc.). Since the greatest changes in traffic associated with the proposed Development will occur during the construction phase, it would typically be similar types of construction activity that could potentially generate traffic that adds to that of the proposed Development.

14.10.2 The proposed Development would be located in an area where there are a number of other wind farm developments proposed. It is known that several other wind farms have a grid connection date similar to that of the proposed Development.

14.10.3 It is not possible to determine exactly if or when these proposed developments may be constructed, or their programme and phasing of operations. However, given the similarity in grid connection date, it is likely that several of these may require to be constructed concurrently.

14.10.4 If similar operations (such as import of rock, concrete or turbine components) were to occur concurrently, the traffic effects on these routes would rise. However, the above detailed assessment of traffic effects due to the proposed Development concluded that all traffic effects were predicted to be Negligible (and below the thresholds for significance in EIA terms). It is considered that there is therefore considerable “headroom” in the capacity of the receptors to accommodate these short term rises in traffic flows.

14.10.5 If the construction of another wind farm site were to coincide with that of the proposed Development and was considered to have an unacceptable joint impact, then discussions would be held between developers and other relevant parties (in conjunction with the Roads Authority) prior to the commencement of the projects, with a view to mitigating any such effects. The measures to be adopted would be enshrined in a robust updated Traffic Management Plan applying to each developer, to ensure that any cumulative effects were avoided (e.g. by staging of deliveries and construction phasing).

14.11 GOOD PRACTICE DURING CONSTRUCTION

Good Practice

14.11.1 Although we are not showing significant impacts during construction it is important to keep the local residents and people visiting the area informed of potential traffic issues that may delay or otherwise affect their journey. Typically, the slower turbine delivery vehicles would have the largest effect on other road users. The following measures are considered good practice in the construction of any wind farm project:

- HGV deliveries including concrete and turbine components would be instructed to avoid school drop off and pick up times.
- During turbine delivery phase, leaflets would be posted in local shops and distributed to houses along the delivery route.
- Identify stopping points along the transport route where slower turbine delivery vehicles can pull over to allow queued traffic to pass.
- Arrange for adequate wheel washing facilities, to allow construction vehicles to clean their wheels before entering onto the public road. Arrange road cleaning vehicle to keep the public road free of mud.

- To reduce air pollution make sure that all construction vehicles are adequately maintained to comply with exhaust emission requirements and are switched off when not in use. Encourage the use of minibuses and car-sharing for personnel transport.
- To reduce noise and vibration disturbance, arrange the transport of heavy loads at times of least sensitivity e.g. not in the evening, or night time deliveries through residential areas.
- To reduce risk to pedestrians and road users, abnormal loads should be adequately escorted and appropriate traffic management and signage used.
- It is important that the local council road department is consulted on all transport issues and to make sure that deliveries do not conflict with other scheduled road works.
- As the number of vehicles required during normal operation and maintenance is not significant, no mitigation measures are proposed. If during the operation period major repair works are required then the good practice measures proposed for the construction period should be reviewed.
- When the method of decommissioning is agreed with the relevant parties for the proposed Development, road traffic impacts should be re-assessed and mitigation measures agreed, if required.

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Author	Mark Kummerer	08/01/2015
Checked	Marie Scaife/Emily Peaston	23/03/2015
Approved	Euan Hutchison	24/03/2015

Client Details	
Contact	Gareth Swales
Client Name	Brockloch Rig III Ltd
Address	c/o Fred. Olsen Renewables Ltd

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BROCKLOCH RIG III

Chapter 15

Socio-economic and Tourism Assessment

Contents

Glossary

Term	Definition
National Scenic Area	A national scenic area (NSA) is a conservation designation used in Scotland, and currently administered by Scottish Natural Heritage.
Present Windy Standard Developments	The 'present Windy Standard Developments' refers collectively to the existing Windy Standard and the under construction Windy Standard II Wind Farms
The proposed Development	The proposed Windy Standard III Wind Farm
The proposed Development Area	The project development area within the site boundary which is subdivided into the Meaul Hill Cluster and Waterhead Hill Cluster

List of Abbreviations

List and describe your abbreviations here.

Abbreviation	Description
CAS	Census Area Statistics
DD&G	Destination Dumfries and Galloway
DECC	Department of Energy and Climate Change
DGC	Dumfries and Galloway Council
DG-REP	Dumfries and Galloway Renewable Energy Partnership
EIA	Environmental Impact Assessment
FC	Forestry Commission
GES	Government Economic Strategy
GROS	General Register Office for Scotland
GVA	Gross Value Added
HMA	Housing Market Area
IEMA	Institute of Environmental Management and Assessment
JSA	Jobseeker Allowance
KPIs	Key Performance Indicators
LDP	Local Development Plan
LEF	Local Economic Forum
MW	Megawatt
NMS	National Museums Scotland
NSAs	National Scenic Areas
NTS	National Trust for Scotland
SIMD	Scottish Index of Multiple Deprivation
SIMD2009	Scottish Index of Multiple Deprivation 2009
SG	Supplementary Guidance
SNH	Scottish Natural Heritage
SPP	Scottish Planning Policy
SUSTRANs	Sustainable Transport
TTWA	Travel To Work Area
UNESCO	United Nations Educational, Scientific and Cultural Organization
ZTV	Zones of Theoretical Visibility

15.1 INTRODUCTION

15.1.1 This Chapter has been compiled by MKA Economics. It assesses the predicted socio-economic and tourism impacts of Windy Standard III (the proposed Development).

15.2 SCOPE OF THE ASSESSMENT

15.2.1 This assessment has employed appraisal techniques consistent with environmental impact guidance published by the Institute of Environmental Management and Assessment[1] (IEMA) and Scottish Natural Heritage[2] (SNH). The assessment also draws on guidance and assumptions from Scottish Enterprise[3] and RenewableUK[4] economic impact guidance.

15.2.2 This assessment calculates both construction and operational employment associated with the proposed Development, and the economic impact this would have on the local and national economies. The assessment also reviews the potential effects on the tourism sector as a result of the proposed Development.

15.2.3 The methodology adopted in this assessment has involved the following key stages:

- Determine baselines;
- Review development for impacts;
- Evaluate significance;
- Identify mitigation; and
- Assess residual impacts.

15.2.4 The assessment presents impacts across the stages of the wind farm lifecycle, which involves two main stages:

- Construction; and
- Operations and maintenance.

15.2.5 Each phase will generate impacts at various spatial levels, including local and national economies. Each phase is introduced in more detail in Table 15.1 below.

Table 15.1: Wind Farm Lifecycle

Phase	Components
Construction	Turbine manufacture; including the tower, blades and internal components; Balance of plant; including activity and supplies required to install completed turbines; and Grid connection; including connection of installed turbines to the electricity grid.
Operations and Maintenance	Turbine maintenance; such as turbines that are operated and maintained by the turbine manufacturer for a warranty period or those maintained by contract or by technicians working for the owner of the wind farm. Site maintenance; including routine tasks such as maintaining site access tracks and bridges, maintaining drainage ditches and repairing gates and fences.

15.2.6 Pre-construction effects, or development effects, have not been assessed as this phase has already commenced and these effects have been summarised as 'wider impacts' in the Summary Section below. However, it should be noted that the Applicant has made extensive use of Natural Power and other local contractors throughout the development phase and as such has already had a notable level of local benefit.

15.2.7 Similarly, decommissioning effects have not been assessed due to the difficulty in accurately predicting the future value of such effects, these are also summarised as 'wider impacts'.

15.2.8 Economic effects can be expected during the construction and operational phases of the proposed Development. These effects will differ in their scale, duration and geographic coverage. Potential effects can be split into expenditure, employment and ultimately economic (in terms of Gross Value Added, or GVA) impact. These are presented in the following sub sections.

15.2.9 In addition this Chapter provides an assessment of the effect on the visitor economy as a result of the proposed Development.

15.2.10 Wider impacts are also addressed; these include other notable impacts on local economy including the pre-development and EIA stages including the employment of Natural Power Consultants (Natural Power) as a local EIA contractor and other local consultants and services including DGA Forestry located in Dumfries, W.J. Bone located in the nearby village of St John's Town of Dalry and Alba Printers Ltd located in Dumfries.

15.2.11 In line with the EIA process set out in Chapter 5: EIA Process, of the ES, to determine the significance of a potential residual effect, the magnitude of change arising from the proposed Development is correlated with the 'sensitivity' of the particular environmental attribute under consideration. Magnitude of change is evaluated in accordance with the definitions set out in Table 15.2 below.

15.2.12 The assessment process aims to be objective and quantifies effects as far as possible; however some effects can only be evaluated on a qualitative basis.

Table 15.2: Definitions of 'magnitude' of change for Socio-Economic and Tourism Assessment

Effect	Description
High	Total loss or major alteration to key elements/features of the baseline (i.e. pre-development) conditions.
Medium	Partial loss or alteration to one or more key elements/features of the baseline (i.e. pre-development) conditions.
Low	Minor shift away from baseline (i.e. pre-development) conditions.
Negligible	Very slight change from baseline (i.e. pre-development) conditions.

15.2.13 Where applicable, in carrying out individual assessments, a scale of increasing 'sensitivity' of the environmental or social receptor is defined. This may be defined in terms of quality, value, rarity or importance to other elements, and be classed as low, medium, or high. Table 15.3 provides an example table to illustrate this concept.

Table 15.3: Examples of Sensitivity for Socio-Economic and Tourism Assessment

Effect	Description
High	Elements of international / national importance generally designated for protection through national legislation / policy

[1] Institute of Environmental Management and Assessment, 2004, Guidelines For Environmental Impact Assessment

[2] Scottish Natural Heritage, A handbook on environmental impact assessment, 2009

[3] Scottish Enterprise, Additionality & Economic. Impact Assessment. Guidance Note, 2008, http://www.scottish-enterprise.com/~/media/SE/Resources/Documents/ABC/additionality-and-economic-impact-assessment-guidance.pdf

[4] RenewablesUK, Onshore Wind: Direct and Wider Economic Benefits, 2012, http://www.renewableuk.com/en/publications/index.cfm/BiGGAR

Effect	Description
Medium	Elements of regional / local importance that are not designated but are generally protected by local policy
Low	Elements of local value that can generally tolerate change

15.2.14 For certain assessment areas, guidance can be taken from the value attributed to elements through designation or protection under law, i.e. landscapes or ecological resources given various levels of protection under planning law. Where assessment of this nature has taken place, the correlation of magnitude against 'sensitivity' determines a qualitative expression for the significance of the effect. This is demonstrated in Table 15.4.

Table 15.4: Significance Matrix for Socio-Economic and Tourism Assessment

MAGNITUDE OF CHANGE			
High	Moderate	Moderate/Major	Major
Medium	Minor/Moderate	Moderate	Moderate/Major
Low	Minor	Minor/Moderate	Moderate
Negligible	Negligible/Minor	Minor	Minor/Moderate
	Low	**Medium**	**High**
			SENSITIVITY OF RECEIVING ELEMENT

15.2.15 Although significance is usually assessed in terms of varying degrees, those effects indicated as 'major' and 'moderate/major' are likely to be regarded as being equivalent to 'significant effects' when discussed in terms of the EIA Regulations.

15.3 POLICY CONTEXT

National Economic Policy Context

15.3.1 The Scottish Government replaced the Government Economic Strategy (GES) in 2015 with Scotland's Economic Strategy (Scottish Government, 2015, http://www.gov.scot/Publications/2015/03/5984). The strategy sets out *"an overarching framework for a more competitive and a fairer Scotland and identifies four broad priority areas where our actions will be targeted to make a difference.'* The strategy is built on two key pillars, namely *'tackling inequality'* and *'increasing competitiveness".*

15.3.2 The strategy framework is structured around four broad priority areas, where Scottish Government actions will be targeted; these are (1) investment (2) innovation (3) inclusive growth and (4) internationalisation. Within *"investment"* there is a commitment to *"invest in Scotland's infrastructure to help Scottish businesses to grow, innovate, and create good quality employment opportunities'* and also to *'prioritise investment to ensure that Scotland protects and nurtures its natural resources and captures the opportunities offered by the transition to a more resource efficient, lower carbon economy".* The proposed Development directly supports both these commitments.

15.3.3 The Scottish Government is also committed to foster a culture of "*innovation"* through supporting the development of highly innovative businesses across the Scottish economy. To support "*inclusive growth"* the Scottish Government understand the importance of realising opportunities across Scotland's cities, towns and rural areas through capitalising on local knowledge and resources to deliver more equal growth across the country. The strategy also prioritises the importance of "*inward investment and internationalisation"*, and the Scottish Government seeks to create the conditions which will continue to make Scotland a major destination for investment.

15.3.4 The proposed Development directly supports both pillars of the strategy and each of the broad priority areas set out in the new economic strategy.

15.3.5 The Scottish Government has developed a refreshed Routemap for Renewable Energy[5] which sets policy framework to deliver energy targets by 2020. The updated and expanded Routemap reflects the challenge of the Scottish Government's new target to meet an equivalent of 100 % demand for electricity from renewable energy by 2020 with an interim target of 50 % by 2015, as well as the target of 11 % renewable heat. The Routemap identifies a number of challenges, including the need to continue to streamline systems and work for greater speed and transparency, without sacrificing proper consideration of the impacts on the local environment. Similarly, the Routemap identifies the scale of the economic opportunity and that Scotland's workforce needs to be prepared to meet the opportunities that will emerge, with up to 40,000 jobs predicted to be created in the renewables sector by 2020.

National Tourism Policy Context

15.3.6 The national tourism strategy[6] confirms the importance of tourism to Scotland's economy and emphasises the resilience of the sector in recent times. However, it cautions that Scotland must remain competitive, by developing and changing to retain visitors in order to prevent losing visitors to other tourism destinations. The mission is for the industry as a whole to break from the status quo and achieve an overnight visitor spend of between £5.5bn and £6.5bn by 2020, generating an additional £1bn or more (at 2011 prices).

15.3.7 A Tourism Development Plan for Scotland[7] has been developed to set out the framework to assist and promote growth in Scotland's visitor economy to 2020. It supports the national tourism strategy by the Scottish Tourism Alliance. The Tourism Development Plan for Scotland sets out a much broader development strategy and proposals across a wider agenda, highlighting the important role played by local partners, notably Area Tourism Partnerships and local authorities.

National Planning Policy Context

15.3.8 The new Scottish Planning Policy (SPP)[8] was published on the 23rd June 2014 and is a statement of Scottish Minister's priorities and will be a material consideration for determining this application.

15.3.9 The SPP highlights that the planning system is essential to achieving the government's central purposes of increasing sustainable economic growth, with regard to principles of sustainable development as outlined in the Planning etc. (Scotland) Act 2006.

15.3.10 The new SPP also introduces a presumption in favour of development that contributes to sustainable development, however to achieve the *"right development in the right place"* development plans, policies and decisions that consider onshore wind should give due weight to net economic benefit and respond to economic issues, challenges and opportunities, as outlined in local economic strategies whilst weighing these impacts against other considerations such as the support of the delivery of energy infrastructure, support of climate change mitigation and adaptation, the principles for sustainable land and avoidance of over-development and protection of the amenity of new and existing development.

15.3.11 The new SPP states that the planning system should *"take every opportunity to create high quality places by taking a design-led approach".* The SPP aims to achieve this through the use of a *"holistic approach that responds to and enhances the existing place while balancing the costs and benefits of potential opportunities*

[5] Scottish Government, 2020 Routemap for Renewable Energy in Scotland - Update, 2013, http://www.scotland.gov.uk/Resource/0044/00441628.pdf

[6] Scottish Tourism Alliance, The National Strategy: Tourism 2020, 2012, http://scottishtourismalliance.co.uk/wp-content/uploads/2013/03/Scottish-Tourism-Strategy-TourismScotland2020.pdf

[7] VisitScotland, Tourism Development Plan, 2013, http://www.visitscotland.org/pdf/Tourism%20Development%20Plan%20for%20Scotland_VisitScotland_efile.pdf

[8] Scottish Planning Policy, available online from: http://www.scotland.gov.uk/Publications/2014/06/5823 (last accessed 08/01/2016)

over the long term". This holistic approach considers the relationships between the four outcomes of the new SPP:

- A successful, sustainable place;
- A natural, resilient place;
- A connected place; and
- A low carbon place.

15.3.12 Those subject policies that are relevant to this Chapter are outlined below.

A Successful, Sustainable Place

15.3.13 The SPP recognises the importance of supporting sustainable economic growth and regeneration, setting out the role that the Scottish Government expects the planning system to play in the sustainable economic growth of Scotland.

Rural Development

15.3.14 The overall approach advocated in the SPP is that of a proactive stance to development in rural areas. The Planning System should:

"In all rural and island areas promote a pattern of development that is appropriate to the character of the particular rural area and the challenges it faces"; and

"Encourage rural development that supports prosperous and sustainable communities and businesses whilst protecting and enhancing environmental quality".

15.3.15 These themes are also to be found in *'A Forward Strategy for Scottish Agriculture'* published in 2001 and in the subsequently published *'Forward Strategy for Scottish Agriculture: Next Steps'* published in March 2006.

Valuing the Historic Environment

15.3.16 The SPP supports the recognition of the contribution made by cultural heritage to our economy, cultural identity and quality of life and describes the historic environment as a *"key cultural and economic asset and a source of inspiration that should be seen as integral to creating successful places"*. As such the planning system should:

- Promote the care and protection of designated and non-designated historic environments and their contribution to sense of place, cultural identify, social well-being, economic growth, and education;
- Change should be sensitively managed to avoid or minimise adverse impacts on the fabric and setting of designated and non-designated historic environments and ensure their character is protected, conserved or enhanced; and
- Those non-designated historic assets and areas of historic interest (historic landscapes, other gardens and designated landscapes, woodlands, etc.) should also be protected and preserved as far as possible, in situ wherever feasible.

Regional Economic Policy Context

15.3.17 A new Regional Economic Strategy for Dumfries and Galloway is in the process of being developed by Dumfries and Galloway Council (DGC). This will replace the current Economic Strategy, which was launched prior to the crises in the financial services sector and subsequent crash in 2008. The new economic strategy has not been launched, and therefore a review of the current economic strategy has been undertaken.

15.3.18 The strategy was developed by the Dumfries and Galloway Local Economic Forum (LEF) in 2008 and it presented a broad consensus as to the issues faced by the region's economy and focuses on achieving a few strategic objectives rather than a raft of smaller interventions. The regional strategy is closely aligned to the GES. Overall, the Regional Economic Strategy for Dumfries & Galloway aims to create *"An innovative and sustainable rural economy"*, which rewards residents with an outstanding quality of life and investors with a stimulating business environment. Supporting this overall vision are four main themes which are summarised in Table 15.5.

Table 15.5: Dumfries and Galloway Economic Strategy

Theme	Comment
Business Infrastructure	Importantly, this theme seeks to balance economic opportunities across the region and states *"a focus on rural development land based industries; renewables and rural industries; would be most appropriate and most likely to improve the competitiveness of local businesses."*
Growing Business	In keeping with the GES, this theme focuses effort on key growth sectors, in particular tourism, food and drink and renewables. This theme also seeks to enhance supply chain opportunities for local businesses from key sector growth.
Quality of Life	The strategy notes *"the natural environment is one of the region's key strengths. Environmental improvement, 'green-ness', avoidance of pollution promotion of sustainable economic growth are critical."* The proposed Development can add value by furthering the green credentials of the region.
Developing a competitive workforce	The strategy stresses the importance of matching the requirements of key sectors and the indigenous workforce, and states *"there are considerable opportunities to develop specialist courses related to Rural Development (land based industries, environmental studies, renewables, rural entrepreneurship, food studies, social-cultural-heritage disciplines)."*

Dumfries and Galloway Renewable Energy Partnership (DG-REP)

15.3.19 Dumfries and Galloway Council agreed a new Renewable Energy Action Plan in 2014. One of the main purposes of the action plan is to support local businesses as they develop capacity and skills to work on renewable energy projects. The support is designed to allow and encourage businesses in the region to grow and realise supply chain opportunities. To drive the action plan forward, a Dumfries and Galloway Renewable Energy Partnership (DG-REP) was been set up in March 2013. Members include Dumfries and Galloway College, Scottish Enterprise, Chamber of Commerce, Federation of Small Business, Skills Development Scotland, Job Centre Plus and a number of private organisations, including Natural Power.

15.3.20 The DG-REP key role is *to "provide a central point of contact and coordination of activities for all those with an interest in the development of all aspects of the renewable energy sector in the Dumfries and Galloway region"*[9].

15.3.21 The vision of DG-REP is to *"secure the maximum economic and employment benefits from the development of the renewable energy sector for the benefit of the region and its communities"*.

Key targets of DG-REP to be met by 2020 in Dumfries and Galloway include:

- 10 % increase in Gross Value Added (GVA); and
- 1,000 jobs created or safeguarded in the Renewables Sector.

15.3.22 Key priorities and actions that have been identified by DG-REP that fall under the key themes of communication, capacity building and partnership are summarised in Table 15.6 below.

