Enoch Hill Wind Farm

Environmental Statement

Volume 1: Main Report

September 2015

Report for

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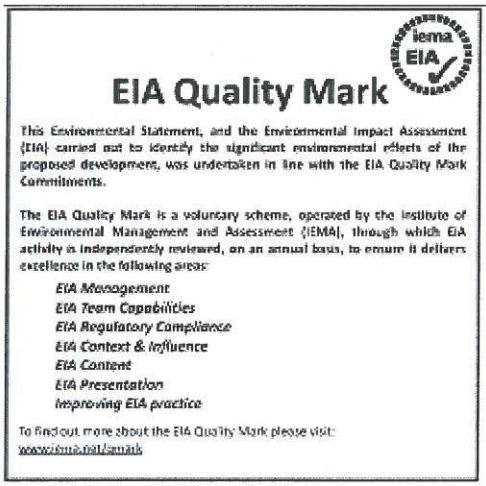

Preface

This Environmental Statement (ES) has been prepared by Amec Foster Wheeler Environment & Infrastructure UK Ltd (Amec Foster Wheeler) on behalf of E.ON Climate and Renewables UK Developments Ltd (the applicant). E.ON is one of the world's largest power and gas companies and in the UK, they supply energy to more than 5 million customers and generate enough electricity for around 8 million homes. E.ON Climate and Renewables was set up by E.ON in 2007 as a global business responsible for developing, constructing and operating all E.ON's renewable energy projects.

This ES accompanies an application for consent (and deemed planning permission) to Scottish Ministers under section 36 of the Electricity Act 1989 for the erection and operation of Enoch Hill Wind Farm (the "Proposed Development"), located between the settlements of Dalmellington and New Cumnock in East Ayrshire. Sections 1.2.1 to 1.2.3 and Chapter 3 of the ES describe the location of the wind farm and the regional context of the proposal. Chapter 4 of the ES provides a description of the Proposed Development.

E.ON proposes to erect up to 19 wind turbines and ancillary structures within the Development Site for the purpose of generating electricity from wind energy, thereby contributing towards (amongst other objectives) economic benefits and Scotland's target of 100 per cent of electricity production from renewable resources by 2020.

The ES reports the findings of the Environmental Impact Assessment (EIA) of the Proposed Development which was undertaken by Amec Foster Wheeler. The EIA has been prepared in accordance with the Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2000 and the content of the ES has been sub-divided into the following four parts:

- Non-Technical Summary (NTS) – summarises the ES Main Text (Volume 1) and provides a brief description of the Proposed Development, outlining the conclusions of the EIA in non-technical language;
- Volume 1 (this volume): Main Text – reports the findings of the EIA in full. This volume contains a detailed description of the Proposed Development. It evaluates the existing environment, identifies and assesses the predicted environmental effects that could occur as a result of the Proposed Development. It provides a detailed analysis of the design procedure and how environmental measures (mitigation/enhancements) have been incorporated into the design to prevent, reduce or offset environmental effects identified;
- Volume 2: Illustrative Figures – the figures accompanying the Main Text containing all the illustrative material referred to in Volume 1, including regional and local maps, wind farm design details, photomontages (simulated views of the Proposed Development) and technical diagrams; and
- Volume 3: Technical Appendices – the appendices accompanying the Main Text of the ES presented in Volume 1 which report details of assessment methodologies, assessment data, technical details and background information.

Printed copies of the NTS and ES (including Figures and Appendices) may be obtained from E.ON Climate and Renewables UK Developments Ltd, Westwood Way, Westwood Business Park, Coventry, CV4 8LG. The Non-Technical Summary is available free of charge, and a limited number of hard copies of the ES are available that may be purchased for £350 per copy. Alternatively, these documents are available as Adobe Acrobat files on CD from the same address at £5 per copy, and are available to download from the project website (https://www.eonenergy.com/About-eon/our-company/generation/planning-for-the-future/wind/onshore/enoch-hill). Hard copies of these documents will also be placed in local libraries by East Ayrshire Council (EAC).

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Volume 1 Main Text

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Note Ecological Figures are contained within the relevant appendices 11.A to 11.H

Volume 3 Appendices

1. Introduction

1.1 Purpose of this Environmental Statement

1.1.1 E.ON Climate and Renewables UK Developments Ltd (herein referred to as *"the applicant"*) is seeking consent from the Scottish Ministers under section 36 of the Electricity Act 1989 to construct and operate a wind farm generating station with an expected rated installed capacity of up to 62.7MW (on the basis of a maximum of 19 turbines each with an expected rated capacity of 3.3MW). The applicant also seeks a Direction from the Scottish Ministers under section 57(2) of the Town and Country Planning (Scotland) Act 1997 that planning permission be deemed to be granted for the proposed Enoch Hill Wind Farm (herein referred to as *"the Proposed Development"*).

1.1.2 This Environmental Statement (ES) reports the findings of the Environmental Impact Assessment (EIA) undertaken for the Proposed Development, which would be built on land in East Ayrshire (herein referred to as the "Development Site"), approximately 5km to the south west of New Cumnock and approximately 7km north east of Dalmellington. The Development Site is situated in a clearing within the Southern Uplands Forest area. The national grid reference (NGR) for the Development Site centre is E 257360, N 608630.

1.1.3 The Development Site and details of the Proposed Development are set out briefly in the next paragraph and more fully described in **Chapter 3 - Site Selection and Design Evolution** and **Chapter 4 - Description of the Proposed Development**.

1.1.4 The ES has been prepared to accompany the application described in paragraph 1.1.1. A full description of the EIA process is provided in **Chapter 2 - EIA Process**. The Proposed Development for which planning permission is being sought comprises the following:

- Up to 19 wind turbines: each would consist of a tubular steel tower supporting three blades;
- Access tracks connecting the turbines and other infrastructure elements described below;
- A new vehicular access from the public highway (the B741);
- Hard standing areas e.g. crane pads;
- Borrow pits (up to 3), to be located within search areas;
- Up to two permanent anemometer mast(s) to monitor weather conditions;
- Temporary works e.g. construction compounds; and
- On-site electrical infrastructure including a wind farm control building and a Scottish Power Energy Networks (SPEN) 132/33kV substation and underground cabling between these buildings and the turbines.

1.1.5 This ES has been prepared by Amec Foster Wheeler Environment and Infrastructure UK Ltd (Amec Foster Wheeler) on behalf of the applicant and provides the environmental information that will be used by the Scottish Ministers and others to inform the process of determining the application and request for planning permission to build and operate the Proposed Development which would be made under section 36 of the Electricity Act 1989 and section 57(2) of the Town and Country Planning (Scotland) Act 1997.

1.2 Overview of the Proposed Development

Site Description

1.2.1 The wider geographical context is shown in **Figure 1.1** and the Development Site boundary is shown in **Figure 1.2**. The nearest large settlements to the Development Site are New Cumnock

located 5km to the north east and Dalmellington located 7km to the south west. The Development Site is located in East Ayrshire directly north of the border with Dumfries and Galloway and the former Stewartry District.

1.2.2 The B741 is located directly to the north and Carsphairn Forest surrounds the west and south of the Development Site boundary, with open cast mining to the north and open moorland to the east. The Southern Upland Way (SUW) is located approximately 12.5km to the east of the Development Site.

1.2.3 The elevation of the Development Site ranges from ~210m to ~569m above ordnance datum (AOD) and covers an area of ~1,466ha (it should be noted that the total operational land take is ~14.23ha which represents ~1% of this figure, see **Table 4.3** in **Chapter 4 – Description of the Proposed Development** for more information), the majority of which is rough grazing land with a number of small watercourses crossing it. Vegetation across the site is predominantly grassland with no tree cover and is used as sheep pasture. The terrain is relatively undulating and steep in some places. The landform in the south of the Development Site comprises Enoch Hill, falling eastward to form High Chang Hill. The northern landform comprises Barbeys Hill, Chang Hill, Rigg Hill and Peat Hill. Benty Cowan Hill is located in the eastern part of the Development Site.

Proposed Development

1.2.4 The applicant has established the viability of constructing and operating a wind farm comprising up to 19 turbines, with an anticipated installed capacity (rated power output) of up to 3.3MW each, plus ancillary infrastructure (including access tracks) as listed in Section 1.1.2. The layout of the Proposed Development is described further in **Chapter 4 - Description of the Proposed Development** and is shown on **Figure 4.1**.

1.2.5 The specific choice of wind turbine to be installed at the Proposed Development is dependent on a future procurement exercise by the applicant, which will depend on commercial and technical considerations at that time including turbine models available on the market at that time.

1.2.6 In the absence of a specific turbine type, a range of turbine parameters have therefore been established to allow environmental effects to be fully assessed. The turbines that would be used at the Development Site would have a maximum height to blade tip of 130m, a hub height of up to 80m and a rotor diameter of up to 106m[1]. For the purposes of the noise assessment, an assessment 'envelope' comprising three potential turbines has been established (further details are provided in **Chapter 7 - Noise**).

1.2.7 The Proposed Development would be operational for up to 25 years following first export of electricity and it has been assumed it will be decommissioned at the end of this period.

1.2.8 The installed capacity of the Proposed Development is anticipated to be up to 62.7MW based on the potential use of 19 turbines with an individual electrical rated output of up to 3.3MW. Taking into account that the turbines will not operate at full capacity all of the time, the potential amount of electricity produced by the Proposed Development has been estimated to be in the order of 148,298MWh per year, which will be equivalent to the approximate domestic needs of approximately 42,651 domestic homes in the UK.[2] Further details of the derivation of these figures and the assumptions made are provided in Section 6.3 of **Chapter 6** - **Renewable Energy Policy, Carbon Balance and Peat Management**.

1.2.9 It is widely accepted that electricity produced from wind energy has a positive benefit with regard to reducing carbon dioxide (CO_2) emissions. **Chapter 6,** Section 6.3 also shows that between 51,959 and 80,301 tonnes of carbon dioxide may be saved each year as a result of the generation of

[1] The hub height will be adjusted to account for any blade longer than 50m to ensure that maximum tip height will not exceed 130m.

[2] Calculated using a capacity factor of 27% which is the long term average load factor figure for Scotland published by Department of Energy and Climate Change (DECC), Energy Trends Section 6: Renewables (ET6.1 Renewable Electricity Capacity and Generation, June 2015. Capacity factor for Scotland - 27%. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/437811/et6_1.xls

electricity by the Proposed Development rather than by conventional power stations using a range of fuel sources (further details of the derivation of these figures and the assumptions made are also provided in Section 6.3). Over its 25 year operation period, the Proposed Development may save between 1,298,975 and 2,007,525 tonnes of CO_2 emissions.

1.2.10 The site will be accessed from the B741. A number of access route options for construction and operation traffic using local roads connecting to A roads exist, with routing options assessed in ES **Chapter 14 - Traffic & Transport**. Access to the Development Site for abnormal loads will travel from the port of Ayr via the A719, A77, A76 and the B741, entering the Development Site at a new junction off the latter in the north western part of the site.

1.2.11 The grid connection for the Proposed Development would be via a new on-site control building which will contain the metering and switchgear and will be connected into an adjacent substation, to be operated and built by SPEN. The connection between the substation within the Development Site and the wider grid is the responsibility of the Transmission Network Operator (TNO) and would be subject to a separate consent procedure and will therefore not be considered within the ES although it is known that the intention is to extend the new 132kV substation compound at New Cumnock collector substation (site location NGR E 251966, N 608134 and install 1 x 132kV feeder bay and bury ~5km of 132kV underground cable between New Cumnock and Enoch Hill wind farm substation.

Benefits of the Development

1.2.12 The importance of taking action now to address climate change is recognised both internationally and nationally. Successive legislation and policy by the EU, the UK and Scottish Governments have increasingly stressed the need to tackle climate change and energy supply. The development of a low carbon economy with greater efficiencies in energy use combined with greater proportion of energy generated by renewable means is therefore seen as essential. Generating energy from domestic, renewable sources also improves the nation's security of supply. Underlining this and recognising Scotland's opportunity to play a leading role, in 2011 the Scottish Government increased their renewable energy target for electricity to 100% by 2020.

1.2.13 A review of the current UK and Scottish renewable energy and electricity target for 2020, shows that whilst Scotland has recently achieved its interim 2011 target of 31% of gross electricity to be produced by renewables, against the backdrop of the UK's obligation to generate at least 15% of all energy consumed from renewable sources by 2020, renewable energy accounted for just 5.2% of total UK energy consumption in 2013 (DECC, 2014). This demonstrates that despite recent increases in deployment rates, additional renewable energy capacity is required to meet the UK's binding renewable energy and decarbonisation commitments. It is also noted that Scotland has failed to meet its climate change target for the fourth year in a row. Scottish greenhouse gas emissions fell by 3.6% between 2012 and 2013 to 53 million tonnes of carbon dioxide (MtCO2e). The Climate Change (Scotland) Act 2009 requires a minimum 42% cut in emissions by 2020 and 80% by 2050.[3] The Proposed Development, with its anticipated installed capacity of up to 62.7MW, will therefore provide a meaningful contribution to Scottish and UK Governments in achieving their targets for renewable energy and greenhouse gas emissions. This will help to meet government objectives for renewable energy generation and a reduction in CO_2 emissions and will boost Scotland's role as a leading renewable energy producer and exporter.

1.3 Project Developer (the applicant)

1.3.1 E.ON is one of the world's largest power and gas companies. In the UK, E.ON supplies energy to more than 5 million customers and generates enough electricity for around 8 million homes. E.ON Climate & Renewables (EC&R) was set up in 2007 as a global business that's responsible for developing, constructing and operating all E.ON's renewable energy projects.

[3] http://www.bbc.co.uk/news/uk-scotland-scotland-politics-33058391

1.3.2 In the UK, E.ON focuses on developing onshore and offshore wind and biomass technologies. The applicant currently owns and operates 16 onshore and five offshore wind farms and two dedicated biomass plants.

1.4 EIA Project Team

1.4.1 As well as the applicant, who contributed to the consultation and the design process of the Proposed Development, the specialist skills of a number of organisations have been utilised to compile the information contained within this ES:

Amec Foster Wheeler Environment and Infrastructure UK Ltd

1.4.2 Amec Foster Wheeler was lead consultant for the Enoch Hill Wind Farm EIA and was responsible for the collation of the ES. Amec Foster Wheeler and its staff have extensive experience of renewable energy development proposals, particularly onshore wind farm developments. The company's staff has been involved in many wind farm developments of a range of scale and type across the UK. The EIA has been directed by Neil Marlborough BA (Hons), DipTP, RTPI and its production managed by Gareth Hughes B.Sc. (Hons), PGDip, MSc. Principal authors for the various technical sections were as follows:

- Carbon Payback and Peat Management (Chapter 6) – Ben Amaira B.Sc (Hons), Graham Burt-Smith B.Sc. (Hons), Ph.D. and Sheila Ross B.Sc. (Hons), Ph.D.;
- Noise (Chapter 7) – George Gibbs B.Eng. (Hons) and James Trow B.Sc. (Hons);
- Shadow Flicker (Chapter 8) – Gareth Hughes B.Sc. (Hons), PGDip, MSc and Tim Doggett B.Sc. (Hons), MSc;
- Landscape and Visual Impact (Chapter 9) – Emma Jinks MA, PgD, PgC and Rebecca Rylott BA (Hons), PgD;
- Historic Environment (Chapter 10) – Amy Roberts HND, B.Sc. (Hons) and John Mabbitt BA (Hons), MA, Ph.D.;
- Ecology (Chapter 11) Rachel Finan B.Sc. (Hons), MSc and Graham Burt-Smith B.Sc. (Hons), Ph.D.;
- Ornithology (Chapter 12) - James Wilson MA and Glen Robson B.Sc. (Hons), Ph.D.;
- Geology, Hydrology and Hydrogeology (Chapter 13) – Eleanor Haresign B.Sc. (Hons), PGDip, Ph.D.; and Shaun Salmon B.Sc. (Hons), MSc, Ph.D.;
- Traffic and Transport (Chapter 14) – James McGavin BA (Hons), MSc and Bev Coupe B.Sc. (Hons), MSc, RTPI;
- Socio-economics (Chapter 15) - Duncan Smart MA (Hons), MSc and Heidi Thorsdalen BA (Hons) RTPI; and
- Infrastructure and telecommunications (Chapter 16) – Tim Doggett B.Sc. (Hons), MSc and Gareth Hughes B.Sc. (Hons),

Other Contributors

1.4.3 Other consultants were involved in the production of elements of this ES and principal authors for the applicable technical sections were as follows:

- Aviation (Chapter 17) – Stuart Heald of Osprey Consulting Services Ltd; and
- Assessment of potential impact of aviation warning lights on Galloway Dark Sky Park and Scottish Dark Sky Observatory - Dr Stuart Lumsden, School of Physics and Astronomy, University of Leeds.

1.5 Structure of the ES

1.5.1 This ES has been prepared by Amec Foster Wheeler on behalf of the applicant and provides some of the information that will be used by the Scottish Ministers to inform the process of determining the section 36 consent application. The ES demonstrates that the environmental considerations specified in Schedule 9 of the Electricity Act 1989 have been met. The applicant also seeks a Direction from the Scottish Ministers under Section 57(2) of the Town and Country Planning (Scotland) Act 1997 that planning permission be deemed to be granted for the Proposed Development. The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2000 (the EIA Regulations) apply to section 36 applications.

1.5.2 The ES comprises four parts:

- Non-Technical Summary (NTS): overview of the findings of the EIA;
- Volume 1 Main Statement: detailing how the EIA process has been applied to the Proposed Development; describing the Proposed Development, how it has evolved and reporting the EIA's findings in relation to each of the environmental topics identified through the scoping process;
- Volume 2 Illustrative Figures: the figures to accompany the text presented in Volume 1; and
- Volume 3 Technical Appendices: technical documentation to support the text presented in Volume 1.

1.5.3 Volume 1 is divided into 18 chapters:

- Chapter 1 Introduction

  Provides background information about the applicant and an overview of the Proposed Development.

- Chapter 2 EIA Process

  Provides an overview of the EIA process, its regulatory context and an outline of the methodology used to assess environmental effects and ensure a consistent and transparent approach to assessment. It describes the scoping and consultation process that assisted in the identification of likely significant environmental effects to be given further consideration.

- Chapter 3 Site Selection and Design Evolution

  Provides details of the site selection process and alternative layouts that were considered within the design evolution process.

- Chapter 4 Description of the Proposed Development

  Provides details of the design and layout of the Proposed Development and how it will be constructed, operated and decommissioned.

- Chapter 5 Planning Policy Context

  Provides an overview of UK and Scottish policy on renewable energy generation. It also presents an overview of national, regional and local planning policy which applies to the Proposed Development.

- Chapter 6 Renewable Energy Policy, Carbon Balance and Peat

  Provides details on relevant climate change policy, expected energy yield, CO_2 savings, carbon payback and peat management.

1.5.4 Consideration has been given to a wide range of environmental topics but the assessment has been focused on those where significant environmental effects are most likely. Chapters 7 to 17 report the findings on each of the environmental topics where the possibility of likely significant

environmental effects was anticipated at scoping stage, and propose mitigation and enhancement measures. The environmental topics covered are:

- Chapter 7 Noise;
- Chapter 8 Shadow Flicker;
- Chapter 9 Landscape and Visual Impact;
- Chapter 10 Historic Environment (includes archaeology);
- Chapter 11 Ecology;
- Chapter 12 Ornithology;
- Chapter 13 Geology, Hydrology and Hydrogeology;
- Chapter 14 Traffic and Transport;
- Chapter 15 Socio-economics;
- Chapter 16 Infrastructure, Telecommunications and Safety; and
- Chapter 17 Aviation.

1.5.5 Chapter 18 summarises the mitigation and residual effects for the Proposed Development.

1.6 Obtaining Further Information

1.6.1 The ES and supporting documentation are available online, please visit the dedicated project website for the Proposed Development: https://www.eonenergy.com/About-eon/our-company/generation/planning-for-the-future/wind/onshore/enoch-hill

1.6.2 Copies of the NTS are available free of charge while stocks last. Copies of the entire ES may be obtained at a cost of £350 + P&P for paper copies and £5 for CD copies. To request one please contact us at E.ON Climate and Renewables UK Developments Ltd, Westwood Way, Westwood Business Park, Coventry, CV4 8LG or swscotland@eon.com.

1.6.3 Hard copies of the application and environmental statement will also be made available for public viewing at:

- Dumfries and Galloway Council, Dalry Registration Office, Main Street, St John's Town of Dalry, Castle Douglas DG7 3UP;
- Dumfries & Galloway Planning Office, Kirkbank House, English Street, Dumfries, DG1 2HS;
- New Cumnock Community Centre, Castle, New Cumnock, Cumnock, Ayrshire, KA18 4AH;
- East Ayrshire Council, The Johnnie Walker Bond, 15 Strand Street, Kilmarnock, KA1 1HU;
- East Ayrshire Council, Dalmellington Area Centre, 33 Main Street, Ayr, KA6 7QL; and
- The Scottish Government Library at Victoria Quay, Edinburgh, EH6 6QQ.

1.7 References

Department of Energy and Climate Change (DECC), (2015) Energy Trends Section 6: Renewables (ET6.1 Renewable Electricity Capacity and Generation.

The Scottish Government (2000). The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations.

The Scottish Government (1997). Town and Country Planning (Scotland) Act.

2. EIA Process

2.1 Overview of EIA

2.1.1 EIA is a systematic procedure that must be followed for certain categories of project (see 2.1.4) before they can be granted a development consent (such as planning permission). It aims to identify a project's likely significant environmental effects, identify mitigation measures to reduce the level of those effects and finally to assess residual effects with these measures applied. This process helps to ensure that the predicted significant effects, and the scope for reducing them are, properly understood by the public and the determining authority (in this instance, the Scottish Ministers) before they make their decision.

2.1.2 An EIA process that culminates in the submission of an ES has a number of key characteristics:

- It is systematic, comprising a sequence of tasks defined both by regulation and by practice;
- It is analytical, requiring the application of specialist skills from the environmental sciences;
- It is impartial, its objective being to inform decision-making rather than to promote the project;
- It is consultative, with provision being made for obtaining information and feedback from interested parties including local authorities, members of the public and statutory and non-statutory agencies; and
- It is iterative, allowing opportunities for environmental concerns to be addressed during the planning and design of a project.

2.1.3 Typically, a number of design iterations take place in response to environmental constraints identified during the EIA process (in effect, incorporating mitigation measures to avoid, reduce or compensate for identified adverse effects). Further details of such measures identified for the Proposed Development are presented in the corresponding environmental topic chapters.

EIA Regulations

Need for EIA

2.1.4 Under section 36 of the Electricity Act 1989, consent is required from the Scottish Ministers for the construction and operation of all power generating plant that would have an installed capacity of more than 50MW. The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2000 (the EIA Regulations) apply to section 36 applications.

2.1.5 The Proposed Development falls under Schedule 2 of the EIA Regulations: a generating station, the construction of which (or the operation of which) will require a section 36 consent but which is not a Schedule 1 development. A Schedule 2 development constitutes EIA development if the development is likely to have significant effects on the environment by virtue of factors such as its nature, size or location.

2.1.6 While it has been determined that the Proposed Development has the potential for significant environmental effects, and hence an EIA has been undertaken, this does not mean that the ultimate conclusion of the assessment is that significant effects would occur. The potential for adverse effects as a result of a proposed development is assessed during the EIA process and consideration then given to environmental measures (mitigation) that could be incorporated into the design of the project or the method of its construction and operation to reduce or eliminate any negative effects (or further enhance positive effects).

Issues to be addressed

2.1.7 Schedule 4 of the EIA Regulations specifies that the ES should describe those:

"aspects of the environment likely to be significantly affected by the development, including, in particular, population, fauna, flora, soil, water, air, climatic factors, material assets, including the architectural and archaeological heritage, landscape and the inter-relationship between the above factors."

2.1.8 Establishing which aspects of the environment and associated issues are relevant for a particular project is captured in an EIA scoping process, whereby the scope of the assessment proposed by the applicant is provided to the determining authority and, taking account of feedback they obtain from key consultees, they in return provide their view on this. The scoping exercise undertaken for the Proposed Development is described in **Section 2.3**.

EIA Guidance

2.1.9 A range of reference material and guidance has been drawn upon in developing the EIA methodology adopted for this Proposed Development. Principal sources of reference material and guidance over and above the EIA Regulations are noted in each technical chapter and, depending on topic area, may include:

- Guidelines for Environmental Impact Assessment (IEMA, 2004);
- Online Renewables Planning Advice: *Onshore Wind Turbines* (Scottish Government, updated May 2014)[1];
- Scottish Government PAN 1 /2011 (March 2011) Planning and Noise;
- Scottish Government PAN 2 /2011 (July 2011) Planning and Archaeology;
- Scottish Government PAN 3 /2010 (August 2010) Community Engagement;
- Scottish Executive Development Department PAN 51 (Revised 2006) Planning, Environmental Protection and Regulation;
- Scottish Government PAN 1/2013 (August 2013) Environmental Impact Assessment;
- Scottish Executive Development Department PAN 60 (updated January 2008) Planning for Natural Heritage;
- Scottish Executive Development Department PAN 61 (July 2001) Planning and Sustainable Urban Drainage Systems;

[1] Components of the Scottish Government's on-line advice about onshore wind turbines remain relevant and now support Scottish Planning Policy (2014), except for passages referring to 'spatial framework', 'spatial planning' and 'areas of search' which are now out-of-date.

- Scottish Executive Development Department PAN 75 (August 2005) Planning for Transport;
- Scottish Executive Development Department PAN 79 (September 2006) Water and Drainage;
- Scottish Executive Development Department PAN 81 Community Engagements; and
- Scottish Government Circular 3/2011 the Environmental Impact Assessment (Scotland) Regulations 2011.

EIA Terminology

Defining Significance

2.1.10 Development proposals affect different environmental elements to differing degrees and not all of these are of sufficient concern to warrant detailed investigation or assessment within the EIA process. The EIA Regulations identify those effects that warrant investigation as those that may be significant. These are identified through a scoping process as defined in **Section 2.3**.

2.1.11 Conclusions about significance of effects are derived with reference to available information about the project description and the environmental receptors (or *'receiving environment'*), and to predictions about the potential changes that the Proposed Development would cause to the affected receptors.

2.1.12 In each of the environmental topic chapters, professional judgement is used in combination with relevant guidance to assess the interaction of the receptor's sensitivity (this may be defined in terms of importance, value, rarity, quality) against the predicted magnitude of change to identify a level of effect. **Table 2.1** provides a general indication of how receptor sensitivity and magnitude of change combine to establish the level of effect for each environmental topic.

2.1.13 The type of categorisation illustrated in **Table 2.1** provides a guide only, and may be moderated by the professional that undertakes the assessment in accordance with judgement and experience. In particular, the divisions between categories of receptor sensitivity, magnitude of change, and level of effect should not be interpreted as definitive, and the lines that represent the boundaries between categories should in many cases be considered as 'blurred'. In some cases, the judgement can be guided by quantitative values, whilst in other cases qualitative descriptions are used. The significance of the effect may also need to be qualified with respect to the scale over which it may apply (e.g. local, regional, national and international). There are also specific variations for some topics, for example noise, where the assessment establishes whether the Proposed Development will meet or exceed limit values defined by the relevant guidance methodology, rather than establishing whether a significant effect will occur. Any such variation is described within the individual technical chapters.

Table 2.1 Establishing the level of effect

		Sensitivity of receptor			
		HIGH	**MEDIUM**	**LOW**	**NEGLIGIBLE / NONE**
Magnitude of change	LARGE	VERY SUBSTANTIAL	SUBSTANTIAL	SLIGHT / MODERATE	NEGLIGIBLE
	MEDIUM	SUBSTANTIAL	MODERATE	SLIGHT	NEGLIGIBLE
	SMALL	MODERATE	SLIGHT	NEGLIGIBLE / SLIGHT	NEGLIGIBLE
	NEGLIGIBLE / NONE	NO EFFECT	NO EFFECT	NO EFFECT	NO EFFECT

2.1.14 As noted, the EIA Regulations guide the assessor to focus on effects that are likely to be significant and, in its simplest form, the outcome of the assessment of a given effect on a particular receptor would be that it is either significant or not significant. However, there may be instances where it is appropriate to further sub-divide the category of 'not significant', for example by use of the terms 'slight' and 'negligible' in terms of the level of effect. The use of the category of 'slight' may for example be used in acknowledgement that there are instances whereby there may be an effect, albeit that this is not likely to be significant - and this approach may better facilitate assessment of cumulative effects where cumulatively several slight effects could be significant. While in general, environmental effects are categorised as: very substantial; substantial; moderate; slight; negligible; or no effect, specific technical assessments may deviate from this, though this will be explained in the relevant methodology section.

2.1.15 Having defined a level of effect, professional judgement in combination with guidance and standards are then applied to identify those considered to be equivalent to significant effects in terms of the EIA Regulations. For some of the topics that are assessed in this ES, there is published guidance about significance evaluation and, where such topic-specific guidance exists, it is used to inform the development of the significance evaluation methodologies. For other topics, a level of effect of very substantial or substantial is generally of most importance to the decision-maker and so these effects are considered significant in terms of the EIA Regulations. Where the level of effect is considered to be moderate or less, these are generally not deemed significant in terms of the EIA Regulations. However, depending on the receptor being considered, it is possible that some moderate effects could potentially be judged as significant in terms of the EIA Regulations, and where this is considered to be the case, the rationale for this conclusion will be provided in the technical assessments.

2.1.16 A definition of how the terms are derived for each topic is set out in the corresponding chapter along with the relevant explanation and descriptions of receptor sensitivity, magnitude of change and levels of effect that are considered significant in terms of the EIA Regulations.

Impacts and Effects

2.1.17 EIA is concerned with the identification of likely significant effects on the environment. However the terms impact and effect are often used synonymously and this can lead to

confusion. For clarity in this assessment, a cause and effect logic is applied where impacts are the changes that arise (e.g. changes in drainage pattern) and effects are the consequences of those changes (e.g. habitat becomes degraded by changes in drainage). They have been defined as follows:

- Impact: any change attributable to the development that is likely to result in an environmental effect, i.e. they are the cause of the environmental effect; and
- Effect: the result of the change in relation to specific environmental resources or receptors (an effect may in turn produce further change, i.e. an effect may become an impact in its own right).

Type of Effect

2.1.18 The EIA Regulations (Schedule 4, Part 1) require consideration of a variety of types of effect, namely direct / indirect, secondary, cumulative, positive / negative, short / medium / long-term, and permanent / temporary. In this ES, effects are considered in terms of how they arise, their valency (i.e. whether they are positive or negative) and duration. Each will have a source originating from the development, a pathway and a receptor and may fall into one of several categories:

- Direct effects are readily identified because of the physical connection between some element of the development and an affected receptor;
- Indirect effects require some additional pathway for the effect to arise, for example, a listed building may not be directly impacted by any elements of a development, but, if the development affected the setting of the listed building there would be an indirect effect;
- Secondary effects would typically require further pathway connections, for example, an effect on a receptor population A could have a secondary effect on receptor population B, if B was itself dependent on A in some way, as, for example, a food source; and
- Cumulative effects arise when the receptors affected by one development are also affected by other developments resulting in the aggregation of environmental effects or the interaction of impacts.

2.1.19 Most predicted effects will be obviously positive or negative, and will be described as such. However, in some cases it is appropriate to identify that the interpretation of a change is a matter of personal opinion, and such effects will be described as ‘subjective’.

Temporal and Spatial Scope

2.1.20 In its broadest sense, the spatial scope is the area over which changes to the environment would occur as a consequence of the development. In practice, an EIA should focus on those areas where these effects are likely to be significant.

2.1.21 The spatial scope varies between environmental topic areas. For example, the effect of a proposed development on the landscape resource and visual amenity is generally assessed within a zone of up to 35km from the wind turbines (and potentially up to 70km for cumulative effects), whilst noise effects are assessed within a much smaller area encompassing those representative properties close to the development site.

2.1.22 The temporal scope of environmental effects is stated where known. Effects are typically described as:

- Temporary – these are likely to be related to a particular activity and will cease when the activity finishes. The terms 'short-term' and 'long-term' may also be used to provide a further indication of how long the effect will be experienced; and
- Permanent – this typically means an irreversible change.

2.1.23 Effects are generally considered in relation to the following key stages of the Proposed Development:

- Construction – effects may arise from the construction activities themselves, or from the temporary occupation of land. Effects are often of limited duration although there is potential for permanent effects. Where construction activities create permanent change, the effects will continue into the operational period;
- Operation – effects may be permanent, or they may be temporary, intermittent, or limited to the life of the Proposed Development (as in the case of wind power developments which gain planning permission for a defined and finite number of years prior to decommissioning and site reinstatement); and
- Decommissioning - effects may arise from the decommissioning activities themselves, or from the temporary occupation of land. The effects would generally be temporary and of limited duration. Additional permanent change would normally be unlikely unless associated with restoration.

2.2 EIA Methodology

2.2.1 Following the identification of the scope of the EIA, individual environmental topics are subject to survey, investigation and assessment, and individual topic chapters are prepared for the ES. The assessment methodologies are based on recognised good practice and guidelines specific to each topic area, details of which are provided in the appropriate chapter.

2.2.2 In general terms, the technical studies undertaken for each topic area and chapter include:

- Collection and collation of existing baseline information about the receiving environment and original surveys to fill any gaps in knowledge or to update any historic information, along with identification of any relevant trends in, or evolution of, the baseline;
- Consultation with experts and relevant consultees to define the scope of the assessment and study area and subsequent consultation in response to emerging study findings;
- Consideration of the potential effects of the Proposed Development on the baseline, followed by identification of design changes to seek to avoid or reduce any predicted adverse effects;
- Engagement with other technical topic specialists and engineers / designers in a design iteration process seeking to optimise the scheme for the differing environmental effects and to identify any appropriate mitigation measures;
- Assessment of the final scheme design and evaluation of significant effects, together with an evaluation of any residual significant effects that remain after mitigation measures have been implemented; and
- Compilation of the ES chapter.

2.2.3 In reality, many of the effects are relevant to more than one environmental topic area, and careful attention has been paid to interrelationships to avoid overlap or duplication between

topic chapters. For example, the assessment of effects on cultural heritage features will be aided by the assessment in the landscape and visual chapter. Similarly, secondary effects on ecological resources arising from hydrological change will be considered in the ecology chapter with a cross-reference to the relevant direct effect in the hydrology chapter.

2.2.4 The following format has been adopted for the presentation of information within the ES:

- Summary – A short summary of each technical chapter is included at the outset (this text is the basis for the Non-Technical Summary that accompanies the ES);
- Introduction and overview – setting the scene for the topic, the nature of the receptors to be considered, and how the proposals might cause change;
- Methodology and Approach – describing how receptors were identified through a scoping process, along with the specific methods used for data gathering, predicting levels of effects and evaluating significance of effects;
- Baseline information – describing the current state and circumstances of the receptors and changes that might be expected to arise in advance of the development being implemented as well as those that might arise regardless of the development;
- Design evolution – identifying where there was potential for an effect and how the scheme (in terms of the location of elements and their scale and any embedded mitigation[2]) has been developed to address that potential;
- Predicted effects: Receptor – the effects predicted to arise as a result of implementing the final design of the Proposed Development;
- Predicted effects: Cumulative – the effects predicted to arise as a result of proposed development in combination with existing and proposed developments in the vicinity of the Development Site;
- Mitigation and enhancement measures – identification of non-embedded measures (i.e. those measures not inherent in the scheme design) which may be necessary to control or manage identified potentially significant effects or provide enhancements;
- Residual effects – an assessment of any effects remaining after non-embedded mitigation measures have been employed; and
- References.

2.2.5 In some cases, technical data and analysis is presented in a technical appendix (that are included in Volume 3 in the case of this ES). It is also necessary to recognise that information on some topics, such as the nesting location of certain bird species, is highly sensitive and may create a risk of persecution if published. Where such sensitive information has been collected, this will not be released into the public domain to safeguard the receptor in question, though it will be provided to the relevant planning authority and statutory consultees to inform the assessment process. The applicant will consider additional requests for this information, but may at its or relevant statutory consultees discretion, withhold such information.

[2] This is the process whereby at an early stage of the design, readily identifiable constraints are taken account of. For example, watercourses were identified on the Development Site and buffered by 50m or 100m to ensure that all infrastructure and construction activities are located outside this area.

2.3 Scope of the EIA

Scoping Process

2.3.1 Scoping is the process of identifying those aspects of the environment and associated issues that need to be considered when assessing the potential effects of a particular development proposal. This recognises that there may be some environmental elements where there will be no significant effects resulting from the development, and hence where there is no need for further investigation to be undertaken.

2.3.2 Scoping is undertaken through consulting organisations and individuals with an interest in and knowledge of the Development Site, combined with the professional judgement and experience of the EIA team. It takes account of published guidance, the effects of the type of development under consideration and the nature and importance of the environmental resources that could be affected.

Request for Scoping Opinion

2.3.3 The proposed EIA scope was defined by the Project Team, based on desk-based and field-based knowledge of the Development Site and prior experience from other wind farm development EIAs.

2.3.4 A scoping report was submitted in November 2012 to the then Energy Consents Deployment Unit (ECDU) of the Scottish Government (now Local Energy and Consents) along with a request for confirmation of the requirement of an EIA along with an opinion (Scoping Opinion) as to the information to be supplied within the ES. A summary of the proposed scope is outlined below in **Table 2.2**, and the scoping report is included as **Appendix 2.A**.

Table 2.2 Summary of EIA Scope

Environmental Topic	Summary of Proposed Scope of Assessment	Element proposed to be Scoped Out	Outcome
Ecology	The Ecology scope will include: ▶ A desktop study including consultation; Extended Phase 1 habitat and protected species surveys; ▶ National Vegetation Classification (NVC) surveys, focussing on notable bog and remnant peatland habitats following standard methodology, within specific areas identified during the Extended Phase 1 Habitat Survey; ▶ Suitability surveys of trees or structures potentially suitable for bat roosts (ground-based); and ▶ Assessment of the potential impact of the development on those designated sites, species and habitats of ecological value that have been identified within the Development Site or adjacent to its boundary.	No species-specific surveys are proposed for reptiles or red squirrel, although a record will be made of any sightings during the completion of other ecological surveys. No manual bat surveys are proposed as agreed with SNH.	Agreement on scope of surveys was reached with SNH.
Ornithology	The Ornithology scope will include: ▶ A desktop study including consultation; ▶ Ornithological field surveys to a scope agreed with SNH to include vantage point surveys, winter walkovers & winter wildfowl surveys; and ▶ Ornithological impact assessment.		Agreement on scope of surveys was reached with SNH and RSPB.
Geology, Hydrology and Hydrogeology	Desk study and site visit of hydrological and hydrogeological receptors on the Development Site and within a 2km search radius and review of their sensitivity in relation to development activities. The development of appropriate mitigation will be included to control potential effects on the receptors identified.	Operational effects would be minimal and addressed through design at construction stage.	SEPA did not state in their scoping response that operational effects should be assessed, so it is assumed they agree with them being scoped out.

Environmental Topic	Summary of Proposed Scope of Assessment	Element proposed to be Scoped Out	Outcome
Archaeology and cultural heritage	Direct effects on known heritage assets will be considered only where these are located within the footprint of the development.	Indirect effects on the settings of stated designated and non-designated heritage assets as outlined in **Chapter 10 – Historic Environment**.	As a result of consultation with Historic Scotland and West of Scotland Archaeology Service (WoSAS), the extended study area for assessment of indirect effects was extended from 5km to 10km.
Landscape and visual amenity	The landscape and visual assessment is in three parts: Landscape effects: ▶ Direct effects upon landscape elements and landscape patterns within and immediately around the Development Site, and upon landscape character (as defined by SNH assessments); and ▶ Indirect effects upon landscape designations within a 35km study area from turbines. Visual effects: ▶ Visual effects experienced by residential receptors within 2km of the Development Site; ▶ Recreational receptors within 5km of the Development Site; and ▶ Visual effects experienced by recreational receptors (on footpaths, bridleways, cycle routes, and tracks), by road users; and by visitors to outdoor visitor / tourist facilities. Cumulative effects ▶ Cumulative landscape and visual effects occurring within the 35km radius study area, resulting from the cumulative effect of two or more wind farms within the 70km radius search area. Other wind farms considered will include existing, consented and those proposals for which a full planning application has been submitted. A cut-off date for cumulative information has been set for design freeze to allow the assessment to be carried out.	Landscape effects - everything over 35km. Visual effects - everything over 35km, and further limitations incorporated for different visual receptors. Cumulative effects –proposals at the pre-planning application stage, wind turbines below 50m beyond 10km and wind turbine developments below 25m in height are excluded.	The elements proposed to be scoped out were accepted by relevant consultees.