[9] Dumfries and Galloway Renewable Action Plan, November 2013

Table 15.6: DG-REP Priorities and Actions

Theme	Priorities	Actions
Communication	Provision of information and coordination of activity; Mapping and promoting business capacity; Marketing opportunities through the use of supplier events; and Provision of local supply sourcing services / supplier database.	Website for the provision of information and marketing opportunities; Up skilling and training opportunities; Business directory; and Coordinated supplier events.
Capacity Building	Supporting Capacity building on the supply side, including referrals; and Reviewing and promoting opportunities or new skills development activity.	Business referral to relevant agencies; Supplier Development Training sessions; Single point of contact set up through website; Provision of technical information / signposting to support micro generation activity; and Accessing funds for renewable energy projects.
Partnerships	Developing new networks within the industry; Researching future opportunities; Providing a focus for economic / skills development support for community benefits income; and Driving policies and initiatives that support the sector.	DG-REP has made commitment to meet on quarterly basis; The role of the group is to focus on providing strategic leadership, oversight and support to the wide range of public and private sector organisations currently active in, or with a responsibility for, the sector; Developing the strategic framework and agreeing the priorities within an Action Plan format; and The Action Plan is to be reviewed by the Partnership on an annual basis to reflect progress and wider external changes.

Regional Tourism Policy Context

15.3.23 The Dumfries and Galloway Regional Tourism Strategy (2011 – 2016) was developed to support the national tourism strategy of increasing tourism revenues by 50 % in the period to 2015. In developing the Regional Tourism Strategy it became apparent that there was overwhelming support for the development of a private sector led organisation to further develop the sector within Dumfries and Galloway.

15.3.24 Destination Dumfries and Galloway (DD&G) was set up in 2010 and is the lead body for progressing the ambition set out in the strategy, namely *"To establish Dumfries and Galloway as a world-class destination in which our visitors receive a superb quality of service, where our products and services exceed their expectations. This will maximise the long-term economic and social benefits which sustainable tourism can bring to the region."*

15.3.25 Tourism is one of the three key economic sectors for Dumfries and Galloway, including food and drink and renewables, the strategy recognises the importance of cross-sector opportunities such as food and tourism and green tourism. One of the 14 Key Performance Indicators (KPIs) set out in the strategy is to enhance the area's green credential by increasing the number of businesses participating in the Green Tourism Business Award Scheme.

15.3.26 A regional Tourism Product Development Strategy[10], prepared on behalf of Destination DG, highlights the need for a range of strategic investments including enhanced transport links, new accommodation products with a specific link to rural tourism and forest tourism, enhancing the Galloway Forest Park (notably the Galloway Forest Dark Sky Park and The Scottish Dark Sky Observatory as Scotland's first UNESCO Biosphere designation) and investments in activity tourism products such as water based tourism and mountain biking.

Regional Planning Policy Context

15.3.27 The Dumfries and Galloway Local Development Plan (LDP)[11] was adopted on the 29th of September 2014 with the aim of guiding the future use and development of land in towns, villages and the rural area, as well as indicating where development should and where it should not happen.

15.3.28 The LDP provides a planning framework for the future use and development of land within Dumfries and Galloway, creating a backdrop to guide the location of development over the next 5 years alongside setting out development opportunities and ways to enhance the urban and rural environment. The overarching principle of the LDP is that:

"all development proposals should support sustainable development, including the reduction of carbon and other greenhouse gas emissions".

15.3.29 Sustainable economic growth is a key element of the LDP and the policies included within the LDP *"provide opportunities to grow, develop, diversify and regenerate the economy in a sustainable manner whilst at the same time protecting the natural and built environment upon which so much of the region's economy depends".*

15.3.30 Economic Development policies of relevance to this Chapter include Policy ED2: Business Development in the Rural Area, which supports Proposals which expand existing businesses or create new ones in the rural area and Policy ED10: Tourism which supports the development of indoor and outdoor tourist attractions and recreational facilities subject to other policies in the Plan.

15.3.31 In addition, LDP Stewartry Housing Market Area Proposals Map also highlights that the proposed development falls within the Stewartry Housing Market Area (HMA), relevant policies that apply include Policy H3 – Housing in the Countryside.

15.3.32 Policy H3 – Housing in the Countryside is supported by the DGC LDP Supplementary Guidance (SG): Housing in the Countryside[12] adopted on the 20th August 2015 which aims to *"provide opportunities in the rural area for economic development, housing and recreation whilst recognising the need to protect the high quality distinctive landscapes in Dumfries and Galloway".*

15.3.33 The LDP also contains policies specific to renewable energy developments. There are two policies directly relevant to the proposed Development, Policy IN1 – 'Renewable Energy' and Policy IN2 – 'Wind Energy'.

[10] Destination Dumfries and Galloway, Regional Tourism Strategy 2011, 2012, http://www.dumgal.gov.uk/CHttpHandler.ashx?id=6686&p=0

[11] DGC Local Development Plan, 2014, http://www.dumgal.gov.uk/CHttpHandler.ashx?id=11287&p=0

[12] DGC LDP Supplementary Planning Guidance, 2014, http://www.dumgal.gov.uk/CHttpHandler.ashx?id=15342&p=0

15.3.34 Policy IN1 – 'Renewable Energy' - of relevance to this Chapter is the policies support of amongst other things development proposals for any renewable energy provided they do not individually or in combination have unacceptable significant adverse impact on the cultural and natural heritage areas and routes important for tourism or recreational use in the countryside or the amenity of the surrounding area.

15.3.35 Policy IN2 – 'Wind Energy' - of relevance to this Chapter is the policies acceptability of any proposed wind energy development through the assessment of amongst other things the:

"The extent to which the proposal avoids or adequately resolves any other significant adverse impact including: - on the natural and historic environment, cultural heritage, biodiversity; forest and woodlands; and tourism and recreational interests".

15.4 METHODOLOGY AND APPROACH

15.4.1 The relevant policy context and methods used to assess the impacts are described together with the baseline conditions that would exist in the area in the absence of the proposed Development. Potential impacts of the proposed Development are discussed, together with mitigation measures that would be implemented to prevent, reduce or offset these impacts, where relevant. Finally, the residual impacts, accounting for the implementation of mitigation, are assessed.

15.4.2 Baseline conditions have been established through desktop studies and consultation. Additional information was also obtained via a Scoping exercise (outlined in Chapter 3: Design Evolution and Alternatives, of the ES), the consultation responses shown in Table 3.1 in Chapter 3: Design evolution and Alternatives, of the ES and by reviewing information regarding local attractions and tourism using the Destination Dumfries and Galloway[13] and VisitScotland[14] websites.

15.4.3 Information concerning public perception of wind farms has been gathered from relevant studies conducted within the United Kingdom. A tourism impact assessment has been completed which utilises the findings of the public perception surveys and measures these against the local tourism baseline as developed from the recent Accommodation Audit conducted by Destination Dumfries and Galloway (DD&G)[15]

15.4.4 It should be noted that the baseline situation assumes Carsphairn Forest has provided a location for the existing 36 turbine Windy Standard Wind Farm since 1996. Therefore, all locally gathered statistics consider this as part of the baseline.

15.4.5 The following sources of information were used in the completion of this section:

- Relevant economic development and tourism policies at national and regional levels;
- Official statistics, including, General Register Office for Scotland, Office of National Statistics, Scottish Annual Business Statistics, Scottish Census Results Online, Scottish Neighbourhood Statistics and VisitScotland;
- Socio-economic profiling compiled by the Planning and Development and Community and Customer Services teams at DGC;
- Headline results from the Carsphairn Community Survey (2014), completed by Stewartry Council of Voluntary Service for the Carsphairn Community Trust; and
- Economic impact assumptions drawn from the RenewableUK latest economic impact publication[16].

15.5 BASELINE CONDITIONS

15.5.1 Dumfries and Galloway is a mainly rural region in south west Scotland. It covers around 6,475 square kilometres (2,500 square miles), with an estimated population of around 150,300 (as at June 2013). The main settlements are Dumfries (around 31,100 residents), Stranraer (10,900), and Annan (8,400). All other settlements have populations of under 6,000. The region is divided into four traditional localities: Annandale and Eskdale, Nithsdale, Stewartry and Wigtownshire. These areas are formally recognised by DGC as 'Area Committee Areas'.

15.5.2 The proposed Development is located near Carsphairn in Stewartry. The baseline socio-economic conditions of Stewartry are derived from Dumfries and Galloway's LDP team and from the Stewartry Community Profile 2011 – 2014[17] and are summarised below. Where figures are not available for the Stewartry area, the assessment has presented figures for the Stewartry North Census Area Statistics (CAS) Ward in which the proposed Development is situated. CAS Ward figures are used as these are the only comparable statistics that are available at the local level. Where applicable the baseline assessment has reviewed findings from the Carsphairn Community Survey[18] completed by Stewartry Council of Voluntary Service for the Carsphairn Community Trust.

Figure 15. 1: Dumfries and Galloway Area Committee Map

Source: Dumfries and Galloway Council

[13] http://www.tourism-intelligence.co.uk/develop-your-business/practical-tools/destination-dumfries-and-galloway

[14] http://www.visitscotland.com/destinations-maps/dumfries-galloway/

[15] Destination Dumfries and Galloway, Accommodation Audit 2012, 2012, http://www.dgtourism4business.co.uk/images/Downloads/FINAL0840-R1%20Destination%20Dumfries%20and%20Galloway%20Accommodation%20Audit.pdf

[16] RenewablesUK, Onshore Wind: Direct and Wider Economic Benefits, 2012, http://www.renewableuk.com/en/publications/index.cfm/BiGGAR

[17] Dumfries and Galloway Council, Stewartry Community Profile, 2011

[18] Carsphairn Community Trust, Carsphairn Community Survey, 2014

Population

15.5.3 The population for Dumfries and Galloway in 2008 was 148,580[19]. It is estimated that this figure has risen slightly to 150,270 according the mid-year estimates 2013. With around 24,079 inhabitants[20], the Stewartry has approximately 16.2 % of the region's population. Essentially a rural area, the Stewartry is the least densely populated area in the region with only 0.14 people for each hectare. This compares with Wigtown (0.17), Annandale and Eskdale (0.24), and Nithsdale (0.40) which is the most densely populated.

Table 15.7: Resident Population

	1998	2008	% of D&G	% Change 98-08
Annandale	36,821	37,490	25.2	1.8 %
Nithsdale	57,932	58,042	39.1	0.2 %
Stewartry	24,002	24,079	16.2	0.3 %
Wigtown	29,985	28,969	19.5	-3.4 %
Dumfries and Galloway	148,740	148,580	100	-0.1 %
Scotland	4,998,567	5,062,011		

15.5.4 More than half the Stewartry's population live in the countryside or in settlements of fewer than 1,000 people. The remainder are primarily concentrated in the three towns of Dalbeattie (4,289), Castle Douglas (3,671) and Kirkcudbright (3,447).

15.5.5 Dumfries and Galloway has a higher proportion of retired people than any other council area in Scotland. In the Stewartry, the proportion of retired people is one of the highest for any locality in Scotland. 20.1 % of the Stewartry's population is retired. The Stewartry has a larger proportion of older people where 10.2 % of its population is aged over seventy-five years, this compares with the regional average of 8.5 % and the Scottish average of 7.1 %. The number of lone pensioners in the Stewartry is 25 % higher than the national average.

15.5.6 General Register Office for Scotland (GROS)[21] projections indicate that the gap between older and younger populations is likely to widen over time. The over-65s population in Dumfries and Galloway is projected to grow by 25 % by 2018 and 56 % by 2033 (29 % for those aged 65-74 and 88 % for those aged 75 and over). The working age population of Dumfries and Galloway is predicted to decline by 10.8 % by 2033. Therefore, the dependency ratio (the ratio of people under 16, or over pensionable age to those of working age) will also continue to slowly rise which has implications for the economic development of the area.

15.5.7 The Stewartry also has a smaller proportion of people under the age of sixteen (17.2 %) when compared to the region (18.9 %) and Scotland (19.2 %). The population is, therefore, ageing and this is seen as the main economic challenge facing the region. It is interesting to note that between 1998 and 2008, the Stewartry had 12 % fewer children aged under 16, 29.2 % less people aged 25 – 39 but 13.6 % more people aged 60 and over and 23.6 % more people aged 80 and over.

15.5.8 The outward migration of under-25s is an ongoing issue for the area. The 15-44 age group is usually regarded as the most important sector of the population for economic growth and economic activity. The Stewartry has only 31.7 % of its population in this age range, compared to a national figure of 34.7 %. When this is taken into account with the under average percentage of under-15s in the population, this presents a significant risk to future economic development.

[19] Dumfries and Galloway Council, Local Development Plan

Main Issues Report - Monitoring Statement, 2009

[20] Ibid

[21] General Register Office for Scotland, 2008-based Population Projections for Scottish Areas, 2008,

Employment

15.5.9 Economic activity in the Stewartry is predominantly based on the area's land assets. The main economic sectors are:

- Agriculture;
- Forestry;
- Fishing;
- Tourism; and
- Local government.

15.5.10 The food processing industry is a notable strength in the local economy, as is tourism, and accordingly a number of local initiatives have been developed to maximise their benefit to the area. Castle Douglas and Kirkcudbright have sought to add value to local economic activity through the thematic identities of Food Town and Artists' Town respectively. Agriculture, fishing and fish processing, and hotels and restaurants are the key employers in the Kirkcudbright Travel To Work Area (TTWA).

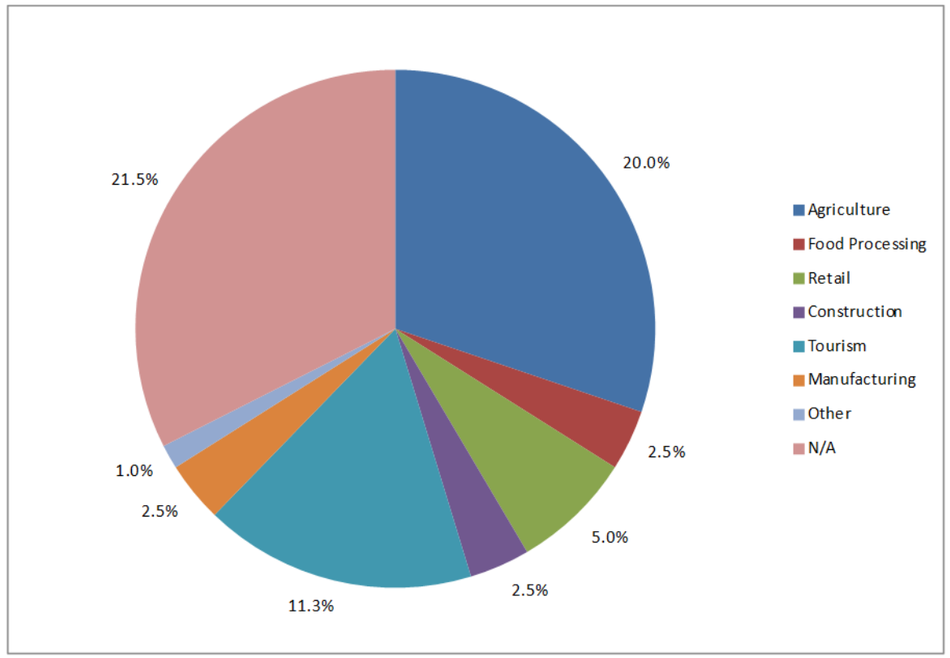
15.5.11 Forest and woodland covers around 28 % of the Stewartry. Around 500 people are employed in forestry in the Stewartry. In addition, the woodlands are a significant environmental and recreational resource, offering key tourism opportunities.

15.5.12 The biggest private employers in the Stewartry include:

- West Coast Sea Products Ltd, Kirkcudbright (180 employees, including fulltime, part-time, and casual staff)
- Tesco, Castle Douglas [retailing] (160 employees, including fulltime, part-time, and casual staff)
- Howie Forest Products, Dalbeattie (140 full-time employees)
- Natural Power Consultants, national headquarters St John's Town of Dalry (approximately 90 full time employees locally, and employing 300 people across the UK)
- Gillespie Leisure Ltd (90 employees at summer peak)
- Lothian, Borders and Angus Cooperative (80 full-time and part-time employees)
- Castle McLellan Foods, Kirkcudbright (46 full-time employees)
- Hayton Coulthard (trailer hire and freight forwarding), Twynholm (45 employees)

15.5.13 A review of the Carsphairn Community Survey outlines the type of businesses which are run by local residents. The figure opposite (Figure 15.2) confirms that agriculture is a key sector at the local level, and tourism is also an important component of the local economy.

Figure 15.2: Carsphairn Locally Run Business Profile



Source: Carsphairn Community Survey 2014

15.5.14 The table below presents headline labour market information[22] for the local, regional and national levels.

Table 15.8: Labour Market Profile

	Stewartry North	D&G	GB
Economically Active	73.1 %	74.0 %	74.0 %
In employment	68.5 %	68.8 %	69.8 %
Employees	47.6 %	57.4 %	61.0 %
Self-employed	20.9 %	11.4 %	8.8 %
Economically Inactive	26.9 %	26.0 %	26.0 %
Retired	7.0 %	6.1 %	4.5 %
Students	3.5 %	2.9 %	5.3 %
Other	16.3 %	17.0 %	16.2 %
Occupation			
Manager	13.8 %	10.2 %	14.8 %
Professional	8.6 %	7.4 %	11.1 %
Technical	10.2 %	10.9 %	13.9 %
Admin/secretarial	9.5 %	10.6 %	13.3 %
Skilled trade	22.9 %	16.5 %	11.6 %
Personal services	8.2 %	8.5 %	7.0 %
Sales/customer services	3.8 %	7.7 %	7.8 %
Process/machine operator	8.6 %	12.9 %	8.6 %
Elementary occupation	14.4 %	15.3 %	11.9 %

15.5.15 The Stewartry North area has a lower proportion of economically active residents and more economically inactive residents than recorded at the regional and national levels. Castle Douglas and Glenkens also has a higher percentage of residents in skilled trades and people in self-employment than witnessed at both the regional and national level.

Unemployment

15.5.16 The number of people out of work and claiming benefits is an up to date measure of economic performance, it also enables accurate comparisons to be made across spatial levels. Table 15.9 below sets out claimants of Jobseeker Allowance (JSA)[23] by gender.

Table 15.9: Unemployment by Gender (DWP Claimant Count August 2014)

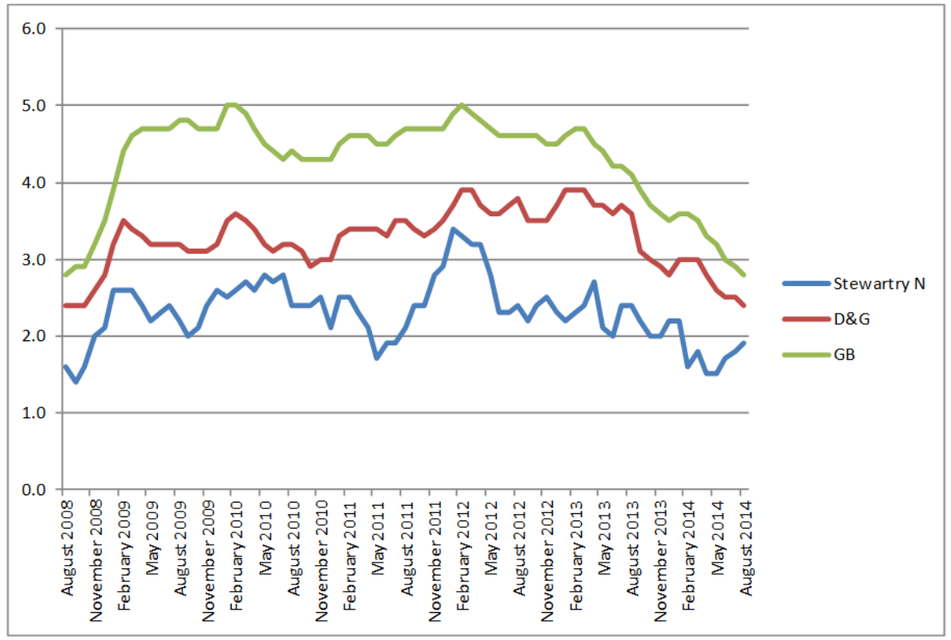
	Stewartry North	D&G	GB
Total	1.9 %	2.4 %	2.3 %
Male	1.8 %	3.2 %	2.9 %
Female	2.0 %	1.6 %	1.7 %

15.5.17 Table 15.9 above shows total unemployment in Stewartry North is lower than both the regional and national average, however the local area has a higher proportion of females out of work. In total there were 39 local residents out of work and claiming benefit in August 2014, which is 18 % greater than the number of people out of work in August 2008, this compares to a fall in unemployment (1 % reduction) at the regional level over the same period. Figure 15.3 illustrates the changes in unemployment rates across the local, regional and national levels between 2008 and 2014, demonstrating that local unemployment has been increasing recently.

[22] Sourced from Nomis Official Labour Market Statistics, http://www.nomisweb.co.uk/

[23] Department for Work and Pensions (DWP) Claimant Count

Figure 15.3: Unemployment August 2008 – August 2014



Source: Department for Work and Pensions (DWP) Claimant Count 2008 - 2014

15.5.18 Table 15.10 shows unemployment by duration, indicating that the local area has a lower proportion of younger people out of work but proportionality more older people out of work than both the region and Great Britain (GB) as a whole. The local area has a higher incidence of short term unemployment but a lower incidence of long term unemployment when compared to regional and national figures. This is likely to be associated with the seasonal nature of core sectors including agriculture and tourism.

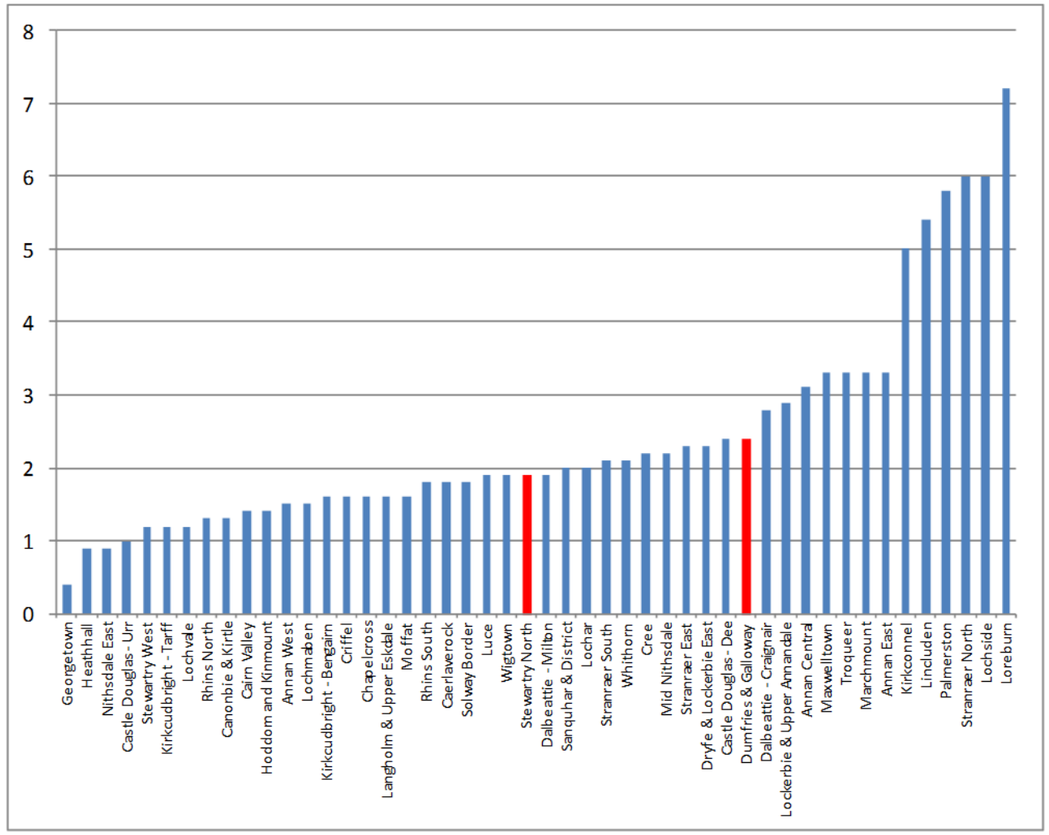
Table 15.10: Unemployment by Age and Duration (DWP Claimant Count August 2014)

	Stewartry North	D&G	GB
By Age of Claimant			
18 – 24	15.4 %	26.8 %	24.1 %
25 – 49	48.7 %	53.4 %	56.4 %
50 +	35.9 %	19.7 %	19.4 %
	Stewartry North	**D&G**	**GB**
By Duration of Claim			
Up to 6 months	66.7 %	54.8 %	53.1 %
Over 6 up to 12 months	7.7 %	16.2 %	16.9 %
Over 12 months	25.6 %	29.0 %	30.0 %

Note: Figures sourced from DWP, not all figures total 100%

15.5.19 Figure 15.4 below summarises unemployment across all wards in Dumfries and Galloway, illustrating that Castle Douglas and Glenkens presently has unemployment rates around the Dumfries and Galloway average. The figure below also highlights the polarised nature of unemployment across the region, where a number of wards have effectively full employment and others have an unemployment rate well in advance of double the national unemployment rate.

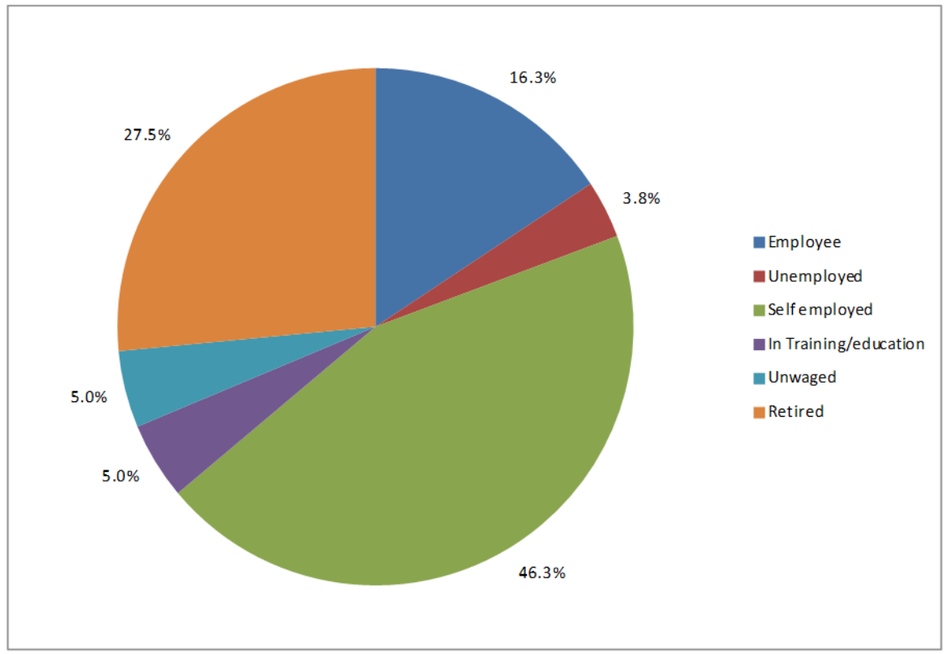
Figure 15.4: Unemployment by Ward, Dumfries and Galloway (DWP Claimant Count August 2014)



Source: Department for Work and Pensions (DWP) Claimant Count 2014

15.5.20 A review of the Carsphairn Community Survey outlines the employment status at the local level. The figure opposite (Figure 15.5 below) outlines that actual unemployment locally is closer to 4 %. It is interesting to note that the proportion of retired residents is almost 30 %, which is also significantly greater than the figures published in official statistics. This figure outlines that around 63 % of local residents are in some sort of paid employment, with the vast majority (46.3 %) in self employment.

Figure 15.5: Carsphairn Employment Status



Deprivation

15.5.21 The method to assess and measure deprivation is the Scottish Index of Multiple Deprivation 2009 (SIMD2009), published by the Scottish Government. The aims were to identify Scotland's most deprived areas, and provide up to date information on the geographical distribution of relative deprivation. SIMD2009 uses categories such as income, education, unemployment, health, access to services and housing, to calculate the average deprivation for small areas called data zones.

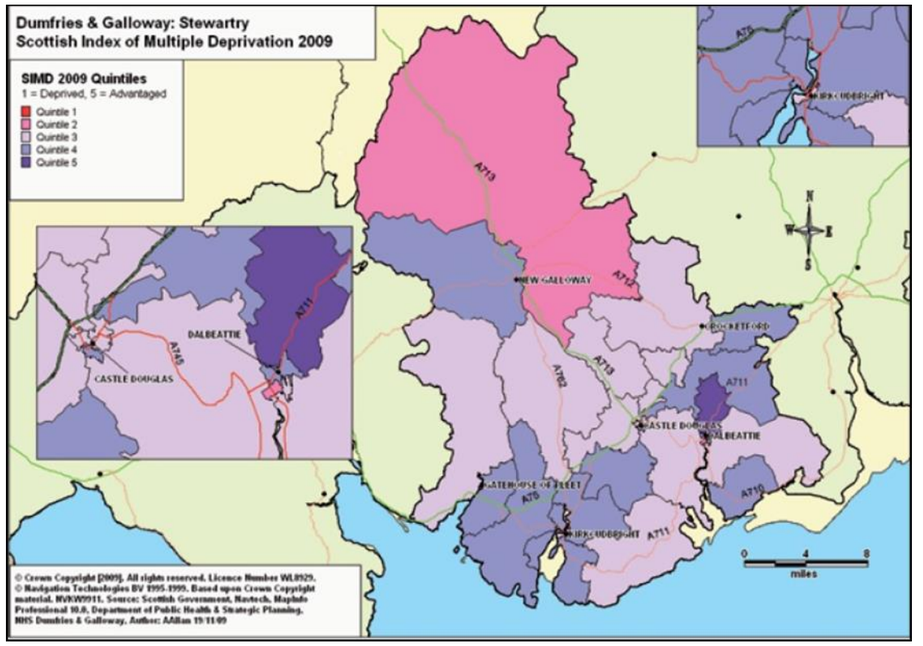
15.5.22 The SIMD is presented at data zone level, enabling small pockets of deprivation to be identified. The result is a comprehensive picture of relative area deprivation across Scotland. Ninety three of the data zones are to be found in Dumfries and Galloway of which nine are considered to be in the most deprived 15 %. None of these are in Stewartry.

15.5.23 Essentially, the higher the score, the more deprivation is in the data zone. For example, the highest level of deprivation in the region is Stranraer North (53.83). The lowest is Lochvale in Nithsdale (4.17). Of all the wards in the Stewartry, the most deprived ward was Castle Douglas - Dee (20.83), while the least deprived ward was Castle Douglas - Urr (10.6). The data zones in the Stewartry fall in the middle section of the index. But, when individual indicators are examined the statistics show a different pattern.

15.5.24 For the geographic access and telecommunications indicator (which includes travel time to doctor, primary school, supermarket and petrol station) Stewartry has seventeen data zones in the 15 % most deprived, as well as four data zones in the least deprived 15 %.

15.5.25 The map below is illustrative of the range and extent of deprivation in Stewartry, according to SIMD estimates. Whilst the majority of Stewartry falls into the third and fourth quintiles (where a quintile is one fifth of the dataset), it is significant that the area to the north, in which the proposed Development is situated, falls into the fifth quintile for deprivation, due to its "remote rural" location.

Figure 15.6: Stewartry Scottish Index of Multiple Deprivation 2009



Source: Scottish Government, Scottish Index of Multiple Deprivation, 2009

Tourism Baseline Conditions

15.5.26 The baseline conditions are those conditions which exist in the absence of the proposed Development. This assessment includes a review of existing tourism development strategies at the national and regional levels and an audit of the regional and national visitor economies.

Scotland's Visitor Economy

15.5.27 Tourism is an important element in the social, economic, environmental and cultural well-being of Scotland, from major cities to rural areas, many of which depend on the industry for jobs and infrastructure. In 2013, almost 15 million overnight tourism trips were taken in Scotland, for which visitor expenditure totalled over £4.6 billion.

15.5.28 According to Scottish Annual Business Statistics[24] the sustainable tourism sector was valued at £3.2 billion in GVA terms in 2012, representing 4 % of Scotland's economic output. The sector employed 175,000 people, which represented 10 % of the Scottish workforce. There were 15,099 registered tourist businesses, which represented 9 % of the total business stock in Scotland.

15.5.29 GVA per employee in the tourism sector was £18,515 in 2012, compared to the national GVA per employee across all sectors of £49,359. Although a key sector in terms of employment, the economic value of the sector is not as significant (in terms of GVA output per head).

Dumfries and Galloway Visitor Economy

15.5.30 At the Dumfries and Galloway level, the tourism sector was valued at £69m in GVA terms in 2012, which represented 5 % of regional economic output. The sector employed 5,000 people in 2012, which represented 12

[24] Scottish Government, Scottish Annual Business Statistics, 2014, http://www.scotland.gov.uk/Topics/Statistics/Browse/Business/SABS/LATables/Tourism-by-LA

% of the region's workforce. There were 592 registered tourist businesses in 2012, which represented 12 % of the total business stock in Dumfries and Galloway. GVA per employee in the tourism sector was £13,420 in 2012, compared to the GVA per employee across all sectors of £31,420.

15.5.31 The latest annual statistics[25] highlight that UK tourists took an estimated 654,000 visits to Dumfries and Galloway spending £99 million in 2013, which represents an average spend of £151 per visit. Overseas tourists made 40,000 visits to Dumfries and Galloway spending £14 million in 2013, which represents an average spend of £350 per visit.

15.5.32 Dumfries and Galloway attracts around 5 % of all domestic trips to Scotland but accounts for less than 2 % of all overseas trips. The region is a well-known destination for UK tourist trips but is not a recognised overseas trip destination; however, the overseas trips which are made are of a high value. The Dumfries and Galloway tourist sector is a significant employer and contributor to regional economic output. The sector accounts for 12 % of all local jobs and businesses, compared to 10 % and 9 % respectively at the national level. However, the economic value (in GVA per output per head) is low at the national level (£18,515), and even lower (£13,420) at the regional level.

Stewartry Tourism and Recreational Assets

15.5.33 The Stewartry, with 16 % of the region's population (the most sparsely populated area within the Dumfries and Galloway region), attracts 33 % of all the visitors to Visit Scotland-run Visitor Information Centres. In addition, there are now a number of community run visitor information facilities across the Stewartry, in Dalbeattie, Auchencairn, Gatehouse of Fleet and New Galloway.

15.5.34 It is important to note that the majority of tourism assets and tourism activities are focused towards the southern coastal area of the Stewartry sub-region. There are considerably fewer tourism and recreational assets in Castle Douglas and Glenkens in which the proposed Development is situated.

15.5.35 In addition to being a known destination for tourists and visitors alike due to the range of tourist opportunities available in the Stewartry, tourism is also a major employer in the locality and offers many opportunities for both full-time and seasonal employment. The Stewartry has two of the most visited visitor attractions in Dumfries and Galloway, namely Dalbeattie Forest (50 km from proposed Development) and Cream o' Galloway near Kirkcudbright (40 km from proposed Development). It is worth noting these attractions lie towards the southern coastal area of the locality.

Table 15.11: Top visitor attractions in Dumfries and Galloway in 2009 and 2014

Attraction	Visitor Numbers 2009	Visitor Numbers 2013	% Change 2009 - 2013	Approximate distance from site
World Famous Old Blacksmith's Shop Centre, Gretna Green	706,633	761,487	+ 7.8 %	100 km
Galloway Forest, Dalbeattie, Stewartry	105,000	423,900	+ 303.7 %	50 km
Mabie Farm Park, Dumfries	74,596	74,523	-0.1 %	65 km
Mabie Forest, Dumfries	135,000	70,500	-47.7 %	65 km
Cream o' Galloway, Kirkcudbright, Stewartry	71,452	60,000	-44.4 %	40 km

Note: Galloway Forest Park numbers for 2009 were presented as Dalbeattie Forest

[25] VisitScotland, Tourism in Southern Scotland, 2013, http://www.visitscotland.org/pdf/Tourism%20in%20Scotland%27s%20Regions%202013.pdf

15.5.36 The proposed Development is located close to the Galloway Forest Park and a number of lochs and forests, which has recorded a significant rise in visitor numbers in recent times. The remote rural aspect of the location has a distinct outdoor recreation draw for tourists and the area is known to be popular for a number of outdoor pursuits including cycling, walking, golfing, fishing and other water based activities.

15.5.37 Castle Douglas Food Town has emerged as a nationally recognised centre for local produce and its range of independent retailers and the theme of food and local produce has been extended to include initiatives such as 'Flavour Taster' and 'Flavour Fortnight', with many events in the programme being hosted in Castle Douglas and it's small scale high-quality producers.

15.5.38 A similar initiative in which the Stewartry plays a part is the annual Spring Fling open galleries event which, in common with the three other localities across Dumfries and Galloway, benefits the Stewartry by bringing many visitors and tourists to the region for the three-day weekend. Similarly, the yearly art exhibitions held in Kirkcudbright are helping to establish Kirkcudbright as a latter-day artist's colony for the creative arts. The annual Flavour Fortnight food festival, which is held at venues across the region also benefits the Stewartry area in terms of attracting new visitors and locals to local food events.

15.5.39 Another popular event hosted locally is the annual Knockengorroch Festival which is a music festival and has been hosted locally for 15 years and the annual Wickerman Festival hosted locally for 14 years. Table 15.12 below presents a summary of a number of other art galleries, museums and heritage centres which are located in the Stewartry.

Table 15.12: Art Galleries, Museums and Heritage Centres in the Stewartry

Venue	Type of Establishment
Barnbarroch Pottery	Kippford Ceramics Gallery (Private)
Broughton House, Kirkcudbright	Historic House and Gallery, with significant collections in store (NTS)
Carsphairn Heritage Centre	Heritage Centre (Trust) with collections
Castle Douglas Art Gallery	Art Gallery (DGC)
Catstrand Centre, New Galloway	Part Gallery Space (Trust)
Clatteringshaws Visitor Centre, New Galloway	Visitor Centre (FC)
Clience Studio, Castle Douglas	Art Gallery (Private)
Creetown Gem Rock Museum	Creetown Gem Museum (Private)
Creetown Heritage Museum	Heritage Museum (Trust) with collections
Dalbeattie Museum	Dalbeattie Heritage Museum (Trust) with significant collections in store
Harbour Cottage Gallery, Kirkcudbright	Art Gallery (Trust) with collections
High Street Gallery, Kirkcudbright	Art Gallery (Private)
John Paul Jones Museum, Arbigland	Heritage Museum (Trust) with collections
Laurieston Gallery	Photo Gallery (Private)
McGill-Duncan Gallery, Castle Douglas	Art Gallery (Private)
Mill on the Fleet, Gatehouse of Fleet	Part Gallery Space / Heritage Centre
North Glen Gallery, Palnackie	Glass Gallery (Private)
Parton Gallery (Alan Wright)	Photo Gallery (Private)
Scottish Showcase Gallery, Kirkcudbright	Art Gallery (Private)
Shambellie House Museum of Costume, New Abbey	Heritage Museum (NMS) with collections

Venue	Type of Establishment
The Cat's Moustache, Creetown	Art Gallery (Private)
The Stewartry Museum, Kirkcudbright	Heritage Museum, with significant collections in store (DGC)
Tolbooth Art Centre, Kirkcudbright	Art Gallery / Heritage Centre (DGC) with collections
Whitehouse Gallery, Kirkcudbright	Art Gallery (Private)

15.5.40 The diversity of landscapes within the Stewartry is a major asset to the region and its communities and greatly enhances its attractiveness as a tourist destination. Nationally and regionally important landscapes include the Fleet Valley and East Stewartry Coast National Scenic Areas (NSAs) and the Solway Coast and Galloway Hills Regional Scenic Areas. The area is also well known for its association with the Southern Upland Way, which was Britain's first official coast to coast long distance footpath. It runs 340 km from Portpatrick on the southwest coast of Scotland to Cockburnspath on the eastern seaboard. At its nearest point the footpath passes through St John's Town of Dalry which is 12 km south of the proposed Development. Visitor counts in 2008 recorded almost 119,000 annual visitors, from more than 30 different countries, and generating around £2.7m for the towns and villages located along the route.

15.5.41 The area's towns and villages are enhanced by attractive parks such as Colliston Park, Dalbeattie or Carlingwalk Loch, Castle Douglas and streetscapes such as Main St John's Town of Dalry or the harbour front in Kippford. Parklands, tree avenues and policy woodlands laid out around 19th and early 20th century country estates remain as attractive landscape features. The wide range of habitats; woodlands, salt marshes, heather moorlands, etc. all contribute to the diversity and quality of the local landscape.

15.5.42 The Dumfries and Galloway Landscape Assessment[26] identifies and describes twenty six distinct 'landscape character areas' of which fifteen are found within the Stewartry; see Chapter 6: Landscape and Visual Assessment, of the ES for further details. Stewartry boasts a rich and diverse cultural landscape which includes the widely recognised theme towns of Kirkcudbright 'Artists' town and Castle Douglas 'Food' town. In addition, cultural tourism offers considerable opportunities for Stewartry due to its 15 art galleries, 9 museums / heritage centres and 10 Historic Scotland sites. A more detailed review of cultural heritage assets has been undertaken in Chapter 9: Cultural Heritage and Archaeology, of the ES.

15.5.43 Because of its geographical location and its historical heritage, the Stewartry has some fine examples of historical architecture including abbeys, castles and tower houses. Table 15.13 lists the Historic Scotland sites in the Stewartry which are open to the public for visits. These assets listed are not close enough to be significantly affected, however Chapter 9: Cultural Heritage and Archaeology, of the ES assesses the potential effects of the proposed Development upon cultural heritage assets identified in the surrounding area.