Environmental Topic	Summary of Proposed Scope of Assessment	Element proposed to be Scoped Out	Outcome
Noise	Operational noise from the development following the ETSU-R-97 methodology with reference to the recommendations relating to wind farm noise assessment, including wind shear, in the UK Institute of Acoustics Bulletin (Bowdler *et al*, 2009). Consideration will be given to the adoption of standard environmental best practice during construction in accordance with BS5288:2009: Code of Practice for Noise and Vibration Control on Construction and Open Sites.	Detailed predictions of construction noise/vibration or construction traffic noise. Once the development is operational, it is envisaged that the amount of traffic associated with it would be minimal. It is considered that the effects of operational traffic would be negligible and therefore further consideration does not need to be given to noise from operational traffic.	The Environmental Health Officer (EHO) at Dumfries and Galloway Council (DGC) agreed that detailed consideration of construction noise/vibration, construction traffic noise and operational traffic could be scoped out of the EIA.
Traffic and Transport	Construction vehicle movements to be established and the need for assessment considered against standard guidance. Potential effects considered are: ▶ Severance; ▶ Driver delay; ▶ Pedestrian delay; ▶ Pedestrian amenity; ▶ Fear and intimidation; and ▶ Accidents and safety.	Minimal level of operational traffic and therefore propose to scope out the operational phase. Decommissioning, as future traffic baseline can be expected to be very different to current conditions and there will be significantly less traffic movements associated with decommissioning in comparison to construction as below ground structure and access tracks will be left in situ.	No consultees have stated that operational effects of traffic or decommissioning effects should be assessed as part of the EIA.
Shadow Flicker	Screening for shadow flicker will be done in accordance with the Planning Advice Sheet Onshore Wind Turbines. All properties located within a 130° segment either side of due north, relative to the turbines, and within ten rotor diameters of a turbine will be assessed for shadow flicker.	As per guidance, in the event that properties are greater than 10 rotor diameters from a turbine, properties will not require a shadow flicker assessment.	No consultees have stated that properties outside the defined study area should be assessed for Shadow Flicker.
Socio-economic	The baseline economic and social position of the local economy will be examined and the potential facets of the development that could have linkages with and effects upon the local economy (including tourism, recreational pursuits and land use etc.) will be established. Direct effects on public access and safety will also be considered. An assessment of the significance of such effects will be carried out.	It should be noted that effects on visual amenity, noise amenity and visual impact etc. will be assessed under the relevant technical section of the EIA.	No consultees have stated that visual amenity, noise amenity and visual impact should be assessed as part of the socio-economic assessment.

Environmental Topic	Summary of Proposed Scope of Assessment	Element proposed to be Scoped Out	Outcome
Air Quality & Climate	A carbon balance assessment will be completed following recognised methodology and incorporated within the front-end development description chapters of the ES. Energy and climate policies framework and associated development benefits will be incorporated into **Chapter 6 - Renewable Energy Policy, Carbon Balance and Peat Management**.	Dust can be controlled through standard mitigation therefore proposed to be scoped out.	No consultees have stated that air quality should be assessed as part of the EIA.
Infrastructure, telecommunication utilities and air safeguarding	The scope will include investigations into establishing the presence of existing infrastructure associated with utilities such as water, gas, electricity, and telecommunications links. The extent of any effects, and necessary mitigation, will be addressed through consultation with the relevant system operators and during the iterative site design process. Aviation issues will be addressed as part of this process.		n/a
Grid Connection	None	The grid connection will be subject to a separate consenting arrangement and therefore will not be considered within the EIA. Information on the potential grid connection location point together with the underground /above ground cable routing will be made available should this become known before the submission of the ES. Grid Connection has been scoped out of the EIA.	No comments have been received from consultees indicating that assessment of the grid connection would be necessary.
Lighting	None	Potential adverse effects from lighting may arise during construction activities and during the operation and decommissioning of the wind farm. Any potential effects during construction and decommissioning can be controlled by standard construction practices and good site management. Any lighting required during operation would be very small in scale and candella. It is therefore proposed to scope out impacts from lighting.	An assessment of the effects on aviation lighting on the Galloway Dark Sky Park and Scottish Dark Sky Observatory has been carried out.

Scoping Opinion

2.3.5 ECDU issued a formal Scoping Opinion on 13 March 2013 and this is presented in full in **Appendix 2.B**. The scoping responses and how they are addressed in the EIA are summarised in **Table 2.3**.

Table 2.3 Scoping Responses

Consultee	Key issues / Points raised during consultations	How points raised have been taken into account in ES
Other		
East Ayrshire Council (EAC)	Requested a statement of expected carbon savings and a programme of work complete with outline plans and specifications for the decommissioning and reinstatement of the site. Recommend consultation with: EAC Roads Division, EAC Outdoor Access Officers, Local Community Councils within 10km.	A carbon calculation is included within the ES in **Chapter 6**. The EAC Roads Department have been consulted and Community Councils have been represented within the community liaison group.
Scottish Government Energy Consents and Deployment Unit	Provided generic advice on the scope a wind farm EIA should cover along with individual responses received from stakeholders consulted.	A compliant EIA has been undertaken. Responses to specific issues raised by consultees are provided in the topic specific sections in this table.
Mountaineering Council of Scotland	Noted they will not be providing a response	n/a
Forestry Commission Scotland	Need confirmation of what is proposed with regard to forestry.	No forestry will be affected by the Proposed Development.
Planning and Policy Context		
Dalmellington Community Council (DCC)	Objected to the Proposed Development as *"contrary to the following sections of the East Ayrshire Local Plan:-TOUR1, PROP2, PROP3, ENV3, ENV8, ENV14, ENV16, ENV17, PROP24, CS12 and CS14 (E(1).(2),(3) and (4)." As well as contrary to the Ayrshire Joint Structure Plan policies "STRAT1, ECON6, ECON7, ECON12, ENV1, ENV2 and ENV7."*	Planning policy is considered in **Chapter 5**. A separate Planning Statement has been produced to assess the Proposed Development against relevant planning policy and has been submitted as part of the application.
EAC	Requested reference be made to *"the approved Ayrshire Joint Structure Plan, the East Ayrshire Local Plan 2010 and the Addendum to the Ayrshire Joint Structure Plan Technical Report TR03/ 2006: Guidance on the Location of Windfarms within Ayrshire"*	These documents are referenced within **Chapter 5 - Planning Policy Context**.

Consultee	Key issues / Points raised during consultations	How points raised have been taken into account in ES
Noise		
Dumfries and Galloway Council (DGC)	No objection in principal, providing site specific noise impact study following ETSU-R-97 is carried out.	A site specific noise impact study following ETSU-R-97 has been carried out and the results are reported in **Chapter 7 – Noise**.
LVIA		
DCC	Objected to the Proposed Development as *"The Ayrshire Joint Structure Plan requires the protection of the landscape character of the area and to give prime consideration to the protection and enhancement of the landscape in Sensitive Landscape Areas. The proposed development is not compatible with this duty (7.3)."*	A Landscape (and visual) impact assessment is provided and reported in **Chapter 9** while planning policy is considered in **Chapter 5**. A separate Planning Statement has been produced to assess the Proposed Development against relevant planning policy. A Design and Access Statement which sets out the design strategy and objectives has been in included with the application.
EAC	Requested a Residential visual assessment for every property within 2km of the Proposed Development and that cumulative impacts be considered. Requested a minimum of a 35km ZTV produced.	An assessment of residential properties has been undertaken on those properties within 2km of the Proposed Development and includes further selected properties within 3km. A comprehensive cumulative LVIA has been undertaken. A ZTV with a radius of 36,690m has been produced.
SNH	Highlight the following landscape and visual matters as requiring particular attention in respect of the LVIA for this proposal: ▶ The off-site impacts of improving the public roads to allow access i.e. the landscape and visual impacts of any road straightening, widening, levelling, tree and hedgerow removal and the upgrading of junctions; ▶ Access tracks and borrow pits should be included in relevant visualisations less than 10km from site; ▶ The options for any felling requirements; and ▶ Should there be a need to install aviation obstruction lighting to some or all of the wind turbines, its visual impact at night will have to be assessed in the ES. Recommend that the EIA take particular cognisance of the following landscape and visual receptors which may be affected by the proposal ▶ Local landscape designations: East Ayrshire's Sensitive Landscape Character Areas, and the South Ayrshire Scenic Area; ▶ The nearby towns of New Cumnock, Cumnock and Dalmellington;	The LVIA has taken the potential effects of associated infrastructure into account (e.g. access tracks, control building, borrow pits, aviation lighting etc). The offsite works are minor in extent, so it is not considered that there would be significant effects in respect of these. An assessment of aviation lighting in relation to the dark sky park and Scottish Dark Sky Observatory has been undertaken by Stuart Lumsden of Leeds University. No felling of forestry will be undertaken. The LVIA has considered East Ayrshire's Sensitive Landscape Character Areas, the South Ayrshire Scenic Area, New Cumnock, Cumnock, Dalmellington, The Southern Upland Way and the Galloway Hills Regional Scenic Area. Potential effects on the Merrick Wild Land Area have been subject to an assessment in accordance with SNH methodology as an Appendix (**9.E**) of the LVIA. Wirelines from all VPs and photomontages from those within 15km have been produced.

Consultee	Key issues / Points raised during consultations	How points raised have been taken into account in ES
	▶ Landscape Character with reference to the Ayrshire Landscape Character Assessment Land Use Consultants 1998); ▶ The Southern Upland Way; ▶ The Merrick Search Area for Wild Land; and ▶ The Galloway Hills Regional Scenic Area to the south in Dumfries and Galloway. Wirelines from all VPs and photomontages from those within 15km.	
Visit Scotland	Visual impact on hill walkers should be assessed from areas such as Cairnsmore of Carsphairn and Windy Standard and Loch Doon.	Potential effects on Cairnsmore of Carsphairn, Windy Standard and Loch Doon have been considered by the LVIA.
Historic Environment		
DGC	Noted no direct effects on assets or significant effects on settings within Dumfries and Galloway anticipated.	n/a
EAC	Noted Craigengillan should be assessed in the study.	Potential effects on Craigengillan House and Garden and Designed Landscape have been assessed and the results reported in **Chapter 10** of the ES.
Historic Scotland	ZTV indicates that 5km study area may need to be widened (e.g. properties such as Craigengillan House, Stable Block and Garden and Designed Landscape (GDL)) may need to be considered). Requested viewpoint with visualisations as close as possible to the house.	A 10km study area was used for the Cultural Heritage Assessment. The properties listed were assessed and a wireframe visualisation from Craigengillan House is presented in **Figure 10.3** of the ES.
Ecology		
EAC	Requested a NVC survey, and an Ecological Clerk of Works (ECoW) during construction.	An NVC survey was undertaken and the results are reported as **Appendix 11.A** of the ES. It is anticipated that an ECoW would be employed to oversee construction activities and it is assumed that this will be implemented under a suitably worded planning condition.
SEPA	State that a phase 1 habitat survey and NVC survey if relevant should be carried out for the site and GWDTEs identified and avoided if possible. State that a detailed map of peat and measures for quantifying the depth and principles of reuse should be provided.	A phase 1 habitat survey and NVC survey have been carried out and potential GWDTEs have been assessed. The results are reported in **Appendices 11.A and 13.B** respectively. The Proposed Development has been designed to avoid these sensitive habitats as far as possible and mitigation measures to reduce effects have been described. Phase 1 & 2 peat depth surveys have been undertaken which have informed a peat slide risk assessment and peat management plan which are presented in as **Appendices 6.B and 6.A** respectively of the ES.

Consultee	Key issues / Points raised during consultations	How points raised have been taken into account in ES
Marine Scotland	Provided general guidance and noted potential need for fisheries baseline work, and ongoing monitoring scheme to be developed.	Baseline fisheries surveys were undertaken and are presented as **Appendix 11.F and 11.G** of the ES. It is not currently anticipated that an on-going monitoring scheme would be required though if considered necessary, this could be addressed via a suitably worded planning condition.
Galloway Fisheries Trust (GFT)	No comment until turbine layout and access track network is confirmed. Requested this information when available.	The turbine layout and track network will be provided to the GFT for comment as part of the section 36 application.
SNH	Confirmed that they were content with the ecology surveys undertaken to date and noted further survey for bats were planned and that consultation was to be undertaken regarding the suitability of watercourses for salmonids.	n/a
Ornithology		
EAC	Noted Ornithology assessment should consider *"hen harrier, golden eagle, short eared owl, barn owl, merlin, peregrine falcon, golden plover and black and red throated diver".*	Effects on these species have been considered, except where they could be ruled out based on lack of recorded activity, including hen harrier, golden eagle, short-eared owl, black- and red-throated divers.
RSPB Scotland	Concerns over cumulative impact from the scheme plus opencast mining, other windfarms and plantation forestry in area. Requested additional black grouse surveys take place in 2013 using standard methods.	Cumulative impacts are assessed in Section 12.10. Black grouse surveys were undertaken between April and May 2013 in line with survey guidance for this species
SNH	SNH were initially contacted in November 2011 by AECOM, who sought advice on the level of survey effort as well as the type of surveys undertaken during the 2011/12 winter season. The dialogue continued through to October 2012 and is documented in Appendices 12.A and 12.B. SNH raised the following four main areas for clarification: ▶ A representative sample of dates and weather conditions should be obtained. ▶ Viewsheds 1, 4 and 7 appear to be more than 180 degrees. ▶ Some of the VPs appear to be close to the proposed turbine layout and would recommend a 500m separation buffer. ▶ Further viewshed mapping is required to confirm appropriate coverage of the turbine layout. SNH confirmed in October 2012 that they were happy with the reasoning and had no further comments.	AECOM provided a summary of the methods and results of the surveys as requested. A summary of the clarifications are outlined below: ▶ Approximately two thirds of the VP surveys were targeted at dusk and dawn with the remainder during the day. Extreme weather conditions were avoided. ▶ The viewsheds of VPs 1, 4 and 7 were expanded to account for the site topography which made it very difficult to obtain extensive coverage and also to encompass several habitat features that were identified as having potential for supporting target species activity. In actuality, target species activity was very low and therefore the expanded viewsheds did not detract from target species flight monitoring. ▶ Surveyors took steps to remain concealed when in position at VPs, using temporary shelters. None of the VPs were located within the viewshed of another VP.

Consultee	Key issues / Points raised during consultations	How points raised have been taken into account in ES
	In their scoping response SNH re-iterated that survey methods had followed their guidance and had no further comments.	▶ Viewsheds provided.
Geology, Hydrology & Hydrogeology		
East Ayrshire Council	Requested full peat depth analysis and peat slide risk assessment. Requested construction impacts on water quality assessed and mitigated. Other standard guidance provided regarding consideration of effects on water quality.	Phase 1 & 2 peat depth surveys have been undertaken which have informed a peat slide risk assessment and peat management plan which are presented in **Chapter 6** of the ES.
SNH	Stated the need for peat surveys.	Phase 1 & 2 peat depth surveys have been undertaken as noted above.
Scottish Water	No Response.	n/a
SEPA	State that a list of groundwater abstractions within a radius of 100m from roads, tracks and trenches and 250m from borrow pits and foundations should be provided. Stated that developments should be designed to avoid engineering activities in the water environment wherever possible and where watercourses need to be crossed, bridging solutions or bottomless or arched culverts which do not affect the bed and banks of the watercourse should be used. Stated that a flood risk assessment should be submitted if proposed works are likely to result in increased flood risk. State that potential pollution risks and a draft schedule of mitigation should be identified.	A list of groundwater abstractions is shown on ES **Figure 13.1**. The Proposed Development has been designed to minimise the number of watercourse crossings as far as possible such that only five new crossings would be required (or six in the event that the borrow pit search area adjacent to Rigg Hill is utilised). The watercourse crossings would be designed in consultation with SEPA (and would conform with WAT-SG-25 guidance). They would allow for a 20% increase in river flows under current legislative recommendations with respect to climate change. The crossings would be constructed in a manner that does not result in reduced water flows within a particular watercourse, either upstream, downstream, or through a culvert structure. Water flows would replicate prior existing conditions to ensure erosion of river bank or river bed is not exacerbated in any way, and that culverts allow the integrity of watercourse flows to remain unchanged. The proposed works are unlikely to result in increased flood risk and therefore a flood risk assessment has not been undertaken. Potential pollution risks are identified in **Chapters 4 and 13** of the ES and mitigation measures in relation to these are described. **Chapter 18** of the ES summarises all the mitigation measures proposed.
Traffic and Transport		
Transport Scotland	Noted that due to frequency and number of abnormal loads it is UK policy to restrict these movements via the nearest suitable port.	It is anticipated that turbines would be delivered to the Port of Ayr which is the nearest suitable port.

Consultee	Key issues / Points raised during consultations	How points raised have been taken into account in ES
Socio-economics		
DCC	Objected to the Proposed Development on the basis of concerns in respect of the impact on the Scottish Dark Sky Observatory within Galloway Forest Dark Sky Park.	An assessment of aviation lighting in relation to the dark sky park and Scottish Dark Sky Observatory has been undertaken by Stuart Lumsden of Leeds University and is reported in **Appendix 15.A** of the ES.
EAC	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. If any re-routing of paths is required alternative routes should be highlighted for consideration.	It is anticipated that it will not be necessary for any public rights of way to be rerouted as a result of the Proposed Development.
Visit Scotland	Requested that the ES should include consideration of impacts on tourism receptors. In particular visual impact on hill walkers should be assessed from areas such as Cairnsmore of Carsphairn and Windy Standard and Loch Doon. Requested impact on Scottish Dark Sky Observatory on Craigengillan Estate be considered.	Potential visual impacts from these areas have been assessed in the LVIA (**Chapter 9**). An assessment of impacts on tourism, recreational, accommodation and hospitality receptors is included within **Chapter 15** of the ES. An assessment of aviation lighting in relation to the dark sky park and Scottish Dark Sky Observatory has been undertaken by Stuart Lumsden of Leeds University and is reported in **Appendix 15.A** of the ES.
Infrastructure, Telecommunications and Aviation		
BT Network Radio Protection	Requested further consultation on windfarm locations noting that the Proposed Development may affect radio link 10399 (Mauchline Te – windy Standard Hill). BT also requested a 100m minimum clearance from the link path.	A 150m buffer has been placed around the BT link.
Civil Aviation Authority (CAA)	The CAA provided its standard guidance to all windfarm applications and noted a specific response would only be provided in response of statutory consultation under the Electricity Act or the Planning Act.	The potential impact of the Proposed Development on Aviation interests is presented in Chapter 17.
NATS	No comment, general guidance and information provided.	The potential impact of the Proposed Development on Aviation interests is presented in Chapter 17.
BAA Glasgow Airport	No comment and noted it need not be consulted further	n/a
Glasgow Prestwick Airport (GPA)	Objection due to clutter on primary surveillance radar	The applicant is committed to undertake further discussions with GPA to resolve any issues arising.

Consultee	Key issues / Points raised during consultations	How points raised have been taken into account in ES
MOD	Objected as within low flying area TTA 20	A meeting was held with the DIO on the 14th August 2013 to discuss the MOD objection to the Proposed Development. It has subsequently been confirmed that this objection has been withdrawn. Further details are presented in Chapter 17 of the ES.
OFCOM	Provide identification of 3 links (Police Service of Northern Ireland link 04764772/2, North West Electronics link 0818707/1 and Eircom UK Limited link 0796374/1) and advice to contact Atkins, JRC and websites for other possible links.	The links identified were confirmed to be outside the area of influence of the Proposed Development. Further consultation was undertaken with Atkins, JRC and relevant infrastructure operators.
JRC	Cleared with respect to radio link infrastructure operated by Scottish Power and Scotia Gas Networks	n/a

Further Scope Evolution

2.3.6 The process of completing topic specific investigations inherently involves further discussions with consultees. Topic specific refinements to scope and the detailed methods to be employed were undertaken as shown in **Table 2.4**.

Table 2.4 Summary of Consultation Following Issue of the Scoping Opinion

Technical Topic/ES Chapter & Consultee	Key issues / Points raised	How points raised have been taken into account in ES
Noise (Chapter 7)		
EAC (Environmental Health Officer).		Agreement of noise monitoring methodology and locations. Agreement that the Meikle Hill property could be considered an acceptable proxy location for the Maneight property where access for noise monitoring was not possible.
LVIA (Chapter 9)		
EAC	Highlighted the following: ▶ Viewpoint 2 should be moved outside the Kyle forest subject to confirmation of the view by fieldwork. ▶ Views from the Glen Afton Leisure Park should be checked. ▶ The Dalgig Road location be replaced to help establish the effect on the upland basin LCT. ▶ A viewpoint from the Auchenroy Hill which is a popular and listed local walking route as well as being within the Garden and Designed Landscape boundary to provide coverage from the Craigengillan Estate. ▶ A viewpoint should be provided from the settlement of New Cumnock somewhere in the vicinity of the cemetery on Afton Road or Connel Road. Photomontages to supplement wireframes should be provided from all residential properties considered within the assessment.	All amendments to viewpoint locations and suggested viewpoint locations were considered in the field and where appropriate, changes to locations were made. The details of this viewpoint location selection process are described in **Chapter 9 – LVIA, Table 9.3**. All residents in properties for inclusion in the Residential assessment were approached to obtain permission to undertake viewpoint photography. Four properties allowed access. For all other properties photography was taken from adjacent, publically accessible roads and incorporated into the figures to support the residential assessment.
Archaeology & Cultural Heritage (Chapter 10)		
WoSAS, Historic Scotland.		Scope and methodologies were agreed following the issue of Scoping Opinion. The WoSAS Sites and Monuments Record was searched and all sites of potentially national importance were considered within a study area of 10km. Scope and methodologies were agreed following the issue of the Scoping Opinion. This opinion was checked and confirmed at a later date due to the time frames involved.
Ecology (Chapter 11)		
SNH.		Agreement of survey methodologies, particularly regarding bats and fish. Records have been sought from many relevant local and national bodies, as listed in the Scoping Report.

Technical Topic/ES Chapter & Consultee	Key issues / Points raised	How points raised have been taken into account in ES
Geology, Hydrology & Hydrogeology (Chapter 13)		
SEPA, DCG. EAC Data Request		Abstraction and discharge (CAR) licences, Private Water Supply (PWS) records, and water monitoring (river flow) data have been obtained.
Traffic & Transport (Chapter 14)		
Ayrshire Road Alliance.	Liaison concerning available accident data and traffic data	No suitable data available. Abnormal load route assessment produce by Colletts and agreed by the Ayrshire Road Alliance.
Infrastructure (Chapter 16)		
Scottish Water, Scottish Gas, Scottish Power, Linesearch, Ofcom, BT, Airwave Solutions (via R4telecom Ltd), Everything Everywhere Ltd, Atkins Ltd, Joint Radio Company.	To determine whether any assets were located within the land available for development.	No new links were identified.
Air Safeguarding (Chapter 17)		
MoD, GPA and NATS.	To discuss and agree any required mitigation measures	A meeting was held with the Defence Infrastructure Organisation (DIO) on the 14th August 2013 to discuss the MOD objection to the Proposed Development. It has subsequently been confirmed that this objection has been withdrawn. Further details are presented in Chapter 17 of the ES.

Scope of Assessment

Environmental Topics

2.3.7 The scoping process has culminated in the identification of the environmental topics to be addressed in the EIA. These are shown in **Table 2.5** along with how these relate to the topics identified in the EIA Regulations as potentially being required to be considered.

Table 2.5 Environmental Topics Addressed in the ES

Topic in the EIA Regulations (Schedule 4)	Topic in this ES
Population	Noise Shadow Flicker Landscape and Visual Traffic and Transport
Fauna	Ecology Ornithology
Flora	Ecology
Soil	Geology, Hydrology and Hydrogeology Carbon Payback and Peat Management
Water	Geology, Hydrology and Hydrogeology
Air	Scoped out (See **Chapter 4, Section 4.4.19** for the main measures for managing dust). Carbon Payback and Peat Management

Topic in the EIA Regulations (Schedule 4)	Topic in this ES
Climatic factors	Effect of the Proposed Development on the climate of the region has been scoped out but a carbon balance assessment has been undertaken in **Chapter 6**.
Material assets (including architectural and archaeological heritage)	Landscape and Visual Historic Environment
Landscape	Landscape and Visual
The interrelationship between the above factors	These are discussed within each chapter as relevant

Cumulative Effects

2.3.8 In line with standard practice, projects that have been the subject of full and validated planning applications have been included in the consideration of potential cumulative effects with the assumption that they will be successful. Consented but not yet constructed schemes are also assessed as part of the cumulative assessment.

2.3.9 Other projects substantially in the public domain either by virtue of a scoping report or indeed a consultation into a specific infrastructure project are excluded as there is insufficient information available to the EIA team upon which to base an assessment. In the case of other wind energy developments, key information is required about the number, location and size of turbines for a full assessment of cumulative effects to be carried out. Furthermore, a planning application for such projects may never be submitted.

2.3.10 In respect of potential cumulative effects with other schemes, the following developments and effects have been identified as requiring consideration as listed in **Table 2.6**, with no other types of development which might give rise to cumulative effects having been identified.

Table 2.6 Wind Farm Developments Assessed for Potential Cumulative Impacts

Ref (See key below)	Name	No. of turbines	Hub height (m)	Rotor diameter (m)	Tip height (m)	Approximate distance from Proposed Development (km)
E01	Windy Standard	36	70	45	92.5	5.0
E02	High Park Farm	1	49	52	75	6.0
E03	Hare Hill	20	40	47	63.5	6.5
E04	Wether Hill	14	60	62	91	18.0
E05	Bankend Rig	11	45	62	76	26.5
E06	Nutberry	6	80	90	125	30.0
E07	Hagshaw Hill	26	35	40	55	30.5
E08	Hadyard Hill	52	60	80	100	30.5
E09	Low Bowhill	1	40	54	67	31.5
E10	Hagshaw Hill Extension	20	49	62	80	32
E11	Calder Water	14	100	94	147	32.5
C01	Windy Standard Extension (Brockloch Rig)	30	80	80	100-120	2.5
C02	Afton	27	80	80	120 & 100	4

Ref (See key below)	Name	No. of turbines	Hub height (m)	Rotor diameter (m)	Tip height (m)	Approximate distance from Proposed Development (km)
C03	Hare Hill Extension	39	60	72	96	7.5
C04	Mansfield Mains	1	36.6	16.5	44.85	9.0
C05	Sanquhar	12	80	100	130	9.0
C06	Dersalloch	23	80	90	125	13.5
C07	Whiteside Hill	11	80	82.4	121.2	14.0
C08	Torrs Hill	2	64.95	70.1	100	17.5
C09	Sunnyside	2	36	52	62	19.0
C10	Penbreck (duplicated in applications as only part of the scheme in South Lanarkshire Council (SLC) is consented)	9 (6 in SLC, 3 in EAC)	80	90	125	20.5
C11	Twentyshilling Hill	9	80	90	125	21.0
C12	Knockman Hill	5	55	52	81	25.0
C13	Blackcraig Hill	23	65	90	110	27.5
C14	Galawhistle	22	80	82	110.2 (18T)- 121.2 (4T)	29.5
C15	Andershaw	14	80	90	125	30.5
C16	Dungavel	13	60-80	80	100-120	30.5
C17	Chapelton Farm	3	45	44	67	31.0
C18	Middle Muir	15	84	104	136 (8T) & 152 (7T)	32.5
C19	Hazelside Farm	2	50	48	74	32.5
C20	Kype Muir	26	80	104	132	33.5
C21	Sneddon Law	15	n/a	n/a	130	34.0
C22	Cleughhead Farm	1	n/a	n/a	79	35.0
C23	Yonderton Farm	1	34	34	51	35.0
C24	Dowhill	1	50	54	77	35.0
C25	Netherholm Farm	1	34	34	51	35.5
C26	Auchrobert	12	80	132	132	35.5
A01	South Kyle	50	93	113	149.5	0.5
A02	Pencloe	21	74.5	101	125	2.0
A03	Benbrack	18	80	100	130	5.0
A04	Taiglim farm	1	24	19.2	34.2	8.5
A05	High Cumnock	8	80	104	132	9.0
A06	Polquhairn	9	60	80	100	9.5
A07	Garleffan	6	83	107	135	10.0

Ref (See key below)	Name	No. of turbines	Hub height (m)	Rotor diameter (m)	Tip height (m)	Approximate distance from Proposed Development (km)
A08	Quantans Hill	19	81	98	130	11.5
A09	Glenmount	19	85	90	130	12.0
A10	Knockshinnoch	2	80	93	126.5	13.0
A11	High Glenmuir	1	35	54	62	13.5
A12	Lethans	26	79 & 95	114	12T-136 & 14T-152	14.0
A13	Keirs Hill	17	96.5	104	149	15.5
A14	Longburn	20	80	108	135	16.0
A15	Ulzieside	12	80	90	125	16.0
A16	Spango	14	89.5	111	145	20.0
A17	Penbreck (duplicated in consented as part of the scheme in SLC is consented)	9 (6 in SLC, 3 in EAC)	80	90	125	20.5
A18	Fowler Farm	1	40	54	67	21.0
A19	Margree	17	85	90	130	23.0
A20	Linburn Farm	2	40	54	67	24.0
A21	Kennoxhead	26	80	93	126.5	25.5
A22	Loch Urr	26	82.5	90	127.5	28.0
A23	Leadhills (Windy Dod)	14	90	104	137	30.5
A24	Glentaggart	5	80	104	132	31.5
A25	Feoch	1	40	54	67	32.0
A26	Burnfoot Farm	1	50	54	77	32.0
A27	Mochrum Fell	8	75	100	126.5 and 116.5 (T5)	34.9

Key:

E – Existing

C- Consented

A - Application

Note: Information collected from local planning authority and developer sources in April 2015.

Wind farm development within 35km was reviewed in August 2015 and changes considered against the assessment as identified in Chapter 9 – LVIA, paragraphs 9.3.34 to 9.3.35.

Consideration of Alternatives

2.3.11 The EIA Regulations require the ES to include:

"An outline of the main alternatives studied by the applicant and an indication of the main reasons for his choice, taking into account the environmental effects".

2.3.12 National planning and energy policy makes it clear that there is no requirement for renewable energy developments to demonstrate an overall need for new renewable generation or a need to

justify them being in a specific location. Nevertheless, the Site Selection and Design Evolution chapter of this ES (**Chapter 3**) describes the Development Site identification process and design criteria.

2.3.13 In EIA terms, the requirement is therefore only to report on alternatives that have been considered rather than it being a requirement to consider alternatives. The examination of alternatives in this ES (discussed in **Chapter 3**) is therefore restricted, as appropriate, to alternative designs that were considered for the Development Site.

2.4 Community Engagement

2.4.1 The applicant has a commitment to promoting open dialogue with statutory and non-statutory consultees and the local community throughout the project lifecycle. Given that a significant amount of information is required to support any meaningful assessment of a wind farm project, it is a challenge to communicate such developments to a diverse range of people. A range of avenues for community consultation have therefore been established which include public information days and exhibitions, an online consultation website (www.eonenergy.com/enochhill), a freephone telephone number (0800 096 1199) and email address (swscotland@eon.com), newsletter and advertisements in local newspapers.

2.4.2 The following public information days were held for the Proposed Development:

- 6th November 2012 at Lagwyne Village Hall, Carsphairn;
- 7th November 2012 at New Cumnock Community Education Centre;
- 14th November 2012 at Hillview Leisure Centre, Kelloholm; and
- 15th November 2012 at Dalmellington Community Centre, Dalmellington.

2.4.3 The following public exhibitions were held for the Proposed Development:

- 7th October 2014 at Dalmellington Community Centre, Dalmellington; and
- 8th October 2014 at New Cumnock Community Centre, New Cumnock.

2.4.4 In addition, a Community Liaison Group (CLG) made up of local residents, community councils and local groups was set up and four meetings of the CLG were held on:

- 27th May 2014;
- 2nd July 2014;
- 10th September 2014; and
- 15 July 2015.

2.4.5 The feedback from the CLG was fed into the design process which is described in detail in **Chapter 3**.

2.4.6 A full statement of community consultation, which describes in more detail the community engagement process described in this section, has been provided in the pre-application consultation (PAC) report which has been submitted with the section 36 application.

2.5 References

Guidelines for Environmental Impact Assessment (IEMA, 2004).

Online Renewables Planning Advice: *Onshore Wind Turbines* (Scottish Government, updated May 2014).

Scottish Government PAN 1 /2011 (March 2011) Planning and Noise.

Scottish Government PAN 2 /2011 (July 2011) Planning and Archaeology.

Scottish Government PAN 3 /2010 (August 2010) Community Engagement.

Scottish Executive Development Department PAN 51 (Revised 2006) Planning, Environmental Protection and Regulation.

Scottish Government PAN 1/2013 (August 2013) Environmental Impact Assessment.

Scottish Executive Development Department PAN 60 (updated January 2008) Planning for Natural Heritage.

Scottish Executive Development Department PAN61 (July 2001) Planning and Sustainable Urban Drainage Systems.

Scottish Executive Development Department PAN75 (August 2005) Planning for Transport.

Scottish Executive Development Department PAN79 (September 2006) Water and Drainage.

Scottish Executive Development Department PAN 81 Community Engagements.

Scottish Executive Development Department Circular 3/2011 on the Environmental Impact Assessment (Scotland) Regulations 2011.

The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2000 (the EIA Regulations).

3. Site Selection and Design Evolution

3.1 Site Identification Process

3.1.1 The careful selection of potential wind farm sites is a critical aspect of the overall development process.

3.1.2 The process which led to identification of the Development Site started in June 2010 when the applicant carried out a high level assessment of the south west Scotland area to identify potentially suitable sites for wind energy development.

3.1.3 An initial assessment of the feasibility of potential development sites was conducted using Geographical Information Systems (GIS) to look at high-level constraints and key criteria for wind farm development. This process allowed early identification of key technical, environmental and planning issues which could either support or hinder the development of wind energy on individual sites.

3.1.4 Some sites were rejected following this exercise due to factors including lack of a suitable wind resource, ornithological sensitivities, landscape and visual sensitivities, planning policy, and commercial constraints. Other sites, including the Development Site, passed this initial assessment and were then subject to further analysis and consultations with relevant consultees.

3.1.5 At the conclusion of the initial assessment, the Development Site was identified as being potentially suitable for wind farm development as no absolute high level constraints had been identified, though it was recognised that it is located within the East Ayrshire Sensitive Landscape Area (SLA).

3.1.6 Potentially suitable sites identified during this first phase of the process were then subject to feasibility assessments. Sites were evaluated, with those satisfying the basic assessment criteria progressing to the next stage of evaluation. These basic assessment criteria included (but were not limited to):

- Land Availability: ensuring there is sufficient land available for development;
- Land Use and Context: assessing the suitability of the existing land use and ensuring that the chosen site is outwith international or national environmental or planning designations (though noting that it is located within a locally designated area [i.e. the East Ayrshire SLA]);
- Wind Resource: ensuring a sufficient wind resource exists to make the development financially viable;
- Electricity Grid: assessing whether the proposed development is within appropriate proximity of a suitable connection point to the electricity grid network;
- Transport Infrastructure: ensuring the development is accessible via public road infrastructure to allow the construction, operation and maintenance of the wind farm;
- Residential Amenity: ensuring the wind turbines can be located sufficiently far away from houses to protect local amenity with respect to noise amenity and shadow flicker;
- Landscape and Visual Capacity: an initial assessment of the landscape and visual effects of a wind farm on important receptors (i.e. ensuring it is not located within a statutory designated landscape and taking into account considerations of landscape capacity and potentially sensitive visual receptors); and
- Nature Conservation Sites: an initial assessment to determine the location of statutorily designated sites such as Sites of Special Scientific Interest (SSSIs), National Nature Reserves (NNRs), Ramsar Sites, Special Areas of Conservation (SAC) and Special Protection Areas (SPAs) in relation to the Development Site.

3.1.7 The conclusion of this feasibility assessment work was that the Development Site met the necessary basic assessment criteria (e.g. a good wind resource and proximity to a potential grid connection) It therefore warranted further detailed environmental and technical assessment.

3.1.8 The applicant subsequently built on the feasibility assessment findings by undertaking design and EIA work for the Proposed Development. This included undertaking consultations with relevant stakeholders such as Scottish Natural Heritage (SNH), Royal Society for the Protection of Birds (RSPB) and the Scottish Environment Protection Agency (SEPA) in order to assess their views on a potential wind farm at the Development Site and to ultimately assist in the evolution of an appropriate, responsibly designed wind farm that is sensitive to the surrounding area.

3.1.9 The proposed wind energy spatial framework included within the East Ayrshire Local Development Plan (EALDP): Proposed Plan (2015) indicates that the Development Site is partially within Group 3 – Areas with potential development and partially within Group 2 – Areas of significant protection. The reason why part of the Development Site lies within a proposed Group 2 area relates solely to the potential presence of carbon rich soils and/or "deep" peat, according to 1:250,000 scale soil carbon richness mapping published by SNH. Providing it can be demonstrated that the Proposed Development can substantially overcome any issues regarding the protection of deep peat and carbon rich soils, the proposed wind energy spatial framework would be supportive of an appropriately designed wind energy development on the Development Site.

3.1.10 The conclusion of this site selection process was that the Development Site met the initial criteria and therefore a further detailed assessment to resolve environmental and technical constraints was undertaken from April 2012 onwards. This led to an initial 23 turbine layout, shown as layout 2 on **Figure 3.1**, which took account of the criteria described at **Section 3.1.6** above.

3.2 Site Context

3.2.1 The Development Site, the boundary of which is shown on **Figure 1.2**, is located in East Ayrshire directly north of the border with Dumfries and Galloway and the former Stewartry District. The proposed turbines are located in the southern portion of the Development Site as a result of the iterative design process which has resulted in turbines being located south away from sensitive landscape and visual receptors and residential properties.

3.2.2 The nearest large settlements to the Development Site are New Cumnock located 5km to the north east and Dalmellington located 7km to the south west. The nearest residential property is located at Maneight to the east (approximately 310m from the boundary of the Development Site and approximately 1,741m from the nearest turbine).

3.2.3 The B741 is located directly to the north and Carsphairn Forest surrounds the west and south of the Development Site boundary, with open cast mining to the north and open moorland to the east. The Southern Upland Way (SUW) is located approximately 12.5km to the east.

3.2.4 The elevation of the Development Site ranges from ~210m to ~569m above ordnance datum (AOD) and covers an area of ~1,466ha (it should be noted that the total operational land take is ~14.23ha which represents ~1% of this figure, see **Table 4.3** in **Chapter 4 – Description of the Proposed Development** for more information, the majority of which is rough grazing land with a number of small watercourses crossing it. Vegetation across the site is grassland with no tree cover and is used as sheep pasture. The terrain is relatively undulating and steep in some places. The landform in the south of the Development Site comprises Enoch Hill, falling eastward to form High Chang Hill. The northern landform comprises Barbeys Hill, Chang Hill, Rigg Hill and Peat Hill. Benty Cowan Hill is located in the eastern part of the Development Site.

3.2.5 The Development Site is located within the 'Southern Upland' Landscape Character Area. The Southern Upland LCA is identified as a landscape character area of medium to low sensitivity in the Ayrshire and Clyde Valley Wind Farm Landscape Capacity Study (2004). The characteristics of the Southern Uplands LCA are large smooth domed or slightly conical shaped hills. The hills often have steep sides and glens, many of which have been enlarged by glacial erosion. The landscape is large with a remote quality. The landscape type of the Southern Uplands with Forest is similar to

that of the Southern Uplands, however the characteristic is very different due to the dominant forest cover (Sitka Spruce).