Table 15.13: Historic Scotland sites within the Stewartry

Venue	Type of Establishment	Approximate distance from site
MacLellan's Castle	C16th Castle	50 km
Drumcoltran Tower, nr Beeswing	C15th Tower House	60 km
Cardoness Castle, Gatehouse	C15th Tower House	55 km
Threave Castle, Castle Douglas	C14th Castle	75 km
Dundrennan Abbey	C12th Abbey	60 km
Sweetheart Abbey, New Abbey	C13th Abbey	65 km
New Abbey Corn Mill, New Abbey	C18th Mill	65 km
Cairnholy, Creetown	3rd and 2nd Millennium BC Chambered Cairns	65 km
Carsluith Castle, Creetown	C15th Tower House	60 km
Orchardton Tower, near Dalbeattie	C15th Tower House	50 km

15.5.44 A more local assessment of tourism assets and activities is illustrated in ES Figure 15.1 in Volume 3 of the ES. This highlights the location of the existing and proposed Development and their location and visibility to local assets and activities. It indicates that in addition to physical attractions, the local area has a number of local and national paths and trails, such as the nationally significant Southern Upland Way and more local paths such as the Glen Afton Heritage Path and the Water of Deugh Core Path. However, it is noted that these all have current visibility of the existing Windy Standard Wind Farm, and the Southern Upland Way has limited visibility of the existing Windy Standard Wind Farm and the proposed Development, as it is around 10 km from the proposed Development at its closest point.

15.5.45 The area also has a significant number of Visit Scotland Quality assured businesses predominantly in the non-serviced sector (e.g. caravans and self-catering accommodation). Please refer to table 15.14 below.

Table 15.14: Visit Scotland Quality Assured businesses in the DG5, 6 and 7 postcode area

Accommodation Type	Count	Units
Caravan & camping	15	1,801 pitches
Hostel	3	78
Hotels	7	146
Self-catering	85	160
Small serviced	39	141
Total	**149**	**2,326**

15.5.46 Destination Dumfries and Galloway commissioned an independent review of tourism accommodation across Dumfries and Galloway in 2012.[27] The audit assessed the type of accommodation across the region as well as presenting a sub-regional review of the dispersals of accommodation, by type, including an assessment of the Stewartry sub-region. Tables 15.15 and 15.16 below present the geographical dispersal of accommodation businesses and resultant bed spaces respectively.

15.5.47 Table 15.15 highlights that the Stewartry has 103 serviced accommodation providers, accounting for 21.4 % of the regional total, and 327 non-serviced accommodation providers, accounting for 40.5 % of the regional total.

15.5.48 In terms of bedrooms, Table 15.16 below illustrates that the Stewartry has 1,069 serviced bed spaces, accounting for 17.5 % of the regional total, and 2,944 non-serviced bed spaces, accounting for 43.0 % of the regional total.

15.5.49 It is important to reiterate that the majority of these assets are located towards the southern coastal fringes of the Stewartry ward, and to a lesser extent in the north in which the proposed Development is to be situated.

[26] SNH, Dumfries and Galloway Landscape Assessment, 1998

[27] Destination Dumfries and Galloway, Accommodation Audit, 2012, http://www.dgtourism4business.co.uk/images/Downloads/FINAL0840-R1%20Destination%20Dumfries%20and%20Galloway%20Accommodation%20Audit.pdf

Table 15.15: Geographical Dispersal of Accommodation Businesses in Dumfries and Galloway

Accommodation Category	All Zones	Wigtownshire	Stewartry	Nithsdale	Annandale
Serviced Sector					
Hotel	93	30	18	19	26
Small Hotel	26	6	3	5	12
Budget Hotel	3	0	0	2	1
Country House Hotel	7	0	2	4	1
Guest Hotel	30	13	2	1	14
B&B	301	81	73	70	77
Inn	19	5	5	4	5
Restaurant with Rooms	2	1	0	0	1
Serviced Sector Sub-Totals	481	136	103	105	137
Serviced Sector %	100 %	28.3 %	21.4 %	21.8 %	28.5 %
Non-Serviced Sector					
Self-Catering	796	252	325	139	80
Hostel	8	3	2	2	1
Exclusive Use	3	0	0	2	1
Other	1	0	0	0	1
Non- Serviced Sector Sub-Totals	808	255	327	143	83
Non-Serviced Sector %	100 %	31.6 %	40.5 %	17.7 %	10.3 %
Overall Totals	1,289	391	430	248	220
Overall %	100 %	30.4 %	33.3 %	19.2 %	17.1 %

Table 15.16: Geographical Dispersal of Bed Spaces in Dumfries and Galloway

Accommodation Category	All Zones	Wigtownshire	Stewartry	Nithsdale	Annandale
Serviced Sector					
Hotel	2,429	476	420	710	823
Small Hotel	580	122	81	123	254
Budget Hotel	465	0	0	306	159
Country House Hotel	217	32	73	64	48
Guest Hotel	300	134	4	15	147
B&B	1,771	476	414	435	446
Inn	300	71	77	62	94
Restaurant with Rooms	26	20	0	0	6
Serviced Sector Sub-Totals	6,092	1,331	1,069	1,715	1,977
Serviced Sector %	100 %	21.8 %	17.5 %	28.2 %	32.5 %
Non-Serviced Sector					
Self-Catering	6,347	1,905	2,872	1,004	566
Hostel	323	106	72	75	70
Exclusive Use	62	0	0	46	16
Other	120	0	0	0	120
Non- Serviced Sector Sub-Totals	6,852	2,011	2,944	1,125	772
Non-Serviced Sector %	100 %	29.3 %	43.0 %	16.4 %	11.3 %
Overall Totals	12,944	3,342	4,013	2,840	2,749
Overall %	100 %	25.9 %	31.1 %	21.9 %	21.1 %

15.5.50 The above research can be used to estimate the likely economic value of the tourism sector to the regional and local areas. MKA Economics has developed a tourism economic valuation based on results of VisitScotland's regional statistics[28] and Destination Dumfries and Galloway's Accommodation Audit[29]. The valuations presented in Table 15.5.17 and 15.5.18 estimates the economic value of the tourism sector at the regional and sub-regional levels based on accommodation occupancy rates, spend levels and locations and employment ratios.

15.5.51 The model estimates that the tourism sector at the regional level generates around £110m in turnover and sustains around 1,876 jobs. At the local (Stewartry) level the tourism sector is estimated to generate around £34m in turnover and sustain 589 local jobs. Again, it should be reiterated that there is an obvious focus of tourism related activity, and therefore associated economic impact, towards the southern coastal fringes of the Stewartry ward. It has not been possible to extrapolate these figures below the sub-regional (Stewartry) level.

[28] VisitScotland, Tourism in Southern Scotland, 2013, http://www.visitscotland.org/pdf/Tourism%20in%20Scotland%27s%20Regions%202013.pdf

[29] Destination Dumfries and Galloway, Accommodation Audit, 2012, http://www.dgtourism4business.co.uk/images/Downloads/FINAL0840-R1%20Destination%20Dumfries%20and%20Galloway%20Accommodation%20Audit.pdf

Table 15.17: Economic Valuation of Tourist Accommodation Stock D&G

Windy Standard III Tourism Economy Baseline						
Total Beds	12758					
	Potential bednights	Room nights	% of UK tourists	% Of OS tourists	UK holiday expenditure	OS holiday expenditure
January	395,498	83,539	78,527	5,012	4,240,445	355,877
February	357,224	98,409	92,505	5,905	4,995,259	419,224
March	395,498	120,538	113,306	7,232	6,118,521	513,493
April	382,740	166,367	156,385	9,982	8,444,809	708,725
May	395,498	206,225	193,851	12,373	10,467,966	878,517
June	382,740	200,038	188,036	12,002	10,153,939	852,163
July	395,498	240,535	226,103	14,432	12,209,535	1,024,677
August	395,498	273,058	256,675	16,383	13,860,436	1,163,228
September	382,740	214,958	202,061	12,898	10,911,288	915,723
October	395,498	192,172	180,642	11,530	9,754,656	818,653
November	382,740	103,614	97,397	6,217	5,259,462	441,397
December	395,498	95,946	90,189	5,757	4,870,215	408,730
Total	**4,656,670**	**1,995,401**	**1,875,677**	**119,724**	**101,286,532**	**8,500,406**
Grand Total						**£109,786,938**
Employment Ratio (Expenditure per KJob)						£ 54,000
Total Employment						**1876**

Table 15.18: Economic Valuation of Tourist Accommodation Stock Stewartry

Windy Standard II Tourism Economy Baseline						
Total Beds	4013					
	Potential bednights	Room nights	% of UK tourists	% Of OS tourists	UK holiday expenditure	OS holiday expenditure
January	124,403	26,087	24,521	1,565	1,324,151	111,128
February	112,364	30,162	28,352	1,810	1,531,003	128,488
March	124,403	33,698	31,676	2,022	1,710,491	143,552
April	120,390	52,523	49,371	3,151	2,666,042	223,746
May	124,403	64,080	60,235	3,845	3,252,690	272,980
June	120,390	61,056	57,393	3,663	3,099,218	260,100
July	124,403	79,983	75,184	4,799	4,059,958	340,729
August	124,403	90,611	85,175	5,437	4,599,437	386,005
September	120,390	67,974	63,895	4,078	3,450,345	289,568
October	124,403	59,949	56,352	3,597	3,043,029	255,384
November	120,390	30,297	28,479	1,818	1,537,860	129,064
December	124,403	29,926	28,130	1,796	1,519,036	127,484
Total	**1,464,745**	**626,345**	**588,764**	**37,581**	**31,793,261**	**2,668,229**
Grand Total						**£ 34,461,489**
Employment Ratio (Expenditure per KJob)						£ 54,000
Total Employment						**589**

Tourist Attitudes towards Wind Farms

15.5.52 A growing body of research regarding the opinions of tourists towards wind farms exists. A summary of the most relevant and highly regarded research includes:

- Wind Farm Consumer Research, VisitScotland (2012);
- Public Attitudes Tracking Survey, Department of Energy and Climate Change (2012);
- Tourism Impacts of Wind Farms, University of Edinburgh (2012); and
- The Economic Impacts of Wind Farms on Scottish Tourism, Moffat Centre (2008).

15.5.53 Overall this research has tended to support the premise that wind farm development has not resulted in a serious negative economic impact on tourism and could even have wider positive impacts. Extracts from the key findings and the potential impact of the proposed Development are summarised below.

The Economic Impacts of Wind Farms on Scottish Tourism, Moffat Centre, 2008

15.5.54 In June 2007, the Scottish Government commissioned independent research to assess whether Government priorities for wind farms in Scotland are likely to have an economic impact on Scottish tourism. The results, published in March 2008, concluded that "*wind farm developments have a minimal impact on tourism, provided they are not visible from important tourism corridors, with 97 % of those surveyed saying wind farms would have no impact on their decision to visit Scotland again. The report also makes recommendations for planning authorities which could help minimise any negative impacts of wind farms on the tourism industry".*

15.5.55 In terms of economic impact, the research concluded that: "*The potential effect on tourism expenditure associated with meeting the renewables target, via substantial wind farm development, will mean that by 2015 there will be £4.7 million less GVA in the Scottish economy than there would have been in the absence of any wind farms (at 2007 prices). This effect will be offset or reinforced by other economic or environmental impacts of wind farms and a part of the adjustment may have already occurred*".

Tourism Impacts of Wind Farms, University of Edinburgh, 2012

15.5.56 As part of the Scottish Parliament's Economy, Energy and Tourism Committee Inquiry into renewable energy targets[30], Professor Aitchison, presented a review of surveys which appraised the tourist impact of wind farms. The research presented findings from a number of surveys, the headline results in terms of the percentage of tourists not discouraged from visiting an area with a wind farm are presented in Table 15.19 below.

Table 15.19: % of Tourists Not Discouraged from Visiting an Area with a Wind Farm

Date	Author	Location	% Tourists Not Discouraged
1996	Robertson Bell Associates	Cornwall	94
1997	Robertson Bell Associates	Wales	83
2000	Cornwall Tourist Board	Cornwall	81.5
2001	Wales Tourist Board	Wales	96
2002	Centre for Sustainable Energy	Somerset	91.5
2002	MORI Scotland	Scotland	95
2004	University of West England	North Devon	93.9
2006	Whinash	Cumbria	91
2008	Glasgow Caledonian University	Scotland	93-99

[30] Scottish Parliament, Report on the achievability of the Scottish Government's renewable energy targets , 2012, http://www.scottish.parliament.uk/S4_EconomyEnergyandTourismCommittee/eeR12-07.pdf

Date	Author	Location	% Tourists Not Discouraged
	Average		**91.3**

15.5.57 The review of secondary research suggests that on average around 91.3 % of tourists surveyed were not discouraged from visiting an area containing a wind farm, when reviewing more recent and Scottish based results the figure is nearer 95 %.

15.5.58 Overall the recent study concluded, *"the findings from both primary and secondary research relating to the actual and potential tourism impact of wind farms indicate that there will be neither an overall decline in the number of tourists visiting an area nor any overall financial loss in tourism-related earnings as a result of a wind farm development."*

15.5.59 The subsequent report from the Economy, Energy and Tourism Committee presented a number of findings, including the following points in regard to the relationship between renewable energy targets and tourism objectives: *"While some strongly held localised and anecdotal opinion exists, the Committee has seen no empirical evidence which demonstrates that the tourism industry in Scotland will be adversely affected by the wider deployment of renewable energy projects, particularly onshore and offshore wind."*

15.5.60 The report also found: *"Whilst care always needs to be taken in terms of the planning process and decisions on the siting of individual projects in areas popular with tourists and in our rural and wild land areas, no one has provided the Committee with evidence, as opposed to opinion, that tourism is being negatively affected by the development of renewable projects. However, given the importance of this issue, the Committee recommends that VisitScotland and the Scottish Government continue to gather evidence on this from visitors to Scotland."*

Public Attitudes Tracking Survey, Department of Energy and Climate Change (DECC), 2012

15.5.61 DECC is currently conducting a tracker poll on the public's attitudes to the Department's main business priorities. The poll involved 2,121 UK face to face interviews in which participants answered 25 questions. The first wave of results identify that the public's views in relation to renewable energy were generally positive, including:

- 79 % said they supported renewable energy for providing our electricity, fuel and heat, with 32 % strongly supporting. Only 5 % opposed renewable energy;
- 78 % agreed that renewable energy developments should provide direct benefit to the communities in which they are located;
- 69 % agreed that renewable energy industries and developments provide economic benefits to the UK;
- 55 % agreed that they would be happy to have a large scale renewable energy development in their area. 19 % disagreed with this statement with 10 % strongly disagreeing; and
- Perceptions of a range of renewable energy sources were mostly positive. Highest levels of support were found for solar (83 %), off shore wind (76 %) and wave and tidal (75 %). On-shore wind had the highest level of opposition, though still only 12 % opposed this, with 5 % strongly opposing (compared with 66 % supporting).

Wind Farm Consumer Research, VisitScotland, 2012

15.5.62 In 2011, VisitScotland commissioned research to learn more about UK consumer attitudes to wind farms, in order to inform VisitScotland policy. This included a range of attitudinal questions, including the following two 'overall statements':

- Wind farms are necessary for the future of energy generation?
- The mean score for this question for UK respondents was 7.63 which suggests that respondents tended to agree that wind farms are necessary for the future of energy generation. Scottish respondents scored 7.55 and so were slightly less in agreement with this statement than the UK sample as a whole.
- Wind farms are an eye sore on the landscape and ruin the tourism experience?
- The mean score for this question for UK respondents was 4.63 suggesting that respondents do not feel that wind farms ruin the tourism experience. Scotland respondents scored 4.32 so again tending to disagree that wind farms currently ruin the tourism experience.

15.5.63 According to the range of research undertaken to date, both over time and across locations, wind farms do not appear to have any significant impacts on the level of tourism. In fact, there is evidence to suggest that well managed wind farms can make a positive contribution to tourism. For example, Whitelee Wind Farm Visitor Centre which opened in 2009, attracted over 120,000 visitors in the first 12 months with additional visitors using the new paths throughout the site. The new paths link into other regional and national path routes including the Irvine Valley Path Network and SUSTRANs.

15.5.64 Based on the research summarised in this section, VisitScotland has published a Position Statement[31] which states*: "VisitScotland understands and supports the drive for renewable energy and recognises the potential of Scotland's vast resource. As a consequence, VisitScotland is not against the principle of wind farm development".*

15.6 EFFECT EVALUATION

Basis of Assessment

15.6.1 This socio-economic impact assessment has been conducted in accordance with appraisal techniques outlined in Economic Impact Guidance[32] and The Green Book guidelines[33], and calculates the economic impacts of the construction and operational phases of the proposed Development.

15.6.2 The impact of the proposed Development on the area in and around the proposed Development Area has been assessed using data on past expenditure, predicted expenditure and employment needs provided by RWE Innogy and Fred Olsen Renewables and economic impact modelling utilising the most recent industry research on the economic impacts of onshore wind farm development.

Receptor Sensitivity

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

15.6.4 The effect of the proposed Development on tourism and recreation is closely related to public attitudes to wind farms however a negative opinion does not necessarily result in a material change in recreational patterns. The relevant conclusions from the most recent studies are discussed later in this Chapter.

Predicted Construction Effects

15.6.5 The proposed Development is a substantial construction project, with a considerable financial investment. The construction phase will include a series of sub-phases including preparing the site, manufacturing and installing the wind turbines, balance of plant and connecting to the grid.

15.6.6 Based on RenewableUK[34] research, the average construction cost per MW is estimated to be around £1.23 million, however, this rate varies between ±15 % depending on the precise nature of each development. For the

[31] VisitScotland, Position Statement – Wind Farms, 2012, http://www.visitscotland.org/pdf/VisitScotland%20-%20Wind%20farms%20Policy.pdf

[32] Scottish Enterprise, Additionality & Economic. Impact Assessment. Guidance Note, 2008, http://www.scottish-enterprise.com/~/media/SE/Resources/Documents/ABC/additionality-and-economic-impact-assessment-guidance.pdf

[33] HM Treasury, The Green Book, 2003, https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/220541/green_book_complete.pdf

basis of this assessment it has been assumed the RenewableUK figure of £1.23 million per MW, which equates to a total construction cost in the region of £83.03 million for the proposed Development, which is based on a maximum installed capacity of 67.5 MW.

15.6.7 The research also found that on average, 45 % of the construction costs are spent in the UK including 7 % in the local area and 29 % at the Scottish level. Table 15.20 below summarises the construction costs across UK spatial areas.

Table 15.20: Construction Costs

Spatial Area	% of spend	£ equivalent
Dumfries and Galloway	6.5 %	£5,396,625
Scotland	29.1 %	£24,160,275
UK	44.8 %	£37,195,200
Windy Standard III Total	**100 %**	**£83,025,000**

Note: Excludes non-UK construction related expenditure (55.2%)

15.6.8 The contract data from RenewableUK case study research assessment has been combined with turnover per employee data and ratio of GVA to turnover for relevant industries (Table 15.21 below). This table also shows the breakdown of construction costs into each of the main components of work, based on the case study data.

Table 15.21: GVA and Employment Ratios

Indicator	Turnover per employee	GVA / Turnover	% of spend
Balance of Plant Contract	£121,000	0.363	27.3 %
Turbine Contract	£162,000	0.393	65.1 %
Grid Connection Contract	£131,000	0.486	7.6 %
Windy Standard III Total	**£148,290**	**0.391**	**100 %**

15.6.9 Applying the data from the RenewableUK research to the proposed level of development (67.5 MW) provides an estimate of the turnover in the UK associated with the proposed Development during the construction stage, £37.20 million. Of this, there is potential for £5.40 million to benefit the local economy and £24.16 million to benefit the Scottish economy.

15.6.10 Applying the assumptions set out in Table 15.21 above provides an estimate on the level of employment at the Scottish level for the wind farm development as 163, contributing £9.45 million in GVA. At the Dumfries and Galloway level the construction phase of the proposed Development could sustain up to 36 jobs and contribute £2.11 million in GVA.

Table 15.22: Economic Impact of the proposed Development

Spatial Area	Jobs	GVA	Turnover
Dumfries and Galloway	36	£2,110,080	£5,396,625
Scotland	163	£9,446,668	£24,160,275
UK	251	£14,543,323	£37,195,200

[34] RenewablesUK, Onshore Wind: Direct and Wider Economic Benefits, 2012, http://www.renewableuk.com/en/publications/index.cfm/BiGGAR

Assessment of Construction Effects

15.6.11 It should be noted that although construction impacts are one-off in nature they will last for the duration of the project (approximately 15 months), thereby ensuring meaningful benefit to the local economy. The expected scale of employment and GVA impact during construction can be judged as having a **beneficial impact** on both the regional and national economies. The effects are expected to be beneficial in nature and are therefore not subjected to an assessment of significance.

15.6.12 In terms of the tourism impacts at the construction phase there are expected to be some short and temporary impacts in terms of interference with rights of access to the proposed Development Area. Due to construction related activities there will be limited access within the site boundary for health and safety reasons for the duration of the construction activities (see Chapter 13: Aviation, EMI, Existing Infrastructure and Shadow Flicker, of the ES which assesses the impact on Public Rights of Way). Carsphairn Forest is a large commercial forest that is not actively promoted for access or recreational purposes, as outlined in ES Figure 15.1 in Volume 3 of the ES there are no long distance walks or cycle paths that cross or are adjacent to the proposed Development Area and Carsphairn Forest is not in itself a major tourism destination (also see Chapter 6: Landscape and Visual Assessment, of the ES which assesses the impact of the proposed Development on nationally and regionally important routes and core paths in terms of landscape and visual impact). In addition, the scale of works proposed is in line with current forestry operations within the forest and as such are judged to be **negligible in nature.**

Predicted Ongoing and Operation Effects

15.6.13 According to RenewableUK research the annual cost of operations and maintenance per MW installed ranges from £12,000 to £110,000 per annum. The operations and maintenance costs are affected by the size of development, land contracts and whether the turbines were still under warranty. The weighted average cost was found to be around £52,659 per MW installed per annum, this figure has been assumed for the purposes of this assessment. The vast majority, 90 %, of the operation and maintenance spend is in the UK, including 29 % spent in the local area and 65 % which was spent regionally.

15.6.14 Table 15.23 below summarises the operation and maintenance costs at the regional, Scottish and UK levels.

Table 15.23: Operational Costs

Spatial Area	% of spend	£ equivalent
Dumfries and Galloway	28.8 %	£1,023,691
Scotland	65.0 %	£2,310,414
UK	90.4 %	£3,213,253
Windy Standard III Total	**100 %**	**£3,554,483**

Note: Excludes non-UK construction related expenditure (9.6%)

15.6.15 The contract data from the case study assessment (i.e. turnover data) has been combined with turnover per employee data and ratio of GVA to turnover for relevant industries (Table 15.24 below). This table also shows the breakdown of operation and maintenance costs into each of the main components of work, based on the case study data.

Table 15.24: GVA and Employment Ratios

Indicator	Turnover per employee	GVA / Turnover	% of spend
Maintenance	£173,000	0.364	43.4 %
Operations	£217,000	0.618	56.6 %
O&M Total	**£198,000**	**0.508**	**100 %**

15.6.16 Applying the data from the RenewableUK research to the proposed level of development (67.5 MW) provides an estimate of the turnover in the UK associated with the proposed Development during the operations and maintenance stage, £3.21 million. Of this, £1.02 million could benefit the Dumfries and Galloway economy and £2.31 million could be injected into the Scottish economy.

15.6.17 Applying the assumptions set out in Table 15.24 above gives the level of employment at the Scottish level for the proposed Development as 12, contributing £1.17 million in GVA. At the local level the operation and maintenance phase of the proposed Development is expected to sustain up to five jobs, contributing £520k in GVA. It is worth noting that the actual impacts at the local level are expected to be above those predicted by the RenewableUK model as Natural Power are already carrying out non-warranty related work on the existing Windy Standard Wind Farm.

Table 15.25: Economic Impact of the Proposed Development

Spatial Area	Jobs	GVA	Turnover
Dumfries and Galloway	5	£520,035	£1,023,691
Scotland	12	£1,173,690	£2,310,414
UK	16	£1,632,332	£3,213,253

Assessment of Ongoing and Operation Effects

15.6.18 The expected scale of employment and GVA impact during the operational phase can be judged as having a **beneficial impact** on both the regional and national economies. The effects are expected to be beneficial in nature and are therefore not subjected to an assessment of significance.

15.6.19 It is worth noting that locally based Natural Power are currently undertaking out of warranty maintenance on the current wind farm. The developer will continue to deploy Natural Power services for all management services, and given Natural Power's disproportionate impact on the immediate local area the level of employment, and resultant GVA, impact is expected to be higher than estimated through the RenewableUK model based approach set out in Table 15.25.

15.6.20 The tourism baseline assessment has shown that the tourism sector is an important employer and income generator at the regional and local levels, generating around £34m and safeguarding 589 jobs in the Stewartry. This suggests that any negative effect which results in lost tourism volume and value may have a negative impact on local economic prosperity at the Stewartry level. However, the analysis has shown that relatively few of the tourist assets in the immediate area would be directly affected and it is recognised that the majority of the tourism assets are primarily located in the south of the region, including Castle Douglas, Kirkcudbright and Gatehouse of Fleet.

15.6.21 In terms of the Zones of Theoretical Visibility (ZTV) the only tourism hub situated in Dumfries and Galloway within the 10 km buffer of the proposed Development is Carsphairn. Carsphairn has one B&B and a small heritage centre which operates on a seasonal basis. The nearest tourist hub in Dumfries and Galloway within the 20 km buffer is St John's Town of Dalry to the south of the proposed Development. St John's Town of Dalry is a small village with limited tourism infrastructure such as a small number of self catering units, B&Bs and two small hotels.

15.6.22 In terms of paths and trails, the ZTV assessment highlights that these assets have existing visibility of the existing Windy Standard Wind Farm, and the Southern Upland Way has limited visibility of the existing Windy Standard Wind Farm and no visibility of the proposed Development, as it is around 10 km from the proposed Development at its closest point. There are only small limited areas of new visibility related to the proposed Development, none of which adversely affect any existing tourism assets (also see Chapter 6: Landscape and Visual Assessment, of the ES).

15.6.23 As noted above, Carsphairn forest is a large commercial forest and is not actively promoted for access or recreational purposes and is not in itself a major tourism destination. No long distance walks or cycle paths cross or are adjacent to the site.

15.6.24 Coupled with findings from the review of secondary data presented in Sections 15.5.52 – 15.5.64 above, which indicate that wind farms have a minor impact on visitor activity; the effect of tourism assets is estimated to be **negligible in nature.**

Cumulative Effects

15.6.25 There are expected to be cumulative socioeconomic effects as a result of other onshore wind farm developments in the region. In line with other aspects of the EIA, the cumulative assessment has considered all operational/consented/construction and submitted/scoped wind farms within a 35 km radius of the proposed Development.

15.6.26 In total, 75 onshore wind farms have been reviewed as part of the cumulative assessment, of which 24 are operational/consented/construction wind farms, with a potential generating capacity of 885 MW. 46 are submitted/scoped wind farm proposals, with a possible generating capacity in the region of 2,320 MW generating capacity (see Table 6.2 in Chapter 6: Landscape and Visual Assessment, of the ES). Overall, the scale of onshore wind farm developments within 35 km of the proposed Development suggests there is the potential for more than 3,000 MW of generating capacity, which can bring significant employment opportunities to the local area.

15.6.27 The scale of investment associated with the construction and operation of the various wind farm investments suggests there will also be considerable employment and contracting opportunities for local businesses and residents. This will aid the economic conditions in the area, although it is recognised that a degree of the economic related benefits will potentially accrue in areas outside the local economy, due to the technical and specialist nature of the proposed and operational developments.

15.6.28 The socio-economic benefits associated with the cumulative projects are expected to be significant, both in construction as well as in operational terms. Certain projects will generate considerably more jobs, notably those larger wind farm proposals, such as the approved Afton and Blackcraig Hill Wind Farms, Windy Standard II which is under construction and the submitted proposals at Loch Urr, Pencloe and South Kyle.

15.6.29 The associated infrastructure requirements, such as substations and grid connections, which are related to the energy generation activity, will create further job opportunities and potential spin-off benefits for local service companies. There is an opportunity for local businesses to benefit from the scale of investment; this will include direct employment as well as indirect and induced impacts associated with servicing the needs of new inward investment, such as accommodation provision, food and drink, retail and transportation.

15.6.30 In terms of the operation of wind farms, the maintenance is often built into the turbine manufacturing contract for a specified warranty period. Since the turbine contracts typically go to overseas firms, maintenance is often undertaken by non-UK based firms, however, Natural Power (based near St Johns Town of Dalry) is already carrying out non-warranty work on the existing Windy Standard Wind Farm which highlights that there are opportunities for locally based firms and sub-contractors. The extent to which local firms and employees are able to benefit from this work depends on the balance between the manufacturers' use of local teams and their use of their own workers.

15.6.31 Nonetheless these cumulative effects, notably during the construction stage, can play an important role in supporting the economic growth ambitions of the local area, which suffers from underlying structural weaknesses, such as high unemployment, low proportion of working age residents and an over-reliance on primary sector jobs. As outlined in DG-REPs own action plan, the development and operation of various wind farms can provide much needed investment, job opportunities and training for local people, whilst maintaining current levels of employment and generating new opportunities. It has the potential to meet the aspirations of the DG-REPs plan by supporting economic diversification objectives and enhancing the resilience of the local area.

15.7 SUMMARY OF SECTION

15.7.1 In terms of construction impact, the wind farm construction value (£83m), of this, there is potential for £5.40 million to benefit the local economy and £24.16 million to benefit the Scottish economy. Applying industry assumptions provides an estimate on the level of construction employment at the Scottish level for the wind farm development as 163, contributing £9.45 million in GVA. At the Dumfries and Galloway level the construction phase of the proposed Development could sustain up to 36 jobs and contribute £2.11 million in GVA. The proposed Development has already supported direct local employment at Natural Power and other local contractors, and the proposed Development will engender additional local employment beyond that predicted by the RenewableUK based model utilised in this assessment.

15.7.2 The operation and maintenance phase is also expected to generate economic impacts. Applying the data from the RenewableUK research to the proposed level of development (67.5 MW) provides an estimate of the turnover in the UK associated with the proposed Development during the operations and maintenance stage, £3.21 million. Of this, £1.02 million could benefit the Dumfries and Galloway economy and £2.31 million could be injected into the Scottish economy. Applying the industry assumptions gives the level of operational employment at the Scottish level for the proposed Development as 12, contributing £1.17 million in GVA. At the local level the operation and maintenance phase of the proposed Development is expected to sustain up to five jobs, contributing £520k in GVA. Again, the actual impacts at the local level are expected to be above those predicted by the RenewableUK model as Natural Power are already carrying out non-warranty related work on the existing Windy Standard Wind Farm

15.7.3 In light of the economic recovery, which has been slower in the Stewartry area, and the fact that Dumfries and Galloway has higher unemployment than the Scottish average, the cumulative effect on the labour market from the current wind farm activity in the area can be positive. The scale of local benefits will be maximised if local firms can provide the necessary skills, plant and resource at competitive rates. This is already the case on the existing Windy Standard Wind Farm and will continue to be actively promoted in its extension.

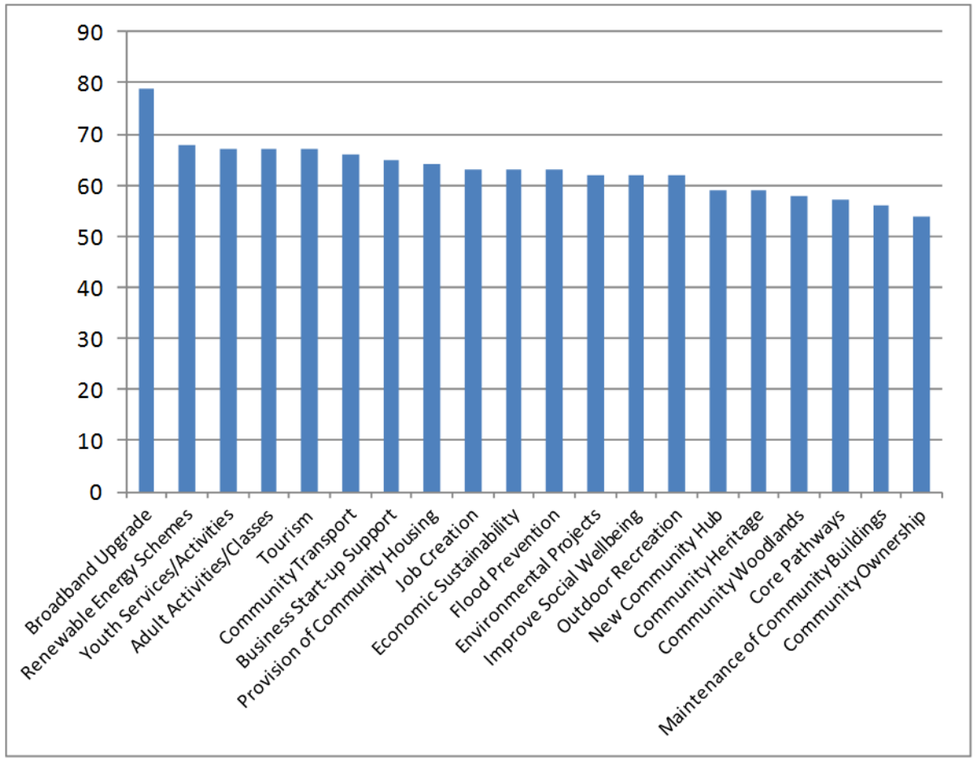
15.7.4 There are not expected to be any detrimental effects on the local recreational and tourism assets as Carsphairn forest is a large commercial forest and is not actively promoted for access or recreational purposes and is not in itself a major tourism destination. No long distance walks or cycle paths cross or are adjacent to the proposed Development (see Chapter 6: Landscape and Visual Assessment, of the ES which assesses the impact of the proposed Development on nationally and regionally important routes and core paths in terms of landscape and visual impact and Chapter 13: Aviation, EMI, Existing Infrastructure and Shadow Flicker, of the ES which assesses the impact on Public Rights of Way). The proposed Development does not adversely affect the visibility of the present Windy Standard Wind Farm and as the review of secondary sources has indicated there is little evidence to suggest tourists are discouraged from visiting an area where there is a wind farm.

15.7.5 In addition to the stated economic opportunities at the construction and operational phases, there is also a variety of wider economic impacts which are excluded from the construction and operational economic impact assessment. The wider impacts which should also be noted as having positive effects on the regional and national economies include:

- Supporting policy objectives; the proposed Development can play an important role in supporting regional and national policy objective. Importantly the proposed Development can support the ambitions set out in the Regional Economic Strategy, notably in ensuring there is balanced opportunity across the region and not focused on the more accessible east, whilst supporting the area's green credentials, supporting local business through supply chain opportunities and thereby creating jobs and offering skills development. In terms of the Regional Planning Policy, the proposed Development will provide much needed investment in this remote and depopulated area, will help to support existing forestry operations on the site and will have various economic spin-offs for the economy and community in the local area. Furthermore it will do so over the 25 year lifetime of the proposed Development therefore providing a long term solution to addressing the decline in population, services and facilities in this area. The proposed Development is therefore considered to be consistent with the underlying intentions of Regional Planning Policy. The proposed Development can directly support DG-REPS own vision and action plan in regard to growing the economic opportunities afforded by the scale and scope of existing and proposed onshore wind farms in the local area.
- Local supply chain opportunities; economic multiplier effects have not been included in the economic assessment due to the difficulty in accurately ascertaining their nature at the local and regional levels. However, it is worth noting DECC/Renewable UK (RenewableUK, 2012) research which estimated that the expenditure of workers who visit the local area benefit the accommodation and food service sector to the value of around £7,500 per MW constructed. The wider 'knock-on' effects can in turn support the supply chain of other activities such as the spending habits of retail operations and accommodation providers.
- Pre-development effects; these have not been assessed in this Chapter but considerable pre-development costs have been borne by Brockloch Rig III Ltd and have benefitted local and national firms. Pre-development activities include; technical consultancy and technical testing and analysis, legal and accounting activities and project management including management consultancy activities and civil engineering. Natural Power Consultants (Natural Power) is leading the EIA phase and is located near St John's Town of Dalry. Natural Power is involved in the construction of over 70 wind farms in the UK. Thus, Natural Power brings demonstrable economic benefits to the Stewartry and wider Dumfries and Galloway region.
- Decommissioning effects; these have also been excluded from the assessment due to the difficulty in predicting impacts in the long term, however there are expected to be economic impacts associated with decommissioning and/or repowering the proposed Development. However, these are generally similar in scale to construction level impacts.
- Income effects; the economic analysis has focused on the GVA impact of generated employment as this is the 'real' impact on the economy. However, it is worth noting that new employment will generate additional wages and salaries, much of which will be spent in the UK.
- Exchequer impacts; the analysis has not attempted to estimate the additional exchequer impacts as a result of taxes borne (Corporation Tax, Employer National Insurance and Irrecoverable VAT) and taxes collected (Income Tax, Employee National Insurance and non-domestic business rates). These are additional financial benefits which will support the regional and national economies.
- Community benefit funds; Brockloch Rig III Ltd are committed to contributing £5k per MW to the local community. Community benefit funds from surrounding developments have previously been used to assist in the purchase of the Carsphairn Village Shop and Tea Room and assist in the maintenance of the building and have been used to assist in improvements to Lagwyne Village Hall in Carsphairn,

15.7.6 A review of the Carsphairn Community Survey outlines the view of local people should Carsphairn receive any future wind farm funding, the figure below summarises the priority projects. Respondents were asked to score each of the community investments on a scale of 1 – 5, with 5 expressing maximum support, the figures below represents the total of all scores recorded and therefore the higher the total the higher the priority.

Figure 15.7: Carsphairn Priority Community Projects



15.7.7 The average score was 63.5 and 'Broadband Upgrade' scored the highest points, the following community investments scored above average points:

- Renewable Energy Schemes
- Youth Services/Activities
- Adult Activities/Classes
- Tourism
- Community Transport
- Business Start-up Support
- Provision of Community Housing

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Author	Marie Scaife	23/09/2015
Checked	Emily Peaston	02/10/2015
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Client Details	
Contact	Gareth Swales
Client Name	Brockloch Rig III Ltd
Address	c/o Fred. Olsen Renewables Ltd

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BROCKLOCH RIG III

Chapter 16

Summary

Contents

List of Abbreviations

Abbreviation	Description
AOD	Above Ordnance Datum
CAA	Civil Aviation Authority
CEMP	Construction Environmental Management Plan
CMS	Construction Method Statement
CRM	Collision Risk Modelling
DGC	Dumfries and Galloway Council
DGERC	Dumfries & Galloway Environmental Resources Centre
DGRSG	Dumfries and Galloway Raptor Study Group

Abbreviation	Description
DGWLCS	Dumfries and Galloway Wind Farm Landscape Capacity Study
EASLA	East Ayrshire Sensitive Landscape Area
ECoW	Environmental Clerk of Works
EIA	Environmental Impact Assessment
ES	Environmental Statement
GPA	Glasgow Prestwick Airport
GVA	Gross Value Added
GWDTEs	Groundwater Dependent Terrestrial Ecosystems
JRC	Joint Radio Company
LDP	Local Development Plan
LVIA	Landscape and Visual Impact Assessment
MoD	Ministry of Defence
NERL	National Air Traffic Service En Route Plc.
NVC	National Vegetation Classification
RBMP	River Basin Management Plan
RSA	Regional Scenic Area
SEPA	Scottish Environment Protection Agency
SNH	Scottish Natural Heritage
SPA	Special Protection Area
VP	Vantage Point
ZTV	Zone of Theoretical Visibility

16.1 INTRODUCTION

16.1.1 This Chapter summarises the findings of the Environmental Impact Assessment (EIA) presented in the Environmental Statement (ES) which was prepared in support of an application under Section 36 of the Electricity Act 1989 to construct and operate a wind farm comprising of up to 20 wind turbines within Carsphairn Forest, near Carsphairn in Dumfries and Galloway. The proposed Development consists of 8 turbines of an overall height from base to tip not exceeding 125 m and a capacity of approximately 3 MW and 12 turbines of an overall height from base to tip not exceeding 177.5 m each with a capacity of approximately 3.6 MW, forestry felling, external transformer housing, widening of existing public road junction, site tracks, crane pads, foundations, underground electricity cables, 2no. permanent anemometer masts, extension of use of consented operations and control building and temporary construction and storage compounds, 4 borrow pits, on-site concrete batching plant, associated works/infrastructure and Health and Safety sign posting.

16.2 OVERVIEW OF THE EIA PROCESS

16.2.1 Chapter 5: EIA Process, of the ES sets out in detail the methodology used to progress the EIA for the proposed Development. As well as addressing the legal requirements set out in the relevant statutory documents notably the Electricity Works (Environmental Impact Assessment)(Scotland) Regulations 2000 as amended by the Electricity Works (Environmental Impact Assessment)(Scotland) Regulations 2008 (the EIA Regulations), the EIA has also followed an iterative design process involving successive rounds of consultation with both statutory consultees and other stakeholders. A summary of the process and the residual effects identified in each section of the ES are set out in the remainder of this Chapter.

16.3 SCOPING OF THE EIA

16.3.1 A scoping report was issued to an agreed list of consultees in March 2014 and formal consultation responses received between March 2014 and July 2014. The responses and recommendations from consultees were then taken into account during the EIA. The scoping responses are detailed in Table 3.1 within Chapter 3: Design Evolution and Alternatives, of the ES. By ensuring that each response has been considered within the assessment a full and robust study has been presented within this ES. Throughout the EIA process, consultations with relevant bodies have been carried out. This has ensured that all bodies, where necessary, have been kept informed about the process throughout the entire assessment.

16.4 GATHERING OF EXISTING DATA

16.4.1 Initial feasibility studies were carried out to determine the viability of the site to host a wind farm and such data helped to inform the EIA process.

16.4.2 Existing data sources which were relevant to each topic were identified and reviewed to help inform the survey requirements. The existing data sources provided a valuable initial stage assessment to inform assessment methodologies and requirements.

16.5 ITERATIVE DESIGN PROCESS

16.5.1 In developing the final layout of the proposed Development, the ES shows how the Applicant has taken into consideration the environmental resources in and around the site and has sought to ensure that the impacts and effects of the proposed Development on these are minimised. This has been an iterative process, taking into account scoping responses, data searches, assessments as they progressed, and consultations with relevant statutory organisations. The design strategy for the key elements of the proposed Development has taken into account the following objectives:

- To provide a turbine layout with simple form, which relates to the landscape character of the site and its surroundings;
- To create a turbine layout which reflects the scale of the landscape in which it is located;

- To avoid an overly complex and visually confusing layout;
- To achieve a balanced composition of the turbines against the landscape and skyline from key view point locations;
- To reflect the pattern of nearby existing and proposed wind farms; and
- To maximise site efficiency in order to compete in a Levelised Cost of Electricity (LCoE) market.