3.2.6 The Muirkirk and North Lowther Uplands Special Protection Area (SPA) and Site of Special Scientific Interest (SSSI) is located approximately 11km to the north of the boundary of the Development Site and they are designated for the breeding season in terms of short eared owls, hen harrier, merlin, peregrine and golden plover, and during the winter season for hen harrier.

3.3 Design Evolution

3.3.1 The applicant and its consultants have undertaken extensive discussions with statutory and non-statutory consultees, the local community (see **Chapter 2**) and the landowners with the accumulated findings all having an influence over the evolution of the design and the scope of the EIA.

3.3.2 A number of queries and issues applicable to the Proposed Development have been raised throughout the community engagement process and these are addressed in more detail within the Pre-application Consultation (PAC) Report which has been submitted with the section 36 application (see **Chapter 2** for an overview of the PAC process). Comments received during this process were in relation to the following potential issues:

- Noise effects;
- Landscape and visual effects;
- Impact on ecology, in particular wildlife and peat;
- Proximity of turbines to residents;
- Traffic and transport effects;
- Health effects;
- Access improvements across the Development Site including walking, cycling and horse riding; and
- Cumulative effects with existing and approved schemes.

Site Design Iterations

3.3.3 The design of the Proposed Development has evolved in response to comments provided through various consultation discussions, desk studies and site work/technical appraisals by the project team. Following a desktop based constraints mapping exercise in 2012, an initial 'feasibility' layout of 23 turbines was considered, with a further constraints mapping exercise taking place in 2013. **Table 3.1** summarises the main design alterations to demonstrate the responsiveness to information and consultation in seeking to reduce potential environmental effects.

Table 3.1 Design Iterations

Design Iteration	Constraints Influencing Layout	Summary of Change
Layout 1	In June 2011 a site boundary was produced which encompassed the area under the Option Agreement between E.ON and the landowners.	N/A
Layout 2	In April 2012, 'Hard constraints' such as existing infrastructure, residential properties, watercourses, roads, public rights of way, etc. were buffered as appropriate (informed by the initial feasibility study) and were taken into account in the design of the initial 23 'feasibility study' turbine layout.	23 turbines were placed within the site boundary as shown on **Figure 3.1**.

Design Iteration	Constraints Influencing Layout	Summary of Change
Layout 3	An initial consultation layout of 40 turbines was produced which took account of hard constraints described above only (i.e. it did not take account of ground conditions, gradients, the terrain or soft environmental constraints). This was presented to the Community Liaison Group (CLG) at a meeting held on 2nd July 2014 to show a theoretical maximum turbine layout. Initial landscape and visual assessment work which was undertaken informed the decision to drop the maximum height of turbines from 150m to 130m.	An additional 17 turbines were added to Layout 2 and all turbines were moved in relation to hard constraints. Maximum turbine height reduced from 150m to 130m. The layout is shown on **Figure 3.1**.
Layout 4	A design workshop was undertaken in July 2014. The hard constraints identified for Layouts 2 and 3 were avoided, with an additional area under a 1km buffer around the B741 avoided to mitigate effects on aviation as agreed with the MoD. While not a hard constraint, a turbine 'avoidance area' at the north of the site was applied in response to feedback obtained as a result of public consultation and Community Liaison Group (CLG) meetings. This constraint was applied to minimise effects on residential properties located to the north of the Development Site. In addition, survey results from the EIA for protected species, noise, vegetation, cultural heritage, peat depth etc. were taken into account and sensitive areas were buffered and avoided as appropriate. The design was optimised from a landscape and visual perspective by examining wireframes from the viewpoints agreed with consultees and turbines were moved to create a balanced and coherent layout. A wake (turbulence) separation distance of five rotor diameters in a north–east to south-west direction and three rotor diameters in a north-west to south-east direction between turbines was applied. A 20 turbine layout resulted.	20 turbines were removed from Layout 3. A 20 turbine design as shown on **Figure 3.1** resulted.
Layout 5	In October 2014 E.ON Civil and Structures engineers visited the Development Site and minor changes to the location of 4 turbines (T10, T15, T4 and T7) were made to drier areas of flatter and potentially more stable topography. In December 2014, one turbine was moved to avoid an area of assessed Groundwater Dependant Terrestrial Ecosystem (GWDTE). A 20 turbine layout was maintained.	Location of five turbines moved slightly. A 20 turbine layout as shown on **Figure 3.1** resulted.
Layout 6	A further design workshop was undertaken in January 2015 where the results of wind monitoring which had been undertaken at the site were taken account of to maximise energy yield and efficiency of turbines, while balancing this with the constraints described for previous layouts. The constraints described above were taken account of, along with the results of additional studies that had taken place on topics such as ecology and assessment of groundwater dependant terrestrial ecosystems. The 5 x 4 wake separation distance used for previous layouts was increased to a 6 x 4 wake separation orientated in a north to south direction as result of wind monitoring which had been undertaken at the Development Site. An 18 turbine layout resulted.	Two turbines were removed from Layout 6. An 18 turbine design as shown on **Figure 3.1** resulted.
Layout 7	A 19 turbine layout was produced in February 2015. This layout resulted from the collaboration of E.ON's wind energy team and Amec Foster Wheeler's Landscape team to produce a revised layout which carefully balanced landscape and visual effects with maximising production of renewable energy. The layout also took into account all the existing physical site constraints as well as considering further insight into the wind regime which had emerged from Layout 7 onwards.	One turbine added to Layout 7 and other turbines moved to increase renewable energy yield and mitigate landscape effects. A 19 turbine layout as shown on **Figure 3.1** resulted.

Design Iteration	Constraints Influencing Layout	Summary of Change
Layout 8	Minor tweaks to Layout 8 resulted in a 19 turbine design freeze layout being produced in March 2015. T7 was relocated slightly to remove line of sight with Great Dun Fell Radar Station. The borrow pit search area near Peat Hill was reduced in size by ~50% to minimise effects on black grouse. Tracks linking T3 to T5 and T17 were realigned to pass between or around areas of eroded peat faces.	Location of one turbine moved slightly. Borrow pit search area near Peat Hill resized, some tracks realigned. A 19 turbine layout as shown on **Figure 3.1** resulted.

3.3.4 Full details of development constraints can be found in the technical chapters.

3.4 References

North, East and South Ayrshire Councils (2007). Ayrshire Joint Structure Plan – Growing a Sustainable Ayrshire. Available at: http://www.ayrshire-jsu.gov.uk/download/Approved%20AJSP%20Nov%202007.pdf (Accessed 11/05/2015).

North, East and South Ayrshire Councils (2009). Addendum to Ayrshire Joint Structure Plan Technical Report TR03/2006: Renewables (2009)

4. Description of the Proposed Development

4.1 Introduction

4.1.1 This chapter provides a description of the Development Site and the Proposed Development, which will include wind turbines, crane pads, access tracks, control building, Scottish Power Energy Networks (SPEN) substation[1], two permanent anemometer masts, borrow pits (within search areas) and a temporary construction compound.

4.1.2 The Proposed Development (shown on **Figure 4.1**) is located in East Ayrshire approximately 5km to the south west of New Cumnock and approximately 7km to the north east of Dalmellington, close to the northern border of Dumfries and Galloway Council. The B741 runs in an east - west direction along the northern part of the Development Site, connecting the aforementioned settlements of Dalmellington and New Cumnock. Carsphairn Forest is located to the west and south of the Development Site boundary, with open cast mining to the north and open moorland to the east.

4.1.3 The elevation of the Development Site is between 210m – 569m above ordnance datum (AOD) and covers an area of approximately 1,466ha, the majority of which is rough grazing land. The topography of the Development Site is characterised by five summits; Peat Hill, Rigg Hill, Enoch Hill, Chang Hill and Benty Cowan Hill. The highest of these is Enoch Hill at 569m above ordnance datum (AOD).

4.2 Development & Design Layout

4.2.1 **Table 4.1** provides a summary of the key features of the Proposed Development, with the design layout as described in the following sections shown in **Figure 4.1**.

Table 4.1 Key Development Features

Component	**Description**
Wind Turbines	Number: up to 19 (see **Table 4.2** for grid references) Model: (See **Section 4.2.8**) Maximum Rated Output per turbine: up to 3.3 MW Turbine Height (to tip): up to 130m (Hub height: up to 80m & Blade Length: up to 53m)*
Turbine Foundations	Number: up to 19 Footprint per Turbine: ~0.05ha based on 25m diameter foundation Foundation Depth: 2-3m dependent on ground conditions.
Turbine Crane Pads	Number: up to 19 Dimensions: 25m by 50m Footprint per Crane Pad: ~ 0.125ha
Permanent Anemometer Masts	Maximum number: 2 (located at National Grid Reference (NGR) E 255533, N 607642 and E 256259, N 606618) Description: up to 80m high permanent wind monitoring mast Crane Pads: 20m x 20m each
Wind Farm Control Building and Compound & SPEN Substation and Compound	Location: Approximately centred on NGR E 255430, N 608980, Dimensions: 180m by 110m Control Building Height: up to 5.5m Maximum Compound Footprint: 1.98ha

[1] This substation will be operated and built by SPEN and planning consent is sought with this application with the understanding that the final footprint position within this compound and the ground floor plans and elevation plans of the SPEN substation will submitted for approval in accordance with the consents planning conditions should approval be granted.

Component	Description
Access Tracks (including turning heads)	Length: ~12.9km / Running Width: up to 6m (wider on bends, see Sections 4.2.13 to 4.2.16 for more details) Footprint: Approximately 8.4ha
Watercourse Crossings	Maximum number: up to 6 culverts
Passing Places (25 no.)	Number: estimated 25 Dimensions: 30m in length, up to 6m wide Footprint: Approximately 0.45ha
Borrow Pits	Total number: up to 3 (See **Table 4.7** for details)
Temporary Construction Compound	Location: centred on NGR E 255405, N 609120. Dimensions:~ 100m by 100m Footprint: ~1.0ha
Cable Trenches	Depth: 1m / Width: 1.2m Cables will be installed in areas along access tracks

*The hub height will be adjusted to account for any blade longer than 50m to ensure that maximum tip height will not exceed 130m.

Turbine Layout

4.2.2 The layout of the Proposed Development, which has taken account of the findings of environmental and engineering studies, including desktop studies, field visits, peat depth surveys, planning designations and wind yield analysis (as noted in **Chapter 3: Site Selection and Design Evolution)**, is shown on **Figure 4.1**. The turbine locations, along with the location of the permanent on-site anemometry masts, are presented in **Table 4.2**.

Table 4.2 Wind Turbine and Permanent Anemometry Mast Locations

Component	Location (NGR)
Turbine 1	E 255563, N 607860
Turbine 2	E 255935, N 608069
Turbine 3	E 255784, N 607516
Turbine 4	E 256194, N 606810
Turbine 5	E 256337, N 607930
Turbine 6	E 256489, N 607097
Turbine 7	E 256621, N 606524
Turbine 8	E 256727, N 608118
Turbine 9	E 256966, N 607483
Turbine 10	E 257168, N 607083
Turbine 11	E 257251, N 607769
Turbine 12	E 257360, N 606678
Turbine 13	E 257559, N 607276
Turbine 14	E 257564, N 608125
Turbine 15	E 257869, N 607570
Turbine 16	E 255175, N 608166
Turbine 17	E 256180, N 607363
Turbine 18	E 258085, N 608016

Component	Location (NGR)
Turbine 19	E 256400, N 606200
Anemometry Mast 1	E 255533, N 607642
Anemometry Mast 2	E 256259, N 606618

Micrositing

4.2.3 Micrositing refers to the precise locating of wind farm infrastructure following more detailed ground investigations that would be carried out post consent. This allows the location of infrastructure to be revised within a specified distance in response to the findings of the more detailed ground investigations that would be carried out as part of the preparations for construction.

4.2.4 Any such repositioning will be limited so as not to involve encroachment into any environmentally or technically constrained areas. In addition, micrositing provides scope to mitigate potential geo-environmental and geotechnical constraints which may only be identified during detailed site investigation works or preparatory ground works. The following factors can potentially be addressed through carefully designed micrositing:

- Minimisation of peat disturbance;
- Avoidance of the most sensitive habitats;
- Minimisation of need for foundation piling; and
- Avoidance of currently undetected archaeological remains.

4.2.5 Where environmental and technical constraints may fall within a micrositing area, further encroachment on such areas can be restricted in any condition attached to the grant of consent (e.g. micrositing may be restricted in a particular direction if this encroaches upon a buffer around a water course for example).

4.2.6 It is proposed that wind turbines and the two permanent anemometry masts will have a micrositing allowance of up to 50m, with crane pads and access tracks connecting to these being microsited accordingly (i.e. up to 50m).

4.2.7 A micro-siting allowance of up to 25m is proposed for access tracks (including associated watercourse crossing), with the exception of any realignment necessary to connect to microsited turbines and crane pads (where the allowance may be up to 50m). These micrositing distances have been taken into account within the technical assessments.

Wind Turbine Parameters

4.2.8 A number of turbine models would be suitable for installation at the Proposed Development. The final choice of turbine would depend upon technical and commercial considerations, and would be decided by the applicant following planning consent.

4.2.9 **Figure 4.2** shows the structure of a typical wind turbine. This is a typical modern horizontal axis, upwind design comprising four main components: a rotor (consisting of a hub and three blades), a nacelle (containing the generator and also often a gearbox) to which the rotor is mounted, a tower, and a foundation. Infra-red aviation lighting of the specification required by the MoD would be installed on each turbine and met masts. This EIA has been undertaken using the following set of maximum parameters, with which the final turbine used must comply:

- Blade Length: Up to 53m;
- Hub Height: Up to 80m[2]; and

[2] The hub height will be adjusted to account for any blade longer than 50m to ensure that maximum tip height will not exceed 130m.

- Tip Height: Up to 130m.

4.2.10 A transformer / switchgear, located within the nacelle or tower of the turbine, or immediately adjacent to it in a small kiosk (typically 5m x 3m x 3m, such that they are generally indistinct from the tower base unless viewed close up or in silhouette against the skyline at greater distances), steps up the voltage to 33kV; power from the turbines at this voltage is fed to the control building via underground electrical cabling. For the purpose of this application it is assumed that external kiosks will be required.

4.2.11 The electricity generated by the Proposed Development will be metered and fed into the electricity transmission system to which it will be connected. The Proposed Development will be connected into the transmission system at 132kV and consent is also sought by the applicant in this application for the construction of a new 132/33kV substation and compound at the Proposed Development, NGR E 255430, N 608980 including the control /switch room, as shown on **Figure 4.8**. Consent is sought for the location and footprint of the substation with the site layout plan, ground floor plans and elevations to be submitted in accordance with planning conditions attached to the consent should approval be granted. It is noted that the maximum height of the substation will be 10m.

4.2.12 The turbine used to inform the EIA is based on a hub height up to 80m and a tip height of up to 130m which represents a likely development scenario. Where specific operational turbine details are required to carry out the assessment (see **Chapter 7 – Noise**), different representative turbines has been used to represent a worst case scenario. An assessment 'envelope' of turbine noise emissions has been derived, incorporating a number of potential wind turbine models suitable for the Proposed Development and using the highest noise level at each wind speed. It is anticipated that for the turbine chosen the turbine blades will rotate at approximately 4 to 18 revolutions per minute, generating power at all wind speeds between about 3m/s and 25m/s. At wind speeds greater than 25m/s (56mph) the turbines will shut down for self-protection.

On-site Access Tracks

4.2.13 A total of approximately 12.9km of new on-site access tracks will be constructed.

4.2.14 Owing to the size of some of the turbine components, all on-site access tracks will be up to 6m wide, with some additional localised bend widening and passing places to a maximum of approximately 12-14m. It is however noted that tracks are more likely to be 4.5m to 5m wide for most of their length. For the purposes of this EIA, a maximum width of 6m has been assumed. Access tracks will be constructed to a depth and quality suitable to bear the load of all envisaged traffic.

4.2.15 The proposed alignment of access tracks was developed initially through desk study and refined following a site visit by Civil Engineers seeking to:

- Minimise the overall track length; and
- Avoid identified constraints (ecologically sensitive areas, areas of deep peat, waterbodies etc).

4.2.16 Depending on the ground conditions identified on the Development Site, a range of road construction methods may be used, for example floating roads where peat deeper than 1m has been identified as being present. Based on current knowledge of the Development Site, approximately 1,900m of floating tracks will be required. The construction methodology for the onsite track types are illustrated in **Figure 4.3**.

Infrastructure Layout

Crane Pads

4.2.17 Each proposed wind turbine requires an area of hardstanding to be built adjacent to the turbine foundation. This provides a stable base on which to lay down turbine components ready for assembly and erection, and to site the cranes necessary to lift the tower sections, nacelle and rotor into place. A typical crane hardstanding is shown in **Figure 4.4**.

4.2.18 The crane hardstandings will be left in place following construction to allow for future use of similar plant should major components need replacing during the operation of the Proposed Development. These pads could also be utilised during decommissioning. The total area of hardstanding at each turbine location will be approximately 1,250m^2.

Temporary Construction Compound and Laydown area

4.2.19 One temporary main site compound will be constructed for the Development Site. An area measuring 100m x 100m has been allowed for the compound which will be enclosed by appropriate security fencing. A concrete batching plant will be installed either adjacent to one of the borrow pits or adjacent to the site compound, with its location to be determined following ground investigation. The final location of this batching plant would not alter the EIA findings on significant effects, taking into account the adoption of standard mitigation and best practice detailed in the Construction Environmental Management Plan (CEMP) and other relevant documents. The indicative location of the construction compound is shown on **Figure 4.1**, and a typical compound configuration is shown in **Figure 4.5**. An additional construction compound for the SPEN substation will be located either within this compound or within the compound which houses the substation and control building.

4.2.20 Surface vegetation and soil/peat will be removed from the area of the compound and laid on geogrid over the surrounding undisturbed vegetation until required for reinstatement during or following construction. The construction compound area will then be overlain with compacted stone to approximately 500mm depth depending on ground conditions.

Permanent Anemometry Masts

4.2.21 Meteorological conditions will be monitored by two permanent, free standing anemometry masts, located as shown in **Figure 4.1**. Their height will match turbine hub-height, i.e. up to 80m. The design of this structure would be of a steel lattice type (an example of a steel lattice type design is shown in **Figure 4.6**), which would have an adjacent crane pad of a similar type to the turbines with dimensions 20m x 20m, and which would be left in situ for the operational period.

On-site Electrical Connections

4.2.22 Wind turbines generally produce electricity at 690V which is typically transformed to 33kV via the turbine transformers. As previously stated, the turbine transformer may be located inside the turbine tower, or nacelle, or it may be installed in a small external kiosk located adjacent to the turbine.

4.2.23 Underground cables will link the turbines to the on-site control building. Detailed construction and trenching specifications will depend on the ground conditions encountered at the time, but typically cables will be laid in a trench 1,000mm deep and up to 1,200mm wide. Cables will be laid in coarse sand or other granular material, and the trenches will then be backfilled with excavated soil/peat and sub-soil which has been sieved and graded to remove stones. **Figure 4.7** shows a typical cable trench detail.

4.2.24 To minimise ground disturbance, cables will be routed along the side of the access tracks wherever practicable. Approximately 10km of 33kV underground cable will be required on-site to connect the turbines and the control building.

Control Building and Substation

4.2.25 The turbines will be connected through suitable switchgear to be installed in a control building on-site. The Transmission System Operator (TSO) for the area, SPEN, will construct a 132/33kV substation which the Proposed Development will connect into adjacent to the wind farm control building. The new SPEN substation, and onsite wind farm control building will sit together within a compound with maximum dimensions of up to approximately 180m x 110m and up to two single storey buildings of approximately 30m x 20m which will house switchgear, metering, protection, control equipment, as well as welfare facilities. The final footprint position within this compound and the ground floor plans and elevation plans of the SPEN substation will submitted for approval in accordance with the consents planning conditions should approval be granted. The compound is

likely to be reduced in size from the maximum size of up to approximately 180m x 110m once full design details for the SPEN substation are confirmed by SPEN, and these dimensions will be submitted for approval to discharge an appropriate planning condition.

4.2.26 **Figure 4.8** provides an illustration of the control building and compound. Final details including external finishes and screen planting will be agreed with East Ayrshire Council. The proposed location of the control building and the main site compound are shown in **Figure 4.1**.

Operational Land Take

4.2.27 The total operational land take (i.e. the Proposed Development footprint post-construction) is shown in **Table 4.3**.

Table 4.3 Footprint Area by Component

Component	**Area (~ha)**
Tracks (including turning heads and passing places)	8.85
Turbine Crane Pads	2.38
Control Building, SPEN Substation and Compounds	1.98
Turbine Bases	0.93
Met Mast foundations and crane pads	0.09
TOTAL OPERATIONAL LAND-TAKE	**14.23**
Temporary Construction Compound	**1.0**
Temporary Borrow Pits (assuming 3 in total)	**5.0**

Off-site Electrical Connection

4.2.28 SPEN will establish 1 x 90MVA 132/33kV transformer arrangement with associated switchgear in a substation located on the Development Site within the area shown in **Figure 4.8**. This will be connected by ~5km of cable, which will be underground, to the New Cumnock 132kV substation. It is anticipated that cabling from the Proposed Development to the New Cumnock 132kV substation will predominantly follow the road network. **Figure 4.9** shows the potential grid connection location.

4.3 Proposed Site Access

Site Entrance

4.3.1 The Development Site access will be created off the B741 that runs along its northern boundary. The new access will be located a short distance to the north east of Polmathburn Bridge, on the north western edge of the Development Site boundary and abnormal loads will not cross this bridge. The new access will be used for all phases of the Proposed Development (construction operation and decommissioning). A typical general arrangement for the new junction is shown on **Figure 4.10**.

Abnormal Loads

4.3.2 Due to the abnormal size and loading of wind turbine delivery vehicles, it is necessary to review the public highways that will provide access to the Development Site to ensure they are suitable, and to identify any modifications required to facilitate access for delivery vehicles.

4.3.3 Access studies incorporating swept path analysis (see **Appendix 14.A** for further information) have been carried out to review potential access routes. The proposed route for abnormal loads (shown on **Figure 14.1**) is from the Port of Ayr, and would follow the designated 'wind farm access route' from the Jura Terminal along Waggon Road. From here the access route would follow via the A719, A77, A76 and the B741, entering the Development Site at a new junction off the latter in the north western part of the site. As the turbine delivery vehicles are abnormal indivisible loads, a Special Order is required under The Road Vehicles (Authorisation of Special Types) (General) Order 2003, which will be obtained prior to any deliveries taking place.

4.3.4 A traffic management plan (TMP) would be developed in discussion with East Ayrshire Council (EAC) following award of consent and would set out all traffic management measures including diversions, programming, stacking areas and vehicle movements on and off-site etc. An outline plan which would form the basis of these discussions is presented in **Chapter 14 – Traffic and Transport, Section 14.8.1**.

General Construction Traffic

4.3.5 The general construction traffic which would include flat bed trucks and Heavy Goods Vehicles (HGVs) delivering plant and equipment (e.g. excavators, bull dozers and cranes) as well as vans and cars associated with construction staff movement, will also access the Development Site from the north via new access on the B741 which runs along the northern boundary of the Development Site. Prior to the B741, the access routes for these vehicles will vary depending on the origin of the contractors and materials (depending on location of any quarries used to source stone in the event on-site borrow pits are not sufficient, for example).

4.4 Construction Process

Proposed Programme

4.4.1 The construction period for the Proposed Development will be approximately 12 months in duration, and will comprise the following activities broadly listed in sequence:

- Construction of the Development Site access point;
- Formation of the temporary construction compound including hard standing and temporary site office facilities;
- Construction on-site access tracks and passing places (as required), inter-linking the turbine locations and control building compound;
- Construction and upgrade of culverts under roads to facilitate drainage and maintain existing hydrology;
- Opening and operating site borrow pit(s);
- Operation of on-site concrete batching plant;
- Construction of crane hardstanding areas;
- Construction of turbine and anemometry mast foundations;
- Construction of site control building and associated substation;
- Excavation of trenches and cable laying adjacent to site roads;
- Connection of on-site distribution and signal cables;
- Delivery and erection of wind turbines and permanent anemometry mast;
- Commissioning of site equipment; and
- Development Site restoration.

4.4.2 Where possible, operations will be carried out concurrently (thus minimising the overall length of the construction programme). In addition, the Proposed Development will be phased such that, at different parts of the Development Site, the civil engineering works can continue whilst the proposed turbines are being erected. Development Site restoration will be programmed and carried out to allow restoration of disturbed areas as early as possible and in a progressive manner.

4.4.3 An indicative programme for construction activities is shown in **Figure 4.11**. The starting date for construction activities is largely dependent upon the date that consent might be granted and the grid connection date (which is largely outside the applicant's control); subsequently the programme will be influenced by constraints on the timing and duration of any mitigation measures confirmed in this ES and/or the planning decision.

4.4.4 The final length of the programme will be dependent on seasonal working and weather conditions. Summer months are favoured for construction due to longer periods of daylight allowing longer working days. Summer months are generally also drier which aids the construction progress and reduces the amount of site debris reaching the public highway (mud etc. and a watching brief will be maintained on the cleanliness of the public highways, with cleaning carried out by contracted road sweepers if required). Weather, particularly wind, has a strong influence on the timing of construction activities. Crane lifting activities are generally limited during strong winds (>11 m/s) and erection during these weather conditions may be avoided for safety reasons. The actual limiting conditions will be reviewed as part of the crane lifting plan. During periods of cold weather, concrete pouring for the turbine bases may be prohibited (temperatures <4°C) or subject to specific cold weather working practices.

Hours of Working

4.4.5 For the purposes of this ES, construction activities have been assumed to take place between 07:00 to 19:00 hours on week days (Monday to Friday) and 07:00 to 13:00 hours on Saturdays. Quiet on-site working activities such as electrical commissioning have been assumed to extend outside the core working times noted (where required). Working hours may be reduced at times due to seasonal or weather restrictions. Some works such as delivery of the components of turbines may take place outside the core working hours to reduce disturbance to other users of the road network.

4.4.6 Work outside these hours is not usual, though if required to meet specific demands (e.g. during foundation pours and highly weather dependent activities), permission for short term extensions to these hours would be sought from EAC as required.

Standard Construction Working Practices

4.4.7 Contractors' working areas will be clearly delineated on-site to ensure that no unnecessary disturbance is caused to any potentially sensitive areas.

4.4.8 Particular attention will be given to the storage and use of fuels for the plant on-site. Oil will be stored in accordance with the Water Environment (Oil Storage) (Scotland) Regulations 2006. Drainage within the temporary construction compound, where construction vehicles will park and where any diesel fuel will be stored, will be directed to an oil interceptor to prevent pollution in the event of any spillage occurring. Storage of diesel fuel will be within a bunded area or self-bunded tank in accordance with the Scottish Environment Protection Agency (SEPA) Pollution Prevention Guidelines. Standard construction working practices will be implemented during construction, operation and decommissioning in order to ensure adherence to Construction Industry Research and Information Association (CIRIA) guidance and other current best practice, including the following the SEPA Pollution Prevention Guidelines (PPG):

- PPG 1 General Guide to the Prevention of Pollution;
- PPG 2 Above Ground Oil Storage Tanks;
- PPG 3 Use and Design of Oil Separators in Surface Water Drainage Systems;
- PPG 4 Treatment and Disposal of Sewage Where No Foul Sewer is Available;

- PPG 5 Works and Maintenance in, or Near, Water;
- PPG 6 Working at Construction and Demolition Sites;
- PPG 8 Safe Storage and Disposal of Used Oils; and
- PPG 21 Pollution Incident Response Planning.

4.4.9 Due consideration will also be given to the following guidance documents:

- *Good Practice during Windfarm Construction* produced by Scottish Renewables (SR), Scottish Natural Heritage (SNH), SEPA and Forestry Civil Engineering (FCS 2013);
- *Control of Water Pollution from Linear Construction Projects* (CIRIA C648, 2006), produced by CIRIA;
- *Constructed Tracks in the Scottish Uplands* 2006, published by SNH; and
- *Floating Roads on Peat* 2010, published by Forestry Commission Scotland and SNH.

Health and Safety during Construction

4.4.10 Health and Safety is of vital importance to the applicant and the requirements of the Construction (Design and Management) Regulations 2015 (CDM 2015) will be addressed throughout the development stages. If planning consent is granted, the Principal Contractor will be required to produce a Construction Phase Health and Safety Plan in accordance with CDM 2015 to outline and define the approach to Health and Safety that will be adopted specifically for the Proposed Development. In addition to CDM 2015, the applicant and their Contractors will also adhere to other relevant UK Health and Safety legislation including:

- Health and Safety at Work Act 1974;
- Management of Health and Safety at Work (Amendment) Regulations 2006;
- Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (1995) (RIDDOR); and
- Guidelines for Health and Safety in the Wind Energy Industry Sector, Renewable UK, 2010.

4.4.11 Method statements and risk assessments will also be undertaken for each work package prior to activities taking place.

4.4.12 The applicant will directly appoint suitably experienced Contractors for the detailed design, procurement and construction of the Proposed Development. Selection will be based partly upon a Contractors' record in dealing with HSSE issues and on the provision of evidence that the Contractor has incorporated HSSE considerations into its method statements, staffing and budgetary provisions.

4.4.13 The applicant will also appoint a Project Manager for the duration of these phases to act as an interface between them and the Contractors. The Project Manager will also monitor the construction works and undertake the duties as defined in the CDM Regulations 2015.

4.4.14 Appropriate signage will be provided on the Development Site to indicate any hazards, those areas which should be avoided or where unauthorised entry is prohibited. During the construction phase, public access on-site would be restricted for health and safety reasons.

Environmental Management during Construction

Construction Method Statement (CMS)

4.4.15 The applicant will engage a Contractor to construct the Proposed Development. During the construction process, the applicant will retain the services of any specialist advisers that may be required, for example on archaeology, ecology, and peat restoration, to be called on as required to

advise on specific issues, including micrositing. More detailed information on the role of such specialist advisors during construction is provided in the relevant ES chapters.

4.4.16 The final range of measures to be taken to reduce or mitigate the environmental impact of the construction process will be captured in the Construction Environmental Management Plan CEMP, Pollution Prevention Plan (PPP), Site Waste Management Plan (SWMP) and emergency procedures that will all fall under the wider Construction Method Statement (CMS). The Contractor will employ an Environmental Clerk of Works (ECoW) during the construction phase who will take a key role in the preparation of the CEMP. The CEMP would ensure that the mitigation measures outlined in this ES are fully implemented and environmental specialists will support the ECoW as required.

4.4.17 The CEMP, will as a minimum, implement all of the mitigation measures required during construction as identified as necessary within the ES to mitigate any likely significant adverse effects, and will outline a suite of control measures to manage the potential environmental impacts during this phase (including noise, pollution, surface water runoff and waste). It would draw on the standard construction practices outlined in **Sections 4.4.7 to 4.4.9**.

4.4.18 The CMS and supporting documents will be submitted for approval by EAC following consultation with bodies such as SEPA prior to construction and development. In order to ensure that they are being suitably adhered to by the appointed contractors, an independent and suitably qualified Engineer, who will also liaise with the various environmental advisers employed during the construction phase, will be appointed by the applicant to monitor implementation and provide specialist advice.

Dust and Air Quality

4.4.19 There is the potential for an increase in dust during construction. However, as well established and effective dust control measures are used during the construction of wind farms, it is not expected that air quality will be affected. The main measures for managing dust that will be used where necessary are:

- Adequate dust suppression facilities will be used on-site. This will include the provision of on-site water bowsers with sufficient capacity and range to dampen down all areas that may lead to dust escape;
- Any on-site storage of aggregate or fine materials prone to dust generation will be managed using enclosures and screening if required so that dust escape from the site is avoided. Sheeting can also be provided for the finer materials that are prone to *'wind whipping'*;
- HGVs entering and exiting the Development Site will be fitted with adequate sheeting to totally cover any load carried that has the potential to be *'wind whipped'* from the vehicle;
- Vehicles used on-site will be regularly inspected and maintained, to minimise vehicle emissions and the risk of leaking diesel or hydraulic fluids;
- Good housekeeping or *'clean up'* arrangements will be employed so that the Development Site is kept as clean as possible. There will be regular inspections of the working areas and immediate surrounding areas to ensure that any dust accumulation, litter or spillages are removed/cleaned up as soon as possible; and
- A site liaison person will investigate and take appropriate action where complaints or queries about construction arise.

4.4.20 These measures would be included in the CEMP.

Site Waste Management

4.4.21 Where possible, and subject to geotechnical testing, any topsoil material generated by excavation of foundations is expected to be re-used on site. This would be re-used on the working areas or allocated for restoration purposes in cutover areas of the Development Site. Excavated material will (depending on type) be used to backfill excavations and for general restoration purposes where

appropriate. It is not expected that any material will be unsuitable for re-use in this way, though in the unlikely event that such material arise, they would be disposed off-site in line with relevant waste disposal regulations.

4.4.22 Soil movement would be undertaken with reference to best practice guidelines available in the Construction Code of Practice for the Sustainable Use of Soils on Construction Sites (Defra, 2009). Soil excavation should be undertaken during dry periods with backacters and dump trucks wherever possible. Topsoil and subsoil should not be mixed or stored together.

4.4.23 The stockpiling of materials would be minimised and any essential stockpiles would be located as far away as possible from watercourses.

4.4.24 Steps will be taken to minimise the extraction of peat as per the Peat Management Plan (PMP) described in **Chapter 6 - Renewable Energy Policy, Carbon Balance and Peat Management**. The PMP will ensure that peat excavated during construction is safely and suitably re-used within the extent of the Development Site wherever possible.

4.4.25 Construction waste is expected to be restricted to normal non-hazardous materials such as off-cuts of timber, wire, fibreglass, cleaning cloths, paper and similar materials. These will be sorted and recycled if possible, or disposed of to an appropriately licensed landfill by the relevant contractor.

4.5 Construction Details

Infrastructure Construction

4.5.1 Construction of the Proposed Development will consist of two main elements. Firstly, civil and electrical construction of the infrastructure and secondly, erection and commissioning of turbines. Construction of the control building and the grid connection are lengthy processes which will commence early in the construction programme to allow a live grid connection to coincide with the commissioning of the turbines. It should be noted that many individual construction processes will run partly or fully concurrent whilst others will progress in a sequence with or without some overlap in time.

4.5.2 The location of the Development Site infrastructure are shown in **Figure 4.1**

On-site Access Tracks

4.5.3 Typical track cross sections are shown in **Figure 4.3**. The design of a particular length of Development Site access track will depend on local geological, topographical and drainage conditions. In terms of design, the primary objectives that have informed the access tracks are:

- Requirements to maintain water flows across tracks and minimise disruption to the current hydrology;
- Minimisation of peat spoil by routing tracks through areas of shallow or no peat where possible;
- Mitigate and manage silt run off and surface water;
- Serviceability requirements for construction and wind turbine delivery vehicles; and
- Constructability considerations.

4.5.4 To achieve a track structure that meets the conditions encountered on the Development Site, whilst meeting the primary track design objectives, two different designs have been developed (each with associated construction techniques) as summarised in **Table 4.4**.

Table 4.4 Typical Access Track Construction Techniques

Design	Construction Method	Typical Site Conditions	Peat Depth (m)
1	Floating road	Deep, flat, stable areas of peat (track thickness estimated 600mm to 1,000mm)	≥1 m
2	Excavated road	Flat with simple drainage condition (track thickness estimated 450mm to 600mm)	<1 m

4.5.5 The alignment of the on-site tracks has already been subject to initial review by an experienced Civil Engineer and re-routed to respond to readily identifiable constraints. The final decision on alignment and on the appropriate type of access track design to adopt for a particular length of track will be made in advance of construction and may involve input from the ECoW as well as site engineers (and any other environmental specialists as required).

4.5.6 A peat depth survey, utilising a Russian sampler which extracts peat samples, has been carried out across all the proposed infrastructure areas (**Appendix 6.B**). The survey identified several areas of deep peat, so some sections of track have the potential to require floating roads. In a floating road, the weight of the road is supported by the peat beneath, thereby avoiding the need for construction foundations to extend through to the underlying solid bedrock. Based on current knowledge of the Development Site, approximately 1,900m of floating tracks will be required, and they will be constructed in line with the good practice guidance produced by the Forestry Commission Scotland (FCS (2013)) and SNH (2010), and Scottish Renewables (SR), SEPA and will include the use of geogrids.

4.5.7 It is anticipated that approximately 12.9km of on-site access track will be required for the Proposed Development. All access tracks will be unpaved and constructed from material sourced from the on-site borrow pit(s) where possible.

4.5.8 As previously noted, the running width of all on-site access tracks will be a maximum of up to 6m wide, with some additional localised bend widening and passing places to a maximum of approximately 12-14m (For the purposes of this EIA, a maximum running width of 6m has been assumed).

4.5.9 In general terms, the construction method will see the topsoil being removed (and laid on the surrounding undisturbed vegetation until required for reinstatement) to expose a suitable sub-soil horizon on which a track can be constructed. A geo-grid will then be placed to minimise the need for imported stone and to reduce the impact on the sub-soils. The track will then be built up on the geo-grid by laying and compacting crushed rock to an estimated depth of 450-600mm, dependent on ground conditions and load capacity. Post-construction the stripped topsoil will be re-laid along the edges of the access track allowing the edges of the access track to re-vegetate whilst maintaining a suitable width throughout the operational period of generally up to 6m.

4.5.10 The detailed drainage design would be developed following consent being granted, but for the purpose of this EIA, the basic principles are that the drainage system would be developed:

- Based on Sustainable Drainage Systems (SuDS) principles; and
- In accordance with the Water Environment (Controlled Activities) Regulations 2011, amended 2013, ("CAR" regulations).

Watercourse Crossings

4.5.11 Watercourse crossings have been avoided in the Development Site layout as far as possible. However, six watercourse crossings with culverts are proposed in order to provide access to certain wind turbines. The water crossing locations are detailed in **Table 4.5**.

Table 4.5 Watercourse Crossing Locations

Watercourse	Grid Reference
WC01	E 255308, N 608124
WC02	E 256067, N 607256
WC03	E 256194, N 607807
WC04	E 256277, N 607837
WC05	E 256442, N 607900
WC06	E 255787, N 608631

4.5.12 At this stage, it is proposed that a simple culvert type construction will be employed, using a cross sectional area that will not impede flow of water. Design of culverts shall be to at least CIRIA Culvert Design and Operation Guide (RP901) standard. A typical culvert detail is shown in **Figure 4.12**. All crossings would be designed to accommodate 1 in 200 year peak flows (with an allowance for climate change) to reduce the risk of flooding, and would be developed in accordance with Engineering in the Water Environment Good Practice Guide - River Crossings: Second Edition (SEPA, 2010) and River Crossings and Migratory Fish: Design Guidance (Scottish Executive 2000). Watercourse crossings will be subject to detailed design following the granting of consent.

4.5.13 The need for drainage will be established on-site during pre-construction surveys. The access tracks will have a suitable cross-fall to allow rainwater to be shed and, where gradients are present, lateral drains will intercept any flow along the road. Where ground conditions are of a permeable nature, swales will be utilised for drainage to allow natural filtering of surface water into the ground. Where areas are less free draining, land drains or drainage ditches will be installed where the topography and ground conditions dictate.

4.5.14 To prevent silt entering water courses, an ongoing scheme of silt mitigation will be carried out, which will include use of: silt traps; silt fences; silt mats etc, all installed to suit the local conditions. The silt mitigation measures will be monitored throughout the construction period by the Contractor and ECoW.

Service Crossings

4.5.15 British Telecom pole mounted telephone cables run alongside the B741. While maps supplied by BT show this cable running along the south side of the B741, site visits have shown that it is actually located to the north of this road and it is therefore not anticipated that it would interfere with site access. In the unlikely event that any work is needed to this line, it will be carried out with full agreement of the infrastructure owner.

Temporary Works: Construction Compound and Lay Down Area

4.5.16 It is proposed that one temporary construction compound with a maximum area of 10,000m^2 will be constructed. A typical compound arrangement is found in **Figure 4.5**. An additional compound for the SPEN substation will be located either in this compound, or in the compound which houses the substation and control building.