16.5.2 In addition, the following principles have been taken into account in order to ensure that the proposed Development best meets the objectives detailed above whilst maximising the efficiency of the proposed Development:

- Larger turbines have only been used selectively in areas of lower ground levels and contained visibility meaning larger turbines can be accommodated more easily;
- The tip heights of turbines have been considered from an above ordnance datum (AOD) point of view and found that the AOD tip heights of the present Windy Standard Developments are greater than that of the proposed Development thus balancing out the overall tip heights of the surrounding developments;
- There is a fairly mixed baseline with extensive commercial forestry, varied topography, and wind farms already demonstrating significant variations in size with everything from the existing Windy Standard Wind Farm to potentially that of South Kyle and other surrounding sites such as Windy Standard II and Afton and this has been considered within the final design;
- Noting the CfD/LCoE climate which is pushing for greater efficiency in electrical generation within a very competitive market, turbines of 177.5 m to tip height are considered within the design of the proposed Development and are proposed within the final design. Higher tip height turbines are capable of significantly increasing the total output therefore maximising the chances of the development being realised if planning can be secured. In addition, the land take of the proposed Development is reduced as fewer turbines are required to generate a greater total output than turbines with lower tip heights; this also reduces the environmental impacts and the carbon footprint of the proposed Development; and
- Noting that the site is within a search for large typology wind turbines area (as defined in the adopted LPD as turbines greater than 80 m), the principle of turbines within the proposed Development Area is already accepted. Larger turbines therefore allow the potential of this search area to be maximised.

16.5.3 Key objectives adopted for the proposed Development specific to the Landscape and Visual Assessment are discussed in Section 16.7 Landscape and Visual Assessment below.

16.5.4 The final layout therefore represents a technically acceptable and commercially viable development. It is considered that the layout, turbine sizes and number are appropriate to the scale and landform of the proposed Development Area with the proposed Development being the end result of a sensitive, well thought out design process whose goal was to provide the optimum balance between clean energy production, technical constraints and environmental considerations.

16.6 SUMMARY OF ASSESSMENTS

16.6.1 Baseline surveys were carried out by specialist consultants in a number of different study areas. This allowed sufficient data to be collected and analysed to form an accurate account of the current status of environmental and human elements in the vicinity of the proposed Development, at the same time filling in any gaps in existing historical data. The prediction of the potential effects from the proposed Development and any mitigation measures were then considered to ensure that the proposed Development has the least impact possible.

16.6.2 Baseline survey methodologies and coverage are described in detail in the relevant assessments in Chapters 6 to 15 of this ES. A summary of each of these assessments is presented below.

16.7 LANDSCAPE AND VISUAL ASSESSMENT

16.7.1 Chapter 6: Landscape and Visual Assessment, of the ES assesses the landscape and visual effects that would arise as a result of the proposed Development. The assessment utilised Zone of Theoretical Visibility (ZTV) diagrams to determine the potential extent of visual influence that would arise from the proposed turbines. In addition, wire-frame diagrams from viewpoints, chosen in consultation with Dumfries and Galloway Council (DGC) and Scottish Natural Heritage (SNH) were examined and assessed.

16.7.2 The design aim of the proposed Development was to build a coherent and logical layout by locating turbines in a way that would be contained within the existing landscape and which would minimise significant visual effects. A design strategy was agreed between the landscape and visual consultant, the Applicant and Natural Power for the key elements of the proposed Development. Key objectives adopted for the proposed Development specific to the Landscape and Visual Assessment include:

- Use of the enclosure provided by the topography of the adjoining uplands to contain the extent of the potential viewshed of the proposed Development;
- The selective use of larger turbines in areas of set back from prominent skylines where visibility from sensitive low lying positions would be restricted;
- Minimisation of effects on key visual receptors including residential receptors, road users and walkers, including those within Glen Afton, Doon Valley and at settlements and road corridors to the north;
- Avoidance of significant effects on areas designated for their landscape value (e.g. Dumfries and Galloway Regional Scenic Area [RSA] and South Ayrshire RSA);
- Focusing of the proposed Development in an area already subject to extensive wind farm development to concentrate development rather than dispersing it throughout the locale, and within a search area where there is an expectation of large typology wind turbines, as defined in the adopted Local Development Plan (LPD);
- Use of a layout that reflects the development pattern of nearby existing and proposed wind farms with that of the present Windy Standard Developments;
- The avoidance, wherever possible of prominent hills/summits and ridges or steep gradients that mark a transition to smaller scale landscapes or along the edge of the uplands;
- The placement of the largest turbines of the proposed Development in locations which ensure that they do not exceed the maximum tip height (in terms of metres above ordnance datum (AOD)) of the present Windy Standard Developments; and
- The use of large turbines to maximise energy outputs whilst minimising landtake and effects on landscape fabric. Wherever possible, ensuring that the proposed Development would be seen in the same part of the view as other wind farm developments, and overlapping with them.

16.7.3 The landscape and visual consultant assisted and fed into the design process for the proposed Development, examining several design layouts before an agreed final layout was eventually put forward for full assessment.

16.7.4 It is considered that the landscape at the broad scale is sufficiently robust to be able to accommodate the proposed Development without significant effects arising. No nationally important landscapes would be significantly affected by the proposed Development. Whilst significant effects were predicted within the Galloway Hills RSA the LVIA concludes that such effects would be localised and would not undermine the designations integrity in respect of its key characteristics or reason for designation. Considered in relation to the East Ayrshire Sensitive Landscape Area (EASLA), the proposed Development would have limited visibility from this large scale and diverse designation. Whilst significant visual effects were predicted at Blackcraig Hill, these would be localised and not, in themselves, sufficient to result in a significant erosion of the character and quality of the designation. It is also important to note that this location is already subject to considerable visibility of wind farms and recently consented developments such as Afton and the Hare Hill extension will inevitably add to this. It should be kept in mind that all landscape and visual impacts identified are temporary and reversible.

16.7.5 No significant effects were identified in respect of settlements, key roads and rail routes considered in the LVIA. No nationally or regionally important routes such as the Southern Upland Way and National Cycleway No.7 would be significantly affected by the proposed Development. Although a number of Core Paths would be, these include Cairnsmore of Carsphairn by the Green Well Core Path, Carsphairn Forest Core Path and Knockgorroch Core Path, of the eighteen viewpoints utilised within the LVIA as representative of key receptor locations, only five would be subject to significant effects. These significant effects would be relevant to those enjoying recreational activities for whom the visual enjoyment of the landscape within the outdoors environment is a primary focus. It should be noted however that not all recreational participants would be significantly affected since there are many locations within this range that would not offer open views to a high proportion of the proposed Development. In other words, if significant effects are to be found, they would be located within that range but not all effects within that range would be significant.

16.7.6 It is recognised that any onshore commercial wind farm in Scotland will result in some significant effect on the landscape resource and visual amenity of an area. The proposed Development is no different to this, however the extent and severity of significant effects has been limited by careful siting and design. The wider landscape would not be transformed. Its broader underlying character would not be compromised and as such, it is considered that the landscape at a broad scale is sufficiently robust enough to accommodate the proposed Development without significant effects arising. Although the landscape is strongly influenced by the proposed Development the larger turbines have only been used selectively – only in areas of lower ground levels and contained visibility meaning larger turbines can be accommodated without significant landscape and visual effects. The result of this is a proposed Development that has a relatively limited number of significant effects on what are generally considered to be receptors of local (rather than national or regional) importance.

16.7.7 The extent of significant cumulative effects attributable to the proposed Development is also considered to be of modest proportions. The proposed Development, seen in conjunction with existing and consented wind farms, would often represent the less prominent scheme and would often share the 'envelope' of other developments in views. Moreover, whilst the numerous proposals for wind farm developments have the potential to result in fundamental change to some landscapes in the area. The LVIA has concluded that in such cases, the proposed Development would not significantly contribute to such a change.

16.8 ECOLOGY

16.8.1 Chapter 7 of the ES assesses the potential effects on the ecological receptors within the zone of influence (i.e. the area affected by the proposed Development and/or within the immediate surrounding environment), which may arise as a result of the proposed Development.

16.8.2 Baseline ecology surveys at the proposed Development were undertaken in 2012, 2014 and 2015, and comprised Phase 1 and National Vegetation Classification (NVC) habitat surveys, bat activity and roost surveys, and surveys for otter, water vole, badger, pine marten and red squirrel.

16.8.3 Consultation with statutory authorities (e.g. SNH, Scottish Environment Protection Agency [SEPA], Galloway Fisheries Trust) was also undertaken as required, alongside a desk based review of relevant records and historical data from public domain sources and relevant organisations (e.g., Dumfries & Galloway Environmental Resources Centre [DGERC]), in order to help characterise the baseline at the proposed Development. In addition, a review of relevant survey data from the neighbouring Windy Standard II was undertaken.

16.8.4 No ecological statutory designated sites are present within the vicinity of the proposed Development Area or within 2 km of the proposed Development. There are four SSSIs within 10 km designated for ecological or geological features, but due to the geographical separation of these sites and the lack of habitat connectivity, any impact on the conservation objectives of these sites due to the proposed Development is considered to be highly unlikely.

16.8.5 The proposed Development is dominated by mature conifer plantation, with smaller open areas such as within rides and the top of Waterhead Hill supporting remnants of mire (classified as the Phase 1 habitat category 'wet modified bog'), grassland and heathland. Most of the vegetation within the proposed Development has developed on peat greater than 0.5 m deep, and although some remnant areas of vegetation is characteristic of blanket bog, most has been modified to some extent through livestock grazing and afforestation. The Nationally Scarce tall bog sedge *Carex magellanica* is present in an area of flood plain mire at the north of the Meaul Hill Cluster.

16.8.6 The proposed Development provides suitable habitat for otter and red squirrel, and field signs of these species were found during surveys. There is also potentially suitable foraging and commuting habitat for badger and bats, and these species were noted to be present during surveys. However, the site is not considered suitable for badger sett construction or for bat roosts, and levels of recorded bat activity were very low. The proposed Development is considered to be sub-optimal for pine marten and water vole, and no conclusive evidence of these species have been observed to date, although suitable habitat for these species exists in the wider area.

16.8.7 In combination with Hydrology assessments presented in Chapter 10: Hydrology, Geology and Hydrogeology, of the ES, the Ecology Chapter determined that due to the type and heavily modified nature of the habitats present at the proposed Development, there are unlikely to be extensive Groundwater Dependent Terrestrial Ecosystems (GWDTEs) on site. Mitigation, such as micro-siting, and best practice measures during the construction phase will ensure that there will be no significant effects on any small areas of GWDTE which may be present.

16.8.8 In the absence of specific mitigation measures it is predicted that there may be significant effects on the following species and habitats during the site preparation and construction phase of the proposed Development: wet modified bog; watercourses; and tall bog sedge. No significant effects on protected mammal species are predicted.

16.8.9 By applying effective mitigation measures, mainly through the design process and following best practice guidelines during construction, the magnitude of residual effects of the proposed Development both alone and in combination with other developments within a 10 km radius are assessed as being low to negligible magnitude and therefore not significant in terms of the EIA regulations.

16.9 ORNITHOLOGY

16.9.1 Chapter 8 of the ES assesses the potential effects on ornithological receptors which may arise during construction, operation and decommissioning of the proposed Development. Consultation with Scottish Natural Heritage (SNH) was undertaken in 2009-2010, in 2012 to inform the baseline survey programme and in 2014 SNH was provided with a detailed breakdown of Vantage Point (VP) work undertaken to date in a pre-EIA Ecology Review. A Scoping Report was issued to consultees in March 2014 and all responses relevant to ornithology were collated and used to inform the assessment.

16.9.2 A single statutory site of international importance with geese as a designated feature was identified within 25 km (Loch Ken and River Dee Marshes SPA/Ramsar site).

16.9.3 Baseline ornithology surveys were undertaken between 2009 and 2013, following SNH guidance that was current at the time. The survey programme comprised VP surveys, black grouse lek surveys, breeding raptor and barn owl surveys, and a breeding bird survey of open ground. In addition, a desk-based review of existing data from the present Windy Standard Developments, together with datasets held by local recording groups (such the Dumfries and Galloway Raptor Study Group (DGRSG)) was used to provide additional baseline information on ornithology in and around the proposed Development.

16.9.4 Flight activity across the proposed Development Area was relatively low, with a total of 40 flights of 10 target species recorded across 17 months of VP surveys. Only very low numbers of flights (0-3 flights per species) were recorded at potential collision height within the risk area. As such, Collision Risk Modelling (CRM) was not undertaken for any species as the resultant predicted collision mortality would have been so low that results would be deemed insignificant.

16.9.5 Six active black grouse leks were present during surveys, two of which were within 1.5 km of the proposed Development Area. The number of lekking birds was generally small (1-2 birds), with the largest (one of the leks within 1.5 km of the proposed Development Area) attended by four males and one female.

16.9.6 During breeding raptor surveys in 2012, a number of merlin flights were recorded between late March and mid-July 2012, including several of birds in the same locale exhibiting signs of breeding behaviour. However, a subsequent search did not identify any nests, and no merlin flights were recorded after mid-July. Thus, it is considered likely that the species may have established a territory, but that any breeding attempt was unsuccessful. The DGRSG provided records of two peregrine nest sites within 5 km of the proposed Development Area. Although a peregrine was observed at one of these sites during the breeding raptor surveys, there was no evidence of attempted breeding and there was no evidence of any breeding sites within 2 km of the proposed Development Area. An active kestrel nest was recorded to the west of the proposed Development Area during breeding raptor surveys in 2013. During surveys for breeding barn owl, old owl pellets were recorded in one of two suitable buildings within 1 km of the proposed Development, but there was no evidence of breeding during nest checks undertaken in 2009 and 2012.

16.9.7 Four ornithological receptors of regional or higher value were recorded at the proposed Development: greylag goose, black grouse, merlin and peregrine. All other species were assessed as being of local or negligible value due to their low conservation status or limited use of the proposed Development Area. No significant effects were predicted for any species although potential effects of disturbance to merlin were of moderate magnitude.

16.9.8 Specific mitigation is proposed for black grouse, merlin, barn owl and kestrel to minimise the potential effects of disturbance and to ensure compliance with the Wildlife and Countryside Act (1981) as amended by the Nature Conservation (Scotland) Act (2004). No other specific mitigation is required although good practice measures, including the use of an Environmental Clerk of Works (ECoW), could be adopted to reduce the possibility of illegal damage, destruction or disturbance to occupied bird nests during the construction phase.

16.9.9 It is considered unlikely that the proposed Development will have a likely significant effect on the Loch Ken and River Dee Marshes SPA/Ramsar site, which is designated for internationally important overwintering populations of Greenland white-fronted goose and Icelandic greylag goose. A single flock of 18 greylag geese was recorded during the entire survey programme, outwith of the proposed Development and as such the effects of collision were predicted to be negligible and not significant for this species.

16.9.10 Assessment of residual effects on ornithological receptors determined that the proposed Development, both alone and in combination with other developments within a 25 km radius, would be no greater than a low or negligible impact and therefore not significant in terms of the EIA regulations.

16.10 CULTURAL HERITAGE

16.10.1 Chapter 9: Cultural Heritage and Archaeology, of the ES assesses the effects on the cultural heritage interests within the area arising as a result of the proposed Development.

16.10.2 There are no scheduled monuments or listed buildings within the proposed Development Area, and no part of the proposed Development Area lies within a Conservation Area or Garden and Designed Landscape. There is one scheduled monument within the 2 km study area: The King's Cairn and cairn to the west of Water of Deugh (the 2 km study area extends 2 km from the proposed turbines and takes in the construction footprint of the proposed Development). There are eleven scheduled monuments within the 10 km study area (the 10 km study area extends 10 km from the proposed turbines).

16.10.3 There is potential for the construction phase to have an effect on previously unrecorded cultural heritage assets in the areas surrounding known cultural heritage assets. No previously recorded heritage assets lie within the construction footprint of the proposed Development. The proposed Development lies in an area with low archaeological potential and the potential for previously unrecorded assets to be present within the proposed Development's construction footprint is considered to be negligible. It is concluded that there is negligible potential for previously recorded heritage assets to be affected by construction.

16.10.4 Potential operational effects upon the setting of cultural heritage assets in the surrounding area have been considered. The effect on the setting of cultural heritage assets is considered to be of no greater than of minor/moderate significance. These effects are not significant and will cease upon decommissioning, except at King's Cairn, where the effect will cease sooner, when the proposed Development is screened by forestry.

16.10.5 A cumulative impact of moderate significance is predicted upon King's Cairn scheduled monument. The impact will be temporary, ending when surrounding forestry screens the valley of the Water of Deugh from view.

16.10.6 Therefore the proposed Development would have no effects that would be determined to be significant in terms of the EIA regulations.

16.11 HYDROLOGY, GEOLOGY, HYDROGEOLOGY AND PEAT

16.11.1 Chapter 10: Hydrology, Geology and Hydrogeology, of the ES assesses the effects on hydrological, hydrogeological and geological environment within the area arising as a result of the proposed Development. The assessment covered an area larger in extent than the actual site boundary to include lower reaches of watercourse catchments that are present within the Planning Application Boundary.

16.11.2 The proposed Development is located within the catchment of the Water of Deugh, which includes the tributary catchments of Polwhat Burn, Lone Stand, Shalloch Burn, Bow Burn and several small unnamed tributaries. The Water of Deugh lies to the west of the proposed Development and flows south to Kendoon Loch before finally discharging into Carsfad Loch. The potential for flooding from different sources has been assessed and methods to limit such impacts have been provided. The potential impact upon water quality has also been assessed; there are two watercourses that are within or downstream of the Planning Application Boundary that are classified in SEPA's River Basin Management Plan (RBMP) for protecting or improving, the Water of Deugh and Bow Burn. The Water of Deugh has poor ecological potential and Bow Burn moderate ecological potential, the water quality of both will be monitored. The proposed Development is determined to have effects no greater than minor/moderate to negligible/minor significance on water quality.

16.11.3 There are no Scottish Water, water abstraction sources, which are designated as Drinking Water Protected Areas under the Water Framework Directive within the Planning Application Boundary. DGC and East Ayrshire Council have also been consulted about the presence of private water supplies within the Planning Application Boundary and within a 3 km buffer. None are recorded within the planning Application Boundary and there are 17 registered private water supplies within 3 km. The proposed Development is determined to have effects no greater than negligible/minor significance on private water supplies.

16.11.4 The Galloway Fisheries Trust has been consulted and the potential impacts upon fishing activities in the area assessed. The proposed Development is determined to have effects no greater than minor to negligible/minor significance upon fisheries and recreational fishing.

16.11.5 Borrow Pits are areas of the site identified as potential sources of rock for use in construction and have been considered in some detail in Technical Appendix 10.2: Borrow Pit Search Report in Volume 4 of the ES. Further detailed investigations would be required to confirm these areas but it has been determined that the site should be suitable for sourcing enough rock onsite for construction. After all the rock required has been sourced, the Borrow Pits would be reinstated in an appropriate fashion as agreed with relevant consultees.

16.11.6 A Construction Method Statement (CMS) could be created before construction begins which will be a document detailing all the appropriate actions to undertake to ensure potential identified impacts are minimised. The proposed Development is assessed as having hydrological, hydrogeological and geological effects which are not significant under the governing EIA regulations.

16.11.7 The mean depth of peat recorded across the proposed Development Area is 0.75 m and for proposed wind turbine locations 0.70 m. Peat data recorded on site was used to influence the locations of the infrastructure with deeper regions of peat avoided where possible. Construction practices shall be guided through the CMS and methods implemented to reduce risks of peat slide.

16.11.8 A comprehensive suite of mitigation and best practice measures has been incorporated into the design. A programme of surface water quality monitoring will be finalised and agreed with SEPA post consent, prior to construction.

16.11.9 Following the implementation of mitigation measures and best practice as described in the CMS any of the potentially significant impacts associated with construction and operational effects will be controlled on all identified receptors.

Carbon Balance Assessment

16.11.10 The Carbon Balance Assessment in Technical Appendix 10.5: Carbon Balance Assessment and 10.6: Carbon Balance Calculation Sheets in Volume 4 of the ES provides extra information regarding potential impact upon peat and assesses the impact in terms of carbon dioxide (CO2) emissions against the total potential carbon savings attributed to the proposed Development. Every unit of electricity produced by a wind energy development potentially displaces a unit of electricity which might otherwise have been produced by a conventional (coal or gas) power station. It is the output from coal-fired and gas-fired plant which is adjusted to meet the electricity demand on the system; therefore, wind power would normally replace the output of these power stations as these are the most flexible plant on the system (wind-generated electricity does not generally replace electricity from nuclear power stations because they operate at 'base load'). However, there is a carbon debt associated with the preparation and construction of any energy development, and the calculation of the carbon balance of the proposed Development provides a mechanism by which the carbon costs of the proposed Development can be weighed against the carbon savings attributable to the wind farm during its lifespan. This calculation is summarised as the length of time (in years or months) that it will take for the carbon savings to equal the carbon costs; and is referred to as the 'payback period'. The carbon balance information can then inform decision makers of the effectiveness of a wind energy development in terms of overall carbon savings.