4.5.17 Surface vegetation and topsoil will be removed from the area of the construction compound and laid on the surrounding undisturbed vegetation until required for reinstatement, post-construction. Geogrid will be laid on the exposed ground and stone added to an approximate depth of 500mm and compacted to a suitable engineering specification.

4.5.18 The compound will be located inside an area contained by 2.5m security fencing, if required by the Contractor. During periods of darkness, directional security lighting would be used. This lighting

would conform to the institute of lighting professionals guidance for Zone E1 (*Guidance Notes for the Reduction of Obtrusive Light GN01:2011)* and would use a shielded downwards pointing installation.

4.5.19 The temporary compound will include: an area for portacabins (to be used as site offices and for the storage of various materials and small components); car parking; and welfare facilities including toilets, a kitchen and a mess room; storage and laydown areas for equipment, plant and construction vehicles; areas for storage of oils and fuel; and facilities for aggregate recycling and concrete batching (may be located adjacent to borrow pit(s)). Foul drainage will either be collected in a holding tank for regular collection and disposal off-site or by using an on-site septic tank. Areas of the compound which represent an increased pollution risk, e.g. oil or fuel storage and vehicle refuelling would be bunded, and drained into an isolated holding tank for treatment and disposal. The bund would ensure a protected volume of 110% of the stored capacity is provided. Drainage would be directed to an oil interceptor to prevent pollution if any spillage occurred.

4.5.20 Water extraction for welfare facilities will be provided via mains water supply where available. Where a mains supply is not available, water will be provided by a bowser or smaller containers. Compliant drinking water arrangements will be put in place.

4.5.21 The construction compound will be reinstated at the end of the Proposed Development construction period. The aggregate forming the compound surface will be removed from the Development Site and the stored topsoil laid onto the exposed natural formation.

4.5.22 The precise configuration, layout and size of the temporary compound would be finalised post consent and after appointment of a construction contractor.

4.5.23 The construction compound would also have areas set aside for the batching plant, along with general materials storage, this could be located next to the borrow pit(s).

General Plant and Equipment

4.5.24 A range of plant and equipment is expected to be delivered to the Development Site near the onset of the works and will be removed as soon as practical at the end of the activity for which the equipment relates.

Turbine Foundations

4.5.25 The final foundation design will be informed by the choice of turbine and detailed geotechnical investigation prior to construction. Foundation design will be undertaken by geotechnical engineers and structural designers, once ground conditions are established and the final turbine model selected.

4.5.26 Where ground conditions permit, turbine foundations will be constructed from reinforced concrete using a 'submerged gravity base' approach. If, following intrusive geotechnical investigation works, ground conditions are proven to be unsuitable for this approach, other forms of foundation will be used, such as piled turbine foundations (though this is not anticipated as being necessary at this stage as set out at **Section 4.5.32** below).

4.5.27 Typical gravity foundations are presented in **Figure 4.13**. Construction of gravity base foundations will involve the excavation of soil/peat and subsoil to expose the underlying load bearing strata or bedrock. Any topsoil and other vegetation removed will be laid on the surrounding undisturbed vegetation until required for reinstatement once the turbine is installed.

4.5.28 The load bearing strata or bedrock will be levelled off and blinded[3] prior to the in-situ casting of the steel-reinforced concrete slab that will be approximately 25m in diameter. The depth of the excavation will be approximately 3-4m, depending on the depth of the load bearing strata or bedrock, and the sides will be battered back to ensure that they remain stable during construction. Each

[3] A process whereby a 50mm layer of low grade concrete is placed directly onto the bedrock to provide a level and firm working base to support the foundation reinforcing cage

foundation is made up from approximately 750m^3 of concrete and approximately 100 tonnes of reinforcing steel.

4.5.29 On top of the slab, a concrete up-stand will then be cast, to which the turbine tower will later be bolted. The excavated area will be backfilled with compacted layers of graded material from the original excavation, and capped with topsoil. The exact details of each foundation will vary across the Development Site in response to the actual ground conditions encountered. A detailed ground investigation will be undertaken prior to construction to establish the requirement at each foundation.

4.5.30 Turbine excavations may be open for four to eight weeks during the construction programme. During this time, excavations will be kept free from water (rainwater and run-off). If local topography permits, the excavations will be free draining. If not, excavations may be mechanically pumped, with all dewatering works carried out in accordance with SEPA's Pollution Prevention Guidelines including discharges through either settling ponds, swales or mechanical silt traps.

4.5.31 Alternative methods of turbine foundation construction will be considered based upon the results of a detailed geotechnical site investigation.

4.5.32 Due to the depths of peat encountered on-site and the desk based assessment of the Development Site geology, it is considered that gravity base foundations will be required. Therefore the use of piled foundations has not been considered further in the EIA.

Crane Pads

4.5.33 Each wind turbine requires an area of hardstanding to be built adjacent to the turbine foundation. The total area of hardstanding at each turbine location, including the turbine foundations and the crane pad will be approximately 1,250m^2.

4.5.34 Surface vegetation and soil/peat will be removed from the area of the crane pad and laid on the surrounding undisturbed vegetation until required for reinstatement. The area will then be covered with geo-grid overlain with compacted stone to approximately 500mm depth, dependent on ground conditions and load capacity.

4.5.35 As noted, crane hardstandings will be left in place following construction in order to allow for the use of similar plant should major components need replacing during the operation of the Proposed Development. These could also be utilised during decommissioning at the end of the Proposed Development's life.

Permanent Anemometry Mast Foundation and Crane Pad

4.5.36 The two permanent anemometry masts will have reinforced concrete foundations of ~5m x 5m to ensure that each would withstand severe weather conditions, and each will have an adjacent crane pad of a similar type to the turbines with dimensions 20m x 20m.

Control Building and Substation

4.5.37 The turbines will be connected through suitable switchgear to be installed in the proposed control building on-site (approximately centred on E 255430, N 608980). The control building compound will comprise a hardstanding with maximum dimensions of approximately 180m x 110m and a single storey building approximately 30m x 20m which will house switchgear, metering, protection and control equipment as well as welfare facilities. The control building will comprise a single storey building which will house switchgear and metering, DC battery power supply unit, Low Voltage (LV) auxiliary supply and distribution consumer unit, protection and control equipment and also welfare facilities. Concrete foundations will be required to take the weight of the components. Attached to the control building will be a secure steel palisade fenced compound, consisting of a hardstanding for the 33kv to 132kV SPEN substation and associated compliance plant. There will also be allocated areas used for storage and maintenance purposes. Consent is sought for the location and footprint of the SPEN substation with the site layout plan, ground floor plans and elevations to be submitted in accordance with planning conditions attached to the consent should approval be granted. A construction compound for the SPEN substation will be accommodated either within the temporary

construction compound or within the compound which accommodates the substation and control building.

4.5.38 Foul drainage will be collected in a septic tank with soakaway. Water extraction for welfare facilities will be provided via mains water supply where available, and if not available, water will be provided by a water harvesting and UV filter system. If this is not suitable for the Development Site then other compliant drinking water arrangements will be put in place.

4.5.39 **Figure 4.8** provides an illustration of the indicative control building and compound. The external finishes/materials would be chosen to blend in with the local vernacular of the area. Final details including external finishes would be agreed with EAC as a condition following consent being granted.

4.5.40 Surface vegetation and soil/peat will be removed from the area of the compound and laid on the surrounding undisturbed vegetation until required for reinstatement, post-construction. The area will then be overlain with compacted stone to approximately 500mm depth depending on ground conditions.

Power Cabling

4.5.41 Underground cables will link the turbines to the on-site control building and substation. Detailed construction and trenching specifications will depend on the ground conditions encountered at the time, but typically cables will be laid in a trench 1,000mm deep and up to 1,200mm wide. To minimise ground disturbance, cables will be routed alongside the access tracks wherever practicable and, if not, the total footprint of construction activity will be stated within the CMS. Approximately 10km of cable trenches will be required to connect the turbines to the on-site control building, with installation methods potentially including burial in ducts across the tracks, burial in trenches and mole-ploughing. **Figure 4.7** shows a typical cable trench detail.

4.5.42 Any excavations will be cordoned off and marked clearly. Cable hauling operations will be coordinated with traffic movements, especially when hauling is being carried out from the roadway. Cable off-cuts and waste from terminations will be systematically collected, stored and recycled or disposed of properly.

4.5.43 The trenches would be dug during periods of relatively dry weather. The electric cables would be placed within the trenches and soils quickly replaced to minimise the ingress of water into the trenches. Regularly spaced clay bunds may be required in the trench backfill to prevent the introduction of preferential flow paths within the cable trenches.

Peat Management during Construction

4.5.44 The Development Site is situated in an area where peat deposits are found. The wind farm layout, design and construction methodology has been refined to minimise peat excavation from tracks and turbine infrastructure, but it has not been possible to avoid it entirely.

4.5.45 Peat is likely to be excavated during the construction of tracks, foundations, hardstandings, control building, SPEN Substation and temporary compounds. The majority of peat spoil will come from foundations, hardstandings and track construction and, to a lesser extent, temporary compounds.

4.5.46 A draft Peat Management Plan (PMP) has been prepared and it will be finalised prior to construction and following completion of detailed ground investigations and micro-siting. The PMP will be further refined and detailed methods and specifications agreed with SEPA and SNH. This will address methods in respect of peat excavation, haulage, storage, re-use and degraded habitat restoration. The PMP will ensure that peat excavated during construction is safely and suitably re-used within the extent of the Development Site wherever possible.

4.5.47 Details of the draft PMP and peat slide risk assessment are provided in **Chapter 6**.

Track Drainage

4.5.48 The need for drainage on the access track network will be considered for all parts of the track network separately, since slope and wetness vary considerably across the Development Site. In flat areas, drainage of floating tracks is not required as it can be assumed that rainfall on the road will infiltrate to the ground beneath the tracks or along the verges. Track-side drainage will be avoided where possible, in order to prevent any local reductions in the water table or influences on the tracks structure and compression (the latter can occur where a lower water table reduces the ability of the peat to bear weight, increasing compression).

4.5.49 Where tracks are to be placed on slopes, lateral drainage will be installed on the upslope side of the track. The length of drains will be minimised, to prevent either pooling on the upslope side or, at the other extreme, creating long flow paths along which rapid runoff could occur. Regular cross-drains will be required to allow flow to pass across the track (as recommended in SEPA's Position Statement WAT-PS-06-02 Culverting of Watercourses [December 2006]), with a preference for subsequent re-infiltration on the downslope side, rather than direct discharge to the drainage network.

Drainage Ditches along Excavated Tracks

4.5.50 Excavated tracks can impede the natural drainage across them and consequently drainage ditches are required. It is anticipated that at times, the water in the ditches will contain high concentrations of sediment from excavations, track construction and possible other accidental pollutants from construction activities. Therefore no water from a drainage ditch will be discharged directly to a watercourse. Instead it will pass through silt fences, silt traps or other best practice pollution control features. Drains will not be discharged directly into natural channels, ephemeral streams or old ditches.

4.5.51 If required, any discharge, once sediment has been removed as described above, would occur under the appropriate SEPA consent.

4.5.52 The ditch design will be considered in line with the recommendations of the FCS and SNH guidance (2013), including the use of flat-bottomed ditches to reduce the depth of disturbance.

4.5.53 In instances of drainage close to surface watercourses, discharge from the drainage may be to surface water rather than re-infiltration. In these situations, best practice control measures including sediment settlement will be undertaken before the water is discharged into surface water systems. The discharges will be small and collect from only a limited area, rather than draining a large area to the same location.

4.5.54 Although drainage will be provided in areas of disturbance as required, areas of hardstanding will be minimised so that this need is reduced. This includes careful design of construction compounds, and minimising the size of crane pads at each turbine location.

Cross Drainage

4.5.55 Where tracks are to be placed on slopes, lateral drainage will be required on the upslope side of the road. The length of drains should be minimised, to prevent either pooling on the upslope side or, at the other extreme, creating long flow paths along which rapid runoff could occur. The spacing of cross drains will depend on the area draining to the cross drain, gradient, choice of material for the drain, and design objective. Where cross drains are required, depending on-site conditions, the aim will be for subsequent re-infiltration on the downslope side rather than direct discharge to the drainage network.

4.5.56 Cross-drainage may be achieved using culverts or pipes beneath the track, again in line with the FCS and SNH (2013) guidance. Drainage will be installed before or during track construction, rather than afterwards, to ensure that the track design is not compromised. The cross drainage will flow out in to shallow drainage, which will allow diffuse re-infiltration to the peat on the downslope side. The cross drains will flow out at ground level and will not be hanging culverts: the avoidance of steep gradients for the tracks will also reduce the risk of erosion occurring at cross-drain outflows.

Check Dams

4.5.57 Check dams (small dams built across channels or ditches) may be required at regular intervals in the drainage ditches alongside an excavated track. They are required for two principal reasons. Firstly they act as a silt/pollution trap slowing the flow of water so allowing sediment to settle out. Secondly, they help to direct water into the cross drains and so allow natural drainage paths to be maintained as much as possible. The spacing of the check dams will depend on the following factors:

- The gradient of the track;
- The spacing of cross-drains; and
- The depth of excavation.

4.5.58 Regular maintenance and clearing of the check dams is imperative to ensure their effectiveness is maintained.

Interface between different Types of Road Drainage

4.5.59 Where the track construction method changes, the drainage methods will also change. If this results in an end point for a drainage ditch, the ditch will be piped across the road and allowed to discharge to land on the down side of the slope (taking into account the precautions against pollution and erosion discussed in **Section 4.5.55 to 4.5.56**).

Materials Import

Rock Requirements

4.5.60 Construction of access tracks, hardstandings, foundations, and compounds within the Proposed Development will require approximately 98,300m^3 of rock. **Table 4.6** below provides a breakdown of the required rock volumes for each construction element. It is anticipated that all of the rock required will be sourced from the on-site borrow pit(s).

Table 4.6 Summary of Rock Volumes Required during Construction

Infrastructure	**Total Rock Volume (m^3)**
Hardstandings and foundations	27,950
Access tracks	55,440
Temporary compounds	5,000
Control building compound	9,900
Total Rock Volume	**98,290**

On-site Rock Source Areas & Borrow Pits

4.5.61 Three potential borrow pit search areas have been identified based on geological information from a high level desk study, along with knowledge of the site gained from surveys and walkovers. These search areas were identified by desk study and professional judgement, with the final location of each borrow pit within each search area; number and estimate of material to be won being determined once full ground investigation works and testing have been completed. The search areas shown in **Figure 4.1** represent suitable areas on-site in which borrow pits could be excavated.

4.5.62 The estimated volumes of stone available from the borrow pit search areas are indicated in **Table 4.7**. This volume represents 100% of the likely required volume of stone for construction, though it is recognised that detailed investigations may mean a relatively higher or lower proportion is secured from the potential borrow pit search area.

Table 4.7 Estimated Volumes of Rock Available from the Borrow Pit

Search Area	Borrow Pit Search Area (m^2)	Estimated Area Excavated (m^2)	Total Estimated Rock Volume (m^3)*
A	136,000	30,000	90,000
B	73,000	10,000	30,000
C	50,400	10,000	30,000
Total Rock Volume			**150,000**

*assuming an average borrow pit depth of 4m, (1m-8m) and 75% recovery rate

4.5.63 It is recognised that the borrow pits have the potential to give rise to a range of environmental effects which would need to be managed. As noted above the extraction requirement, and thus the potential for precise environmental effects, cannot be confirmed until detailed intrusive investigations are undertaken. Once these are completed a detailed plan for each borrow pit will be developed and agreed with key consultees, i.e. EAC, SEPA and SNH. The plan would address establishment, extraction and restoration phases with the management protocols for the borrow pits included in the CMS, which is envisaged to be subject to an appropriate planning condition. Any quarrying activities will also follow the Approved Code of Practice, Health and Safety at Quarries Regulations 1999. Nonetheless the likely effects and proposed mitigation that would be anticipated to address effects is likely to include:

- Traffic – The majority of traffic moving stone will use on-site access tracks. Any requirement to access highways will be addressed through a Traffic Management Plan (TMP);
- Blasting – Effects from blasting will be controlled through use of relevant protocols, blast mats and through appropriate communication and publicity about blasting occurrence. Blasts at each borrow pit can be expected to be infrequent, and at some distance from residential receptors and are therefore not anticipated to be of any substantive concern, nor likely to give rise to significant effects;
- Noise / vibration – Potential effects arise from blasting itself as well as the use of excavation and stone crushing equipment. Use of appropriately silenced equipment, publicity over blasting, adherence to operational hours (10.00 to 16.00 on Monday to Friday and 10.00 to 12.00 on Saturdays for borrow pits as per the anticipated planning conditions) and the distance to residential receptors provide the main mitigation for such effects which are anticipated to be well within limits of acceptability established by guidance;
- Dust – Residential receptors are at a considerable distance from potential borrow pit areas (closest at ~500m) and thus no dust effects on them are expected. Some potential for dust to be deposited on adjacent vegetation exists, though with damping down of surfaces or use of mist sprays as appropriate, this should avoid any significant effects (and this would be assessed by the appointed ECoW);
- Visual intrusion – Construction effects will be discernible through the presence of construction machinery. Long term, an appropriate restoration plan for the borrow pit(s) will be developed in agreement with consultees (SEPA, SNH, EAC) which is expected to include some re-grading of the final profile and measures to encourage re-vegetation and potentially peat habitat restoration;
- Water - The potential for sediment laden water to be released will be controlled through appropriate design and treatment facilities at the borrow pit(s). Design will be specific to each location and where possible will encourage natural infiltration;
- Water - The potential for ingress of water to excavations will be controlled by gravity drainage to settlement lagoons, and encouraging natural infiltration. Where dewatering is required, giving rise to additional potential effects of excavations on the surrounding groundwater levels, the re-use of filtrated water from the settlement ponds may be used to provide a compensatory water

source for any groundwater-dependent features by discharging to a vegetated surface just upgradient of their location; and

- Wastes – Any waste arisings will be handled as per other construction wastes.

Concrete Batching Plants

4.5.64 A concrete batching plant will be required as there are no nearby readymix concrete suppliers. The batching plant will require the import of sand and cement, as well as a supply of water in order to produce concrete. For the vehicle movements we have assumed a worst case that all aggregates will need to be imported. A water extraction license under CAR will be required, assuming up to 50m^3 per day.

4.5.65 The batching plant would contain conveyor belts, hoppers and a loading area where the concrete mixers will be filled up from above. Concrete mixers would travel between the batching plant and the wind turbine foundations and would thus stay within the confines of the Development Site during the construction phase. Areas of the batching plant will be enclosed within a bund and have an impervious base that would drain to a silt lagoon. The raw material storage area within the batching plant would comprise sand and processed rock bays and cement silos.

4.5.66 The majority of the concrete is required for turbine foundations with additional material for control building, transformers, and permanent anemometry mast foundations. **Table 4.8** provides an estimate for each.

Table 4.8 Estimated Volume of Concrete

Infrastructure	**Total Volume of Concrete (m^3)**
Wind turbine foundation x 19	Up to 14,250
Control building foundation	360
Sub Station HV Plinths	375
Anemometry mast foundations	25
Turbine kiosk foundations	171
Total Concrete Volume	Up to **15,181**

Post-Construction Development Site Restoration and Commissioning

4.5.67 If required for major works, the crane hardstanding can be re-used in its entirety by removing the dressed vegetation. Excavated material which does not have a viable and suitable identified use will be classified as waste material, and would be managed and removed from the Development Site and disposed of in accordance with the relevant legislation (including the Environmental Protection Act 1990, Landfill (Scotland) Regulations 2003 and the Waste Management Licensing (Scotland) Regulations 2011).

4.5.68 The temporary construction compound and associated facilities will be removed and fully re-instated with vegetation/peat displaced from elsewhere on the Development Site and landscaped to match the local topography.

4.5.69 There will be a period of commissioning and testing prior to the start of the full operational phase of the Proposed Development.

4.6 Operational Details

Land Management

4.6.1 It is anticipated that long term land management practices will continue unaffected by the Proposed Development with normal agricultural practices continuing unimpeded after completion of construction.

4.6.2 On-site access tracks have been sited alongside field boundaries where possible to minimise effects on continued management.

Meteorological Effects and Turbine Control

4.6.3 A Supervisory Control and Data Acquisition (SCADA) system will be implemented which would obtain information from each of the turbines on their performance, and would allow them to be controlled remotely. This would allow any faults with the equipment at the Proposed Development to be highlighted.

4.6.4 Although wind turbines are designed to stop generating at wind speeds over 25m/s, they are built to withstand very high wind speeds, and are normally certified against structural failure for wind speeds up to 60m/s (in excess of 120mph).

4.6.5 Turbines are fitted with a lightning protection system as part of their design, and snow does not generally pose problems other than for gaining access to the Development Site. Occasionally very heavy snow and ice may affect anemometers or the aerodynamics of the turbine blades resulting in temporary automatic shutdown. After shutdown due to icing, the turbine can be restarted remotely further to a manual, visual or technical inspection to ensure that the turbine blades are free of ice, thereby eliminating the potential for *'ice-throw'*. The wind turbines will also be fitted with vibration sensors which would detect any imbalance which might be caused by icing, which would allow the turbines to be shut down automatically.

4.6.6 While ice-throw is unlikely for the reasons described, notices would be installed at access points to the Proposed Development to warn visitors and members of the public of the possible risk of ice throw in colder weather.

Turbine Maintenance

4.6.7 Each manufacturer has specific maintenance requirements but typically routine maintenance or servicing of turbines is carried out twice a year, with a main service at twelve monthly intervals and a minor service at 6 months. In the first year, there is also an initial three month service after commissioning. The turbine being serviced is switched off for the duration of its service.

4.6.8 Teams of two people with a 4x4 vehicle would carry out the servicing. It takes two people (on average) one day to service each turbine.

4.6.9 At regular periods through the project life, oils and components will require changing, which will increase the service time. Gearbox oil changes are required approximately every 18 months. Changing the oil and worn components will extend each turbine service by one day.

4.6.10 Blade inspections will occur as required (somewhere between two and five years) using a Cherry Picker or similar, but may also be performed with a 50T crane and a man-basket. It could take up to three weeks to inspect all of the turbines at the Proposed Development. Repairs to blades would utilise the same equipment.

4.6.11 Blade inspection and repair work is especially weather-dependent. Light winds and warm, dry conditions are required for blade repairs. Hence summer months (June, July and August) are typically the most appropriate period for this work.

Environmental Management during Operation

4.6.12 E.ON's wind energy developments are operated in accordance with documented ISO 14001 environmental management procedures which ensure compliance with applicable environmental legislation and best practice.

4.6.13 Although activity at the Development Site will be limited during the operational period, the measures outlined in site and task specific risk assessments and method statements including control measures in relation to surface water runoff, dust, pollution control and waste will remain in place to cover any maintenance works which may be required.

4.6.14 The Proposed Development will be managed by a team of wind energy engineers whose duties will include compliance with statutory HSE requirements. Where potential environmental or health and safety hazards are identified, a site specific risk assessment is completed, and control measures implemented to ensure that the risks are minimised as far as possible.

4.6.15 The operational phase of the Proposed Development would be managed under the requirement of E.ON's internal Environmental Management Systems (EMS).

Site Waste Management

4.6.16 Operational waste will generally be restricted to small volumes of waste associated with machinery repair and maintenance disposed of by the maintenance contractors in line with normal waste disposal practices.

4.7 Decommissioning Details

Wind Farm Decommissioning Requirements

4.7.1 At the end of the Proposed Development's operational lifetime, there are two options available:

- To re-power the Development Site with new turbines, which would require a new application and further environmental assessment; or
- To remove the wind turbines, met masts, kiosks, control building and SPEN substation and re-instate the Development Site.

4.7.2 The latter option of decommissioning at the end of the 25 years operational lifespan forms part of the application for the Proposed Development and has informed this ES. It is generally proposed that the above ground structures (wind turbines, kiosks, met mast and control building/sub-station will be removed (as per any condition relating to this topic upon the granting of permission) and the hardstanding areas re-instated where appropriate. Access tracks may be left in situ for use by the landowner.

4.7.3 Prior to wind turbine removal, due consideration will be given to any potential impacts arising from these operations. Some of the potential issues could include:

- Potential disturbance by the presence of cranes, HGVs and engineers on-site;
- On-site temporary construction compound would need to be located appropriately;
- Time of year and time-scale (to be outside sensitive periods); and
- Access tracks may remain in use for the benefit of the landowner and other stakeholders.

4.7.4 A comprehensive plan for the work will be drawn up in advance of decommissioning to ensure safety of the public and workforce and the use of the best available techniques at that time.

Decommissioning Process

4.7.5 The wind turbines (towers, nacelle, hub, blades and electrical kiosk) will be completely removed using a crane and taken off-site for recycling. The only parts which are currently difficult to recycle are the composite blades. Most items will be broken down so that specialist vehicles are not required unless there is a potential follow on use for the components in one piece.

4.7.6 During decommissioning, the bases will be broken out to below ground level and covered by soil/peat, which will be reinstated and re-vegetated (this is considered to be less environmentally damaging than removing them completely). All cables would be cut off below ground level, de-energised and left in the ground.

4.7.7 A Restoration and Decommissioning Plan (RDP) would be submitted and agreed with the relevant authorities close to the Proposed Development's end-of-life. Any applicable new legislation or guidelines published prior to decommissioning would be considered and taken into account in relation to any design of mitigation prior to decommissioning taking place.

Control Building and Distribution System Decommissioning

4.7.8 The control building and associated equipment will be removed and the components reused or recycled. As with turbine bases, the foundations themselves will be cut down to below ground level and left in situ covered in soil/peat which will be re-vegetated.

4.7.9 The buried distribution cables will be de-energised and will be cut off below ground level at the ends. The assessment will be carried out closer to the time to take into account changes in best practice over the project life, and if it is considered to be viable, cables may be recovered for recycling where appropriate.

Access Track Decommissioning

4.7.10 The access tracks are unlikely to be removed. The current view is that the disturbance associated with the removal and disposal of the material would have much a greater environmental effect than leaving them in place. Upon decommissioning the tracks would therefore likely be left in situ for future use by landowner and other stakeholders.

4.8 References

Control of Water Pollution from Linear Construction Projects (CIRIA C648, 2006), produced by CIRIA.

Culvert Design and Operation Guide (C689) (CIRIA), 2010.

Constructed tracks in the Scottish Uplands, SNH, 2013.

Engineering in the Water Environment Good Practice Guide - River Crossings: Second Edition, SEPA, 2010.

Environmental Protection Act 1990, Landfill (Scotland) Regulations 2003 and the Waste Management Licensing (Scotland) Regulations 2011.

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, Prepared by: Forestry Civil Engineering & Scottish Natural Heritage, August 2010.

Good practice during wind farm construction – A joint publication by Scottish Renewables, Scottish Natural Heritage, Scottish Environment Protection Agency, Forestry Commission Scotland, 2nd edition 2013.

General Guide to the Prevention of Pollution: PPG1, Pollution Prevention Guidelines, Scottish Environment Protection Agency.

General Guide to the Prevention of Pollution: PPG 2, Pollution Prevention Guideline Above Ground Oil Storage Tanks.

Guidance Note GS6 – Avoiding Danger from Overhead Lines, HSE, 2013.

Guidance Notes for the Reduction of Obtrusive Light GN01, Institute of Lighting Professionals, 2011.

Pollution Prevention Guidelines: PPG 3, Use and design of oil separators in surface water drainage systems.

Pollution Prevention Guidelines: PPG 4, Treatment and disposal of sewage where no foul sewer is available.

Pollution Prevention Guidelines: PPG5, Works and Maintenance in or Near Water, Scottish Environment Protection Agency.

Pollution Prevention Guidelines: PPG 6, Working at Construction and Demolition Sites, Scottish Environment Protection Agency.

Pollution Prevention Guidelines: PPG 8 Safe storage and disposal of used oils.

Position Statement WAT-PS-06-02 Culverting of Watercourses, SEPA, 2006

River Crossings and Migratory Fish: Design Guidance, Scottish Executive, 2000.

Water Environment (Controlled Activities) (Scotland) Regulations, 2011.

Water Environment *(*Oil Storage*) (*Scotland*)* Regulations*,* 2006.

5. Planning Policy Context

5.1 Statutory Provisions

5.1.1 This chapter sets out the key planning policies and other material considerations applicable to the Proposed Development which have informed the siting and design process. Specific policies which are contained within policy documents are also referenced within the relevant technical assessments presented in **Chapters 6 - 17** of this ES.

5.1.2 The statutory Development Plan is an important consideration in the decision making process along with national legislation, planning policy and guidance, local supplementary planning guidance, and other material considerations. **Chapter 6 - Renewable Energy Policy, Carbon Balance and Peat Management** outlines the renewable energy generation policy context for the Proposed Development.

5.1.3 It should be noted that this chapter does not assess the Proposed Development's accordance with relevant planning and renewable energy policies. The applicant has submitted a separate Planning Statement, which assesses in detail how the Proposed Development accords with the relevant National, renewable energy, and Development Plan policies, and with other material considerations.

5.1.4 Given that the Proposed Development is a generating station expected to have an electricity generation capacity exceeding 50MW, it stands to be determined under the terms of section 36 of the Electricity Act 1989 (as amended).

5.1.5 When formulating and considering section 36 applications, applicants and Scottish Ministers must satisfy the requirements of paragraphs 3(1), 3(2)) and 3(3) of Schedule 9 of the Electricity Act 1989 (as amended)[1] . Paragraph 3(1) requires them to consider the "*desirability of preserving natural beauty, of conserving flora, fauna and geological or physiographical features of special interest and of protecting sites, buildings and objects of architectural, historic or archaeological interest*". Under paragraph 3(2) the Scottish Ministers are required to assess the extent to which the developer has fulfilled the requirement to "*do what he reasonably can to mitigate any effect which the proposals would have on the natural beauty of the countryside or on any such flora, fauna, features, sites, buildings or objects*". Furthermore, paragraph 3(3) requires both applicants and the Scottish Ministers to "*avoid, so far as possible, causing injuries to fisheries or to the stock of fish in any waters*" through the formulation and determination of applications made in Scotland under section 36 of the Electricity Act 1989 (as amended).

5.1.6 To fully authorise the Proposed Development, the Scottish Ministers are entitled to make a direction when granting section 36 consent that planning permission for the wind farm generating station and ancillary development (comprising the SPEN substation) is deemed to be granted under Section 57(2) of the Town and Country Planning (Scotland) Act 1997 (as amended).

5.1.7 In assessing the legal framework within which the application for the Proposed Development requires to be considered, it is recognised that the statutory Development Plan is a relevant consideration which should be taken into account alongside all other relevant information; however section 25 of the Town & Country Planning (Scotland) Act 1997 is not specifically engaged.

[1] Whilst Schedule 9 of the Electricity Act 1989 (as amended) refers to proposals for energy infrastructure developments from licence holders, case law (*Trump International Golf Club Scotland Ltd v Scottish Ministers [2014] SLT 406* and Opinion of the Court in the Reclaiming Motion *Sustainable Shetland v The Scottish Ministers and Viking Energy Partnership [2014] CSIH 60*) has clarified that applications made under section 36 of the Act (as amended) do not need to be submitted only by licence holders. Consequently the requirements specified in Schedule 9 of the Act also apply to other section 36 applicants.

5.2 National Planning Policy, Guidance and Advice

5.2.1 This section provides an overview of applicable national planning policy, guidance and advice documents.

5.2.2 National planning policy is contained within the National Planning Framework (NPF) 3 and the Scottish Planning Policy (SPP), both of which were published on 23rd June 2014. Subject specific national planning policies of potential relevance to the Proposed Development are contained within the Scottish Historic Environment Policy (2011), as well as within the relevant National Planning Advice and Circulars, as discussed within this Chapter.

National Planning Framework 3

5.2.3 NPF3 (Scottish Government, 2014) provides a statutory framework around which to orientate Scotland's long-term spatial development. The Framework highlights the spatial planning implications of multiple national policy documents and commitments, including the binding decarbonisation targets enshrined within the Climate Change (Scotland) Act 2009.

5.2.4 Overall the NPF3 emphasises the Scottish Government's commitment to increasing sustainable economic growth across all areas of Scotland and therefore orientates the efforts of Scotland's planning system towards this purpose. The introduction to the NPF3 notes the importance of, maintaining economically active and vibrant rural areas whilst "*safeguarding our natural and cultural assets and making innovative and sustainable use of our resources*". The national spatial strategy of the NPF3is structured around four key themes including, namely :

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

5.2.5 These themes are presented as '*planning outcomes'* within the SPP and their relevance to the Proposed Development is considered at 5.2.7 below.

Scottish Planning Policy

5.2.6 The relevant policy in the SPP is a material consideration that carries significant weight. It sets out the Scottish Government's expectations regarding the treatment of specific planning issues within development planning and development management. The SPP includes policies relating to sustainable development and renewable energy including onshore wind development which are directly applicable to the Proposed Development, as detailed below.

5.2.7 The SPP aims to contribute to the achievement of the Scottish Government's overarching purpose of achieving sustainable economic growth. Both the NPF3 and the SPP are underpinned by a common vision, which is articulated within the SPP at paragraph 11:

"We live in a Scotland with a growing, low-carbon economy with progressively narrowing disparities in well-being and opportunity. It is growth that can be achieved whilst reducing emissions and which respects the quality of environment, place and life which makes our country so special. It is growth which increases solidarity – reducing inequalities between our regions. We live in sustainable, well-designed places and homes which meet our needs. We enjoy excellent transport and digital connections, internally and with the rest of the world."

5.2.8 To implement this vision statement the SPP identifies four planning outcomes based on the themes of the NPF3, which are:

- "*Outcome 1: A successful, sustainable place – supporting sustainable economic growth and regeneration, and the creation of well-designed, sustainable places."*

- *"Outcome 2: A low carbon place – reducing our carbon emissions and adapting to climate change*". This outcome relates to the legally binding target of reducing Scotland's greenhouse gas emissions by 80% by 2050 compared with 1990 levels, as set out in the Climate Change (Scotland) Act 2009. The outcome further sets out Scotland's commitment to generating at least 30% of overall energy demand, and the equivalent of at least 100% of gross electricity consumption, from renewables by 2020. The need to facilitate this transition by supporting diversification in the energy sector and the importance of onshore wind are recognised within NPF3.
- *"Outcome 3: A natural, resilient place – helping to protect and enhance our natural and cultural assets, and facilitating their sustainable use.*" As noted in the NPF3, Scotland's principal asset is the land, which must be managed sustainably as both an economic and dynamic resource and an environmental asset. The role of rural areas in the transition towards a low carbon economy is recognised.
- *Outcome 4: A more connected place – supporting better transport and digital connectivity".*

5.2.9 The SPP's Principal Policy on Sustainability (paragraphs 24-35) includes a presumption in favour of development that contributes to sustainable development. This relates to the identification of the need for, and the acceptability of, the development. Thirteen principles (found at paragraph 29 of SPP) which should guide planning policies and decisions have been identified. The principles of relevance to the Proposed Development include:

- *"Giving due weight to net economic benefit…;*
- *responding to economic issues, challenges and opportunities, as outlined in local economic strategies;*
- *Supporting good design and the six qualities of successful places;*
- *Supporting delivery of infrastructure…;*
- *Supporting climate change mitigation and adaptation…;*
- *Having regard to the principles for sustainable land use set out in the Land Use Strategy;*
- *Protecting, enhancing and promoting access to natural heritage, including green infrastructure, landscape and the wider environment...; and*
- *Avoiding over-development, protecting the amenity of new and existing development and considering the implications of development for water, air and soil quality".*

5.2.10 Policies regarding renewable energy development, including wind energy, are set out within the SPP at paragraphs 152-174. It is noted that taken together, the NPF3 and the SPP should "*facilitate the development of generation technologies that will help to reduce greenhouse gas emissions from the energy sector…efficient supply of low carbon and low cost heat and generation of heat and electricity from renewable energy sources are vital to reducing greenhouse gas emissions and can create significant opportunities for communities*" (paragraph 152-153).

5.2.11 The SPP identifies four planning principles (paragraph 154) related to the delivery of electricity and heat infrastructure, three of which are of relevance to the Proposed Development:

- "*Support the transformational change to a low carbon economy...;*
- *Support the development of a diverse range of electricity generation from renewable energy technologies...; and*
- *Guide development to appropriate locations and advise on the issues that will be taken into account when specific proposals are being assessed... ".*

5.2.12 The SPP (paragraph 155) states that "*Development plans should seek to ensure an area's full potential for electricity and heat from renewable sources is achieved, in line with national climate change targets, giving due regard to relevant environmental, community and cumulative impact*

considerations". The SPP (paragraph 157 also states that Development Plans "*should set out the factors to be taken into account in considering proposals for energy developments. These will depend on the scale of the proposal and its relationship to the surrounding area…*".

5.2.13 The SPP makes it clear that proposals for energy infrastructure development "*should always take account of spatial frameworks for wind farms and heat maps where these are relevant*" (paragraph 169). In this regard, the methodology for preparing new wind energy spatial frameworks is set out in Table 1 of the SPP and under paragraph 161 all Development Plans including LDPs are required to include a wind energy spatial framework. The proposed spatial framework within the East Ayrshire Local Development Plan Proposed Plan (2015) is outlined at paragraph 5.4.6.

5.2.14 The SPP identifies the following considerations which are likely to be relevant when determining proposed renewable energy developments (paragraph 169):

- *"Net economic impact, including local and community socio-economic benefits such as employment, associated business and supply chain opportunities;(addressed in **Chapter 15 – Socio Economics, Tourism and Recreation**);*
- The scale of contribution to renewable energy generation targets; (addressed in ***Chapter 6 - Renewable Energy Policy, Carbon Balance and Peat Management**);*
- Effect on greenhouse gas emissions; (addressed in ***Chapter 6 - Renewable Energy Policy, Carbon Balance and Peat Management**);*
- *Cumulative impacts – planning authorities should be clear about likely cumulative impacts arising from all of the considerations below, recognising that in some areas the cumulative impact of existing and consented energy development may limit the capacity for further development; (addressed in **Chapters 6 - 17**);*
- *Impacts on communities and individual dwellings, including visual impact, residential amenity, noise and shadow flicker; (addressed in **Chapter 7 – Noise, Chapter 8 – Shadow Flicker and Chapter 9 – LVIA**);*
- *Landscape and visual impacts, including effects on wild land; (addressed in **Chapter 9 – LVIA**);*
- *Effects on the natural heritage, including birds (addressed in **Chapters 11– Ecology** and **Chapter 12 - Ornithology**);*
- Impacts on carbon rich soils, using the carbon calculator; *(addressed in **Chapter 6 - Renewable Energy Policy, Carbon Balance and Peat Management** and **Chapter 13 – Geology, Hydrology and Hydrogeology**);*
- Public access, including impact on long distance walking and cycling routes and scenic routes identified in the NPF; *(addressed in **Chapter 9 – LVIA, Chapter14 – Traffic and Transport** and **Chapter 15 - Socio Economics, Tourism and Recreation**);*
- *Impacts on the historic environment, including scheduled monuments, listed buildings and their settings; (addressed in **Chapter 10 – Historic Environment**);*
- Impacts on tourism and recreation (addressed in ***Chapter 15 – Socio Economics, Tourism and Recreation**)*;
- *Impacts on aviation and defence interests and seismological recording; (addressed in **Chapter 17 – Aviation**);*
- *Impacts on telecommunications and broadcasting installations, particularly ensuring that transmission links are not compromised; (addressed in **Chapter 16 – Infrastructure and Telecommunications**);*
- *Impacts on road traffic; (addressed in **Chapter 14 – Traffic and Transport**);*
- *Impacts on adjacent trunk roads; (addressed in **Chapter 14 – Traffic and Transport**);*

- *Effects on hydrology, the water environment and flood risk; (addressed in **Chapter 13 – Geology, Hydrology and Hydrogeology**);*
- *The need for conditions relating to the decommissioning of developments, including ancillary infrastructure, and site restoration;*
- *Opportunities for energy storage; and*
- *The need for a robust planning obligation to ensure that operators achieve site restoration".*

5.2.15 The SPP confirms that development management processes rather than spatial frameworks, are the appropriate mechanisms to assess the merits of individual proposals, which should be considered against the full range of environmental, community, and cumulative impacts. The SPP seeks to ensure that wind farms are sited in appropriate locations stating that "*areas identified for wind farms should be suitable for use in perpetuity. Consents may be time-limited but wind farms should nevertheless be sited and designed to ensure impacts are minimised and to protect an acceptable level of amenity for adjacent communities*" (paragraph 170).

5.2.16 Other subject specific policies within the SPP which are of relevance to the Proposed Development are listed in **Table 5.1**.

Table 5.1 Relevant Subject Specific Policies within the SPP

Subject Policy	SPP Reference	Overview
Promoting Rural Development	Paragraphs 74 - 91	The SPP identifies planning principles related to sustainable rural development including *"…encourage rural development that supports prosperous and sustainable communities and businesses whilst protecting and enhancing environmental quality…"*.
Supporting Business and Employment	Paragraphs 92 - 108	This section highlights the need to "*give due weight to net economic benefit of proposed development*" (paragraph 93). The SPP identifies energy as one of several key growth sectors which should be appropriately supported through development plans.
Valuing the Historic Environment	Paragraphs 135 - 151	The SPP states that planning should promote the care and protection of the designated and non-designated historic environment and should take account of all aspects of the historic environment. Detailed policy provisions relating to the protection and enhancement of different types of historical assets are outlined in this ES, **Chapter 10 – Historic Environment**.
Valuing the Natural Environment	Paragraphs 193 - 233	The SPP identifies a number of planning principles related to natural heritage protection and ecological resilience. Principles (paragraph 194) of relevance to the Proposed Development include that planning should: • *"Facilitate positive change while maintaining and enhancing distinctive landscape character;* • *Conserve and enhance protected sites and species...* • *Promote protection and improvement of the water environment...in a sustainable and co-ordinated way;* • *Seek to protect soils from damage...* • *Protect and enhance ancient semi-natural woodland as an important and irreplaceable resource, together with other native or long-established woods, hedgerows and individual trees with high nature conservation or landscape value;* • *Seek benefits for biodiversity from new development where possible..."* Detailed policy provisions relating to the protection and enhancement of different types of natural resources and natural heritage assets are outlined in this ES, **Chapter 9 – LVIA**, **Chapter 11 – Ecology** and **Chapter 12 - Ornithology**.
Maximising the Benefits of Green Infrastructure	Paragraphs 219 - 233	The SPP identifies a number of planning principles related to the protection, enhancement and promotion of green infrastructure including core paths and other important routes.
Promoting Responsible Extraction of Resources	Paragraphs 234-248	The SPP sets out development management requirements for proposed borrow pits. These should only be permitted: • If there are significant environmental or economic benefits compared to obtaining material from local quarries;

Subject Policy	SPP Reference	Overview
		• They are time-limited; tied to a particular project; and • Appropriate reclamation measures are in place. Borrow pits requirements are detailed within **Chapter 4 – Description of Proposed Development** and they are assessed within technical assessment chapters where relevant.
Managing Flood Risk & Drainage	Paragraphs 254-268	A precautionary approach to flood risk from all sources is promoted and where relevant, flood risk assessments and the deployment of SUDs are required. Relevant provisions are outlined in **Chapter 13 - Geology, Hydrology and Hydrogeology**.
Promoting Sustainable Transport and Active Travel	Paragraphs 269-291	Notes the requirement to consider traffic impacts including cumulative. Relevant provisions are outlined in **Chapter 14 - Traffic and Transport**.

Scottish Historic Environment Policy (SHEP)

5.2.17 This document sets out Scottish Ministers' policies for the historic environment and provides policy direction for Historic Scotland. At paragraph 1.14 the document identifies a number of key principles which underpin SHEP, including that "*there should be a presumption in favour of preservation of individual historic assets and also the pattern of the wider historic environment; no historic asset should be lost or radically changed without adequate consideration of its significance and of all the means available to manage and conserve it*".

National Planning Advice and Circulars

5.2.18 National planning policy is supported by Planning Circulars, Planning Advice Notes (PANs), Advice Sheets and Ministerial/Chief Planner Letters to Planning Authorities. Planning Circulars contain guidance on policy implementation through legislative or procedural change, while PANs expand on national policy and incorporate best practice advice.

5.2.19 The following Scottish Government/Scottish Natural Heritage Planning Circulars and Advice documents are considered to be of relevance to the Proposed Development:

- PAN 1/2013: Environmental Impact Assessment (August 2013);
- Spatial Planning for Onshore Wind Turbines – Natural Heritage Considerations (June 2015);
- Onshore Wind – Some Questions Answered (December 2014);
- Online Renewables Planning Advice regarding Onshore Wind Turbines (last updated May 2014);
- Online Planning Advice regarding Flood Risk (published 18th June 2015);
- PAN 2/2011 Planning and Archaeology (July 2011);
- PAN 1/2011 Planning and Noise (March 2011);
- PAN 3/2010 Community Engagement (August 2010);
- PAN 60 Planning for Natural Heritage (2000, revised January 2008);
- PAN 51 Planning, Environmental Protection and Regulation (Revised October 2006);
- PAN 79 Water and Drainage (September 2006);
- PAN 75 Planning for Transport (August 2005);
- PAN 68 Design Statements (August 2003); and
- PAN 61 Planning and Sustainable Urban Drainage Systems (July 2001).

5.2.20 Of particular relevance are the Spatial Planning for Onshore Wind Turbines – Natural Heritage Considerations guidance published by Scottish Natural Heritage in June 2015, the Scottish Government's Onshore Wind – Some Questions Answered website and the Online Renewables Planning Advice regarding Onshore Wind Turbines (last updated 28th May 2014)[2].

Spatial Planning for Onshore Wind Turbines – Natural Heritage Considerations (SNH, June 2015)

5.2.21 Part 3 – Development Management within this guidance document identifies natural heritage considerations relevant to the determination of applications for wind energy developments. While the document does not set out any new policy positions or technical requirements for applicants, it highlights the general importance of natural heritage considerations, cross matches existing policy requirements with available guidance documents and provides helpful clarification.

5.2.22 In relation to the impacts of wind energy development on carbon rich soils, deep peat and priority peatland habitat, the document notes that the carbon rich soils, deep peat and priority peatland habitat map currently being prepared by SNH (publication expected imminently) "*cannot (and should not) be used in isolation to determine the impacts of a specific development proposal on peat. This should be based on a detailed, site specific survey of peatland habitats and peat depths across the site using existing methods…*".

Onshore Wind – Some Questions Answered

5.2.23 This online document provides guidance regarding the implementation of technical aspects of the SPP (2014) related to onshore wind energy planning. In particular, the document:

- clarifies that landscape capacity studies do not form part of spatial frameworks for wind as defined in the SPP. However they can be "*supportive studies*" for development planning and development management purposes;
- explains that deep peat and carbon rich soil mapping currently being prepared by SNH will be able to map these resources for inclusion within wind energy spatial frameworks;
- contains guidance regarding how local and strategic development planning authorities should prepare wind energy spatial frameworks and how community separation distances should be applied within these frameworks. In this regard it is noted that the application of a separation distance on a wind energy spatial framework "*is not a ban on wind farm development in the identified area*" and separation distances should be defined on an individual basis taking account of local topography, landscape and built environment features;
- states that the sites of proposed wind farms should be suitable for use in perpetuity, even where an individual wind farm proposal may have an operational life span specified by condition; and
- clarifies that the term 'wild land' refers specifically to the SNH Map of Wild land areas (2014). Whereas the SPP at paragraph 200 describes "*the general characteristics of wild land*".

Online Renewables Planning Advice regarding Onshore Wind Turbines

5.2.24 This document confirms that the development of onshore wind turbines is expected to continue to grow and that there is an increased focus on development within "*lower-lying more populated areas, where design elements and cumulative impacts need to be managed*". The document provides advice relating to a number of considerations in the determination of applications for wind energy developments, as summarised below:

[2] The Scottish Government have confirmed that parts of this advice document remain relevant despite the fact that the document pre-dates the publication of the SPP (2014). The areas of this advice document which are no longer relevant refer to "spatial framework", "spatial planning" and "areas of search".

- Landscape Assessment - an assessment of the individual and cumulative landscape impacts should be carried out to identify where the wind farm may be seen from;
- Landscape Impact - an assessment of development impacts on the skyline and landscape character should be conducted;
- Impacts on Wildlife and Habitat, Ecosystems and Biodiversity - the potential for a development to both positively and negatively impact on the wildlife, habitats, ecosystems and biodiversity of an area should be assessed and mitigation implemented if appropriate. Risk needs to be quantified which may include carbon release calculations associated with impact on peat, bird collision, displacement and disturbance;
- Buffer zones - Buffer zones should not be established around areas designated for their natural heritage importance and proposals should be considered on their merits;
- Impact on Communities - consideration should be given to the impact on communities including shadow flicker, noise, electro-magnetic interference, and ice throw;
- Separation Distances - individual developments should take into account specific local circumstances and geography. It is noted that the recommended separation distance of up to 2km between wind farms and the edge of settlements "*is a guide not a rule and decisions on individual developments should take into account specific local circumstances and geography*". The document further confirms that "*there is no guide distance between established and proposed groups of wind turbines*";
- Aviation Matters - consideration should be given to potential impacts on aviation safeguarding, including adverse effects on radar and communication systems;
- Military Aviation and Other Defence Matters - consideration should be given to the impact on military aviation, particularly within low flying zones, and other activities within defence establishments;
- Historic Environment Impacts - consideration should be given to the potential direct and/or indirect impacts of development proposals on built and natural heritage;
- Road Traffic Impacts – the potential impact on road traffic should be assessed and turbines should be set back from roads and railways in order to ensure safety and minimise driver distraction;
- Cumulative Impacts - an assessment of the cumulative impact should be carried out considering capacity, scale and pattern of the turbines. Ancillary developments including tracks and power lines are of relevance. The significance of the landscape and the views, proximity and inter-visibility and the sensitivity of visual receptors should also be considered; and
- Good practice techniques should be followed to minimise impacts during wind farm construction and decommissioning.

5.3 Development Plan

5.3.1 The current development plan for the Development Site comprises:

- The Approved Ayrshire Joint Structure Plan 2007; and
- The Adopted East Ayrshire Local Plan 2010.

5.3.2 It should be noted that both plans are due to be superseded by the East Ayrshire Local Development Plan, currently at Proposed Plan stage and considered in **Section 5.4**.

Approved Ayrshire Joint Structure Plan (2007)

5.3.3 In considering the relevance of the Ayrshire Joint Structure Plan (2007) ('the Structure Plan') it must firstly be noted that this plan predates both current national planning policies (i.e. the SPP and NPF3, published June 2014) and also the previous version of SPP (published February 2010). In this regard the SPP (paragraph 33) states that where a Development Plan is more than five years old it is considered to be out of date. As such, where Structure Plan conflicts with current national planning policies these Structure Plan polices are only of limited relevance to the determination of the section 36 application for the Proposed Development.

5.3.4 The Structure Plan seeks to provide a strategic land use context to guide development across Ayrshire up to 2025. The introduction to the plan identifies a number of challenges which must be overcome within the region, including the need to take action to mitigate climate change alongside the requirement to demonstrate environmental stewardship protecting and enhancing biodiversity, geodiversity, landscapes and cultural assets.

5.3.5 The Structure Plan is framed around five objectives, three of which are relevant to the Proposed Development:

- "*To support measures that encourage economic development underpinned by a sustainable economy;*
- *To develop strong and vibrant communities by realising their potential for regeneration and growth and through the promotion of appropriate development for rural areas; and*
- *To safeguard and enhance the quality of the environment."*

5.3.6 The Structure Plan acknowledges that Ayrshire has "*significant renewable energy resources and is well placed to exploit its generation and use*" (paragraph 43), with employment associated with renewable energy having the potential to "*create significant opportunities for the area*" (paragraph 42).

5.3.7 The Economic Investment map (page 16) identifies a number of "*areas of search for large-scale wind farms*". The geographical extent of the areas of search shown on this map cannot accurately be determined due to the map's schematic nature and low resolution, but it appears that the Development Site is not located within an identified area of search for Large-Scale Wind Farms. It should be noted that this spatial framework predates the SPP (June 2014) methodology for wind energy spatial framework. The proposed spatial framework within the East Ayrshire Local Development Plan Proposed Plan (2015) is outlined at paragraph 5.4.5.

5.3.8 The key policies within the Structure Plan of relevance to the Proposed Development are Policy ECON 6 - Renewable Energy and Policy ECON 7 - Wind Farms.

5.3.9 Policy ECON 6 - Renewable Energy encourages proposals for the generation and utilisation of renewable energy. The policy explains that renewable energy proposals should conform to the structure plan and should have no significant adverse impacts, including cumulative impacts, or infrastructure constraints. Policy ECON 6 also states that the design of renewable energy developments should be sensitive to landscape character, biodiversity and cultural heritage.

5.3.10 Criterion (e) of Structure Plan Policy ECON 7 states that proposed wind energy outside identified Areas of Search be assessed against the following constraints, taking into account both positive and negative impacts and the effect of mitigation measures:

- *"Historic Environment;*
- *Areas designated for their regional and local natural heritage value;*
- *Tourism and recreational interests;*
- *Communities;*
- *Buffer Zones;*

- *Aviation and Defence interests; and*
- *Broadcasting Installations".*

5.3.11 Criterion (f) states that proposals affecting designated Sensitive Landscape Character Areas "*shall satisfactorily address any impacts on the particular interest that the designation is intended to protect but the designation shall not unreasonably restrict the overall ability of the plan area to contribute to national targets*".

5.3.12 Criterion (g) of Policy ECON 7 states that where appropriate, the following criteria will be used to assess development proposals:

- the cumulative impact of wind energy developments;
- grid capacity;
- landscape & visual impacts;
- impacts on the historic environment;
- ecological impacts;
- impacts on hydrology;
- amenity impacts on communities; and
- impacts on aviation safeguarding and telecommunications.

5.3.13 An addendum to the Technical Report informing ECON 7 was published in 2009, Addendum to Ayrshire Joint Structure Plan Technical Report TR03/2006: Renewables (2009). This document does not form part of the Development Plan, but is a material consideration which is used by East Ayrshire Council in the assessment of wind farm applications. Of note, the indicative wind energy spatial framework contained within the Technical Report predates the SPP (June 2014). Thus while the methodology applied within the Technical Report is broadly in accordance with the SPP6 (2007, superseded 2010) identifying "*broad areas of search*", "*areas of significant protection*" and "*areas of potential constraint*" it does not reflect current national policy. According to the Addendum to Ayrshire Joint Structure Plan Technical Report TR03/2006: Renewables (2009), the Development Site appears to be located within an area of potential constraint.

5.3.14 All other Structure Plan policies of relevance to the Proposed Development are outlined in **Table 5.2**.

Table 5.2 Other Relevant Policies within the Ayrshire Joint Structure Plan (2007)

Policy	**Summary**
Policy STRAT 1 – Sustainable Development (in particular Schedule 1)	The schedule attached to this policy lists a number of *"guiding principles of sustainable development"* for use in determining planning applications. Principles of relevance to the Proposed Development include: a) Community Regeneration: *"Developments will require to be of good quality design and reflect where appropriate local character and materials"*. b) Environmental Quality: *"Important cultural heritage resources will be safeguarded; Development will require to respect the landscape character of the area and not result in visual damage or intrusion; Development should not lead to unacceptable damage to species and habitats; New development will be expected to take account of the impacts of climate change; New development will be located where there is no unacceptable risk from flooding...; Development should not have an adverse effect on land, air and water quality or nuisance by way of smell, noise or light...; Non-renewable resources will be used prudently".* Development Obligations: *"Developers will be expected to mitigate the adverse impacts of their developments and to ensure the costs involved are not borne locally; Developers should consult with...all appropriate amenity bodies on any significant development proposals".*

Policy	Summary
Policy ECON 14 – Rural Diversification	This policy highlights the support for rural diversification including proposals for small scale renewable energy among others.
Policy ENV1 Landscape Quality	This policy seeks to maintain and enhance the quality and distinctiveness of landscapes across Ayrshire. Applicable assessment criteria to conserve those features that contribute to local distinctiveness include*:* *a) "Setting of communities and buildings within the landscape;* *b) Patterns of woodland, fields, hedgerows, and tree features;* *c) Special qualities of rivers, estuaries and coasts;* *d) Historic landscapes; and* e) *Skylines and hill features, including prominent views*".
Policy ENV2 – Landscape Protection	This policy sets out assessment criteria for proposals within National Scenic Areas and Sensitive Landscape Areas. In relation to the latter the policy states that "*in Sensitive Landscape Character Areas the protection and enhancement of the landscape shall be given full consideration in the preparation of local plans and the determination of planning applications*".
Policy ENV6 – Protection of the Built Heritage	This policy states that proposals which would have an adverse impact on listed buildings, conservation areas, historic gardens & designated landscapes, archaeological locations and landscapes will not be in conformity with the Structure Plan.
Policy ENV7 – Natural Heritage Designations	This policy underlines the applicable statutory protection of international and national natural heritage designations.
Policy ENV8 - Flooding	This policy indicates that proposals which would be at significant risk of flooding or which would increase the probability of flooding elsewhere will not be permitted.
Policy ENV11 – Air, Noise and Light Pollution	This policy seeks to protect against new development that would expose large numbers of people to unacceptable levels of air, noise and light pollution.

East Ayrshire Local Plan (2010)

5.3.15 The East Ayrshire Local Plan 2010 (the Local Plan) was adopted by East Ayrshire Council (EAC) on 26th October 2010. Volume 1 of the Local Plan sets out an overall strategy for the development of East Ayrshire up to 2017.

5.3.16 The Local Plan is focused around achieving a single primary strategic aim, which is: "*to promote sustainable development, to maximise the economic potential of East Ayrshire and to improve the quality of life of its residents*". Around this, a further nine specific aims to frame proposals and policies have been identified and the following five are of relevance to the Proposed Development:

- "To maintain and improve the integrity, vitality and viability of the area settlements and their rural settings (AIM 2);
- To facilitate the expansion and diversification of the East Ayrshire economy and to maximise the economic potential of the area for industrial, business, commercial and tourism development (AIM3);
- To protect, conserve and enhance the character, appearance and amenity of East Ayrshire, especially as regards its landscape quality, the built and natural environment and areas of natural heritage and built heritage importance (AIM 4);
- To promote appropriate development in rural areas (AIM8); and
- To address the threat posed by climate change, to encourage the more efficient use of resources, to reduce energy consumption and CO2 emissions and to facilitate the development of renewable sources of energy (AIM9)".

5.3.17 The Rural Area Map, in line with the Structure Plan, identifies the Development Site as located within a Sensitive Landscape Area and not within an '*area of search for large scale windfarm*

development'. As per the Structure Plan, the Local Plan and its spatial framework for wind energy predates the SPP (June 2014). The proposed spatial framework within the East Ayrshire Local Development Plan Proposed Plan (2015) is outlined at paragraph 5.4.6.

5.3.18 The key policies within the Local Plan which are relevant to the Proposed Development are Policies CS12 – Renewable Energy Developments (General) and CS14 - Wind Energy Development. It is therefore considered that in relation to the Local Plan the Proposed Development should primarily be tested for its accordance with these policies.

5.3.19 Policy CS12 includes a presumption in favour of renewable energy development subject to demonstrating no significant, unacceptable adverse impact, including adverse cumulative impacts:

- *"On any registered statutory or non-statutory sites of nature conservation interest;*
- *On the amenity of nearby communities or sensitive establishments;*
- *On any recognised built heritage resources;*
- *On the visual amenity of the area; and*
- *On existing infrastructure."*

5.3.20 Policy CS12 also requires developers to demonstrate "*there will be no unacceptable adverse environmental impact caused by the proposed connections linking the proposed development with the national grid and the surrounding road network*".

5.3.21 Policy CS14 – Wind Energy Developments states that wind energy developments will be assessed against criteria specified within the Structure Plan Policy ECON 7 and against any future supplementary planning guidance to be prepared relating to cumulative impact.

5.3.22 Other Local Plan policies which are potentially of relevance to the Proposed Development are outlined in **Table 5.3**. These policies largely relate to general development proposals rather than to renewable energy proposals, so in some cases are only of limited relevance to the Proposed Development.

Table 5.3 Other Relevant Policies within the East Ayrshire Local Plan (2010)

Policy	**Summary**
Policy SD1 – General Strategic Policy	This policy links to Policy STRAT 1 within the Structure Plan, and references the Guiding Principles for Sustainable Development contained within Schedule 1. This policy outlines that new development should not have any unacceptable adverse impact on: "*The character and appearance of the particular location in which it is proposed;* *The environment and amenity of local communities and residents of the area;* *Landscape character quality; and* *Natural or built heritage resources."*
Policy CS15 - Renewable Energy Fund	This policy requires that renewable energy funds should be set up to compensate local communities affected by the development of commercial wind farms. The policy requires that for the first 10 years of a project's life, the fund should be used solely for local projects within 10km of the development. Thereafter, the fund should be split evenly between local projects and projects across the wider East Ayrshire area.
Policy CS16 – Removal of Turbine Requirement	This policy states "*where a wind turbine is not in operation producing electricity for a continuous period of six months, the operator will be required to provide evidence to the Council that the apparatus is in the process of being repaired or replaced. Otherwise, the Council will deem the turbine to be surplus to requirements and require its removal, with the land restored to its original condition within an appropriate period to be agreed with the Council".*
Strategic Policy ENV1 - Built Heritage	This policy seeks to protect Listed Buildings and Conservation Areas (including their respective settings), Historic Gardens and Designed Landscape, Scheduled Ancient Monuments and Archaeological and Industrial Archaeological Sites and Landscape.
Strategic Policy ENV2 - Natural Heritage	This policy aims to protect, preserve and enhance all natural heritage resources requiring conservation including Special Protection Areas, Special Areas for Conservation and Sites of Special Scientific Interest, Confirmed or Provisional Wildlife Sites and Local Nature Reserves.

Policy	Summary
Strategic Policy ENV 3 – Sensitive Landscape Areas	This policy sets out the *"priority and prime consideration"* which will be afforded to the protection and enhancement of the landscape in the determination of proposed developments located within Sensitive Landscape Areas.
ENV4 - Listed Buildings	This policy requires development proposals with the potential to affect a listed building or its setting to preserve the building, its setting, or any features of special architectural or historic interest which it possesses.
Policy ENV6: Ancient Monuments and Archaeology	This policy requires Scheduled Monuments and other identified nationally important archaeological resources to be preserved in situ and within an appropriate setting. The policy states that *"developments which have an adverse effect on Scheduled Monuments or the integrity of their settings shall not be permitted unless there are exceptional circumstances"*. The policy operates a presumption in favour of in situ preservation of archaeological resources *"wherever feasible"* and notes the need to *"weigh the significance of any impacts on archaeological resources and their settings against other merits of development proposals"*. In addition, the policy states that *"where the case for preservation does not prevail, the developer shall be required to make appropriate and satisfactory provision for archaeological excavation, recording, analysis and publication in advance of development"*.
Policy ENV8: Historic Gardens and Designed Landscapes	This policy seeks to safeguard Historic Gardens and Designed Landscapes. It aims to protect and enhance such areas including: "*important views to, from and within them, or upon the site or setting of component features which contribute to their value*."
Policy ENV13: Natural Heritage	This policy requires any proposal that would have a significant effect on a Natura 2000 site to undergo an Appropriate Assessment. The policy states: "*Where an assessment is unable to conclude that a development will not adversely affect the integrity of the site, development will only be permitted where* *a) "There are no alternative solutions; and* b) *There are imperative reasons of overriding public interest*."
Policy ENV15: Natural Heritage	This policy aims to prevent development causing *"unacceptable and irreparable damage to important landscape features"*. It requires developers *"to conserve and enhance features which contribute to the intrinsic landscape value and quality of the area concerned, and which are likely to be adversely affected by particular development proposed"*.
Policy ENV16: Landscape Character	This policy seeks to prevent development which would create an unacceptable visual intrusion or irreparable damage to the landscape character of rural areas. The policy states that "*the Council will ensure, through the development process that any unauthorised development is in keeping with, has minimal visual impact on, and reflects the nature and landscape character of, the rural area in which it is located, in terms of layout, materials used, design, size, scale, finish and colour. The design and material finish of any ancillary features will also be required to be sympathetic to the character and appearance of the area."*
Policy ENV17 - Land in Rural Areas	This policy includes a general presumption against any development which would, *"have significant unacceptable adverse impact or cause irreparable damage to built heritage resources requiring conservation of their settings, including listed buildings, conservation areas, historic gardens and designed landscape, scheduled ancient monuments, archaeological and industrial archaeological sites."* This presumption applies to development proposals which would result in significant unacceptable adverse impact or cause irreparable damage to natural heritage resources, have significant unacceptable adverse visual impact or cause irreparable damage to the landscape character and scenic quality of the area within which it is proposed. The policy is also applicable to proposals which affect the quality of water resources or result in the destruction of areas of peat which are considered to be of significant ecological value.
Policy ENV21: Flooding	This policy includes a presumption against development that is likely to result in increased flood risk.
Policy ENV24: Water Environment	This policy includes a presumption against any developments which have an adverse effect on the water environment. The policy supports the source control and passive treatment measures recommend by SEPA in its 'Guide to Sustainable Urban Drainage' and will support new developments with innovative methods of surface water disposal and treatment which meet the standards of SEPA and the Water Authority".
Policy ENV25: Air Quality, Noise and Light Pollution	This policy requires all developers to ensure that their proposals have minimal adverse impact on air quality. The policy also states that the Council will also ensure that *"new development will have minimum adverse effects on the physical environment and the amenity of an area as a result of light and noise pollution"*.
Policy ENV26: Noise	This policy includes a presumption against any proposals *"located in areas demonstrated or proven to be directly adversely affected by existing noise or other polluting activities, or within safety zones around recognised hazardous installations"*.

Policy	Summary
Policy T3: Roads requires developers to ensure that proposals meet with the Council's roads standards.	This policy requires developers to ensure that proposals meet with the Council's roads standards.
Policy T5: Section 75 Agreement	This policy sets out the circumstances where developers will be requested to enter into Section 75 Agreements with regard to making financial provision of transportation infrastructure improvements which may be required as a result of the development.
Policy T9: Rights of Way	This policy seeks to protect existing or potential rights of way, bridle paths or footpaths used by the general public for recreation or other purposes.

5.4 Other Material Considerations

East Ayrshire Local Development Plan Proposed Plan (2015)

5.4.1 EAC are currently preparing a Local Development Plan ('the LDP Proposed Plan'). Once adopted, this LDP will constitute the statutory Development Plan for East Ayrshire and will replace the current Structure Plan and Local Plan. The LDP Proposed Plan was subject to public consultation from 13th March 2015 – 24th April 2015 and is expected to undergo a formal examination by Reporters appointed by Scottish Ministers in autumn 2015. It should be noted that the applicant submitted a series of representations the East Ayrshire LDP Proposed Plan, which are provided in full within **Appendix C** of the Planning Statement that accompanies the section 36 application for the Proposed Development.

5.4.2 The LDP Proposed Plan sets out a vision statement (paragraph 2.13) for 'The Rural Area' of East Ayrshire, which the Development Site lies within:

"The rural area of East Ayrshire will be one of its most valuable assets. Limited housing and business development will have taken place to sustain the rural economy and sympathetic tourism opportunities will have been developed attracting more people into the area. Whilst wind energy development will have taken place to ensure that East Ayrshire plays its part in contributing towards a low carbon Scotland, this will not dominate or adversely affect the attractiveness of the rural area and its value as a setting for East Ayrshire's towns and villages or its ability to attract new residents, businesses and visitors."

5.4.3 The LDP Proposed Plan contains a number of policies of relevance along with a proposed wind energy spatial framework. Of note, Policy OP1: Overarching Policy sets out a number of criteria relating to general environmental and amenity issues which should be considered in the determination of all development proposals. Policy TOUR4: The Dark Sky Park sets out assessment criteria for development proposals located within the Galloway Forest Dark Sky Park, including the Transition Area which extends for a 10km radius from the Park which the Development Site lies on the edge of.

5.4.4 Policy RE1: Renewable Energy Developments sets out the overarching criteria for all renewable energy proposals. This policy states that such proposals will be supported by the Council "*where it can be demonstrated that there will be no unacceptable significant adverse impacts on all of the relevant Renewable Energy Assessment Criteria set out in Schedule 1 of the LDP, that the scale of the proposal and its relationship with the surrounding area are appropriate and that all other relevant LDP policies are met…*". The assessment criteria listed in Schedule 1 to the LDP Proposed Plan relate closely to the development management criteria for renewable energy proposals listed within the SPP (see **Section 5.2** above).

5.4.5 Map 12 of the LDP Proposed Plan sets out a spatial framework for wind energy development above 50m in height. In line with the SPP (June 2014) this spatial framework identifies three groups of areas:

- Group 1: Areas where development will not be acceptable (only applicable to National Parks and National Scenic Areas, none of which are located within East Ayrshire);
- Group 2: Areas of significant protection; and
- Group 3: Areas with potential for development.

5.4.6 According to Map 12 the Development Site covers areas identified within Group 3 and Group 2. In relation to the proposed spatial framework, Policy RE3: Wind Energy Proposals over 50 Metres in Height states that significant protection will be afforded to Group 2 areas. In these areas wind energy developments must demonstrate that *"any significant effects on the qualities of these areas can be substantially overcome by siting, design or other mitigation and where the proposal is acceptable in terms of all applicable Renewable Energy criteria set out in Schedule 1*". Policy RE3 also provides support for proposed wind energy developments in Group 3 areas "*where it can be demonstrated that they are acceptable in terms of all applicable Renewable Energy Assessment Criteria set out in Schedule 1*".

5.4.7 Policy RE4: The Cumulative Impact of Wind Energy Proposals highlights that the cumulative impact arising from wind energy developments is listed as an assessment criteria in Schedule 1 to the LDP Proposed Plan. Similarly, Policy RE5: Wind Energy and the Landscape highlights that landscape impacts arising from wind energy development is listed as an assessment criteria in Schedule 1 to the LDP Proposed Plan. This policy also draws attention to the East Ayrshire Landscape Wind Capacity Study (EAWLCS – see below).

5.4.8 All other (subject specific) proposed policies of relevance to the Proposed Development are listed in **Table 5.4**.

Table 5.4 Other Relevant Proposed Policies within the East Ayrshire LDP Proposed Plan (2015)

Proposed Policy Reference	**Proposed Policy Title**
Policy RES11	Residential Amenity
Policy TOUR4	The Dark Sky Park
Policy TOUR5	Galloway and Southern Ayrshire Biosphere
Policy RE7	Removal of Wind Turbines
Policy RE8	Community Benefits
Policy RE9	Financial Guarantees
Policy RE10	Compliance Monitoring
Policy T4	Development and Protection of Core Paths and Natural Routes
Policy ENV1	Listed Buildings
Policy ENV2	Scheduled Monuments and Archaeological Resources
Policy ENV4	Gardens and Designed Landscapes
Policy ENV6	Nature Conservation
Policy ENV7	Wild Land and Sensitive Landscape Areas
Policy ENV8	Protecting and Enhancing the Landscape
Policy ENV9	Trees, Woodland and Forestry
Policy ENV10	Carbon Rich Soils
Policy ENV11	Flood Prevention
Policy ENV12	Water, Air and Light and Noise Pollution

East Ayrshire LDP Draft Supplementary Guidance

5.4.9 Once adopted, the East Ayrshire LDP Proposed Plan will be supported by a set of statutory and non-statutory Supplementary Guidance documents. Three draft Supplementary Guidance documents were published for consultation alongside the East Ayrshire LDP Proposed Plan, of which two, 'Planning for Wind Energy' and 'Financial Guarantees', are of relevance to the Proposed Development.

Planning for Wind Energy Draft Supplementary Guidance

5.4.10 This draft document supports the implementation of proposed policies RE3-RE6 within the East Ayrshire LDP by clarifying the criteria against which proposed medium and large scale wind energy development will be assessed. The document was subject to public consultation in tandem with the East Ayrshire LDP Proposed Plan, and during this period the Applicant submitted detailed representations regarding it (see **Appendix C** of the Planning Statement which accompanies the section 36 application for the Proposed Development).

5.4.11 In Section 1.3 it is noted that "*a broad upland arc*" running around the eastern and south-eastern edges of East Ayrshire represents a landscape type commonly associated with wind energy development. The Development Site is located within this upland arc.

5.4.12 Table 2 within the document lists individual constraints within East Ayrshire relevant to the spatial framework methodology set out in Table 1 of the SPP. A footnote to Table 2 of the document states that on the advice of SNH, category 6 (deep peat) and category 5 (deep peat and other carbon rich soils) areas as shown on the 1:250,000 Soil carbon richness map have been considered as constraints. All of the identified constraints are mapped in Map 3 to produce the proposed wind energy spatial framework for East Ayrshire. Section 2.3 of the document clarifies the implications of the proposed wind energy spatial framework for wind energy proposals. It is noted that only Group 1 areas are to be afforded a presumption against wind energy development and that "*whilst group 2 areas are to be given significant protection, there may be limited opportunities for sensitively sited wind energy proposals, where it can be demonstrated that any significant effects on the qualities of these areas can be substantially overcome by siting, design or other mitigation, through assessment against the criteria listed in Schedule 1 of the Plan. Within Group 3 areas, proposals will be supported where it can be demonstrated that that they are acceptable in terms of the criteria listed in Schedule 1 of the Plan and detailed in Section 3 below*".

5.4.13 Section 3 then sets out detailed criteria and information requirements to be considered in the determination of wind energy planning applications (and section 36 applications). Criteria of relevance to the section 36 application for the Proposed Development are:

- Wind energy applications should be supported by an LVIA, which "*must follow best practice in the selection of viewpoint locations and in the preparation of photomontage/panoramic images. (Visual representation of wind farms (SNH – July 2014)*". Viewpoints considered within the LVIA must be agreed with the Council and for larger schemes should be discussed with SNH.
- Applicants should have regard to the East Ayrshire Landscape Wind Capacity Study (2013), which constitutes approved non-statutory supplementary guidance. The study is referred to within **Chapter 9 – LVIA** of this ES and within the Planning Statement which accompanies the section 36 application for the Proposed Development as the 'EAWLCS'.
- The document summarises the key messages from the EAWLCS as being that "*turbines over 50 metres should be directed to the less sensitive parts of East Ayrshire's uplands…wind energy development should not compromise the most valuable features of the East Ayrshire upland landscape, and…should not result in unacceptable cumulative impacts when taken together with other developments*".
- It is stated on page 12 that the EAWLCS (2013) identifies areas with High and High-Medium sensitivity to turbine development of 70m+ and 50-70m. Maps 3 and 4 within this document then indicate the sensitivity of landscape character area across East Ayrshire. However, whilst Map 3 identifies the Development Site as having high sensitivity to 70m+ turbines, the EAWLCS

assigns a lower High-medium sensitivity to the same area, and no other sensitivity changes appear to have occurred between the EAWLCS (2013) and Map 3 of this document. As set out in the applicant's representation regarding Map 14 and Proposed Policy RE5 within the East Ayrshire LDP Proposed Plan (2015)[3], it is presumed that this apparent change of sensitivity is simply an unintended GIS mistake.

- Page 15 of the document identifies the key conclusions of the EAWLCS as being that "*landscapes identified as having a high sensitivity to development have no scope to accommodate that scale of development…landscapes identified as having a high-medium sensitivity to development have very limited scope to accommodate that scale of development...*".
- Section 3.1.2 sets out detailed guidance regarding the assessment of cumulative impacts from wind energy developments within LVIAs.
- In relation to carbon rich soils, section 3.1.3 states that "*areas of carbon rich soils, deep peat and priority peatland habitats are identified within the spatial framework as areas requiring special protection. In line with Policy RE3 of the LDP, any proposal in such an area will only be permitted where any significant effects on the environmental quality of such soils can be substantially overcome by siting, design or mitigation*". This section also requires developments on peatlands to utilise the Scottish Government's carbon calculator to balance predicted carbon savings and losses.
- Sections 3.1.4 – 3.3.3 state that applicants should fully assess impacts on natural heritage, historic environment features, water quality, flood risk, net total annual CO_2 savings, residential amenity (noise, shadow flicker and visual dominance), relevant tourism receptors, the local economy (including employment and wider socio-economic benefits), aviation and defence interests (particularly Glasgow Prestwick Airport), traffic levels and the functioning of the road network, and broadcasting installations.
- Section 3.3.4 notes that period(s) of inactivity or reduced output from turbines may be required to control cumulative noise and/or shadow flicker impacts, and that this must be taken account of when determining the renewable energy benefits of a proposed wind energy development.
- Section 3.3.5 sets out guidance for the siting and design of infrastructure and ancillary work and notes that the impacts of this development will be considered in the determination of proposals.
- Section 3.3.6 requires all applications to be accompanied by a sufficiently detailed restoration programme, the details of which will be secured through a section 75 obligation.
- Section 5 details a checklist of required environmental and other information which must be provided in support of applications for wind energy development.

Financial Guarantees Draft Supplementary Guidance

5.4.14 This draft document provides guidance to support proposed policy RE9, which seeks to ensure suitable financial guarantees are in place for certain development types including wind energy developments to ensure that all decommissioning, restoration and aftercare obligations can be fully met. Section 3 of the document sets outs East Ayrshire Council's proposed process for independently valuing the costs associated with decommissioning and restoration of a proposed development and for securing financial guarantees from applicants.

Dumfries & Galloway Development Plan

5.4.15 Although the Proposed Development is located within the EAC area, the Dumfries and Galloway Development Plan is a valid consideration considering the proximity of the Development Site to its

[3] This representation is provided in full within Appendix C of the Planning Statement which accompanies the section 36 application for the Proposed Development.

administrative boundary. The Dumfries and Galloway Development Plan comprises the Dumfries & Galloway Local Development Plan (adopted 2014) ('the Dumfries and Galloway LDP') and associated Statutory Supplementary Guidance.

5.4.16 Policies of relevance within the Dumfries and Galloway LDP include Policy: IN1 Renewable Energy and Policy IN2: Wind Energy Development (Part 1 Assessment of Windfarm Proposals only). The relevant sections of Policy IN1 seeks to protect environmental receptors including the landscape, cultural and natural heritage, water and fishing interests, air quality and general amenity from unacceptable significant adverse impact. Part 1 of Policy IN2 provides additional relevant assessment criteria including:

"…Landscape and visual impact:

- *The extent to which the proposal addresses the guidance contained in 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 or visual impact from two or more wind energy developments and the potential for mitigation.*

Impact on local communities:

- *The extent of 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…".*

5.4.17 **Table 5.5** lists other policies within the Dumfries and Galloway LDP which are of relevance to the Proposed Development.

Table 5.5 Relevant Policies within the Dumfries and Galloway LDP (2014)

Policy Reference	**Policy Title**
Policy OP1	Development Considerations
Policy ED11	Galloway and Southern Ayrshire Biosphere
Policy ED12	Dark Sky Park
Policy HE1	Listed Buildings
Policy HE6	Historic Gardens and Designed Landscapes
Policy NE2	Regional Scenic Areas

Policy Reference	Policy Title
Policy NE3	Sites of International Importance for Biodiversity
Policy NE4	Species of International Importance
Policy NE5	Sites of National Importance for Biodiversity and Geodiversity
Policy NE11	Supporting the Water Environment
Policy CF4	Access Routes

5.4.18 The Dumfries and Galloway LDP is supported by multiple statutory Supplementary Guidance Documents. Of these, the Part 1 Wind Energy Development: Development Management Considerations including landscape capacity appendices is of relevance to the Proposed Development. Similar to the draft East Ayrshire Planning for Wind Energy Supplementary Guidance, this document provides guidance regarding potential environmental and other impacts which should be assessed through the EIA process or through other supporting documents.