16.11.11 In consultation with SEPA and SNH, the Scottish Government's Carbon Calculator has been used and concluded that the proposed Development will pay back its expected carbon debt from manufacture, construction, impact on habitat and decommissioning within 1.7 years if it replaces the grid-mix of electricity generation, 0.8 years if it replaces coal and 1.1 if it replaces the fossil-fuel mix (see Technical Appendix 10.5: Carbon Balance Assessment and 10.6: Carbon Balance Calculation Sheets in Volume 4 of the ES).

16.12 NOISE

16.12.1 Chapter 11: Noise, of the ES assesses the noise effects that would arise as a result of the proposed Development.

16.12.2 Based on the installation of 20 turbines, predicted turbine noise levels at dwellings neighbouring the proposed Development were assessed in line with guidance in ETSU-R-97. Predicted cumulative noise impacts from the existing and consented wind farms in the vicinity of the proposed Development Area were assessed. An assessment of the potential noise impact due to construction activity was also carried out in line with published guidelines in BS 5228, Part 1: 2009+A1:2014 – 'Code of Practice for Noise and Vibration Control on Construction and Open Sites - Noise'.

16.12.3 When considering only the proposed Development, predicted levels and measured background noise levels indicate that at dwellings neighbouring the proposed Development, wind turbine noise levels will not exceed the Lower Daytime Hours Noise Criterion proposed by ETSU-R-97 nor exceed the Night-time Hours Noise Criterion proposed by ETSU-R-97.

16.12.4 There are a number of operational, consented and proposed wind turbines located in the vicinity of the proposed Development Area and therefore a cumulative assessment was undertaken. Predicted cumulative operational noise levels and measured background noise levels indicate that for dwellings neighbouring the proposed Development, cumulative wind turbine noise would meet the Noise Criteria proposed within ETSU-R-97; therefore, the operational noise effects are deemed not significant.

16.12.5 An assessment of the potential noise associated with construction of the proposed Development indicates that noise associated with such activity will be limited to acceptable levels.

16.12.6 The noise impact from the proposed Development can be considered negligible and therefore not significant in terms of the EIA Regulations.

16.13 FORESTRY

16.13.1 Chapter 12: Forestry, of the ES considers the forestry aspects of the proposed Development and describes the proposed Development plans for felling, restocking and forest management practices. The Forestry Study Area which extends to 3,478.83 ha is located within Carsphairn Forest in Dumfries and Galloway and is primarily used as commercial forestry plantation. The majority of the woodlands were planted in the early 1970's with subsequent replanting as areas have been felled and then restocked. The planting consists primarily of Sitka spruce and other commercial conifers, with small areas of broadleaf woodland and unplanted land.

16.13.2 The windfarm felling programme was largely driven by technical constraints. Areas of forestry would require to be felled to accommodate the construction and operation of the proposed Development. Typically a minimum area of about 1.54 ha (equivalent to an 70 metre radius circle) would be required to be felled for each turbine; a 10 m buffer around each item of infrastructure, in addition to the area required for the infrastructure; and a 50 m corridor for access roads.

16.13.3 In the case of the proposed Development further felling is proposed for forest management and wind yield purposes in addition to the felling required for the infrastructure. In older woodlands such as Carsphairn Forest there is a risk of windblow in the remaining crop when parts of the stands are removed for new tracks or turbine keyholes. In these areas the crops would be felled to a windfirm boundary at the time of construction. Where the crops are younger, only the area necessary to accommodate the turbine, track or other infrastructure and provide the relevant buffer zone would be felled at the time of construction.

16.13.4 Felling required for a development can be divided into two categories. Firstly, that required during the construction phase of the development, which for the purposes of this assessment, has been anticipated as 2018. Secondly, felling required during the operational period of the proposed Development. In this case all the felling would take place during the construction period.

16.13.5 The majority of the areas to be felled for the proposed Development would be restocked as per the existing Forestry Plan apart from the areas detailed below:

- Land required for the proposed Development infrastructure subject to the buffer zones/keyholes described above. However, the opportunity would be taken through the implementation of the plan to reduce the buffer zones where possible during restocking;
- Land to be left unplanted for wind resource protection and turbine performance purposes; and
- Land left unplanted for forest management or forest design purposes.

16.13.6 In modifying the restocking plan, a number of points were taken into account as detailed below:

- Fragmentation of coupes were minimised as much as possible in the restocking design;
- Coupe shapes were modified to ensure that access for future forestry operations, principally harvesting, would be maintained; and
- Coupe shapes and edges were modified to follow good practice.

16.13.7 Species composition was also considered, taking into account existing restocking plans, the proposed Development operational objectives, landowner objectives and forestry policies.

16.13.8 It is planned to utilise the open ground associated with the proposed Development infrastructure, such as tracks, for forest design purposes as management boundaries. This would reduce the amount of other designed open ground required within the restocking plan, reducing the loss of woodland area.

16.13.9 The species composition of the forests would change only slightly as a result of the proposed Development forestry plans. In particular the area of primary conifer species would decrease from 59.52 % of the Forestry Study Area to 58.69 % as a result of the proposed Development proposals.

16.13.10 The proportion of secondary conifer species would remain the same.

16.13.11 The proportion of broadleaf woodland would increase under the proposed Development plans by 0.01%.

16.13.12 The total proportion of open ground would increase from 31.22 % to 32.05 % due to the incorporation of the proposed Development infrastructure into the forest.

16.13.13 There would be a small net loss of woodland area. The overall area of stocked woodland would decrease by 28.87 ha (0.83 %) of the Forestry Study Area as a result of the proposed Development forestry plans.

16.13.14 There would be a change in the pattern of timber harvesting with felling programmes being advanced compared with the baseline. As a result the total volume of timber to be harvested over the period would decrease by 11,809 m3 (0.8 %).

16.13.15 It is recognised that, there would be a small net loss of commercial woodland area as a result of the proposed Development equivalent to 28.87 hectares (0.83 % of the Forestry Study Area).

16.14 AVIATION AND EXISTING INFRASTRUCTURE

16.14.1 Chapter 13: Aviation, EMI, Existing Infrastructure and Shadow Flicker, of the ES considers the potential effects upon aviation interests and existing infrastructure such as communication links and Public Rights of Way. Relevant bodies including the Ministry of Defence (MoD), Civil Aviation Authority (CAA) National Air Traffic Service En Route Plc. (NERL), and Glasgow Prestwick Airport (GPA) have been consulted with regard to the proposed Development.

16.14.2 The proposed Development largely avoids direct impacts on aviation issues, with the exception of its potential impact on the GPA Primary Surveillance Radar. However, it is anticipated that this issue can be overcome by the Applicant through the application of a mitigation solution identified by GPA. The Applicant is also liaising with RenewableUK (RUK) and the CAA with regards to aviation lighting requirements and will work with the CAA and other relevant consultees to agree a suitable lighting pattern where required. In addition to this it must be noted that RUK has been requested by the CAA to provide a Briefing Note on Onshore Aviation Lighting[1] which takes into consideration the likelihood that onshore wind turbines with a tip height in excess of 150 m will be greater in the future as a result of the need to reduce costs through turbine optimisation and site selection, via larger rotors on taller hub heights. As a part of the Briefing Note, RUK has reviewed the current plethora of aviation lighting references for onshore and offshore projects in the UK and UK Continental Shelf (UKCS), including CAA, Ministry of Defence (MOD), Maritime and Coastguard Agency (MCA) and RUK documents. The Briefing Note provides recommendations with regards to aviation lighting for turbines with a tip height in excess of 150 m and provides suggested next steps. Natural Power on behalf of Brockloch Rih III Ltd (BR3) has responded to the draft Briefing Note and will continue to work with RUK on this matter in the future.

16.14.3 Fixed microwave links which provide direct lines of communication for things like TV and mobile telephone networks have been considered in the design of the proposed Development; however it was found that there are no fixed microwave links within the proposed Development Area. Consultation response from Atkins Limited (ATKINS) also raised no objection.

16.14.4 The Joint Radio Company (JRC) has confirmed there are no issues with respect to radio link infrastructure operated by Scottish Power and Scotia Gas Networks. JRC does not foresee any potential problems based on known interference scenarios and data provided. In addition, BT has stated that the proposed Development should not cause interference to BT's current and planned radio networks and ATKINS has confirmed that the proposed Development should cause no interference to UHF Radio Scanning Telemetry communications used by its client.

16.14.5 The design of the proposed Development has also taken in to account potential Public Rights of Way and other paths in and around the proposed Development Area. Consultation with Scotways has confirmed there are no known Public Rights of Way across the proposed Development Area. The Dumfries and Galloway Core Paths Maps have also been consulted and again these maps show there to be no Core Paths within the proposed Development Area. There is however, a core path that follows the forestry tracks to the south of the Waterhead Hill Cluster. For Health and Safety reasons, access across the proposed Development Area, including the main access route, would be managed during the construction phase. Any temporary restrictions on passage through the proposed Development Area would be appropriately sign posted and if necessary, temporary diversions put in place. The details of which would be agreed pre-construction with the local planning authority and presented in a CMS. During the operational period, sign posts will be erected next to the access tracks to direct personnel to the relevant infrastructure onsite. This is for health and safety purposes to allow navigation across the site in the case of an emergency. The core path itself would not be negatively impacted upon during construction but the temporary effect upon the use of these paths during construction would be affected. Any effects would be temporary and any potential diversions will be managed and presented in the CMS post consent. Furthermore, the access across the proposed Development would be improved with the introduction of the proposed access tracks which would be maintained throughout the operational lifetime of the proposed Development.

16.14.6 Scottish Water has confirmed that there are no Scottish Water water abstraction sources which are designated as Drinking Water Protected Areas under the Water Framework Directive, in the area that may be affected by the proposed Development and therefore, Scottish Water drinking water sources and assets should not be affected.

16.14.7 In consideration of potential shadow flicker effects, given that all properties are more than 10 rotor diameters from proposed turbine locations, it is therefore deemed unlikely that any shadow flicker effect will be caused by the proposed Development.

16.14.8 With mitigation the residual impacts upon aviation and existing infrastructure by the proposed Development is considered to be not significant.

16.15 TRAFFIC AND TRANSPORT

16.15.1 Chapter 14: Traffic and Transport, of the ES provides a full assessment of the potential impacts upon traffic and transport resulting from the construction, operation and decommissioning of the proposed Development. Traffic generated by the proposed Development would be almost entirely limited to vehicle movements related to the construction and decommissioning phases. During operation, traffic would be minimal since much of the operation of the wind farm would be monitored remotely and would consist mostly of inspection and maintenance visits. Turbine components, electrical equipment, concrete or the raw materials for concrete (cement, sand and aggregate), steel for turbine foundations and electrical cabling would all need to be transported to the site using the public road system.

16.15.2 Current (baseline) conditions have been established using traffic survey data obtained from the Department for Transport. Various bodies including the Scottish Government and Transport Scotland were consulted and assessments carried out in line with current policy and guidance.

16.15.3 Vehicles and equipment would be delivered to site at the commencement of the relevant construction phase and would remain on site until work relating to that stage was completed. Such equipment would include cranes for erecting the turbines and excavators for cable installation and foundation excavation.

16.15.4 Most vehicles used during the construction activities would be below the width requirement for wide loads, with the exception of the turbine deliveries (nacelle, tower sections and blades) and possibly the main and tailing cranes that would be used for the erection of the turbines. The local roads authority may consider a police escort necessary for some abnormal loads, depending on conditions on the proposed access route and the size of the loads. The cranes are likely to require only a single journey along the public highway to and from the

[1] RenewableUK, Briefing Note to the Civil Aviation Authority re Configurations for Onshore Aviation Lighting to Meet the Requirements of the Air Navigation Order Article 219, January 2016.

proposed Development. Road axle weights would not exceed regulated levels unless agreed with the relevant authorities.

16.15.5 Following good practice guidance the following actions are proposed in order to minimise any potential disturbance as far as possible:

- HGV deliveries including concrete and turbine components would be instructed to avoid school drop off and pick up times.
- During turbine delivery phase, leaflets would be posted in local shops and distributed to houses along the delivery route.
- Identify stopping points along the transport route where slower turbine delivery vehicles can pull over to allow queued traffic to pass.
- Arrange for adequate wheel washing facilities, to allow construction vehicles to clean their wheels before entering onto the public road. Arrange road cleaning vehicle to keep the public road free of mud.
- To reduce air pollution make sure that all construction vehicles are adequately maintained to comply with exhaust emission requirements and are switched off when not in use. Encourage the use of minibuses and car-sharing for personnel transport.
- To reduce noise and vibration disturbance, arrange the transport of heavy loads at times of least sensitivity e.g. not in the evening, or night time deliveries through residential areas.
- To reduce risk to pedestrians and road users, abnormal loads should be adequately escorted and appropriate traffic management and signage used.
- It is important that the local council road department is consulted on all transport issues and to make sure that deliveries do not conflict with other scheduled road works.
- As the number of vehicles required during normal operation and maintenance is not significant, no mitigation measures are proposed. If during the operation period major repair works are required then the good practice measures proposed for the construction period should be reviewed.
- When the method of decommissioning is agreed with the relevant parties for the proposed Development, road traffic impacts should be re-assessed and mitigation measures agreed, if required.

16.15.6 Following the assessments, it has been determined that even in the absence of the mitigation measures highlighted above, the overall impact of the proposed transport associated with the proposed Development will not be significant.

16.16 SOCIO-ECONOMIC AND TOURISM ASSESSMENT

16.16.1 Chapter 15: Socio-Economic and Tourism Assessment, of the ES calculates the construction and operational employment associated with the proposed Development and assesses the economic impact upon the local and national economies and the potential impacts upon tourism.

16.16.2 Scotland's Economic Strategy 2015 identifies priority areas where actions will be targeted to make a difference, to Scotland's economy, these focus on "investment", "innovation", "inclusive growth" and "internationalism". The proposed Development directly supports each of the broad priority areas set out in the new economic strategy.

16.16.3 The Routemap for Renewable Energy in Scotland also identifies the economic opportunity for 40,000 new jobs in the period to 2020.

16.16.4 Policies and strategies also focus on the importance of tourism to Scotland's economy and cautions that Scotland needs to remain competitive. However, it is recognised that the tourism assets are primarily located towards the southern coastal area of the Stewartry sub-region. In addition, research has tended to support the premise that wind farm development has not resulted in a serious negative economic impact on tourism and could even have wider positive impacts.

16.16.5 The development phase of the proposed Development has not been assessed as this phase has already commenced, however these effects have been summarised as part of the 'wider impacts' of the proposed Development and are discussed in Chapter 15: Socio-economic and Tourism Assessment, of the ES. It is noted that the employment of Natural Power Consultants (Natural Power) located near St John's Town of Dalry as the lead agent brings demonstrable economic benefits to the Stewartry and wider Dumfries and Galloway region. The Applicant has made extensive use of Natural Power and other local contractors throughout the development phase and as such has already had a notable level of local benefit.

16.16.6 In terms of construction impact, the wind farm construction is estimated to cost in the region of £83.03 million. Of this, there is potential for £5.40 million to benefit the local economy and £24.16 million to benefit the Scottish economy. Applying industry assumptions provides an estimate on the level of employment at the Scottish level for the wind farm development as 163, contributing £9.45 million in Gross Value Added (GVA). At the Dumfries and Galloway level the construction phase of the proposed Development could sustain up to 36 jobs and contribute £2.11 million in GVA.

16.16.7 The operation and maintenance phase is also expected to generate economic impacts. The level of employment at the UK level associated with the proposed Development during the operations and maintenance stage is sixteen, which equites a turnover that is estimated to be £3.21 million. Of this, £1.02 million could benefit the Dumfries and Galloway economy and £2.31 million could be injected into the Scottish economy. Applying the industry assumptions gives the level of operational employment at the Scottish level for the proposed Development as twelve, contributing £1.17 million in GVA. At the local level the operation and maintenance phase of the proposed Development is expected to sustain up to five jobs, contributing £520k in GVA.

16.16.8 Other wider economic impacts of the proposed Development that have not been addressed in the construction and operational economic impact assessment that have positive effects on the regional and national economies include the support of policy objectives; the proposed Development can play an important role in supporting regional and national policy objective and can support the ambitions set out in the Regional Economic Strategy, notably in ensuring there is balanced opportunity across the region and not focused on the more accessible east, whilst supporting the area's green credentials, supporting local business through supply chain opportunities and thereby creating jobs and offering skills development. In terms of the Regional Planning Policy, the proposed Development will provide much needed investment in this remote and depopulated area, will help to support existing forestry operations on the site and will have various economic spin-offs for the economy and community in the local area. The proposed Development can also directly support the Dumfries and Galloway Renewable Energy Partnerships (DG-REP) vision and action plan in regard to growing the economic opportunities afforded by the scale and scope of existing and proposed onshore wind farms in the local area.

16.16.9 Local supply chain opportunities and economic multiplier effects have not been included in the economic assessment due to the difficulty in accurately ascertaining their nature at the local and regional levels. However, it is worth noting DECC/Renewable UK (RenewableUK, 2012) research which estimated that the expenditure of workers who visit the local area benefit the accommodation and food service sector to the value of around £7,500 per MW constructed. The wider 'knock-on' effects can in turn support the supply chain of other activities such as the spending habits of retail operations and accommodation providers.

16.16.10 Community benefit funds have also not been included in the economic assessment, however BR3 are committed to contributing £5k per MW to the local community. Community benefit funds from surrounding developments have previously been used to assist in the purchase of the Carsphairn Village Shop and Tea Room and assist in the maintenance of the building and have been used to assist in improvements to Lagwyne Village Hall in Carsphairn.

16.17 SITE DESIGN, ASSESSMENT OF IMPACTS AND MITIGATION

16.17.1 As environmental and visual assessments developed, and any potentially higher magnitude impacts were identified, mitigation measures were adopted and incorporated into the design. This iterative design process

continued until the most appropriate wind farm design was achieved. In this way, the proposed Development presented here can be seen to have incorporated mitigation measures directly into the design process, and the findings and conclusions of the environmental impact assessments reflect the incorporation of those measures.

16.17.2 The final site design took into consideration the advice gained from the consultation and scoping process, baseline studies and surveys. In doing so what is presented within this ES is a wind farm design that fits within the boundaries of the technical and economic constraints with acceptable impacts on the environment and visual conditions within the area.

16.18 RESIDUAL EFFECTS AND MITIGATION

16.18.1 The following table summarises the mitigation measures incorporated into the design and those proposed for the construction, operation and ultimate decommissioning of the proposed Development.