5.4.19 On 5th August 2015 Dumfries and Galloway Council formally adopted the Dark Sky Park Friendly Lighting Supplementary Guidance (as part of the Dumfries & Galloway Development Plan. This statutory Supplementary Guidance provides guidance on good lighting practice within the Galloway Forest Dark Sky Park, including the Transition Area which the Development Site lies on the edge of. It provides further details on the implementation of LDP Policy ED12: Dark Sky Park within the adopted Dumfries & Galloway LDP (2014). This Supplementary Guidance is considered relevant to the Proposed Development given that East Ayrshire Council has not prepared its own guidance regarding the Transition Area of the Galloway Forest Dark Sky Park.

East Ayrshire Landscape Wind Capacity Study (2013)

5.4.20 This study considers the sensitivity of landscape character types within East Ayrshire to a range of wind turbine developments. The document has been approved as non-statutory Supplementary Guidance by East Ayrshire Council and is intended to serve both as a tool for the preparation of East Ayrshire's emerging Local Development Plan (LDP) and as a material consideration within the determination of relevant applications.

5.4.21 Within this study the 'large' typology covers all wind turbines with a blade tip height of 70m or higher and therefore is applicable to the Proposed Development. Map 3 within the document indicates that the Development Site lies predominantly within the Southern Uplands landscape character type (20a), although north eastern parts of the Development Site are located within the Upland Basin landscape character type (15) and the southern extent of the Development Site borders the Southern Uplands & Forestry landscape character type (20c). Sections 4-15 of the document provides details regarding the landscape sensitivity of each of the landscape character areas identified in Map 3.

5.4.22 In relation to spatial frameworks this document identifies recommended search areas for large and medium typology wind energy developments, based exclusively on a landscape capacity assessment rather than also considering other technical and environmental constraints or taking account of factors such as wind yields. The recommended search areas only considered the sensitivity of individual landscape character areas to wind energy development, and potential cumulative landscape and visual impacts from further wind energy development.

5.4.23 The Development Site is largely located within a recommended area of search for medium typology (50-70m tip height) wind energy development as it largely falls within landscape character areas which have been assessed as having medium or lower landscape sensitivity. A small area at the north west corner of the Development Site is located within a recommended area of search for large typology (>70m tip height), while a small area at the north east corner is located outwith the recommended area of search for medium or large typology wind energy development. It should be

noted that turbines are not proposed to be located within either the north west or north east of the Development Site.

5.4.24 It should be noted that the methodology which underpins the recommended spatial framework in this document is not consistent with the approach outlined in SPP (June 2014). As such, this document does not represent a spatial framework for wind energy developments for the purposes of complying with the SPP at paragraph 161.

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6. Renewable Energy Policy, Carbon Balance and Peat Management

6.1 Non-Technical Summary

6.1.1 This chapter of the ES outlines the prevailing climate change and renewable energy legislation and policy framework and describes the carbon balance of the Proposed Development, taking account of peat within the Development Site. The 'carbon balance' for the Proposed Development is calculated using Scottish Government guidance. The calculation of carbon balance provides a mechanism by which the carbon cost as a result of a wind farm, primarily as a result of component manufacture and construction activities (including peat excavation), can be weighed against the carbon savings attributable to it during its operational lifetime. This calculation is summarised as the length of time (in years) that it will take the carbon savings to balance the carbon costs and is referred to as the 'payback period'. An assessment of the Proposed Development's impact on the existing peat within the Development Site, and the effects in terms of carbon dioxide emissions are also provided.

6.1.2 The design process included careful siting of tracks, turbines and other infrastructure to minimise effects of the Proposed Development upon peat and carbon emissions. A Peat Management Plan (PMP) quantifies the volume of peat that may need to be excavated based upon peat depth surveys that have been carried out in accordance with approved guidance. The PMP also sets out a range of mitigation measures to further minimise effects on peat and carbon emissions. These include methods to be employed for peat stripping, temporary stockpiling and subsequent reinstatement. The PMP concludes that all excavated peat can be re-used to landscape infrastructure within the Proposed Development.

6.1.3 It is predicted that the carbon loss in developing the Proposed Development is expected to be paid back in ~1.5 years (~6% of the operational life of 25 years). The calculation of carbon balance and payback has been based on the expected values where site specific data is available and worst case assumptions where it is not. Even in the worst case scenario, the Proposed Development will have achieved the carbon balance within ~3.6 years (~14% of the 25 year operational life).

6.1.4 On the basis of potential annual CO_2 savings of 63,768 tonnes/year, based on the figure of 430g of CO_2 savings per kWh and a capacity factor[1] of 27% (Department of Energy and Climate Change (DECC), June 2015 average capacity figure for Scotland), the Proposed Development could result in a total carbon saving[2] of approximately 1.6M tonnes over its 25 year operational life, and generate electricity to supply the equivalent of 42,651 average homes in East Ayrshire on an annual basis.

6.2 Renewable Energy & Climate Change Policy Framework

6.2.1 This section sets out the climate change and renewable energy governance frameworks which apply to the Proposed Development. It firstly provides an overview of important developments in climate change science and the associated climate change policy framework, before considering relevant energy legislation and policy documents. All of the policy documents discussed in this section are relevant considerations in determining the planning application for the Proposed Development.

[1] The ratio of the actual energy produced by a turbine in a period time compared to the hypothetical maximum output of the turbine.

[2] Every unit of electricity produced by a wind farm development effectively displaces a unit of electricity which could otherwise have been produced by a conventional coal or gas power station. The displacement of electricity produced by a coal or gas power station by a low carbon technology such as wind turbines would represent a 'carbon saving'.

Climate Change

6.2.2 **Tables 6.1 and 6.2** provide an overview of influential scientific documents and associated policy responses regarding global climate change. These documents demonstrate the severity of climate change and identify the need to significantly reduce greenhouse gas emissions through transitioning to a low carbon economy. The documents also emphasise that the deployment of renewable energy technologies forms a cornerstone of the low carbon economy.

Table 6.1 Influential Climate Change Documents – International & European

Document Title	Summary
International	
IPCC Fifth Assessment Report - Overview	Published by the Intergovernmental Panel on Climate Change (IPCC) and approved by its 195 member governments, the Fifth Assessment Report (referred to as AR5) provides the most up to date view of the current state of scientific knowledge relevant to climate change. It comprises three Working Group (WG) reports and a Synthesis Report, each of which contains a Summary for Policymakers Report and a Full Scientific Report. The Summary for Policymakers Reports are of relevance to governance stakeholders and therefore are considered below.
IPCC Fifth Assessment Report: Climate Change 2015: Synthesis Report - Summary for Policymakers **(IPCC, 2015)**	As the final component of AR5, this document provides the latest integrated view of climate change science, mitigation and adaptation from the IPCC. In relation to observed changes, the document identifies clear evidence of human influence on the global climate. It notes that recent anthropogenic emissions are the highest in history and that climatic changes have already had *"widespread impacts on human and natural systems".* In relation to the causes of climate change, the document concludes that "unprecedented" atmospheric concentrations of carbon dioxide, methane and nitrous oxide, resulting from industrial activities including fossil fuel combustion are "extremely likely to have been the dominant cause of the observed warming since the mid-20th century". The document makes clear that evidence for human influence on the climate system has grown since the publication of the IPCC's Fourth Assessment Report in 2007. In relation to the impacts of climate change, the document notes that "*changes in climate have caused impacts on natural and human systems on all continents and across the oceans*". Physical impacts to date include melting snow and ice and precipitation changes, whilst identified human impacts include changes in crop yields and ocean acidification. In addition, at least some extreme weather events experienced since 1950, including increased frequency of heavy precipitation events, as well as warming sea temperatures and increased high sea level have been linked to global climate change. The document predicts that climate related risks for human and natural systems will increase throughout the current century. Identified risks for Europe include increased damage from river and coastal flooding, extreme heat events and wildfires, and restrictions in water availability. To limit further warming and associated increased likelihood of "*severe, pervasive and irreversible impacts for people and ecosystems*", the document calls for climate change mitigation through "*substantial and sustained reductions in greenhouse gas emissions*".
IPCC Fifth Assessment Report: Climate Change 2014: Working Group III - Summary for Policymakers **(IPCC, 2014)**	This document presents an overview of academic research regarding the scientific, technological, environmental, economic and social aspects of climate change mitigation. The document confirms that "*total anthropogenic GHG* (Greenhouse Gas) *emissions were the highest in human history from 2000 to 2010 and reached 49 (±4.5) $GtCO_2eq/yr$ in 2010"* (page 5). 47% of the GHG emissions increase between 2000 and 2010 was directly attributable to the energy supply sector, which generated 25% of total GHG emissions in 2010. The document confirms that without additional mitigation, global mean surface temperature will increase further (page 8) and calls for low carbon energy technologies to generate more than 80% of electricity by 2050, compared with the current baseline position of approximately 30%. The document also advocates unabated fossil fuel generation to be virtually phased out by 2100.
IPCC Fifth Assessment Report: Climate Change 2014: Impacts, Adaptation and Vulnerability - Summary for Policymakers (IPCC, 2014)	Forming part of AR5, this document considers the vulnerability and exposure of human and natural systems to risks and potential benefits from climate change. It also considers how impacts and risks related to climate change can be reduced and managed through adaptation and mitigation.

Document Title	Summary
IPCC Fifth Assessment Report: Climate Change 2013: The Physical Science Basis - Summary for Policymakers **(IPCC, 2013)**	This first part of the IPCC's 5th Assessment Report states that *"warming of the climate system is unequivocal*" (page 3)" *and* concludes that *"it is extremely likely that human influence has been the dominant cause of the observed warming since the mid-20th century"* (page 12). Responding to this report, the (then) UK Secretary of State for Energy & Climate Change, Ed Davey, commented: *"This report is the most authoritative, credible analysis of climate change science ever...this report makes clear what is at stake if we don't act"* (DECC, 2013a).
United Nations Framework Convention on Climate Change (UNFCCC, 1992)	The UNFCCC aims to stabilise atmospheric greenhouse gas concentrations at a level sufficiently low *"to prevent dangerous anthropogenic interference with the climate system"* (page 9). To date the Kyoto Protocol is the principal protocol arising from the UNFCCC.
Kyoto Protocol to the United Nations Framework Convention on Climate Change (UNFCCC, 1998)	The Kyoto Protocol required participating developed countries to cut overall emissions by 5.2% by 2012 from 1990 levels. Under the Doha amendment to the Kyoto Protocol, a second commitment period will run until December 2020 (UNFCCC, 2012) under which the UK and EU have committed to emissions reductions of 20% from 1990 levels.
Durban Platform for Enhanced Action (UNFCCC, 2011)	This decision commits all UNFCCC signatories to agree a new legally binding climate change protocol by 2015, which will enter into force by 2020.
Multiple decisions taken at the eighteenth Conference of Parties (COP18) and the eighth Meeting of the Parties (CMP8) in Doha during November 2012, including: Decision 1/CMP.8 and Decision 1/CP.18 (UNFCCC, 2012)	This amends the Kyoto Protocol by formally extending the life of emissions reduction targets until 31st December 2020. As noted above, the UK and EU are required to reduce GHG emissions by at least 20% by 2020 compared with 1990 levels. Decision 1/CP.18 affirms that *"parties will urgently work towards the deep reduction in global greenhouse gas emissions required to hold the increase in global average temperature below 2°C above pre-industrial levels and to attain a global peaking of global greenhouse gas emissions as soon as possible*" (page 3).
Lima Call for Climate Action (UNFCCC, 2014)	Reached at the 20th conference of the parties to the UNFCCC, this agreement commits all UNFCCC signatory countries to action to cut carbon emissions and emphasises the aim of restricting temperature rises to below 2°C above pre-industrial levels.
Geneva Climate Conference 2015: Ad Hoc Working Group on the Durban Platform for Enhanced Action – Negotiating Text (UNFCCC, 2015)	The main outcome from the Geneva Climate Conference 2015 was agreement from all 194 UNFCCC signatory counties of a negotiating text which will form the basis of a comprehensive new global climate treaty. This treaty, which will be finalised in Paris in late 2015, will include five yearly "commitment cycles" of climate change mitigation targets and actions to be introduced by signatory countries.
European	
EU 202020 Climate & Energy Package (European Commission, 2008)	The European Council of Ministers ('the European Council') agreed a comprehensive Climate and Energy Package in December 2008, which includes three challenging climate and energy targets to be met by 2020. Known as the '20-20-20' targets, these are: 1) A reduction in EU greenhouse gas emissions of at least 20% below 1990 levels; 2) 20% of total EU energy consumption to come from renewable energy sources, to be implemented through the Renewable Energy Directive (2009/28/EC); and 3) A 20% reduction in primary energy use compared with projected levels, to be achieved by improved energy efficiency. The European Council has also given a long term commitment to decarbonisation, with a target to reduce EU GHG emissions by 80-95% by 2050 from 1990 levels. This target corresponds with the aforementioned international aim of limiting global temperature increases to 2°C above pre-industrial levels.
EU 2030 Framework for Climate and Energy Policies (European Commission, 2014)	On 24th October 2014 the European Council agreed a new framework of climate and energy policies covering the period up to 2030. The headline commitments in the framework are: 1. A binding EU target of an at least 40% domestic reduction in greenhouse gas emissions by 2030 compared to 1990 (i.e. without the use of international carbon trading); 2. A binding EU target of at least 27% of all energy consumed to come from renewable energy consumed in 2030; and 3. An indicative target at the EU level of at least 27% improvement in energy efficiency. These new commitments are intended to dovetail with the existing EU 202020 Climate & Energy Package detailed above.

Document Title	Summary
	Responding to the publication of this new framework, the (then) UK Secretary of State for Energy & Climate Change commented: "*This is a historic moment. Europe has sent a clear and firm message to the world that ambitious climate action is needed now*".

Table 6.2 Influential Climate Change Documents – United Kingdom & Scotland

Document Title	Summary
United Kingdom	
2009 UK Climate Projections (UKCP09) Briefing Report (Jenkins *et al.*, 2009)	The 2009 UK Climate Change Projections (UKCP09) provides projections of climate change for the UK, in much greater detail than any previous UK climate scenarios. UKCP09 describes evidence for global climate change as *"unequivocal"*.
UK Climate Change Risk Assessment (CCRA) 2012 Evidence Report (DEFRA/HR Wallingford, 2012)	Based upon the UKCP09, the CCRA Evidence Report presents the latest evidence regarding the risks and opportunities of climate change for the UK until 2100. Impacts and risks which are specific to Scotland are addressed in a technical report that sits alongside the central Evidence Report (see below for details).
Climate Change Act 2008	This framework legislation sets the UK on a long term path towards a low carbon economy. It requires a legally binding 80% reduction by 2050 in the UK's net CO_2 account - covering all six Kyoto Protocol GHG - compared with 1990 levels. To ensure continued progress towards the 2050 emissions target the Act established a rolling system of 5 year carbon budgets. In December 2008 the Committee on Climate Change proposed 'interim' carbon budgets covering the five year periods 2008-12, 2013-17, and 2018-22. These budgets, which were subsequently enacted by the UK Government in 2009, require the UK's greenhouse gas emissions in 2020 to be reduced by 34% compared with 1990 levels. In 2011 the UK Government legislated for its fourth carbon budget (covering the period 2023-2027), which necessitates a 50% emissions reduction by 2027 compared with 1990 levels.
The Carbon Plan (DECC, 2011a)	As required under sections 12 and 14 of the Climate Change Act 2008, The Carbon Plan sets out proposed measures to implement the UK's first four carbon budgets and thereby achieve a 50% reduction in the UK's annual net carbon account by 2027 (from 1990 levels). Regarding the electricity sector, the document states that *"by 2050, electricity supply will need to be almost completely decarbonised. Power will be generated largely from renewables and nuclear and fossil fuel stations fitted with CCS technology"* (paragraph 2.145, p70). In relation to renewable energy, paragraph 2.167 declares the UK Government's strong commitment to increase renewable energy generation, with the intention that renewables will provide over 30% of electricity generation by 2020, potentially rising to over 40% by 2030.
UK Fourth Carbon Budget Review (CCC, 2013)	In advance of the UK Government's forthcoming review of the fourth carbon budget, the Committee on Climate Change conducted an analysis of the appropriateness of the fourth carbon budget and published recommendations on 11th December 2013. The overall conclusion of the Committee on Climate Change is that *"there has been no significant change in circumstances as specified in the Climate Change Act and therefore the budget should not and cannot be changed under the terms of the Act"* (CCC, 2013: 8). Thus the Committee recommends that the current target of reducing net carbon emissions by 50% by 2027 compared with 1990 levels should be retained.
Meeting Carbon Budgets - 2014 Progress Report to Parliament (CCC, 2014)	The latest annual progress report from the UK Committee on Climate Change provides an assessment of the UK's decarbonisation performance against statutory carbon budgets. This report concludes that whilst the UK's first carbon budget (2008-2012) was achieved, the "underlying pace" of decarbonisation efforts will be insufficient to achieve more demanding future carbon budgets. The report therefore calls for a strengthening of carbon reduction policies, including the setting of a power sector decarbonisation target for 2030.
Scotland	
A Climate Change Risk Assessment for Scotland (DEFRA/HR Wallingford, 2012)	As part of the wider UK CCRA this technical report outlines the risks from climate change facing Scotland up until 2100. Identified potentially significant threats for Scotland include: 1) *"Changes in soil conditions, biodiversity and landscape as a result of warmer, drier summers.* 2) *Reductions in river flows and water availability during the summer, affecting water supplies and the natural environment.*

Document Title	Summary
	3) *Changes in, or loss of, species with specific threats to native species and migration patterns.* 4) *Changes in coastal evolution affecting people, property, infrastructure, landforms, habitats and species.* 5) *Changes to ocean water temperature and quality, affecting the quality of shellfish and the location of commercial fish stocks.* 6) *Increased risk of pests and diseases affecting agriculture and forestry, and the opportunity for new plants to bring associated new pests and disease causing pathogens.* 7) *Increases in flooding both on the coast and inland, affecting people, property, infrastructure, landforms, habitats and species.* 8) *Increase in insurance losses, ICT disruption and transport network disruption resulting from an increase in the occurrence of extreme weather events.* 9) *An increase in the number of people at risk of death, injury or mental health problems as a result of flooding".*
Climate Change Act (Scotland) 2009	The Climate Change (Scotland) Act 2009 represents Scotland's official response to the threats posed by global climate change. The Act sets binding net carbon emission reduction targets of 42% by 2020 and 80% by 2050 compared with 1990 levels, and also requires Scottish Ministers to meet annual emission reductions targets in line with a trajectory towards the 2050 target. Taken together the Climate Change (Annual Targets) (Scotland) Orders of 2010 and 2011 specify annual emission reduction targets until 2027. In addition, section 44 of the Act requires all public bodies, including planning authorities and the Scottish Government itself, to *"act in the way best calculated to contribute to the delivery of the emissions targets".*
Climate Change Delivery Plan: Meeting Scotland's Statutory Climate Change Targets (CCDP) (Scottish Government, 2009)	This document outlines the high level measures required in each of Scotland's economic sectors to meet the statutory targets imposed through the Climate Change (Scotland) Act up to 2020. It acts as a precursor to the first statutory Report on Proposals and Policies (RPP1) (Scottish Government, 2010b) which sets out how the Scottish Government intends to meet its annual emission reduction targets to 2022. Chapter 2 of the CCDP identifies four transformational outcomes which underpin the Scottish Government's climate change mitigation efforts, one of which is to realise *"a largely de-carbonised electricity generation sector by 2030, primarily using renewable sources for electricity generation…"* (page 7). Chapter 3 of the CCDP addresses electricity generation and demand issues, emphasising the need to generate more low carbon electricity and the requirement to significantly increase renewable energy generation in Scotland. The CCDP explicitly supports the deployment of renewable energy technologies and in particular, identifies the potential of hydro and onshore wind schemes across Scotland.
A Low Carbon Economic Strategy for Scotland (Scottish Government, 2010)	This strategy explains thematically how the Scottish Government intends to transition Scotland's current economy towards a low carbon one. The document observes that *"onshore wind is still the technology that can make the most immediate positive impact on our low carbon economy"* (page 90) and therefore envisages the continued deployment of onshore wind farms. The document makes clear that the Scottish Government will support the deployment of all scales and types of renewable energy technologies in appropriate locations. Importantly, this document includes a commitment to determine section 36 applications for energy infrastructure projects expeditiously.
Low Carbon Scotland - Meeting the Emissions Reduction Targets 2013-2027: the Second Report on Policies and Proposals (RPP2) (Scottish Government, 2013)	Building upon the CCDP (SG, 2009) and the RPP1 (SG, 2010), this report sets out the Scottish Government's proposed actions to meet the statutory emissions reduction targets under the Climate Change (Scotland) Act from 2013 to 2027. The document notes the important role of the Scottish planning system in developing a low carbon economy, stating that *"the reduction of emissions will continue to be a major consideration in the planning system's promotion of sustainable places"* (page 90). This document explicitly states that the Scottish Government's renewable energy targets are intended to be intermediary steps towards a target of achieving a carbon intensity of 50g CO_2/kWh of electricity generation in Scotland by 2030.
Scottish Greenhouse Gas Emissions 2013: Official Statistics Publication (Scottish Government, 2015)	This publication provides the latest available official estimates of greenhouse gas emissions in Scotland for the years 1990 to 2013. The data show that between 1990 and 2013 there was a 34.3 per cent reduction in estimated emissions, attributed largely to a fall in energy supply emissions (including in the production of electricity) and from the waste management sector. In 2013, Scottish emissions of the basket of six greenhouse gases which are controlled under the Climate Change (Scotland) Act 2009 are estimated to be 53 million

Document Title	Summary
	tonnes carbon dioxide equivalent ($MtCO_2e$). This is 3.6 per cent lower than the 2012 figure of 54.9 $MtCO_2e$, a 2.0 $MtCO_2e$ decrease[3].
Reducing Emissions in Scotland 2015 progress report (Committee on Climate Change, 2015)	This document presents a review of the latest available emissions data for Scotland against annual emissions reduction targets. Key findings from this analysis are: 1. Net GHG emissions increased by 0.5% in 2012 and breached the annual statutory GHG emissions target for Scotland by 4.5%. This was attributed to increased heating demand (due to weather conditions) and increased use of coal for electricity generation. 2. Gross GHG emissions in Scotland, including from international aviation and shipping, rose by 0.8% in 2012. This compared favourably to a 2.7% increase in GHG emissions for the UK as a whole. 3. The 2,400MW Longannet coal fired power station, which provides a significant amount of Scotland's electricity generation capacity and contributed to the 2012 emissions data, did not participate in the UK's capacity market auction for 2018/19. In March 2015 ScottishPower Generation announced that the station would close in early 2016.

Climate Change Governance Framework and the Proposed Development

6.2.3 The climate change, scientific, legislative and policy framework summarised in Tables 6.1 and 6.2 raises a number of pertinent issues for the design, planning and assessment of all new developments, including the Proposed Development. In particular, there is a need to:

- Recognise the significance and urgency of required emission reductions at all spatial scales and in all economic sectors. The Proposed Development would contribute to the decarbonisation of Scotland's and the UK's energy generation sector, thereby helping to meet ambitious and binding European, Scottish and UK climate change mitigation targets;
- Understand the importance of local action, including the development of individual renewable energy schemes such as the Proposed Development, as the basis for global climate change mitigation;
- Recognise the need to rapidly transition to a low carbon economy and understand the crucial role of renewable energy schemes such as the Proposed Development in achieving this;
- Understand the roles and responsibilities of planning authorities and the Scottish Government in climate change mitigation actions. The duties of all public bodies in response to climate change are clearly set out within the Climate Change Act (Scotland) 2009, and climate change mitigation is emphasised within national and local planning policy documents as an important material consideration in the determination of energy infrastructure projects such as the Proposed Development (see **Chapter 5 – Planning Policy Context**);
- Identify the likely positive and negative impacts of individual developments on climate change and vice versa, and consider this within all relevant decision making. **Section 6.3** quantifies the energy yield and carbon balance of the Proposed Development and, in doing so, explains how the development would contribute to the decarbonisation of the UK energy generation sector;
- Consider energy infrastructure development as a key area where substantial carbon emission reductions can be achieved through the deployment of renewable energy technologies; and
- Acknowledge that onshore wind energy remains the most technologically mature and commercially feasible renewable energy technology. Consequently the deployment of large

[3] Calculated using the 2015 methodology, which incorporates methodological improvements compared with the methodology used in the equivalent 2014 publication.

scale onshore wind farms such as the Proposed Development forms an essential component of the transition to a low carbon economy.

Renewable Energy

6.2.4 The deployment of renewable energy technologies to decarbonise the UK energy generation sector can be considered primarily as a response to the climate change policy agenda outlined above. However, it is also driven by other socio-economic and environmental factors, including:

- The need to develop new electricity generating capacity to replace ageing thermal and nuclear plants across the UK in order to ensure security of supply and adequate supply to meet the demand; and
- The desire to exploit Scotland's significant renewable energy potential to become the *"green powerhouse of Europe"* (Scottish Government, 2010), thereby boosting inward investment and employment.

6.2.5 The importance of deploying renewable energy technologies is considered within a number of policy documents, several of which include time limited targets for substantial increases in the proportion of energy generated from renewable sources. Relevant policy documents regarding the UK's energy policy framework with respect to renewables are outlined in **Table 6.3**.

6.2.6 It is acknowledged that some of the documents referred to below pre-date the establishment of the current UK Government administration in May 2015. However, successive governments since the turn of the century, including the current UK Government, have consistently confirmed the need to decarbonise the UK's electricity supply through developing a diverse energy mix including onshore wind energy, in order to achieve binding renewable energy and climate change mitigation targets. This longstanding policy position confirms the continued relevance of all of the UK Government policy documents outlined in **Table 6.3**.

Table 6.3 Summary of Renewable Energy Policy Framework

Document Title	Heading
International/European	
IPCC Special Report on Renewable Energy Sources and Climate Change Mitigation (IPCC, 2011)	This report provides a comprehensive literature review and assessment of the costs, benefits and potential impacts of renewable energy technologies. Chapter 7: Wind Energy (pages 535-608) discusses a range of issues related to the deployment of onshore and offshore wind farms and states that wind energy *"is a mature renewable energy source that has been successfully deployed in many countries. It is technically and economically capable of significant continued expansion, and its further exploitation may be a crucial aspect of global GHG reduction strategies..."* (page 542).
European Energy 2020 Strategy (European Commission, 2010)	This document sets out the overall energy policy direction of the EU, which is centred around three objectives: • Security of supply: to minimise the EU's vulnerability concerning imports, shortfalls in supply, possible energy crises and uncertainty of future supply; • Competitiveness: to ensure the effective implementation of the internal energy market; and, • Sustainability: to ensure that the EU addresses climate change by reducing its emissions to a level that would limit global temperature increases to 2°C above pre-industrial levels.
Renewable Energy Directive 2009/28/EC	This legislation requires EU member states to generate 20% of their total energy consumption from renewable sources by 2020 and to publish national strategies for the deployment of renewable energy technologies. The overall renewable energy target is split differentially between Member States, with the target for the UK being that 15% of all energy consumed should come from renewable sources by 2020.
Renewable Energy Progress Report (European Commission, 2015)	This mid-term assessment report reveals that 25 EU countries are expected to have met their 2013/2014 interim renewable energy targets and remain on track to achieve binding renewable energy targets set through Renewable Energy Directive

Document Title	Heading
	2009/28/EC. In 2014, the projected share of renewable energy in gross final energy consumption across the EU stood at 15.3%. However, the report confirms that the UK has fallen short of its EU renewable energy targets since 2013 and is projected to miss its binding renewable energy target for 2020. It therefore calls for member states including the UK to "*assess whether their policies and tools are sufficient and effective in meeting their renewable energy objectives*".
United Kingdom	
The Energy Challenge: Energy Review Report 2006 (DTI, 2006)	This report provides a review of progress towards the goals set out in the 2003 Energy White Paper, one of which was for renewable sources to supply 20% of UK electricity by 2020. Annexe D of this report emphasises the national significance of renewable energy developments.
2007 Energy White Paper: Meeting the Energy Challenge (DTI, 2007)	The UK Government's energy policy has remained consistent for many years and is outlined in this document. It can be summarised as: • "*Tackling climate change by reducing carbon dioxide emissions both within the UK and abroad; and* • *Ensuring secure, clean and affordable energy as we become increasingly dependent on imported fuel*." This document sets out a 'Renewables Statement of Need', which explicitly notes that any scale of development that contributes to the production of renewable electricity is a welcome addition. The White Paper also emphasises that the significant national benefits which accrue from renewable energy generation should be considered as an important material consideration in the determination of relevant planning applications and afforded appropriate weight by decision makers.
The UK Renewable Energy Strategy (HM Government, 2009)	This document implements EU Directive 2009/28/EC on Renewable Energy and supports the achievement of statutory climate change targets under the Climate Change Act 2008. The strategy predicts that the UK will need to generate more than 30% of its electricity from renewable sources by 2020 (115 TeraWatt hours), with wind energy expected to *provide "more than two-thirds"* (pages 10) of this total. The strategy states that: *"Wind power is currently one of the most developed and cost-effective renewable electricity technologies. The UK has the largest potential wind energy resource in Europe"* (pages 28). In addition to the importance of renewable energy for climate change mitigation, the strategy refers to the substantial predicted socio-economic benefits associated with the deployment of renewable energy, including enhanced national energy security.
Renewable Energy Roadmap (DECC, 2011)	The primary objective of the Roadmap is to ensure that 15% of UK energy demand is met from renewable sources by 2020, but also beyond 2020. Specific reference is made to advice from the Committee on Climate Change which concluded that there is scope for renewable energy to meet 30-45% of the UK's electricity demand by 2030. The document states that *"onshore wind could contribute up to around 13 GW by 2020. Achieving this level of capacity equates to an annual growth rate of 13%"* (page 30). Furthermore the document explicitly states that new developments not already in the planning system will be required to meet both the 2020 renewable energy target and longer term decarbonisation objectives.
Overarching National Policy Statement for Energy (EN-1) (DECC, July 2011)	Pursuant to Section 5(9) of the Planning Act 2008, this document sets out UK national policy for new energy infrastructure development. The Statement (paragraph 1.5.2) notes that as energy policy is reserved to the UK Government, this Statement may be relevant in the determination of energy infrastructure proposals within Scotland. Overall the Statement outlines the importance of developing new low carbon energy infrastructure to transition the UK towards a low carbon economy (paragraphs 2.2.5-2.2.6): "*The UK economy is reliant on fossil fuels, and they are likely to play a significant role for some time to come. Most of our power stations are fuelled by coal and gas. The majority of homes have gas central heating, and on our roads, in the air and on the sea, our transport is almost wholly dependent on oil…However, the UK needs to wean itself off such a high carbon energy mix: to reduce greenhouse gas emissions, and to improve the security, availability and affordability of energy through diversification*". In addition the Statement confirms the importance of developing new renewable energy installations including onshore wind farms within the UK's energy mix, as it states (paragraphs 3.3.10-3.3.11): "*As part of the UK's need to diversify and decarbonise electricity generation, the Government is committed to increasing dramatically the amount of renewable*

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	generation capacity…In the short to medium term, much of this new capacity is likely to be onshore and offshore wind…An increase in renewable electricity is essential to enable the UK to meet its commitments under the EU Renewable Energy Directive. It will also help improve our energy security by reducing our dependence on imported fossil fuels, decrease greenhouse gas emissions and provide economic opportunities". Specifically in relation to onshore wind energy, the Statement states unequivocally that "*onshore wind is the most well-established and currently the most economically viable source of renewable electricity available for future large-scale deployment in the UK*". Given that the UK Government has consistently sought to achieve its renewable energy and climate change mitigation targets at least cost, it is therefore evident that new onshore wind energy developments are an essential component of implementing the UK Government's energy policy objectives.
National Policy Statement for Renewable Energy Infrastructure (EN-3) (DECC, July 2011)	Further to EN-1, this National Policy Statement provides further details regarding UK Government policy and the regulatory framework applicable to new onshore wind energy developments with an installed capacity exceeding 50MW, as well as other categories of developments. The Statement (paragraph 2.7.1) reaffirms the maturity of onshore wind energy technologies and the need to deploy new onshore wind energy developments in order to cost effectively achieve binding renewable energy targets.
Annual Energy Statement 2014 (DECC, 2014)	This document provides the most recent comprehensive statement of UK Government energy policy. The document confirms that the objectives of UK energy policy remain consistent with those outlined in the Energy Whitepaper (2007), namely "*ensuring light, power, heat and transport are affordable for households and businesses; providing energy security; and reducing carbon emissions in order to mitigate climate change*". In relation to onshore wind energy, the document notes that this is "*one of the most established and cost-effective renewable technologies*" and therefore the technology has an important role to play in achieving all of the UK Government's energy policy objectives at least cost.
UK Government Written Ministerial Statement: Ending New Subsidies for Onshore Wind (18th June 2015)	This Written Ministerial Statement by the Secretary of State for Energy and Climate Change outlines the current UK Government's commitment to end subsidies for new onshore wind developments. Whilst ending these subsidies the statement recognises the continued importance of both renewable energy generally and onshore wind energy specifically within the UK's energy generation mix, as it states: "*The Government is committed to meeting objectives on cutting carbon emissions and the UK's 2020 renewable energy targets. Onshore wind has deployed successfully to-date and is an important part of our energy mix*". This Written Ministerial Statement explains that the decision to end new subsidies for onshore wind energy developments is based on the current UK Government's view that there is now "*enough onshore wind in the pipeline… for onshore wind to play a significant part in meeting our renewable energy commitments*". However, given that the UK's obligations under Renewable Energy Directive 2009/28/EC remain unmet this approach contradicts the National Renewable Energy Action Plan (paragraph 2.21), which states: "*We cannot be certain that all the projects in the pipeline will be consented or commissioned or that they will progress quickly enough to contribute when needed. This is why the Overarching National Policy Statement for Energy states that there is an urgent need for new large scale renewable energy projects to come forward to ensure that we meet the 2020 target and wider decarbonisation ambitions*". It is considered that the UK government's decision to end new subsidies for onshore wind is premature, contrary to existing national (UK and Scottish) energy policy and not compatible with efforts to achieve binding and time limited renewable energy and decarbonisation targets. As this UK Government decision relates to the financing of developments it is further considered that this decision is not itself a material consideration in the determination of the section 36 application for the Proposed Development.
Digest of UK Energy Statistics 2015 (DECC, 2015)	Against the backdrop of the UK's obligation to generate at least 15% of all energy consumed from renewable sources by 2020, the latest statistics indicate that whilst renewable energy accounted for 19.1% of total electricity generation in 2014, renewable energy (not merely renewable electricity) accounted for just 7.0% of total UK energy consumption in 2013. More positively, 9.5% of the UK's electricity was generated by onshore and offshore wind in 2014: 5.5% from onshore wind and 4% from offshore wind, saving more than 13 million tonnes of carbon emissions. The installed capacity of renewables increased by 24% (to 24.6 gigawatts) in 2014, partly due to a 13% growth in onshore wind capacity. As a result onshore and offshore wind energy installations powered the equivalent of more than 7.6 million British homes in 2014.

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	Owing to the clear deficit between actual renewable energy generation in 2014 (7.0%) and the UK's binding renewable energy target for 2020 (15%) and the very limited time available to close this gap, it is considered likely that the UK will miss this target. This was recognised in the European Commission's latest review of the implementation of Renewable Energy Directive 2009/28/EC (see above). It is therefore clear that additional renewable energy generation capacity, particularly from mature and cost effective technologies which are led principally by onshore wind farms, is required in the short term to meet the UK's binding renewable energy and decarbonisation commitments.
Scotland	
Renewables Action Plan (Scottish Government, 2009)	This document states that in addition to specific targets for renewable electricity generation, the Scottish Government is committed to achieving a target of 20% of total Scottish energy use coming from renewable sources by 2020. The Action Plan sets out a vision for onshore wind development: *"continued expansion of portfolio of onshore wind farms to help meet renewables target, with robust planning framework supporting timely processing of consents applications and ensuring wind farms are consented where they are environmentally acceptable"* (page 77). Importantly, this document clarifies that the Scottish Government's renewable energy targets relate to installed capacity, not consented projects or proposals within the planning system. Thus little weight should be placed upon potential capacity as the focus should be on actually delivering installed capacity. In addition, the renewable energy targets are expressed in terms of a number of MW of installed capacity to be achieved "by" certain dates. Therefore these dates represent end points by which target levels of installed capacity are to be achieved.
2020 Renewables Routemap (Scottish Government, originally published June 2011, updated October 2012 and December 2013)	The 2020 Renewables Routemap declares the ambition of the Scottish Government to generate the equivalent of 100% of Scotland's electricity and 11% of heat demand from renewable sources by 2020. This includes an interim target of generating the equivalent of 50% of gross annual electricity consumption from renewables by 2015. The updated Routemap also commits the Scottish Government to achieving an overall renewable energy target of 30% of total energy consumption by 2020. The document confirms that the Scottish Government has adopted a target to achieve a carbon intensity of 50gCO_2/kWh of electricity generation in Scotland by 2030 (the equivalent of an 83% reduction in carbon intensity). This necessitates rapid and significant transitioning from fossil fuel generation to low carbon generation.
Electricity Generation Policy Statement 2013 (Scottish Government, 2013)	This Statement sets out the vision for electricity generation including the delivery of all Scottish Government's renewable energy targets. Four key principles set out the vision for a desirable electricity generation mix: 1) *"A secure source of electricity supply;* 2) *at an affordable cost to consumers;* 3) *which can be largely decarbonised by 2030;* 4) *and which achieves the greatest possible economic benefit and competitive advantage for Scotland"* (page 7) The Statement states that meeting the 100% 2020 renewable energy target *"will require the market to deliver an estimated 14-16GW of installed capacity"* (paragraph 30). It further states that *"wind power, alongside other forms of onshore and offshore renewables, provides an electricity supply which is largely emissions free, and, because of its decentralised nature, contributes significantly to greater security of supply"* (paragraph 37).
Energy in Scotland 2015 (Scottish Government, 2015)	This report provides a comprehensive statistical overview of the Scottish energy industry, including the renewables sector. It confirms that the contribution of renewables to total electricity generation in Scotland increased to 32% in 2013, the equivalent to approximately 44.4% of Scotland's electricity needs. For the UK, renewable electricity generation in 2013 increased to 15%. In relation to the Scottish Government's target of generating 30% of Scotland's energy consumption from renewables by 2030 and the binding targets for renewable energy generation in 2020 established under EU Directive 2009/28/EC (15% of UK total energy consumption from renewables), renewable energy generation accounted for 11.6% of Scotland's gross final energy consumption but only 4.6% of gross final energy consumption across the UK in 2012. The document notes that as of September 2014 Scotland had 8.7 GW of renewable capacity either under construction or consented, the majority of which comprises onshore and offshore wind generation. Despite this potential project pipeline the report states that "*the Scottish Government recognises that there are a number of*

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	factors which mean that not all the projects consented will progress to commissioning, and the renewable electricity targets remain challenging". These statistics demonstrate that additional renewable energy capacity is needed in order to achieve Scotland's ambitious renewable energy and decarbonisation targets, but also to assist the UK to meet legally binding targets under the Renewable Energy Directive (2009/28/EC) of generating 15% of all energy from renewable sources by 2020.
Scotland's Economic Strategy (Scottish Government, 2015)	Building upon the previous Government Economic Strategy (2011), this document identifies the transition to a low carbon economy, including the deployment of renewable energy technologies, as a "*key aspect*" of the current Economic Strategy for Scotland.
Energy Statistics Summary - March 2015 (Scottish Government, 2015)	This document provides an overview of the key trends emerging from the publication of updated energy generation statistics for Scotland by the UK Department for Energy and Climate Change on 26th March 2015. The document notes that there was 7.2GW of installed renewable electricity generating capacity in Scotland by the end of 2014, representing an increase of 10% from 2013. Renewable electricity generation in Scotland accounted for approximately 29% of total UK renewable electricity generation. Wind energy generation reached a record level of 11,592 GWh in 2014, up 4.0% on 2013.
The Scottish Ministers' response to the UK Government's decision to end new subsidies for onshore wind developments (Scottish Government, June 2015)	In response to the UK Government's decision in June 2015 to end new subsidies for onshore wind developments, the Scottish Government's Energy Minister Fergus Ewing issued multiple statements setting out the continued importance of new onshore wind energy developments to Scotland. • On 28th June 2015 the Minister stated: "*The most recent energy figures show renewables continue to go from strength to strength, with almost half of Scotland's electricity use coming from renewables last year and wind delivering record amounts of power in the first three months of 2015. Scotland accounts for around a third of total UK renewables generation. This makes the recent decision by the UK Government to end the RO next year even more regrettable...The Scottish Government remains committed to the renewable sector and to achieving our target of 100 per cent of our electricity demand through renewables by 2020 and the onshore wind sector is a significant part of that.*" • On 25th June 2015 he stated: "*Onshore wind is one of the most cost effective renewable energies, yet the UK Government's perverse decision to end support puts this hard work and progress in jeopardy and the Scottish Government will continue to argue against it*". These statements demonstrate that the Scottish Government recognises the ability of onshore wind energy to deliver socio-economic benefits whilst effectively decarbonising the energy generation section. As such the Scottish Government supports the continued deployment of onshore wind energy developments in appropriate locations across Scotland.

Renewable Energy Policy Framework and the Proposed Development

6.2.7 The high level of importance afforded to renewable energy within all of the policy documents detailed in **Table 6.3** provides strong support for the deployment of renewable energy schemes including onshore wind schemes such as the Proposed Development. In particular, these policy documents:

- Identify the specific need for renewable energy developments such as that proposed at the Development Site to contribute to the decarbonisation of Scotland's and the UK's energy generation sector. This is essential to achieve ambitious European, Scottish and UK renewable energy deployment targets, in pursuit of wider climate change mitigation targets;
- Recognise the nationally important socio-economic and environmental benefits which can be delivered by exploiting Scotland's significant renewable energy potential;
- Demonstrate that the principle of onshore wind farm development continues to enjoy strong policy support In Scotland. In particular, clear support for renewable energy developments is

evident at the Scottish national policy level within the documents outlined in **Table 6.3** and within planning policy documents outlined in **Chapter 5 – Planning Policy Context**; and

- Acknowledge that onshore wind energy remains the most technologically mature and commercially feasible renewable energy technology for mass deployment in the context of the 2020 targets outlined above. Consequently the deployment of large scale onshore wind farms, such as the Proposed Development, forms an essential component of the transition to a low carbon economy.

6.3 Carbon Savings

6.3.1 Every unit of electricity produced by a wind farm development effectively displaces a unit of electricity which could otherwise have been produced by a conventional coal or gas power station. The displacement of electricity produced by a coal or gas power station by a low carbon technology such as wind turbines would represent a carbon saving.

6.3.2 The installed capacity of a wind turbine is a measure of its maximum rated output, which in the context of the Proposed Development is likely to be a maximum of up to 62.7MW (assuming 19 x 3.3MW machines). Calculations of the likely electricity generation of the turbines are dependent on the 'capacity factor', which involves an assessment of the actual output of the development against its installed capacity[4].

6.3.3 On this basis and with an expected installed capacity of up to 62.7MW, the maximum amount of electricity produced by the Proposed Development has been estimated to be up to 148,298MWh per year based on an expected capacity factor of 27%[5]. A range of capacity factors have been used to calculate carbon dioxide (CO_2) savings as a result of the Proposed Development, shown in **Table 6.4**.

6.3.4 It is widely accepted that electricity produced from wind energy has a positive benefit with regard to reducing CO_2 emissions. However, there has been much debate about the actual level of emissions savings that might arise from a wind farm development. In estimating the actual saving it is important to consider the mix of alternative sources of electricity generation, for example, coal, oil and gas powered. To represent this energy mix, Renewable UK recommend the use of a static figure of 430g of CO_2 saved for every kWh generated (Renewable UK, UKWED Figures explained, 2014). A figure of 430g of CO_2 savings per kWh has therefore been assumed for the purposes of this assessment, with savings of carbon dioxide estimated on the basis of a range of capacity factors.

6.3.5 The Department for Energy and Climate Change (DECC) produces a range of statistics detailing electricity consumption across the UK. The average domestic consumption in Scotland, based on sales per household, was 3,852kWh in 2013 (compared to a UK average figure of 3,940 kWh in 2013) (DECC Regional and Local authority electricity consumption statistics, 2005 to 2013[6]). The average domestic consumption in East Ayrshire in 2013 was 3,477kWh, which is lower than both the Scottish and UK average.

6.3.6 The electricity generated by the Proposed Development will enter the National Grid, and therefore cannot be tracked to the individual consumer, but the electricity is likely to supply demand in the

[4] The net capacity factor of a wind farm is the ratio of its actual energy output (after energy losses within the wind farm have been accounted for) over a defined period of time (typically a year) to its energy output, had it operated at maximum power output continuously, over the same period of time.

[5] It should be noted that the expected capacity factor for the Proposed Development is subject to confirmation following the completion of wind monitoring on-site; however it is considered reasonable to use the figure of 27% as this is the long term average load factor figure for Scotland published by Department of Energy and Climate Change (DECC), Energy Trends Section 6: Renewables (ET6.1 Renewable Electricity Capacity and Generation, June 2015. Capacity factor for Scotland - 27%. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/437811/et6_1.xls

[6] Department of Energy and Climate Change (DECC), Regional and local authority electricity consumption statistics: 2005 to 2013 https://www.gov.uk/government/statistical-data-sets/regional-and-local-authority-electricity-consumption-statistics-2005-to-2011 last accessed 20/05/15

geographical area of the grid connection point. Therefore, it is relevant to consider electricity demand in the vicinity of the Proposed Development (i.e. within East Ayrshire).

6.3.7 The potential electricity generation and 'Homes Equivalent' electricity generation (based on 3,477kWh annual domestic consumption in East Ayrshire) are provided in **Table 6.4.** The potential CO_2 savings as a result of the Proposed Development generating electricity instead of conventional power stations, with an assumed 430g CO_2 per kWh generated, are also presented. Results are presented for a range of assumed capacity factors.

Table 6.4 Potential CO_2 Savings and Electricity Generation

Capacity Factor (%)	Electricity Generation (MWh per year)[7]	Homes Equivalent (based on average East Ayrshire consumption of 3,477kWh)	Carbon dioxide savings (Tonnes of CO_2 per year) based on Renewable UK savings figure (electricity generation x 0.43)
22	120,835	34,753	51,959
27	148,298	42,651	63,768
34	186,745	53,709	80,301

6.4 Carbon Storage and Emissions

6.4.1 The site is largely underlain by peat, which is a carbon "sink" (i.e. carbon is stored in the peat) that supports blanket bog vegetation. Blanket bog represents a large source of terrestrial carbon storage which is becoming increasingly more important in light of climate change mitigation through European and UK targets for reducing greenhouse emissions. In order for blanket bog to be active (i.e. laying down peat and therefore functioning as a carbon sink) it is dependent on a number of very specific conditions including sufficient rainfall, suitable temperature and topography along with limited human management activity that may be damaging (such as drainage, burning, forestry, and/or livestock grazing).

6.4.2 Active blanket bog is very sensitive to land use changes and is a Scottish Biodiversity list and UK Biodiversity Action Plan habitat as well as being listed on Annex I of the EC Habitats Directive (see **Chapter 11 - Ecology**).

6.4.3 Large-scale wind farm developments on peatlands may result in a negative impact on blanket bog habitats if not appropriately considered during scheme design and development. Changes to the peatland habitat through development could reduce carbon storage capability and increase CO_2 release from disturbed organic soil, thereby increasing the CO_2 payback time and reducing overall net carbon benefits of the Proposed Development.

6.4.4 At Enoch Hill, most of the blanket bog vegetation shows signs of being degraded due to agricultural management (see **Chapter 11 - Ecology**) and it is therefore uncertain whether the site of the Proposed Development supports active blanket bog. Nevertheless, excavation of peat to construct the Proposed Development will result in a reduction in carbon storage/increase CO_2 release from disturbed organic soil; and this carbon loss needs to be accounted for in the carbon balance and payback calculations.

6.4.5 The Proposed Development has been designed to minimise the excavation of peat as far as possible (see **Chapter 3 - Site Selection and Design Evolution**). Nevertheless, the construction will involve disturbance of a volume of peat. This is quantified within a Peat Management Plan (PMP) (**Appendix 6.A**), which also demonstrates how all excavated peat can be reinstated within the site following construction. In addition to setting out a range of control measures for in-situ peat

[7] For example using a 27% capacity factor, figures are derived as follows: 62.7MW (19 × 3.3MW turbine) × 8,760 hours/year × 0.27 (capacity factor) = 148,298MWh

protection, peat stripping and excavation, temporary peat stockpiling and reinstatement, the PMP also sets out methods for monitoring and inspection to maintain the integrity of the excavated peat.

6.4.6 In addition to reduced carbon storage and increased CO_2 release from disturbed organic soil caused by the excavation of peat, there are also carbon emissions associated with the construction, servicing, maintenance and decommissioning of a wind farm development. Carbon loss in terms of emissions also needs to be accounted for in the carbon balance and payback calculations.

6.5 Carbon Balance and Payback Calculation

6.5.1 The calculation of the carbon balance provides a mechanism by which the carbon losses can be weighed against the carbon savings attributable to the wind farm during its lifetime. This calculation is summarised as the length of time (in years) that it will take the carbon savings to balance the carbon costs and is referred to as the 'payback period'. This information can then inform decision makers of the performance of a wind farm development in terms of overall carbon savings.

Stakeholder Consultation

6.5.2 SEPA provided a scoping response (29 November 2012) which stated: "*Where the proposed infrastructure will impact upon peatlands, a detailed map of peat depths (this must be to full depth) should be submitted. The peat depth survey should include details of the basic peatland characteristics. By adopting an approach of minimising disruption to peatland, the volume of excavated peat can be minimised and the commonly experienced difficulties in dealing with surplus peat reduced. The generation of surplus peat is a difficult area which needs to be addressed from the outset given the limited scope for re-use. The ES or planning submission should detail the likely volumes of surplus peat that will be generated, including quantification of catotelmic and acrotelmic peat, and the principles of how the surplus peat will be reused or disposed of"*. These issues are dealt with in **Appendix 6.A: Peat Management Plan, Appendix 6.B: Peat Slide Risk Assessment and Appendix 6.C: Carbon Balance – Average Peat Depth Calculations Spreadsheet**).

6.5.3 In addition, the SEPA scoping response stated: "*In line with Scottish Planning Policy and government guidance, we recommend that the ES or planning submission contains a section systematically assessing carbon balance. This assessment should quantify the gains over the life of the project against the release of carbon dioxide during construction. It should include all elements of the proposal, including borrow pits, construction of roads/tracks and other infrastructure and loss of peat bog"*. This has been undertaken and the results of the carbon balance and payback calculations are presented below, in **Appendix 6.D: Carbon Calculator Spreadsheet** and in **Appendix 6.E: Carbon Calculator - Justification for Values Used.**

6.5.4 In their scoping response of 18 December 2012, SNH stated that: "appropriate field surveys should be undertaken to determine the extent of peat deposits as part of the Environmental Impact Assessment (EIA) process and to inform site design and layout. If peat is found to be present on site, we would expect the applicant to carry out a peat stability assessment. It is important that Peat Depth Surveys and Peat Slide Risk Assessments are as extensive as necessary to capture and assess all relevant areas. The assessment should include turbine, infrastructure and laydown locations, plus the access tracks and any borrow pits. We also strongly recommend early engagement with SEPA with regard to excavated peat reuse and disposal". These issues are dealt with in **Appendix 6.A: Peat Management Plan, Appendix 6.B: Peat Slide Risk Assessment and Appendix 6.C: Carbon Balance – Average Peat Depth Calculations Spreadsheet**.

6.5.5 In their scoping response of 18 December 2012, RSPB stated: "In addition to their value as habitats that support a range of breeding and wintering birds, we are concerned by the potential impacts on peat habitats. The impacts from both a habitat and carbon storage perspective must be fully assessed in the ES". Ecological issues are addressed in **Chapter 11 - Ecology** and the results of the carbon balance and payback calculations are presented below, in **Appendix 6.D:**

Carbon Calculator Spreadsheet and in **Appendix 6.E: Carbon Calculator - Justification for Values Used**.

Methodology

6.5.6 Climate Change mitigation for the Proposed Development has been addressed initially through the reduction of peat excavation at the design stage as discussed in **Chapter 3 - Site Selection and Design Evolution**. This was completed by first carrying out an assessment of the extent of peat present on the Development Site through extensive peat depth surveys. Details of the depth and extent of peat is provided in the Peatslide Risk Assessment (**Appendix 6.B**) and the findings of this report were taken into consideration during the wind farm design process in order to minimise the disturbance of peat and the risk of peatslide through careful siting of wind turbines and associated infrastructure.

6.5.7 The Peat Management Plan (PMP) for the Proposed Development (**Appendix 6.A, Peat Management Plan**) outlines the estimated volumes of excavated peat associated with the Proposed Development. It also includes control measures to protect peat, including temporary storage and restoration, which are designed to minimise potential peat waste. The peat excavation calculations completed for the PMP, such as for borrow pits, foundations, hardstandings and access tracks, have been incorporated into the carbon balance calculations where appropriate.

6.5.8 In 2003, SNH produced a Technical Guidance Note (TGN) discussing the likely carbon savings associated with wind farm developments on areas of blanket bog and forests. The TGN was expanded in 2008, when the Scottish Government published *Calculating carbon savings from wind farms on Scottish peat lands - A New Approach*, providing an in-depth approach to calculating the carbon savings from wind farms on Scottish peat lands (Nayak *et al*, 2008; 2010). This carbon calculator has since been used increasingly by developers to determine the lifecycle carbon balance of wind farm developments. In 2011, the Scottish Government supported further development of the carbon calculator tool (referred to as the Nayak analysis). An assessment has been carried out in accordance with the guidance provided by the authors of the carbon calculator tool (Nayak *et al*, 2010) as well as guidance provided by the Scottish Government (Scottish Government 2011c and 2011d) and this is presented in the following paragraphs.

6.5.9 This assessment is based upon carbon balance figures calculated using the latest carbon calculator (protected excel spreadsheet version 2.9.0, March 2014). The calculator compares the potential annual rate of emissions savings due to displacement of other fuel sourced electricity (grid-mix, coal-fired and fossil fuel-mix). Both the coal-fired and fossil-fuel mix emission figures are based on historic averages from Digest of UK Energy Statistics which smooths out anomalies due to weather, cost and other variables. The most widely accepted emission figure for assessing carbon payback is the grid mix which includes electricity generated from renewable sources, nuclear power and fossil fuels. This also has an element of future generation factored in, as advised by DECC. It is considered that coal-fired and grid-mix emissions represent the best-case and worst-case scenarios, respectively, and these are presented in **Appendix 6.D**, **Carbon Calculator Spreadsheet**.

6.5.10 A table showing the justification for each value entered into the carbon balance calculator is provided in **Appendix 6.E**, **Carbon Calculator - Justification for Values Used**. A spreadsheet setting out the relevant calculations is included in **Appendix 6.C, Carbon Balance – Average Peat Depth Calculations Spreadsheet**.

6.5.11 The following sections outline the specific values for the carbon losses and carbon gains associated with the Proposed Development. For each input parameter, an expected, minimum and maximum value is requested to provide an expected, best case and worst case scenario for the carbon payback. For the Proposed Development, a turbine capacity of up to 3.3MW has been input with up to 19 as the number of turbines for the best case and worst case scenarios.

Carbon Cost/Losses

6.5.12 The manufacturing, construction and installation (including concrete) of the wind turbines at the Development Site has an associated carbon cost. Using figures quoted in Nayak et al (2011), the carbon emissions for the expected case for 3.3MW turbines associated with the manufacture, construction and decommissioning of the 19 turbines, is 49,830 tonnes CO_2 equivalent (t CO_2e), which equates to approximately 32% of total CO_2 losses.

6.5.13 The carbon payback model attributes carbon losses due to the requirement for extra capacity to back up wind power generation at times of peak demand. This is quantified as a percentage of total capacity, which was input as 5% for this case (the recommended figure within the model), and equates to 48,128 t CO_2e (i.e. approximately 30% of total carbon dioxide losses).

6.5.14 Carbon losses associated with CO_2 release from soil organic matter for the expected case amount to 59,102 t CO_2e which equates to approximately 37% of total carbon dioxide losses. These losses result from peat removal and drainage effects following excavation of peat for items of infrastructure, notably turbine foundations, hard standings and access tracks, as well as borrow pits. It is worth noting that this figure assumes 100% loss of CO_2 from removed/disturbed peat, as this is the default value within the carbon model and cannot be amended. In reality, losses are likely to be considerably less than this, as it is expected that all of the peat will be used in reinstating the Development Site (see the PMP, **Appendix 6.A**).

6.5.15 Further carbon losses are generated by the reduction of carbon fixing potential which occurs due to the loss of bog plants as a result of wind farm construction. For the expected case, this is 1,057 t CO_2e, which equates to approximately 1% of total carbon dioxide losses.

Carbon Gains

6.5.16 There are no carbon gains due to bog restoration or early removal of drainage from foundations and hardstandings. Within the PMP (see **Appendix 6.A**) it is predicted that all peat will be re-used within the Proposed Development for habitat reinstatement.

6.6 Carbon Payback of the Development

6.6.1 To calculate the carbon payback period, Nayak *et al* 2011 use three different fossil fuel displacement scenarios (see **Appendix 6.D**):

- Grid mix, the mix of electricity sources supplying the UK as a whole;
- Coal fired for coal fired electricity generation; and
- Fossil fuel mix for fossil fuel sourced electricity generation alone.

6.6.2 Nayak *et al* 2011 recommend using the fossil fuel sourced grid mix scenario as the most appropriate for calculating the carbon payback time (the counterfactual). Based on this scenario, the payback for the Proposed Development is predicted to be 1.5 years for the expected outcome. The payback period could be as low as 0.6 years for the best case scenario, but increases to 3.6 years for the worst case scenario. The carbon payback for each scenario is shown in **Table 6.5** below.

Table 6.5 Payback in years for each Scenario used in the Carbon Calculator

Fuel source	**Carbon payback time (yrs.) Expected outcome**	**Carbon payback time (yrs.) Best case scenario**	**Carbon payback time (yrs.) Worst case scenario**
Coal fired	1.2	0.5	2.8
Grid mix	2.3	0.9	5.5

Fuel source	Carbon payback time (yrs.) Expected outcome	Carbon payback time (yrs.) Best case scenario	Carbon payback time (yrs.) Worst case scenario
Fossil fuel mix	1.5	0.6	3.6

6.7 Summary

6.7.1 The calculation of carbon balance and payback has been based on the expected values where site specific data are available and worst case assumptions where they are not.

6.7.2 It is predicted that the carbon loss in developing the Proposed Development will be paid back in ~1.5 years (~6% of the 25 year operational life) based upon the fossil fuel mix and the expected outcome. Even considering the worst case scenario, the Proposed Development will have achieved the carbon balance within ~3.6 years (14% of the 25 year operational life).

6.7.3 On the basis of potential annual CO_2 savings of 63,768 tonnes/year (based on figure of 430g of CO_2 savings per kWh and a conservatively estimated capacity factor of 27%), the Proposed Development could result in a total carbon saving of approximately 1.6M tonnes over its 25 year operational life, and generate electricity to annually supply the equivalent of 42,651 average homes in East Ayrshire.

6.8 References

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7. Noise

7.1 Non-Technical Summary

7.1.1 An assessment considering noise arising from the construction, operation and decommissioning of the Proposed Development has been undertaken. For each phase of the Proposed Development, the assessment considers compliance with the appropriate noise limit(s).

7.1.2 Construction noise effects would be temporary and intermittent during the anticipated 12 month construction programme, and not continuous. Construction noise effects can generally be controlled by following standard industry practices, including set construction working hours, which would be controlled by conditions. The assessment shows that the separation distance between the construction areas and access routes and receptors is sufficient to ensure that any construction noise effects will not cause undue disturbance during the main periods of activity. It is assumed that decommissioning noise will be generally less or, at worst, similar to that experienced during the construction period. Therefore, no significant effects are anticipated with respect to noise from construction and decommissioning activities.

7.1.3 Operational noise was assessed in accordance with ETSU-R-97: *The Assessment of Rating of Noise from Windfarms,* as recommended by The Scottish Government. The assessment was based upon an assessment 'envelope' of turbine noise emissions, which considered a number of potential wind turbine models suitable for the Proposed Development and used the highest noise level at each wind speed. Predicted noise levels from the Proposed Development at each of the assessed receptors were found to be at least 6.0 decibels (dB) below the associated daytime noise limits. During the night-time period, margins of at least 9.0dB were shown. Therefore, the Proposed Development will have no significant noise effects upon nearby residential receptors.

7.1.4 The operational noise assessment also considered potential cumulative noise effects resulting from existing, consented and proposed wind farm developments. The cumulative noise assessment demonstrated that even when all residential receptors are downwind of all wind projects operating concurrently, predicted turbine noise emissions would be more than 3.0dB below the relevant noise limit at each assessed sensitive receptor. This is a precautionary approach/conclusion as, in reality, it is not possible for all receptors to be downwind of all wind farms at any one time as a result of their distribution across the landscape. No significant cumulative noise effects were predicted.

7.1.5 In conclusion, it is considered that the Proposed Development will comply with all relevant standards and guidelines designed to protect residential amenity in respect of noise, and will therefore not result in any significant noise effects.

7.2 Introduction and Overview

7.2.1 This chapter assesses the potential effects of noise from the Proposed Development on existing noise-sensitive residential areas in the vicinity of the Development Site. It should be read with reference to the scheme description in **Chapter 4 - Description of Proposed Development**.

7.2.2 Noise can have an effect on the environment and on the quality of life enjoyed by individuals and communities. Noise is often therefore an important consideration in the determination of planning applications. This assessment considered the likely noise effects predicted to arise during the construction, operation and decommissioning of the Proposed Development.

7.2.3 Construction noise effects are normally of a temporary nature and result from both moving and static sources. Assessment allows the temporary impact of construction noise to be understood and for suitable mitigation measures to be identified to minimise any potential significant adverse effects.

7.2.4 When operational, wind turbines emit two types of noise – mechanical noise and aerodynamic noise. The main sources of mechanical noise are from internal components housed within the

nacelle, such as the gearbox and generator. Mechanical noise from a modern wind turbine is negligible, as the nacelles are insulated to reduce noise emissions and the various mechanical components housed within the nacelle are acoustically isolated to prevent structure-borne noise. Aerodynamic noise occurs from the movement of the blades passing through the air. At higher wind speeds, aerodynamic noise is usually masked by the increasing sound of wind blowing through trees and around buildings. The level of masking determines the perceived audibility of the wind farm. This noise impact assessment established the relationship between wind turbine noise and the natural masking noise and assesses levels against established standards.

7.2.5 This noise assessment included an assessment of operational noise from the Proposed Development, and also considers the cumulative effects from existing, consented and proposed wind farms. The assessment methodology adopted, including proposed monitoring locations, has been agreed with the relevant Environmental Health Officer (EHO) at East Ayrshire Council (EAC).

7.2.6 Following a summary of relevant policy and legislation, this chapter describes the adopted assessment methodology, the overall baseline conditions and how the design of the project evolved (embedded mitigation, see **Section 2.2.4** for a definition of this term) from a topic specific viewpoint. The scope of the assessment and a detailed assessment of the likely significant effects are presented, along with details of any environmental measures required to avoid, minimise, mitigate or compensate for any remaining adverse noise effects. The chapter concludes with a summary of residual noise effects and an evaluation of their significance following the incorporation of these environmental measures (applied mitigation) into the project.

7.2.7 A list of relevant terminology and abbreviations used in the chapter are presented in **Appendix 7.A**.

7.3 Methodology and Approach

Policy and Legislative Context

7.3.1 The key national guidance document, which provides guidelines on the assessment of noise in Scotland, is Planning Advice Note 1/2011 (PAN 1/2011) issued in March 2011 (Scottish Government, 2011). PAN 1/2011 does not aim to provide a definitive source of guidance on noise issues, however it does set out the range of noise issues that determining authorities need to be aware of in formulating development plans and making decisions on planning applications. With regards to the noise effects of wind farms it states:

"Good acoustical design and siting of turbines is essential to minimise the potential to generate noise".

7.3.2 The web based renewables advice, referred to within PAN 1/2011, is regularly updated by The Scottish Government and gives specific advice in relation to noise emanating from on-shore wind turbines, stating:

"The Report, "The Assessment and Rating of Noise from Wind Farms" (Final Report, Sept 1996, DTI), (ETSU-R-97) describes a framework for the measurement of wind farm noise, which should be followed by applicants and consultees, and used by planning authorities to assess and rate noise from wind energy developments, until such time as an update is available. This gives indicative noise levels thought to offer a reasonable degree of protection to wind farm neighbours, without placing unreasonable burdens on wind farm developers, and suggest appropriate noise conditions."

7.3.3 Consequently, the assessment methodology adopted was that found in the ETSU-R-97 Guidance: The Assessment of Rating of Noise from Wind Farms (1996) ("ETSU-R-97 Guidance"). The advice presented in the ETSU-R-97 Guidance was produced by the Working Group on Noise from Wind Turbines, a body comprising a number of interested parties including, amongst others, wind farm operators, Environmental Health Officers, acoustic consultants and legal experts. The assessment approach was developed to address the shortcomings of other standards in addressing wind farm noise.

7.3.4 **Table 7.1** details the planning policy and guidance relevant to this noise assessment.

Table 7.1 Relevant planning policy and guidance

Policy / Guidance Reference	**Policy / Guidance Issue**
National Planning Advice	
Planning Advice Note 1/2011	PAN 1/2011 provides general guidance and advice on the role of the planning system in helping to prevent and limit the adverse effects of noise.
Ayrshire Joint Structure Plan	
Ayrshire Joint Structure Plan – Addendum to the Structure Plan Technical Report TR03/2006 (2009)	A report which advises councils on wind farms in Ayrshire. The report recommends a turbine separation distance of 700m and that properties in the vicinity of a wind farm should not experience noise levels, due to the wind farm, in excess of 35dB(A) under all wind conditions.
Guidance Relating to Construction Noise	
BS5228:2009+A1:2014 'Noise Control on Construction and Open Sites' Part 1: Noise	Detailed guidance on assessing noise from construction sites.
Guidance on the Assessment of Noise from Wind Farms	
ETSU-R-97, *'The Assessment and Rating of Noise from Wind Farms'*, The Working Group on Noise from Wind Turbines	Information and advice to developers and planners on the environmental assessment of noise from wind turbines. The guidance offers a framework for the measurement of wind farm noise and gives indicative noise levels that offer a reasonable degree of protection to wind farm neighbours.
Institute of Acoustics *'A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise'*	A good practice guide (GPG) produced by a noise working group setup by the Institute of Acoustics (IoA) presenting current good practice in the application of ETSU-R-97 assessment methodology for wind turbine developments above 50kW.

Consultation

7.3.5 EAC provided a response to Amec Foster Wheeler's Request for a Scoping Opinion confirming that a noise assessment taking into account *'the requirements of ETSU, BS 4142 and the WHO Guidelines'* is required. The noise assessment is also required to assess noise impacts during the construction and operation of the Proposed Development.

7.3.6 A further consultation response from EAC (Mr Billy Gilchrist, EHO) on 26th May 2014, confirmed the acceptability of Amec Foster Wheeler's proposed assessment methodology, including the proposed baseline noise monitoring locations and that the operational noise assessment would be based upon the methodology outlined within ETSU-R-97 Guidance, as recommended within the Scottish Governments' web based renewables advice. Additional assessments of operational noise taking into account the requirements of *'BS 4142 and the WHO Guidelines'*, as per EAC's Scoping Response, were therefore not necessary.

7.3.7 As a result of these discussions, the following assessment methodologies and scope were agreed:

- An assessment of construction noise would follow guidance presented within BS 5228:2009 *'Code of practice for noise and vibration control on construction and open sites – Part 1: Noise'* (now superseded by BS 5228:2009+A1:2014)*;*
- An assessment of operational noise should adopt a daytime noise limit in the range of 35-40dB $L_{A90,\ 10min}$ (or background + 5dB, whichever is greater) with a night-time noise limit of 43 dB $L_{A90,\ 10min}$ (or background + 5dB, whichever is greater), as advocated within the ETSU-R-97 Guidance;

- The assessment of operational noise could adopt a fixed limit of 45dB $L_{A90, 10min}$ (or background + 5dB, whichever is greater) for properties where the occupier of the property has some financial involvement in the wind farm; and
- An assessment of operational noise should consider the likely cumulative noise impacts at receptors from the existing, consented and proposed wind farms in close proximity of the development.

7.3.8 Due to the magnitude of the separation distances involved, vibration effects during construction and operation of the Proposed Development were scoped out and no such assessments were undertaken.

7.3.9 In addition, due to the temporary nature of the construction phase, increased noise impacts at sensitive receptors from HGVs using the public road network would be predicted to be small. A detailed noise assessment relating to construction traffic movements on the local road network was therefore not undertaken. However, an assessment of noise impacts from construction related HGV using the Proposed Development's access routes has been undertaken. The results of this assessment are presented within this chapter.

7.3.10 Further consultations were undertaken with EAC (Mr Billy Gilchrist, EHO) on 18th June 2014 as Amec Foster Wheeler had been unable to secure access to deploy noise monitoring equipment at a property to the north of the Proposed Development (Maneight). Mr Gilchrist confirmed that EAC would accept noise measurements at Meikle Hill, also to the north of the Proposed Development, as being representative of those at Maneight, and thus it could be considered an acceptable proxy location.

Methodology for Establishment of Effects

Construction Noise Modelling

7.3.11 It is anticipated that the overall duration of the construction stage of the Proposed Development will be approximately 12 months. During the construction period, a range of different activities could take place within the Development Site, for example, delivery of materials, upgrading and creation of access tracks, installation of a temporary construction compound, installation of turbine foundations, construction of control building compound, potential borrow pits and turbine installation. More detail on these activities is provided in **Chapter 4 - Description of Proposed Development**.

7.3.12 The precise construction methodology for the Proposed Development will not be finalised until such time as a construction contractor is commissioned, and as such, the actual plant to be used is unknown. The plant list given in **Table 7.2** was therefore based upon the intended construction programme by the applicant as set out in **Chapter 4 - Description of Proposed Development**. The noise emission data quoted was taken from BS5228-1:2009+A1:2014.

Table 7.2 Construction Plant Source Data

Plant	dB L_{Aeq} at 10m	Mobile/ Fixed Plant	Number	Total Sound Power Level, L_{WA} dB(A)
Construction of new access routes and hardstanding areas (including junction improvements, construction of on-site tracks, plus construction of hardstanding areas for the construction compound, control building and borrow pits)				
30 t tracked excavator	75	Mobile	1	103
23 t Articulated Dump Truck (ADT)	74	Mobile	1	102
Site dumper	76	Mobile	2	107
Bulldozer	75	Mobile	1	103

Site access				
Road breaker (handheld pneumatic) + compressor	82	Mobile	1	110
Bulldozer	75	Mobile	1	103
Asphalt paver (+ tipper lorry)	75	Mobile	1	103
Vibrating roller	74	Mobile	1	102
Turbine foundation construction				
30 t tracked excavator	75	Mobile	1	103
ADT (tipping fill)	74	Fixed	2	105
ADT (moving)*	81	Mobile	2	112
Site dumper*	76	Mobile	2	107
Large rotary bored piling rig	83	Mobile	1	111
70 t mobile crane	70	Mobile	1	98
Concrete mixer truck	80	Mobile	2	111
Diesel generator	74	Fixed	2	105
Vibrating poker	69	Fixed	2	100
Turbine erection				
120 t crane	67	Fixed	1	95
600 t mobile crane	71	Mobile	1	99
Articulated HGV	81	Mobile	3	114
Diesel generator	65	Fixed	1	93
Borrow pits				
30 t tracked excavator	75	Mobile	1	103
ADT (tipping fill)	74	Fixed	2	105
ADT (moving)*	81	Mobile	2	112
Site dumper*	76	Mobile	2	107
Large rotary bored piling rig	83	Mobile	1	111
70 t mobile crane	70	Mobile	1	98
Concrete mixer truck	80	Mobile	2	111
Diesel generator	74	Fixed	2	105
Vibrating poker	69	Fixed	2	100
Tracked Drill Rig	84	Mobile	1	115
Haulage road use				
HGV	77	Mobile	18 per hour	105
Vibrating roller	74	Mobile	1	102

7.3.13 Predictions of noise emissions have been carried out for the various phases of construction work noted in **Table 7.2**, assuming 50% hard ground between receptors and the plant, and that the plant would operate at the point of closest approach to each receptor. It has been assumed within the calculations that all mobile plant would operate 66% of the time, and all fixed plant 100% of the time. This is considered a 'worst-case' scenario.

7.3.14 It is assumed that decommissioning noise should be generally less or, at worst similar to that experienced during the construction period, for instance, the use of borrow pits or piling activities would not take place It is therefore assumed that noise effects relating to the decommissioning of the Proposed Development would be no more significant than those experienced during construction; provided similar restrictions on working hours and transport routes are applied.

Operational Noise Modelling

Research Background

7.3.15 In May 2013, the Institute of Acoustics (IoA) published '*A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise'* (IoA GPG). The IoA GPG is as a result of a comprehensive public consultation process, and was produced and peer reviewed by a number of noise consultants who act on behalf of both developers and opponents of wind farms, some of whom sat on the ETSU-R-97 Noise Working Group.

7.3.16 The use of the IoA GPG in the assessment of wind turbine noise has been endorsed by Scottish Government. John Swinney MSP, Cabinet Secretary for Finance, Employment and Sustainable Growth, stated in a letter to the IoA on 29th May 2013:

'In view of the careful, expert work and consultation that has informed the Good Practice Guide, I am happy to accept that it represents current industry good practice.'

7.3.17 Whilst the IoA GPG does not examine the noise limits set out within the ETSU-R-97 Guidance, it does present good practice in its application for wind developments greater than 50kW. The assumptions listed in the section below are all confirmed within the IoA GPG as the correct approach to modelling wind turbine noise emissions.

7.3.18 In line with the IoA GPG, the model used in this assessment was based upon that found in ISO 9613-2 *'Acoustics - Attenuation of sound during propagation outdoors'* (ISO, 1996). The model considered:

- Geometric divergence (attenuation with distance);
- Air absorption;
- Barriers (including buildings or topography);
- Screening (including vegetation); and
- Ground absorption and reflection.

7.3.19 The ISO 9613-2 algorithm has been chosen as being the most robust prediction method; based on the findings of a joint European Commission research project into wind farm noise propagation over large distances. According to this research, this model (like all the others considered in the research) tends to over-estimate noise levels at nearby dwellings, rather than under-estimate them. The conclusion of the study was that the ISO 9613-2 algorithm tended to predict noise levels that would generally occur under downwind propagation conditions.

7.3.20 Another important outcome of the research demonstrated that under upwind propagation conditions, between a given receiver and the wind farm, the wind farm noise level at that receiver will be as much as 10dB(A) to 15dB(A) lower than the level predicted based on ISO 9613-2.

Operational Noise Modelling for the Proposed Development

7.3.21 For the purposes of the assessment, noise level predictions have been based upon the following assumed model parameters, all of which are advocated within the IoA GPG:

- A receiver height of 4.0 metres above local ground level – to represent the height of a typical bedroom window;
- Mixed ground (G = 0.5) – this represents a ground cover that has equal amounts of fully reflective and fully absorptive character. For the purposes of this assessment, mixed ground represents a ground cover that is as equally absorptive of noise as it is reflective;
- Air absorption based on a temperature of 10°C and 70% relative humidity;
- $L_{A90,\ 10min}$ is 2dB less than $L_{Aeq,\ 10min}$ for wind farm noise; and
- Predicted turbine noise levels inclusive of any 'Canyon Effect' penalty (discussed below).

7.3.22 An assessment of cumulative noise impacts at sensitive receptors has included wind developments that are likely to produce noise levels within 10dB of those from the Proposed Development. Conversely, where it has been demonstrated that the Proposed Development is likely to produce noise levels at least 10dB lower than those of an existing or proposed development, then the impact of the Proposed Development upon cumulative noise immissions at that receptor is considered negligible. This approach is advocated within the IoA GPG. The developments considered are discussed in **Section 7.8**.

Canyon Effect

7.3.23 The IoA GPG recommends that a noise correction should be applied in circumstances where the intervening terrain height between a proposed wind development and sensitive receptors drops away significantly. The correction is to account for the effective decrease in ground absorption at higher propagation paths. Where a 'canyon effect' is shown to occur a penalty of 3dB (or 1.5dB if a ground absorption factor of 0 is being used) is applied to the overall predicted noise level at receptors.

7.3.24 An analysis of the terrain surrounding the proposed development using Ordnance Survey Landform Panorama 50m digital terrain data indicated some of the properties surrounding the Proposed Development would qualify for the 'canyon effect' penalty. A suitable penalty of 3dB has therefore been applied to the predicted turbine noise levels from the offending turbines at these locations.

Significance Evaluation Methodology

Overview of Construction and Decommissioning Noise Assessment Procedure

7.3.25 For construction phase emissions, it is standard industry practice to refer to the guidance relating to acceptability presented within British Standard BS 5228:2009+A1:2014 *'Code of Practice for Noise and Vibration Control on Construction and Open Sites – Part 1:Noise'* . The appropriate noise limit for a project in an area such as the Development Site would be 65 dB $L_{Aeq,\ 12h}$ (or $L_{Aeq,\ T}$) during the daytime (07:00-19:00 weekdays, 07:00-13:00 Saturday). The limit is applicable to all construction activities taking place on site, including all fixed and mobile plant operations associated with the Proposed Development, and including the movement of HGVs on site.

Overview of Operational Noise Assessment Procedure

7.3.26 ETSU-R-97 Guidance advises (Paragraph 4, page 4) within the context of wind energy::

"The planning system must therefore seek to control the environmental impacts from a wind farm whilst at the same time recognising the national and global benefits that would arise through the

development of renewable energy sources and not be so severe that wind farm development is unduly stifled."

7.3.27 The EIA Regulations require that all likely 'significant' effects are identified. The majority of noise related guidance and standards (including the ETSU-R-97 Guidance) are not directly related to the concepts of 'significant' and 'not significant' that underpin the EIA process. However, for the purposes of this assessment, the determination of effect significance for each phase of the development is based upon compliance with the applicable noise limit; i.e. breach of the noise limits indicates a 'significant' effect, whereas compliance with noise limits indicates a 'not significant' effect. As noise levels exceeding the ETSU-R-97 Guidance noise limits are deemed to be 'significant', they would require further consideration with a view to appropriate mitigation being identified.

7.3.28 ETSU-R-97 Guidance provides a simplified approach if predicted operational noise at receptors is limited to an $L_{A90,10min}$ of 35dB in wind speeds up to 10ms^{-1} at 10m height. Preliminary modelling for the Proposed Development indicated that operational noise was likely to exceed this threshold at a number of surrounding properties. The ETSU-R-97 Guidance therefore recommends that wind farm noise limits should be set relative to existing background noise levels, subject to a fixed minimum limit, and that these limits should reflect the variation in background noise with wind speed. The wind speeds that should be considered range from the wind turbine 'cut-in' speed (i.e. the wind speed at which the turbine begins to operate, typically 4ms^{-1}) up to 12ms^{-1}, the point at which wind turbines are usually at or above 95% of their rated power and thus no significant increases in noise emission from the turbines are expected beyond this speed. Wind speeds are referenced to a 10m measurement height (V_{10}) on the wind farm site.

7.3.29 The daytime noise limit is derived from background noise data measured at residential properties during the 'quiet daytime', as defined in the ETSU-R-97 Guidance, which comprises:

- Weekday evenings from 18:00 - 23:00; plus
- Saturday from 13:00 - 23:00; and
- All day Sunday 07:00 - 23:00.

7.3.30 The noise measurements are plotted against the concurrent wind speed data measured at the application site and a 'best fit' correlation is established.

7.3.31 In low noise environments (i.e. where background noise levels are less than 30-35dB(A)), the ETSU-R-97 Guidance recommends that wind farm noise for quiet daytime periods should be limited to a lower fixed level within the range 35-40 dB $L_{A90,10min}$ or 5 dB(A) above the prevailing background noise level, whichever is the greater. The choice of which lower fixed level to use within the range is based upon a number of factors as outlined in Paragraph 22 of the ETSU-R-97 Guidance. These include:

- The number of dwellings in the neighbourhood of the wind farm;
- The effect of noise limits on the amount of electricity generated; and
- The duration and level of exposure.