Table 16.1: Register of mitigation for the proposed Development

ES Chapter/Principal Area of Effect	Mitigation Measure	Considerations
Landscape and Visual	Mitigation by design	• The siting and layout of the proposed Development was based on an iterative design process aimed at reducing environmental impacts whilst achieving suitable technical and commercial objectives. The adoption of key objectives including: – Use of the enclosure provided by the topography of the adjoining uplands to contain the extent of the potential viewshed of the proposed Development; – The selective use of Larger turbines in areas of set back from prominent skylines where visibility from sensitive low lying positions would be restricted; – Minimisation of effects on key visual receptors including residential receptors, road users and walkers, including those within Glen Afton, Doon Valley and at settlements and road corridors to the north; – Avoidance of significant effects on areas designated for their landscape value (e.g. Dumfries and Galloway RSA and South Ayrshire RSA); – Focusing of the proposed Development in an area already subject to extensive wind farm development to concentrate development rather than dispersing it throughout the locale, and within a search area where there is an expectation of large typology wind turbines, as defined in the adopted LDP; – Use of a layout that reflects the development pattern of nearby existing and proposed wind farms with that of the present Windy Standard Developments; – The avoidance, wherever possible of prominent hills/summits and ridges or steep gradients that mark a transition to smaller scale landscapes or along the edge of the uplands; – The placement of the largest turbines of the proposed Development in locations which ensure that they do not exceed the maximum tip height (in terms of metres above ordnance datum (AOD)) of the present Windy Standard Developments; and – The use of large turbines to maximise energy outputs whilst minimising landtake and effects on landscape fabric. Wherever possible, ensuring that the proposed Development would be seen in the same part of the view as other wind farm developments, and overlapping with them. • Use of modern turbine design features to reduce visual clatter and provide a simpler appearance such as the use of three bladed horizontal axis turbines with tubular steel towers, a balanced ratio between tower height and blade length and selecting the most appropriate colour for the turbine. • The amount of felling required has been minimised, ensuring that important forested edges are retained which provide mitigation of views from locations such as the A713 corridor, Carsphairn and New Cumnock • In order to mitigate night time visual impacts infra-red lighting would be employed on the Waterhead Hill Cluster to meet the requirements of the aviation authorities and negate any potential associated visual impacts as infrared lighting is not visible to the naked eye. • As far as possible existing forest tracks and the access tracks for the existing Windy Standard Wind Farm and Windy Standard II (the present Windy Standard Developments) would be used to minimise the amount of ground disturbance and loss of characteristic vegetative cover. New tracks would be constructed to match the appearance of existing forestry tracks and have been designed to avoid prominent slopes and summits. The proposed tracks would be aligned so as to take advantage of the screening effect of intervening topography and/or vegetation. • Crane pads would be surfaced to match the proposed track construction. • In order to avoid potential visibility of the grid connection cables would be undergrounded within the site from each turbine to the substation and onsite grid connection. Undergrounded sections of cable would, wherever practicable, be placed beside proposed access tracks to reduce disturbance of the landscape and to ease future maintenance. • Upon completion of construction works at the proposed Development the construction compound would be removed and the ground reinstated. • The concrete batching plant would be positioned within an existing borrow pit excavation east of Brockloch Rig and would therefore be enclosed and screened from the vast majority of views. • Borrow pits have been located to make use of existing forestry borrow pits and/or to avoid prominent slopes and summits, and would be restored

ES Chapter/Principal Area of Effect	Mitigation Measure	Considerations
		during the construction phase of the proposed Development. • All soils stripped from construction areas and borrow pits would be retained in clearly demarcated stockpiles of no greater than 3 m height in locations immediately around the edges of borrow pit excavations and/or directly placed to reinstate track sides. • On completion of the construction phase, all areas subject to ground disturbance adjacent to built elements would be reinstated to match adjoining undisturbed ground.
	Operational mitigation	Given turbine location and elevation, views of them from both local and more distant locations will tend to place them against land and sky with the balance of either depending on the location of the viewer. Accordingly, it is considered that the most appropriate response is to deploy a simple pale grey colour and non-reflective render
	Decommissioning mitigation	During decommissioning of the proposed Development, all above ground structures would be removed and the ground reinstated. Subject to further assessment of site hydrology and soil cover depths, below ground structures and foundations would be left in place to avoid further disturbance.
Ecology	Mitigation by design	• In order to minimise land take and potential impacts on habitats and protected species, use of existing access tracks for the existing Windy Standard Developments, and the existing forest tracks within the conifer plantation, is proposed where possible. • A minimum distance of 50 m has been maintained between the proposed infrastructure and watercourses where possible, with the exception of three new watercourse crossings. • Dry culverts or mammal ledges will be installed where appropriate, in particular where watercourse crossings are sited close to the main flow of the Polwhat Burn where otter signs were observed. • The layout of the turbines, access track and associated infrastructure has minimised impact on sensitive habitats where possible and areas of deepest peat and peat slide hazard zones, taking into account other constraints. Where avoidance has not been possible the access infrastructure will be constructed in such a way as to ensure the integrity and connectivity of the hydrology of sensitive habitats, such as flood plain mire, basin mire and acid/neutral flush would be maintained. Access tracks would be designed in keeping with SNH good practice Constructed Tracks in the Scottish Uplands. • Prior to commencement of works at the proposed Development (including felling), pre-construction surveys will be carried out, including surveys for badger, red squirrel drey searches and a check of all riparian habitat for otter. • The felling schedule will be informed by pre-construction surveys. If applicable following pre-construction survey results, to reduce potential for localised effects of disturbance and associated impacts of red squirrel population instability, felling works should be scheduled to avoid the red squirrel breeding season as far as practically possible (February to September). To minimise potential for localised impacts of habitat destruction, disturbance and reduced connectivity, felling activities should be scheduled appropriately through the implementation of a felling design plan. Where replanting of trees take place in the locality, coniferous tree species, which are known to provide a medium to high carrying capacity for red squirrel should be reintroduced to ensure a long term reliable and diverse food source for red squirrel, contributing to the long term stability of the Carsphairn Forest RSPW. • Plant required for the felling operations will avoid tracking over the area of flood plain mire and associated tall bog sedge in the Meaul Hill Cluster, and alternative access to coupes adjacent to this ride will be used. Logs from the felled forestry will not be stacked in this sensitive habitat, or brash piled or spread in this area. • All felling operations would take into account guidance included in the Forestry Commission and Scottish Government's policy on the Control of Woodland Removal, and follow best practice in relation to protected species.
	Construction mitigation	• It is recommended that an Ecological Clerk of Works (ECoW) is present on site during enabling works and construction. They should be a suitably experienced individual, whose role would be to ensure that works are carried out in accordance with environmental measures detailed in the CMS, and to ensure compliance with international and national legislation. • Micro-siting would be used within a maximum limit of deviation of 50 m where it does not affect other constraints. Where micro-siting cannot avoid areas of sensitive habitats or features the ECoW would discuss and agree additional required mitigation to ensure impacts are minimised. • Contractors should be made aware of the ecological sensitivities on site through regular toolbox talks, including the presence of European and nationally protected species and habitats. • Watercourse protection measures would include protection against siltation and sedimentation, and pollution incidents such as the implementation of

ES Chapter/Principal Area of Effect	Mitigation Measure	Considerations
		a pollution response plan and the safe storage of chemicals in bunded containers. Refuelling of vehicles and machinery would be carried out at a central designated area, on an impermeable surface, located at least 50 m away from any watercourse. Monitoring of water quality would be carried out during construction. • Best practice measures would be implemented during the construction of the three watercourse crossings (i.e. culverts) such as ensuring no building materials block passage of protected species such as fish along a watercourse. • Any land degraded by construction and not required for the operation of the proposed Development would be restored after construction is completed, such as the construction compound, around areas of tracks, crane hardstandings, borrow pits and turbine bases. • Measures to control the impact of dust on sensitive habitats would be implemented during the preparation and construction phase. • To prevent accidental mortality of protected species during construction, deep excavations, foundations and pipe openings etc. should be covered when not active to prevent entrapment of animals such as otter, badger or red squirrel, or alternatively a temporary ramp installed to enable them to exit any steep-sided excavation. In addition, a speed limit of 15 mph will be enforced for any vehicle within Windy Standard III, in order to reduce the risk of collision with protected species. • Where possible (and where other constraints allow) micro-siting of infrastructure will be undertaken in consultation with the ECoW to minimise proximity to a potential Ground Water Dependant Terrestrial Ecosystems (GWDTEs). Where micro-siting is not possible, foundation excavation will be undertaken with care, assessing for water ingress and the degree of bedrock fracturing and weathering. • A precautionary approach should be adopted during the construction phase with regards to bats, with implementation of good working practices during felling operations. Replanting of trees following completion of construction will ensure a minimum buffer of 70 m from turbine bases to the edge of suitable habitat, is maintained in line with good practice guidance (i.e. >50 m from the edge of the turbine's rotor swept area). This mitigation measure will also ensure minimisation of collision risk to bat species potentially using woodland edge habitats during the operational phase. • A precautionary approach should be adopted with regards to otters, with an otter survey undertaken of suitable habitats within the proposed Development Area and a 250 m buffer prior to commencement of felling and construction. • The potential impacts of habitat loss to the local badger population may be reduced, should adjacent areas of coniferous plantation in the local environment be retained or replanted. In particular, planting of mixed broadleaved woodland along riparian zones would provide increased foraging opportunities. Establishment of new areas of woodland and creating tree lines would provide safe commuting routes between woodland blocks.
	Operational mitigation	• The potential for pollution incidents during routine maintenance activities will be minimised by adoption of SEPA best practice guidance. • A post-consent water quality, macroinvertebrate and fish population monitoring programme will be implemented and, along with mitigation measures during construction, will be outlined within a Construction Environmental Management Plan (CEMP) (see Draft Construction Environmental Management Plan in volume 4 of the ES). • Where possible and practical to do so maintenance works will take place during the day to minimise the potential for disturbance to protected species on site (since these are mostly nocturnal) and a speed limit of 15 mph will be enforced for any vehicle going on site, in order to reduce the risk of collision with protected species. • Areas of ground around turbines (i.e. within the 70 m buffer which will not be replanted) will be managed to ensure that they remain free of tree and tall shrub growth in order to maintain an appropriate buffer between potential bat features and the rotor swept area (see the Forestry Mitigation by Design section of this table below and ES Chapter 12: Forestry, of the ES).
	Decommissioning mitigation	Best practice measures used in the construction stage and specific best practice guidance for the restoration and decommissioning of wind farms will be followed.
Ornithology	Construction mitigation	• It is proposed that a comprehensive monitoring programme is implemented to monitor the baseline bird community during construction. • Pre-construction surveys for black grouse leks will be undertaken prior to construction and any behaviour indicating active leks will be recorded and monitored. All monitoring will be carried out by suitably experienced surveyors. Should an active lek be located during pre-construction monitoring, an exclusion zone of 500 m radius around the lek will be enforced during the peak lekking period of the last week in March to mid-May, following current best practice. Felling in the vicinity of the exclusion zone will be undertaken outside the peak black grouse lekking season where possible. Where it is not possible to maintain this exclusion zone for the duration of the lekking season it will be maintained during the times of day when peak lekking occurs (one hour after dawn and before dusk).

ES Chapter/Principal Area of Effect	Mitigation Measure	Considerations
		• Should any barn owl or kestrel nesting habitat be lost due to re-development of buildings, it is proposed that a barn owl nesting box be installed in alternative suitable habitat within the breeding pair's home-range but at a distance of >200 m from the nearest proposed turbine location. This would involve a desk-based evaluation of habitats surrounding the proposed Development Area to identify a suitable site, followed by a site visit to confirm suitability, after which the box would be installed. • With regards to best practice regarding breeding birds and compliance with the Wildlife and Countryside Act (1981) as amended by the Nature Conservation (Scotland) Act (2004), the appointment of a suitably experienced ornithologist as Ecological Clerk of Works (ECoW) during the bird breeding season (March to August, inclusive) will be implemented. Among other tasks, this will involve locating any active nests close to construction works shortly before these commence. Any active nests found will be cordoned off to a suitable distance for the species concerned (up to 50 m for open-ground nesting species and up to 20 m for woodland and scrub nesters) and construction operations delayed within the cordon until the young have fledged and/or the nest becomes vacant. • Prior to the start of construction/breeding bird season, contractors will be made aware of the ornithological sensitivities within the proposed Development Area through the use of on-site posters and a toolbox talk. Should any breeding birds be found within construction areas, all works would stop immediately and appropriate exclusion zones (depending on the species) would be established. No works would recommence within the exclusion zone until the breeding attempt is complete and the nest site is no longer active. • Post construction monitoring of the breeding and wintering bird population will be undertaken to assess predicted impacts against the actual effects. The monitoring programme will be subject to consultation with SNH, DGC and RSPB Scotland. It is likely that the programme will target black grouse and raptors and will complement current monitoring to be undertaken as part of the Environmental Monitoring Plan for Windy Standard II.
	Decommissioning mitigation	Mitigation of decommissioning activities should follow that proposed for the mitigation of construction activities, including pre-decommissioning surveys and ecological supervision of activities.
Cultural Heritage and Archaeology	Mitigation by design	The layout of the proposed Development has reduced the impacts on cultural heritage by avoiding any areas of interest.
	Construction mitigation	No construction impacts upon previously recorded heritage assets have been identified and it is considered that there is negligible potential for previously unrecorded heritage assets to be affected. Therefore no mitigation is proposed in relation to construction impacts.
	Operational mitigation	Operational effects have been assessed as being of minor or lesser significance and no mitigation is proposed.
	Decommissioning mitigation	Impacts are considered similar to construction and therefore no decommissioning effects are predicted and no mitigation is proposed.
Hydrology, Geology and Hydrogeology	Mitigation by design	• Due to the nature of the environment occupied by the proposed Development it is imperative that the design and infrastructure helps maintain or even improve the local hydrology. • A series of buffer distances have been adopted to help reduce effects of the proposed Development on the hydrological environment. A 50 m buffer was implemented for all identified natural hydrological features. • Design of the infrastructure has also meant that the associated access tracks are located greater than 50 m from natural hydrological features. However, where access necessitates essential watercourse crossing, construction features have been limited in these buffers as far as possible, for example, minimising tracks running parallel to watercourses and trying to avoid track junctions being constructed in these zones
	Construction mitigation	• A specific CEMP will ensure that best practice measures are put in place and activities carried out in such a manner as to prevent or minimise effects on the surface and groundwater environment. • All runoff derived from construction activities and site infrastructure will not be allowed to directly enter the natural drainage network. All runoff will be adequately treated via a suitably designed drainage scheme with appropriate sediment and pollution management measures. • All soil/peat stockpiles as well as equipment, materials and chemicals will be stored well away from any watercourses. Chemical, fuel and oil stores will be sited on impervious bases with a secured bund. • Standing machinery will have drip trays placed underneath to prevent oil and fuel leaks causing pollution. Where practicable, refuelling of vehicles and machinery will be carried out in designated areas, on an impermeable surface, and well away from any watercourse. • Only emergency maintenance to construction plant will be carried out on the proposed Development Area, in designated areas, on an impermeable surface well away from any watercourse or drainage, unless vehicles have broken down necessitating maintenance at the point of breakdown,

ES Chapter/Principal Area of Effect	Mitigation Measure	Considerations
		where special precautions will be taken. • On-site welfare facilities will be adequately designed and maintained to ensure all sewage is disposed of appropriately. This may take the form of an on-site septic tank with soakaway, or tankering and off-site disposal depending on the suitability of the site for a soakaway and prior agreement with SEPA. • Fresh concrete and cement are very alkaline and corrosive and can be lethal to aquatic life. The use of wet concrete in and around watercourses will be avoided and carefully controlled. • All activities undertaken as part of the proposed Development will be monitored throughout the construction phase. Such monitoring will be to ensure environmental compliance. Water quality monitoring will also occur throughout each phase of the proposed Development and will help to maximise the effectiveness of mitigation measures whilst monitoring effects on the hydrological environment. • Contingency plans will ensure that emergency equipment is available on site i.e. spill kits and absorbent materials, advice on action to be taken and who should be informed in the event of a pollution incident. • All relevant staff personnel will be trained in both normal operating and emergency procedures, and be made aware of highly sensitive areas on site. • Prior to the commencement of work and during construction figures showing site drainage and hydrologically sensitive areas will be regularly checked to review potential for runoff and ponding of water across the proposed Development Area and to ensure that runoff patterns are well known. • The drainage systems installed on the proposed Development Area will also have sediment management measures incorporated into their design to help reduce or wholly mitigate effects on the hydrological environment. The type of sediment management will depend on the volume of construction activities occurring in particular areas across the proposed Development Area. For all of the suggested control measures regular inspection and maintenance is necessary, particularly after prolonged heavy rainfall. • Locks shall be fitted to all fuel storage tanks or containers and there shall be a nominated trained person to oversee the refuelling and delivery to ensure there is no spillage • A fuel bowser will be used for refuelling on the access tracks or hardstanding. The bowser driver shall be responsible for ensuring that refuelling of mobile plant does not take place within 50 m of a watercourse. The bowser driver will receive extra training on spill prevention and response. Oil booms will be provided and maintained downstream of the works at all watercourse locations that the access track crosses for the duration of the construction period to act as a defence against the unlikely event of an oil or fuel spillage.
	Operational mitigation	The risk of instability during operation will be addressed through the implementation of appropriate mitigation during construction and an ongoing appraisal of peat slide will be carried out across the proposed Development Area throughout the operation of the proposed Development.
	Decommissioning mitigation	Mitigation during the decommissioning phase will follow those measures implemented during the construction phase.
Noise	Mitigation by design	Throughout the site design process the layout of the proposed Development was repeatedly reviewed to optimise its turbine numbers and locations, subject to a wide range of constraints identified during the design process, including noise and landscape. The site design process therefore satisfactorily minimised any increase in ambient noise levels at two levels: firstly through several iterations of site specific design and secondly, at a higher level, through the use of ETSU-R-97 itself.
	Construction mitigation	• Careful consideration would be given to the type of plant to be used during construction and the contractors would inform the residents when particularly noisy activities are likely to take place to ensure any disruption is kept to a minimum. • Generally, construction activities would be confined to the periods 07:00 - 19:00 weekdays and Saturdays 07:00 - 13:00. • There may be the requirement for extended operating hours to minimise traffic disruptions during the movement of abnormal loads and during large concrete pours. The principal contractor would: – Keep local residents informed of the proposed working schedule, where appropriate, including the times and duration of any abnormally noisy activity that may cause concern; – Ensure site work continuing throughout 24 hours of a day shall be programmed, when appropriate, so that haulage vehicles would not arrive at or leave the proposed Development between 19.00 and 07.00 hours, with the exception of abnormal loads that would be scheduled to avoid significant traffic flows;

ES Chapter/Principal Area of Effect	Mitigation Measure	Considerations
		– 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; – Ensure regular maintenance of all equipment used on Site, including maintenance related to noise emissions; – Ensure that vehicles are 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 would be provided.
	Operational mitigation	The exact model of 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 turbines for the proposed Development. Predictions of wind turbine noise for the proposed Development have been based upon sound power level data candidate wind turbines and a noise prediction model that can be considered to provide a realistic impact assessment.
	Decommissioning mitigation	Mitigation during the decommissioning phase will follow those measures implemented during the construction phase.
Forestry	Mitigation by design	There will be a net loss of commercial woodland area as a result of the proposed Development equivalent to 28.87 hectares (0.83 % of the Forestry Study Area), this net loss represents in part those areas of the proposed Development that will be managed in order to leave open habitats for protected species (see the Ecology Operational mitigation section of this table and ES Chapter 7: Ecology, of the ES)
Aviation and Existing Infrastructure	Mitigation by design	• Potential direct impacts with microwave links avoided by locating infrastructure outwith identified pathways. • The proposed Development meets the requirements of 10 rotor diameter separation distance between nearby properties and the nearest turbine to ensure that there are no shadow flicker impacts on surrounding properties.
	Operational mitigation	• While there would be a potentially significant impact on the GPA radar and the proposed Development is just on the extremities of the 30 km critical impact zone, there is a proposed mitigation solution from GPA which is very nearly finalised which would be a suitable remedy for the impacts of the proposed Development. • The Applicant is also liaising with Renewables UK and the CAA with regards to aviation lighting requirements and will work with the CAA and other relevant consultees to agree a suitable lighting pattern where required.
Traffic and Transport	Construction mitigation	• HGV deliveries including concrete and turbine components would be instructed to avoid school drop off and pick up times. • During turbine delivery phase, leaflets would be posted in local shops and distributed to houses along the delivery route. • Identify stopping points along the transport route where slower turbine delivery vehicles can pull over to allow queued traffic to pass. • Arrange for adequate wheel washing facilities, to allow construction vehicles to clean their wheels before entering onto the public road. Arrange road cleaning vehicle to keep the public road free of mud. • To reduce air pollution make sure that all construction vehicles are adequately maintained to comply with exhaust emission requirements and are switched off when not in use. Encourage the use of minibuses and car-sharing for personnel transport. • To reduce noise and vibration disturbance, arrange the transport of heavy loads at times of least sensitivity e.g. not in the evening, or night time deliveries through residential areas. • To reduce risk to pedestrians and road users, abnormal loads should be adequately escorted and appropriate traffic management and signage used. • It is important that the local council road department is consulted on all transport issues and to make sure that deliveries do not conflict with other scheduled road works. • As the number of vehicles required during normal operation and maintenance is not significant, no mitigation measures are proposed. If during the operation period major repair works are required then the good practice measures proposed for the construction period should be reviewed. • When the method of decommissioning is agreed with the relevant parties for the proposed Development, road traffic impacts should be re-assessed

ES Chapter/Principal Area of Effect	Mitigation Measure	Considerations
		and mitigation measures agreed, if required.
	Operational mitigation	As the number of vehicles required during normal operation and maintenance is not significant, no mitigation measures are proposed. If during the operation period major repair works are required then the good practice measures proposed for the construction period should be reviewed.
	Decommissioning mitigation	When the method of decommissioning is agreed with the relevant parties for the proposed Development and after the lifetime of the proposed Development, road traffic impacts should be re-assessed and mitigation measures agreed, if required.

16.19 CONCLUDING STATEMENT

16.19.1 The ES has highlighted that the only residual significant effects that have been identified during the EIA process are as a result of visual and landscape impacts. A relatively limited number of significant effects were identified within Chapter 6: Landscape and Visual Assessment, of the ES on what are generally considered to be receptors of local (rather than national or regional) importance. Whilst a localised significant effect has been identified, the wider landscape would not be transformed as a result of the proposed Development and as such, it is considered that the landscape at a broad scale is sufficiently robust enough to accommodate the proposed Development without significant effects arising. The extent of significant cumulative effects attributable to the proposed Development is also considered to be of modest proportions. The proposed Development, seen in conjunction with existing and consented wind farms, would often represent the less prominent scheme and would often share the 'envelope' of other developments in views. Moreover, whilst the numerous proposals for wind farm developments have the potential to result in fundamental change to some landscapes in the area. The LVIA has concluded that in such cases, the proposed Development would not significantly contribute to such a change. As such, Chapter 6: Landscape and Visual Assessment, of the ES concludes that the proposed Development is not significant in EIA terms.

16.19.2 Subject to suggested mitigation measures, the ES did not identify any other potentially significant residual effects (in terms of the EIA Regulations) on any other environmental or human receptors during the preparation, construction, operation and decommissioning of Windy Standard III and as such the overall impact of the proposed Development is considered not significant in EIA terms.

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