7.3.32 Given that there are no dwellings in close proximity to the Proposed Development, with the closest residential receptor to a proposed turbine location being more than 1.8 km away, and the generating capacity of the Proposed Development, a lower fixed daytime noise limit of 40 dB $L_{A90,10min}$ (or 5 dB(A) above background, whichever is greater) has been applied to this assessment. The magnitude and duration of exposure at residential receptors is discussed in greater detail in **Section 7.7**. It is noted that this approach is in keeping with the noise limits outlined within the Decision Notice for the adjacent operational wind development, Windy Standard Extension (Brockloch Rig).

7.3.33 The night-time noise limit is derived from the background noise data measured during the night-time period of 23:00 to 07:00 every day. As with the daytime data, this is plotted against the concurrent wind speed data and a 'best fit' correlation established. For night time periods, the

ETSU-R-97 Guidance recommends limits of 43dB $L_{A90,10min}$, or 5dB(A) above prevailing background, whichever is the greater.

7.3.34 The only exception to the daytime and night-time limits outlined above is for properties with a financial involvement in the development where ETSU-R-97 Guidance limits can be increased to 45dB $L_{A90\ 10mins}$ (or 5dB(A) above the background, whichever is greater). The properties at Knockburnie and Brochlock Farm are owned by the landowners of the Development Site, thus they qualified for this increased noise limit.

7.3.35 The ETSU-R-97 Guidance noise criteria assume that the wind turbine noise contains no audible tones. Where tones are present, a correction is added to the measured or predicted noise level before comparison with the recommended limits. The level of correction will depend on how audible the tone is. A warranty was sought from the manufacturers of the candidate turbine for the Proposed Development such that the noise output will either not require a tonal correction (under the ETSU-R-97 Guidance) or, where tonal corrections are required, the noise criteria will be met having made the appropriate correction for any tonal component.

7.3.36 The ETSU-R-97 Guidance states the $L_{A90,\ 10min}$ descriptor should be used for both the background noise and wind farm noise when setting limits.

7.4 Baseline Information

Current Baseline

7.4.1 Potential properties for noise monitoring around the Development Site were identified through the use of Ordnance Survey (OS) maps, preliminary noise modelling and initial consultations with the EHO at EAC. A total of 5 No. locations were originally selected for background noise monitoring. However, as Amec Foster Wheeler were unable to secure access to the property at Maneight, EAC agreed that the noise monitoring results at Meikle Hill could be used as a proxy. EAC agreed to this approach in an email correspondence to Amec Foster Wheeler on 18th June 2014.

7.4.2 Background noise monitoring was therefore undertaken at 4 No. locations surrounding the Proposed Development, the positions of which are shown in **Figure 7.1**. Measured noise levels at these locations are deemed representative of the nearest sensitive receptors to the site. While a representative of EAC was not available to attend the noise kit deployment in order to confirm the micro-siting of the equipment, the methodology employed was in line with guidance advocated within the IoA GPG.

7.4.3 Unattended, long term monitoring of background noise levels was undertaken at these 4 No. locations between 23rd June 2014 and 21st July 2014, ensuring there were at least 3 weeks of continuous noise measurements at each location. The length of the noise survey ensured a good distribution of wind speeds and directions to correspond with the noise level results at each monitoring location.

7.4.4 Monitoring positions are shown in Figure 7.1 and are listed in **Table 7.3**.

Table 7.3 Noise Monitoring Locations

Ref	Location	Easting	Northing	Monitoring Position
M1	Meikle Hill	253464	608875	The sound level meter (SLM) was located to the south-west of the main house. The SLM was deployed in a free-field position, more than 10m from the façade of the main house. The main contributor to the noise environment at this location was from occasional road traffic movements along the B741. Additional noise contributions were from wind in the trees to the west of the monitoring location, and from sheep in an adjacent field.

Ref	Location	Easting	Northing	Monitoring Position
				The SLM was deployed to the south-west of the main house as this area was considered to be the property's main amenity area. The SLM location was also on the side of the property away from the B741.
M2	Knockburnie	256177	610457	The SLM was located to the west of the main property, in a 'free-field' position, more than 10m from the closest reflecting façade. The main contributors to the noise environment during kit deployment were noted as occasional road traffic movements along the B741 and from occasional HGV accessing the 'House of Water' quarry to the north-west. The SLM was located away from the main property in order to avoid noise impacts from the working farm.
M3	Dalleagles Terrace	257635	610587	The SLM was located in the rear garden, to the south of the property. The SLM was deployed in a free-field position more than 10m from the main house, and 4m from a garden out-house. The noise environment at the SLM location was dominated by occasional road traffic movements along the B741 to the north of the property. Additional contributions to the noise environment from bird song were noted. The SLM location was chosen as it was on the opposite side of the property to the B741, which was the dominant noise source.
M4	Brochloch	259458	610538	The SLM was located in a 'free-field' position, to the north-east of the property, more than 4m from the closest acoustically reflective façade. The SLM was located in a 'court-yard' area, so that it was sheltered from the wind in trees, to the west of the property. Contributions to the noise environment included bird song and distant road traffic noise.

7.4.5 The equipment used for the background noise monitoring comprised Rion NL-31 Class 1 integrating logging SLMs. These were enclosed in an environmental case with sufficient battery power to enable approximately 7 days continuous logging at the required 10 minute averaging periods, logging the L_{A90}, L_{Aeq} and a range of other environmental parameters. The sound level meters were calibrated on deployment and recovery. Batteries were changed and the equipment calibrated approximately every seven days during the survey with no significant drifts in calibration noted at any point.

7.4.6 The measurement systems were fitted with appropriate wind and rain protection for the microphone to maintain Class 1 measurement accuracy (the standard required for noise measurements in the UK). Full details of the noise monitoring kit specifications are given in **Appendix 7.B**.

7.4.7 All microphones were located away from acoustically reflective façades in a location deemed to be representative of background noise at the property (IoA GPG, SB8). Microphones were located away from any obvious local sources of noise, for example boiler flues. Details of the background noise measurements taken at each location (and representative wind and rain measurements), are summarised in **Appendix 7.C** as time-history graphs. Photographs of each measurement location are provided in **Appendix 7.D**. A peak in noise levels was noted on the time-history graphs for each of the monitoring locations. This is likely to be as a result of the 'dawn chorus'. In order to present conservative background noise levels, night-time periods after 04:40 have been removed from the final data set (i.e. the night-time period for each monitoring location was 23:00 to 04:40).

7.4.8 A summary of the measured noise levels during the quiet daytime and night-time periods at each monitoring location is given in **Table 7.4** below. The existing ambient noise levels during times when construction activities could be carried out are also given.

Table 7.4 Summary of Background Noise Levels

Ref.	Monitoring Location	Quiet Daytime dB $L_{A90,10min}$	Night-Time dB $L_{A90,10min}$	Construction Hours (07:00-19:00) dB $L_{Aeq,10min}$
M1	Meikle Hill	<20.0 – 39.2	<20.0 – 37.1	32.7 – 83.3
M2	Knockburnie	21.4 – 54.4	20.1 – 39.9	31.7 – 74.9
M3	Dalleagles Terrace	<20.0 – 46.3	<20.0 – 48.8	38.9 – 62.3
M4	Brockloch	<20.0 – 42.8	<20.0 – 50.5	28.9 – 69.6

7.4.9 Meteorological monitoring was completed during the noise monitoring survey using two 80m high anemometer masts which recorded wind speeds and directions, along with rain gauges deployed close to noise monitoring locations. One meteorological mast was located towards the centre of the Development Site and the second was located to the south, near to the edge of the site boundary. Each meteorological mast collected 10 minute averaged wind speeds and directions at heights of 20m, 40m, 62.5m and 80m. In-line with the recommendations outlined within the IoA GPG, wind speed measurements from the meteorological mast to the centre of the site ('MET mast 2'), representative of the wind speed and directions on the site, was used in the assessment.

Derived Baseline

Wind Shear

7.4.10 The level of wind shear at a particular location defines the relationship between wind speeds at different heights. A low level of wind shear means that the wind speed at the hub height of the turbines is not much greater than that near the ground, whereas a high level of wind shear means that the wind speed at hub height is significantly greater than that near the ground.

7.4.11 Wind turbine manufacturers reference their turbine noise emissions to a 10m height wind speed, assuming a standard level of wind shear in their calculations, the implication being that should the site experience a high level of wind shear, for a particular 10m height wind speed, the wind speed at hub height might be greater than assumed within the noise modelling, and thus wind turbine noise levels would be greater for the same background noise level.

7.4.12 The moderately complex terrain of the Development Site is such that the potential for a high level of wind shear is relatively low compared to other sites which are in lowland areas. Nevertheless, to ensure that the assessment fully addressed the issue and complied with the IoA GPG, simultaneous 10 minute averaged wind speed and direction data was recorded on the Development Site at a height equivalent to the proposed 80m hub-height.

7.4.13 The wind speeds at 10m height, against which the noise limits are derived, were calculated as follows:

- The wind speeds at the 80m hub-height have been measured using the anemometry mast for each 10 minute period; and
- The 80m hub-height wind speed was then converted to a 10m height using a standard roughness length of 0.05m, as assumed by turbine manufacturers in certifying turbine noise emissions, to maintain the requirement of the ETSU-R-97 Guidance of deriving noise limits referenced to a 10m height.

7.4.14 Thus, the noise assessment effectively compared measured background noise levels with potential worst case wind speeds at hub-height.

7.4.15 The graphs shown in **Figure 7.2** show the range of wind speeds and directions recorded over the noise monitoring period. During the survey, standardised 10m height wind speeds of up to 10.5ms^{-1} were recorded during the quiet daytime period and up to 13.0ms^{-1} during the night-time periods.

7.4.16 Winds measured were predominantly from the south and south-east, during the daytime period, and from the south during the night-time period. In undertaking the wind analysis at each receptor, the noise and wind speed data where rainfall occurred have been excluded from the assessment; as heavy rain could elevate measured noise levels.

Predicted Future Baseline

7.4.17 Due to the semi-rural character of the area, it is likely that no significant changes to the baseline would occur in the foreseeable future in the absence of the Proposed Development. Over time, background noise levels due to road traffic movements may increase somewhat as a consequence of natural road traffic growth, however, these changes are unlikely to be significant, and would serve to increase (not decrease) noise immission limits at the noise sensitive receptor properties in the vicinity of the Proposed Development.

7.4.18 In addition, background noise levels may increase due to the proposed and consented wind farms. This assessment considered the likely cumulative noise impacts at receptors in the event that all sites identified for the cumulative impact assessment were operating concurrently.

Information Gaps

7.4.19 A detailed method statement for the construction of the Proposed Development will be produced in partnership between the applicant and the construction contractors appointed by them. The details of this will not be known until after planning determination, therefore the noise assessment for the construction period was based upon knowledge of typical plant gained from similar wind farm construction projects.

7.4.20 There were no information gaps with regard to the range of turbine models which informed the assessment envelope.

7.5 Design Evolution

7.5.1 Wind farm noise assessment is part of an iterative design process, the aim of which is to achieve a design from which noise emissions meet limits derived following the approach given in ETSU-R-97 Guidance and/or relevant local guidelines. Consequently, the design of the scheme is such that necessary operational noise limits are met and no mitigation measures are required.

7.5.2 By way of the separation between receptors and turbines resulting from this process, construction noise is also limited, thus only general good-practice noise control measures are required by way of embedded design mitigation and no specific mitigation is necessary.

Potential Receptors

7.5.3 Sensitive receptors around the Proposed Development to be considered within the noise assessment were identified through the use of OS maps, preliminary noise modelling and in consultation with the EHO at EAC. The locations considered within the assessment are shown in **Figure 7.1** and listed in **Table 7.5**.

7.5.4 Representative background noise levels have been applied to receptors where noise monitoring was not undertaken at that location so that they could be considered within the assessment. The representative monitoring location assumed for each receptor is detailed in **Table 7.5** and was based upon Amec Foster Wheeler's observations of the ambient noise environments during the monitoring surveys, existing dominant noise sources and local environs.

Table 7.5 Noise Sensitive Receptors and Representative Noise Monitoring Locations

Ref.	Receptor	Easting	Northing	Representative Noise Monitoring Location
R1	Meikle Hill	253500	608850	M1 – Meikle Hill
R2	Nith Lodge	253600	609270	M1 – Meikle Hill
R3	Maneight	254277	609669	M1 – Meikle Hill
R4	Knockburnie	256231	610424	M2 – Knockburnie
R5	Dalleagles	257292	610564	M3 – Dalleagles Terrace
R6	Dalleagles Terrace	257682	610580	M3 – Dalleagles Terrace
R7	Brockloch	259441	610532	M4 - Brockloch
R8	Laglaff	260210	610300	M4 - Brockloch

Potential Significant Effects

7.5.5 As outlined above, the determination of effect significance for each phase of the Proposed Development is based upon compliance with the applicable noise limit; i.e. breach of the noise limits indicates a 'significant' effect, whereas compliance with noise limits indicates a 'not significant' effect. It is however acknowledged that the ETSU-R-97 Guidance approach does not directly aim to determine significance in an EIA context, rather it represents a balance between the need for wind energy and the need to protect residential amenities. The approach and scope for the various elements of the noise assessment as set out in the scoping report and agreed with the EHO at EAC is as follows:

- Construction noise assessment based upon predictions of plant noise from a number of operations at relevant receptors; and
- Operational noise assessment of predicted turbine noise against measured background noise levels.

7.6 Predicted Effects: Construction and Decommissioning

7.6.1 Construction noise is transient in nature and can generally be controlled by following standard industry practices, applying best practicable means and using modern, well-maintained and serviced items of plant.

7.6.2 Predictions have been undertaken using the plant list and noise source levels given in **Table 7.2**, for the nearest properties to the proposed turbine locations and access route. The predicted noise levels during construction are given in **Table 7.6.**

Table 7.6 Construction Noise Assessment

Ref	Receptor	Predicted dB $L_{Aeq, 1hr}$					
		Construction of Access Route	Upgrades on Road	Turbine Foundation Construction	Turbine Erection	Borrow Pits	Access Route
R1	Meikle Hill	29.0	30.1	35.0	31.8	47.2	35.7
R2	Nith Lodge	31.6	32.6	34.4	31.2	49.3	37.1

Ref	Receptor	Predicted dB $L_{Aeq, 1hr}$					
		Construction of Access Route	Upgrades on Road	Turbine Foundation Construction	Turbine Erection	Borrow Pits	Access Route
R3	Maneight	41.0	42.1	35.3	32.1	56.5	42.4
R4	Knockburnie	28.4	29.4	32.4	29.2	49.7	35.4
R5	Dalleagles	23.6	24.6	32.0	28.8	44.4	32.7
R6	Dalleagles Terrace	24.8	25.9	32.0	28.8	42.8	33.1
R7	Brockloch	22.7	23.8	30.5	27.3	40.2	32.2
R8	Laglaff	22.5	23.6	29.7	26.4	38.9	32.1

7.6.3 The noise predictions confirmed that noise effects may occur when work is at its closest approach to the receptors. However, due to the high separation distances (>1.8 km from the closest turbine construction works, ~470 m from the closest access road construction, ~560m from the closest borrow pit) between the construction activity and the nearest receptors, the minimum noise guideline value of 65dB (A) quoted in BS5228-1:2009+A1:2014 would not be exceeded at any of the identified receptors. On this basis, construction noise is unlikely to have a 'significant' effect upon the closest assessed receptors.

7.7 Predicted Effects: Operation

7.7.1 A range of turbine models would be appropriate for the Proposed Development. The final selection of turbine will follow a competitive tendering process and thus the actual model of turbine may differ from those upon which the assessment has been based. However, the final choice of turbine will be required to comply with the noise criterion levels which have been established for the Proposed Development within the noise assessment.

7.7.2 In order to reflect the range of commercially available turbines which would be appropriate for the Proposed Development, the noise predictions were based upon an 'assessment envelope', which results in predictions for a generic turbine. To achieve this, a range of commercially available turbines have been considered and the greatest sound power level has been selected at each wind speed, irrespective of turbine type. Thus, the assessment was not based upon a single turbine, rather what can be considered a worst-case at each wind speed based upon a range of turbines potentially suitable for the Proposed Development.

7.7.3 The turbines considered within assessment envelope were the: Siemens SWT 3.2-10; GE 3.2-103; and GE 2.85-103. Details of the sound power levels selected for each wind speed are given in **Table 7.7** below. Full details of the sound power level data used within the assessment are given within **Appendix 7.E**.

Table 7.7 Sound Power Levels for Assessment Envelope

Candidate Turbine	Standardised 10m Height Wind Speed (V_{10}) ms^{-1}									
	3	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
	Sound Power Level of Turbines L_{WA} dB									
Siemens SWT 3.2-101*	93.0	97.2	101.8	106.5	108.5	109.0	109.0	109.0	109.0	109.0
GE 2.85-103*	94.4	94.9	99.1	104.1	107.0	107.0	107.0	107.0	107.0	107.0
GE 3.2-103 *	97.1	98.0	101.7	104.9	106.7	107.0	107.0	107.0	107.0	107.0
Assessment Envelope	**97.1**	**98.0**	**101.8**	**106.5**	**108.5**	**109.0**	**109.0**	**109.0**	**109.0**	**109.0**

* Sound Power Levels include additional +2dB uncertainty correction, as per guidance presented within IoA GPG.

7.7.4 The sound emitted by wind turbines consists of a number of different frequencies, some of which are more dominant than others. These frequencies are grouped together into what are known as octave band centre frequencies or spectra. Within each spectrum, the highest frequency is twice the lowest frequency and the octave bands are defined by the octave band centre frequency. The addition of these spectra gives an overall sound power level for the turbine. The amount of sound absorption over a given distance depends on the frequency of the noise - high frequency sound is absorbed more readily by the ground and atmosphere than low frequency sound.

7.7.5 The noise predictions were based upon the frequency spectrum for the GE 2.85-103 85m hub-height, as this is found to have the sound power spectrum with the largest amount of low frequency content. The spectrum was determined at a wind speed of V_{10} = 8ms^{-1} and is reproduced in **Table 7.8**. The spectrum was then scaled to the appropriate broadband sound power level detailed in **Table 7.7** to reflect the conservative levels derived from the assessment envelope, in order to carry out the predictions.

Table 7.8 Sound Power Level Spectrum for Candidate Turbines

Candidate Turbines	Octave band centre Frequency (Hz), dB L_{WA}							
	63	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
GE 2.85-103	90.2	94.7	96.0	97.4	99.0	99.1	92.8	73.1

Noise Prediction

7.7.6 Noise levels have been predicted in accordance with the methodology outlined in **Section 7.3** for the nearest residential properties to the wind farm, as shown in **Figure 7.1**, and as listed in **Table 7.5**. Some of these residential properties are located in close proximity to one another.

7.7.7 **Table 7.9** and **Table 7.10** present the following information for each wind speed for each of the eight properties assessed for daytime and night-time respectively:

- Values of the quiet daytime amenity and night-time background noise curve at the integer wind speeds, measured and adjusted for wind shear;
- The quiet daytime amenity and night-time noise limits derived from the background noise curve, in accordance with the ETSU-R-97 Guidance;

- The predicted turbine noise levels from the Proposed Development based on worst-case downwind noise propagation at receptors, assuming turbines are operating simultaneously and inclusive of a 'canyon effect' penalty where applicable; and
- The margin by which the predicted turbine noise (inclusive of any 'canyon effect' penalty) meets the noise limits at each wind speed using the worst-case downwind noise predictions (negative values indicate the predicted noise levels are lower than the noise limits).

7.7.8 **Figures 7.3** to **Figure 7.10** present the noise levels graphically. The solid black, red and green lines show respectively the background noise, the noise limit and the predicted turbine noise.

7.7.9 It should be noted that the predicted turbine noise was equal for both the day and night-time periods and the assessments have been presented separately to take account of the different applicable noise limits.

Table 7.9 Daytime Noise Assessment

Noise Parameters, $L_{A90,\ 10mins}$, dB	**Standardised 10m Height Wind Speed (V_{10}) ms^{-1}**									
	3	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
R1 – Meikle Hill										
Background Noise Level	23.2	23.8	24.7	26.0	27.7	29.9	32.9	36.6	36.6	36.6
ETSU-R-97 Derived Noise Limit	40.0	40.0	40.0	40.0	40.0	40.0	40.0	41.6	41.6	41.6
Predicted Turbine Noise Level	21.3	22.2	26	30.7	32.7	33.2	33.2	33.2	33.2	33.2
Margin Under Noise Limit#	-18.7	-17.8	-14.0	-9.3	-7.3	-6.8	-6.8	-8.4	-8.4	-8.4
R2 – Nith Lodge										
Background Noise Level	23.2	23.8	24.7	26.0	27.7	29.9	32.9	36.6	36.6	36.6
ETSU-R-97 Derived Noise Limit	40.0	40.0	40.0	40.0	40.0	40.0	40.0	41.6	41.6	41.6
Predicted Turbine Noise Level	19.5	20.4	24.2	28.9	30.9	31.4	31.4	31.4	31.4	31.4
Margin Under Noise Limit#	-20.5	-19.6	-15.8	-11.1	-9.1	-8.6	-8.6	-10.2	-10.2	-10.2
R3 – Maneight										
Background Noise Level	23.2	23.8	24.7	26.0	27.7	29.9	32.9	36.6	36.6	36.6
ETSU-R-97 Derived Noise Limit	40.0	40.0	40.0	40.0	40.0	40.0	40.0	41.6	41.6	41.6
Predicted Turbine Noise Level	22.1	23.0	26.8	31.5	33.5	34.0	34.0	34.0	34.0	34.0
Margin Under Noise Limit#	-17.9	-17.0	-13.2	-8.5	-6.5	-6.0	-6.0	-7.6	-7.6	-7.6
R4 - Knockburnie										
Background Noise Level	26.0	26.4	26.8	27.3	28.0	29.1	30.6	32.7	32.7	32.7
ETSU-R-97 Derived Noise Limit	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0
Predicted Turbine Noise Level	21.5	22.4	26.2	30.9	32.9	33.4	33.4	33.4	33.4	33.4
Margin Under Noise Limit#	-23.5	-22.6	-18.8	-14.1	-12.1	-11.6	-11.6	-11.6	-11.6	-11.6
R5 – Dalleagles										
Background Noise Level	29.3	29.8	30.3	30.9	31.7	32.5	33.4	34.4	34.4	34.4
ETSU-R-97 Derived Noise Limit	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0
Predicted Turbine Noise Level	21.6	22.5	26.3	31.0	33.0	33.5	33.5	33.5	33.5	33.5
Margin Under Noise Limit#	-18.4	-17.5	-13.7	-9.0	-7.0	-6.5	-6.5	-6.5	-6.5	-6.5

Noise Parameters, $L_{A90, 10mins}$, dB	Standardised 10m Height Wind Speed (V_{10}) ms^{-1}									
	3	4	5	6	7	8	9	10	11	12
R6 – Dalleagles Terrace										
Background Noise Level	29.3	29.8	30.3	30.9	31.7	32.5	33.4	34.4	34.4	34.4
ETSU-R-97 Derived Noise Limit	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0
Predicted Turbine Noise Level	20.8	21.7	25.5	30.2	32.2	32.7	32.7	32.7	32.7	32.7
Margin Under Noise Limit#	-19.2	-18.3	-14.5	-9.8	-7.8	-7.3	-7.3	-7.3	-7.3	-7.3
R7 - Brockloch										
Background Noise Level	26.8	27.7	28.7	29.9	31.1	32.5	34.1	35.7	35.7	35.7
ETSU-R-97 Derived Noise Limit	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0
Predicted Turbine Noise Level	18.8	19.7	23.5	28.2	30.2	30.7	30.7	30.7	30.7	30.7
Margin Under Noise Limit#	-26.2	-25.3	-21.5	-16.8	-14.8	-14.3	-14.3	-14.3	-14.3	-14.3
R8 - Laglaff										
Background Noise Level	26.8	27.7	28.7	29.9	31.1	32.5	34.1	35.7	35.7	35.7
ETSU-R-97 Derived Noise Limit	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.7	40.7	40.7
Predicted Turbine Noise Level	17.7	18.6	22.4	27.1	29.1	29.6	29.6	29.6	29.6	29.6
Margin Under Noise Limit#	-22.3	-21.4	-17.6	-12.9	-10.9	-10.4	-10.4	-11.1	-11.1	-11.1

Negative values indicate turbine noise lies below noise limit

Table 7.10 Night-Time Noise Assessment

Noise Parameters, $L_{A90, 10mins}$, dB	Standardised 10m Height Wind Speed (V_{10}) ms^{-1}									
	3	4	5	6	7	8	9	10	11	12
R1 – Meikle Hill										
Background Noise Level	20.5	20.6	20.9	21.3	21.9	22.7	23.7	24.9	26.3	27.9
ETSU-R-97 Derived Noise Limit	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0
Predicted Turbine Noise Level	21.3	22.2	26.0	30.7	32.7	33.2	33.2	33.2	33.2	33.2
Margin Under Noise Limit#	-21.7	-20.8	-17.0	-12.3	-10.3	-9.8	-9.8	-9.8	-9.8	-9.8
R2 – Nith Lodge										
Background Noise Level	20.5	20.6	20.9	21.3	21.9	22.7	23.7	24.9	26.3	27.9
ETSU-R-97 Derived Noise Limit	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0
Predicted Turbine Noise Level	19.5	20.4	24.2	28.9	30.9	31.4	31.4	31.4	31.4	31.4
Margin Under Noise Limit#	-23.5	-22.6	-18.8	-14.1	-12.1	-11.6	-11.6	-11.6	-11.6	-11.6
R3 – Maneight										
Background Noise Level	20.5	20.6	20.9	21.3	21.9	22.7	23.7	24.9	26.3	27.9
ETSU-R-97 Derived Noise Limit	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0
Predicted Turbine Noise Level	22.1	23.0	26.8	31.5	33.5	34.0	34.0	34.0	34.0	34.0
Margin Under Noise Limit#	-20.9	-20.0	-16.2	-11.5	-9.5	-9.0	-9.0	-9.0	-9.0	-9.0

Noise Parameters, $L_{A90, 10mins}$, dB	Standardised 10m Height Wind Speed (V_{10}) ms^{-1}									
	3	4	5	6	7	8	9	10	11	12
R4 - Knockburnie										
Background Noise Level	24.5	24.6	24.7	24.9	25.1	25.5	25.9	26.3	26.9	27.5
ETSU-R-97 Derived Noise Limit	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0
Predicted Turbine Noise Level	21.5	22.4	26.2	30.9	32.9	33.4	33.4	33.4	33.4	33.4
Margin Under Noise Limit#	-23.5	-22.6	-18.8	-14.1	-12.1	-11.6	-11.6	-11.6	-11.6	-11.6
R5 – Dalleagles										
Background Noise Level	23.5	23.2	23.1	23.2	23.4	23.8	24.4	25.1	26.0	27.1
ETSU-R-97 Derived Noise Limit	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0
Predicted Turbine Noise Level	21.6	22.5	26.3	31.0	33.0	33.5	33.5	33.5	33.5	33.5
Margin Under Noise Limit#	-21.4	-20.5	-16.7	-12.0	-10.0	-9.5	-9.5	-9.5	-9.5	-9.5
R6 – Dalleagles Terrace										
Background Noise Level	23.5	23.2	23.1	23.2	23.4	23.8	24.4	25.1	26.0	27.1
ETSU-R-97 Derived Noise Limit	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0
Predicted Turbine Noise Level	20.8	21.7	25.5	30.2	32.2	32.7	32.7	32.7	32.7	32.7
Margin Under Noise Limit#	-22.2	-21.3	-17.5	-12.8	-10.8	-10.3	-10.3	-10.3	-10.3	-10.3
R7 - Brockloch										
Background Noise Level	25.4	25.3	25.3	25.5	25.9	26.3	26.9	27.7	28.6	29.6
ETSU-R-97 Derived Noise Limit	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0
Predicted Turbine Noise Level	18.8	19.7	23.5	28.2	30.2	30.7	30.7	30.7	30.7	30.7
Margin Under Noise Limit#	-26.2	-25.3	-21.5	-16.8	-14.8	-14.3	-14.3	-14.3	-14.3	-14.3
R8 - Laglaff										
Background Noise Level	25.4	25.3	25.3	25.5	25.9	26.3	26.9	27.7	28.6	29.6
ETSU-R-97 Derived Noise Limit	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0
Predicted Turbine Noise Level	17.7	18.6	22.4	27.1	29.1	29.6	29.6	29.6	29.6	29.6
Margin Under Noise Limit#	-25.3	-24.4	-20.6	-15.9	-13.9	-13.4	-13.4	-13.4	-13.4	-13.4

Negative values indicate turbine noise lies below noise limit

7.7.10 As shown in **Table 7.9** and **Table 7.10**, the predicted turbine noise levels based upon the turbine assessment envelope shown in **Table 7.7** met (i.e. did not exceed) the associated noise limits at each of the assessed locations. On this basis, operational noise would not have a 'significant' effect upon the closest assessed receptors.

7.7.11 The smallest margin between the daytime noise limits and the predicted turbine noise levels was 6.0 dB and shown to occur at R3 - Maneight. The smallest margin between the night-time noise limits and the predicted turbine noise levels is 9.0 dB, and shown to occur at R3 - Maneight.

7.7.12 Whilst a lower fixed daytime noise limit of 40 dB $L_{A90, 10min}$ (or 5 dB(A) above background noise, whichever is greater) has been applied in the assessment shown in **Table 7.9**, predicted turbine noise immissions from the Proposed Development in isolation would also meet the lower daytime noise limit of 35 dB $L_{A90, 10min}$ (or 5 dB(A) above background, whichever is greater). The adoption of the higher daytime lower fixed noise limit ensured a higher level of margin below the associated

noise limits from the Proposed Development's turbine noise immissions when considered cumulatively with the closest operational, consented and proposed wind developments. The results of this cumulative assessment are shown in **Table 7.14** and **Table 7.15** below.

7.8 Predicted Effects: Cumulative

7.8.1 In addition to considering the noise effects from the Proposed Development in isolation, cumulative noise predictions have been undertaken which account for the likely effects of the closest existing, consented and application wind farm developments, as summarised in **Table 7.11** below. No other, non-wind farm developments likely to have the potential to create cumulative noise effects during construction, operation or decommissioning with the Proposed Development were identified, therefore have not been considered within this assessment.

Table 7.11 Cumulative Wind Developments

Wind Development Name	Status	Number of Turbines	Assumed Turbine Type
South Kyle*	Proposed	50	Assessment Envelope
Pencloe*	Proposed	21	Siemens SWT 3.2-101
Windy Standard	Operational	36	Nortank 0.6MW
Windy Standard Extension (Brockloch Rig)	Consented	30	Vestas V90 3MW
Afton*	Consented	27	NM80 2.75MW
Benbrack*	Proposed	18	Assessment Envelope
High Lane Farm	Consented	1	Vestas V52 0.85MW

* Turbine sound power level taken from ES

7.8.2 The sound power levels assumed for the turbines within the cumulative noise assessment are detailed in **Table 7.12**. The sound power levels are presented for wind speeds between 3–12 ms^{-1}.

Table 7.12 Sound Power Levels for Cumulative Development Turbines

Cumulative Turbines	Standardised 10m Height Wind Speed (V_{10}) ms^{-1}									
	3	4	5	6	7	8	9	10	11	12
	Sound Power Levels dB L_{WA}									
South Kyle	100.2	100.2	103.6	107.1	108.5	109.0	108.7	108.5	108.5	108.5
Pencloe	101.6	101.6	106.3	108.5	109.0	109.0	109.0	109.0	109.0	109.0
Windy Standard*	100.8	100.8	100.8	100.8	100.8	100.8	100.8	100.8	100.8	100.8
Windy Standard Extension (Brockloch Rig)	98.7	98.7	101.8	104.6	106.3	107.2	107.2	107.9	107.9	107.9
Afton	92.3	92.3	96.1	101.2	103.1	103.9	104.7	105.5	105.5	105.5
Benbrack	97.1	98.0	101.8	106.5	108.5	109.0	109.0	109.0	109.0	109.0
High Lane Farm	96.0	96.6	99.2	103.4	105.9	106.4	106.8	105.7	104.9	104.5

* Sound Power Levels included additional +2dB uncertainty correction, as per guidance presented within the IoA GPG

7.8.3 The frequency spectrum assumed for the noise predictions of the cumulative wind developments is shown in **Table 7.13** below. In each case, the frequency spectrum was determined at a wind speed of V_{10} = 8ms^{-1}, and then scaled to the appropriate broadband sound power level, as detailed in **Table 7.12**.

Table 7.13 Sound Power Level Spectrum for Cumulative Development Turbines

Cumulative Turbines	**Octave band centre Frequency (Hz), dB L_{WA}**							
	63	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
South Kyle	94.0	96.1	99.2	101.6	103.8	102.5	98.7	88.7
Pencloe	89.4	95.8	99.7	101.5	104.5	102.6	96.5	82.9
Windy Standard	76.6	84.4	91.2	95.2	92.0	88.5	85.0	76.4
Windy Standard Extension (Brockloch Rig)	91.8	94.0	97.3	99.6	101.8	100.5	96.7	86.7
Afton	85.8	93.0	95.7	96.6	94.7	91.3	85.9	80.3
Benbrack	90.2	94.7	96.0	97.4	99.0	99.1	92.8	73.1
High Lane Farm	80.7	88.6	94.4	100.0	99.7	95.8	89.4	79.2

7.8.4 **Table 7.14** and **Table 7.15** presents the information outlined in **Section 7.7.7**, but taking into account the predicted turbine noise levels from wind developments shown in **Table 7.11**. The predicted turbine noise levels at each receptor assumed that all turbines operate simultaneously and that receptors were all in a downwind position.

Table 7.14 Daytime Cumulative Noise Assessment

Noise Parameters, $L_{A90,\ 10mins}$, dB	**Standardised 10m Height Wind Speed (V_{10}) ms^{-1}**									
	3	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
R1 – Meikle Hill										
Background Noise Level	23.2	23.8	24.7	26.0	27.7	29.9	32.9	36.6	36.6	36.6
ETSU-R-97 Derived Noise Limit	40.0	40.0	40.0	40.0	40.0	40.0	40.0	41.6	41.6	41.6
Predicted Cumulative Turbine Noise Level	27.2	27.4	31.0	34.9	36.5	37.0	36.9	36.8	36.8	36.8
Margin Under Noise Limit#	-12.8	-12.6	-9.0	-5.1	-3.5	-3.0	-3.1	-4.8	-4.8	-4.8
R2 – Nith Lodge										
Background Noise Level	23.2	23.8	24.7	26.0	27.7	29.9	32.9	36.6	36.6	36.6
ETSU-R-97 Derived Noise Limit	40.0	40.0	40.0	40.0	40.0	40.0	40.0	41.6	41.6	41.6
Predicted Cumulative Turbine Noise Level	26.0	26.2	29.7	33.6	35.2	35.7	35.5	35.4	35.4	35.4
Margin Under Noise Limit#	-14.0	-13.8	-10.3	-6.4	-4.8	-4.3	-4.5	-6.2	-6.2	-6.2
R3 – Maneight										
Background Noise Level	23.2	23.8	24.7	26.0	27.7	29.9	32.9	36.6	36.6	36.6

Noise Parameters, $L_{A90, 10mins}$, dB	Standardised 10m Height Wind Speed (V_{10}) ms^{-1}									
	3	4	5	6	7	8	9	10	11	12
ETSU-R-97 Derived Noise Limit	40.0	40.0	40.0	40.0	40.0	40.0	40.0	41.6	41.6	41.6
Predicted Cumulative Turbine Noise Level	25.9	26.3	29.9	34.0	35.7	36.2	36.1	36.1	36.1	36.1
Margin Under Noise Limit#	-14.1	-13.7	-10.1	-6.0	-4.3	-3.8	-3.9	-5.5	-5.5	-5.5
R4 - Knockburnie										
Background Noise Level	26.0	26.4	26.8	27.3	28.0	29.1	30.6	32.7	32.7	32.7
ETSU-R-97 Derived Noise Limit	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0
Predicted Cumulative Turbine Noise Level	25.0	25.4	29.1	33.2	34.9	35.3	35.3	35.3	35.3	35.3
Margin Under Noise Limit#	-20.0	-19.6	-15.9	-11.8	-10.1	-9.7	-9.7	-9.7	-9.7	-9.7
R5 – Dalleagles										
Background Noise Level	29.3	29.8	30.3	30.9	31.7	32.5	33.4	34.4	34.4	34.4
ETSU-R-97 Derived Noise Limit	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0
Predicted Cumulative Turbine Noise Level	24.9	25.4	29.1	33.1	34.8	35.3	35.3	35.3	35.3	35.3
Margin Under Noise Limit#	-15.1	-14.6	-10.9	-6.9	-5.2	-4.7	-4.7	-4.7	-4.7	-4.7
R6 – Dalleagles Terrace										
Background Noise Level	29.3	29.8	30.3	30.9	31.7	32.5	33.4	34.4	34.4	34.4
ETSU-R-97 Derived Noise Limit	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0
Predicted Cumulative Turbine Noise Level	24.6	25.1	28.8	32.7	34.3	34.8	34.8	34.8	34.8	34.8
Margin Under Noise Limit#	-15.4	-14.9	-11.2	-7.3	-5.7	-5.2	-5.2	-5.2	-5.2	-5.2
R7 - Brockloch										
Background Noise Level	26.8	27.7	28.7	29.9	31.1	32.5	34.1	35.7	35.7	35.7
ETSU-R-97 Derived Noise Limit	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0
Predicted Cumulative Turbine Noise Level	25.9	26.1	30.1	33.3	34.5	34.9	34.9	34.9	34.9	34.9
Margin Under Noise Limit#	-19.1	-18.9	-14.9	-11.7	-10.5	-10.1	-10.1	-10.1	-10.1	-10.1
R8 - Laglaff										
Background Noise Level	26.8	27.7	28.7	29.9	31.1	32.5	34.1	35.7	35.7	35.7
ETSU-R-97 Derived Noise Limit	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.7	40.7	40.7
Predicted Cumulative Turbine Noise Level	26.5	26.7	30.7	33.8	34.8	35.1	35.2	35.2	35.1	35.1
Margin Under Noise Limit#	-13.5	-13.3	-9.3	-6.2	-5.2	-4.9	-4.8	-5.5	-5.6	-5.6

Negative values indicate turbine noise lies below noise limit

Table 7.15 Night-Time Cumulative Noise Assessment

Noise Parameters, $L_{A90, 10mins}$, dB	Standardised 10m Height Wind Speed (V_{10}) ms^{-1}									
	3	4	5	6	7	8	9	10	11	12
R1 – Meikle Hill										
Background Noise Level	20.5	20.6	20.9	21.3	21.9	22.7	23.7	24.9	26.3	27.9
ETSU-R-97 Derived Noise Limit	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0
Predicted Cumulative Turbine Noise Level	27.2	27.4	31.0	34.9	36.5	37.0	36.9	36.8	36.8	36.8
Margin Under Noise Limit#	-15.8	-15.6	-12.0	-8.1	-6.5	-6.0	-6.1	-6.2	-6.2	-6.2
R2 – Nith Lodge										
Background Noise Level	20.5	20.6	20.9	21.3	21.9	22.7	23.7	24.9	26.3	27.9
ETSU-R-97 Derived Noise Limit	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0
Predicted Cumulative Turbine Noise Level	26.0	26.2	29.7	33.6	35.2	35.7	35.5	35.4	35.4	35.4
Margin Under Noise Limit#	-17.0	-16.8	-13.3	-9.4	-7.8	-7.3	-7.5	-7.6	-7.6	-7.6
R3 – Maneight										
Background Noise Level	20.5	20.6	20.9	21.3	21.9	22.7	23.7	24.9	26.3	27.9
ETSU-R-97 Derived Noise Limit	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0
Predicted Cumulative Turbine Noise Level	25.9	26.3	29.9	34.0	35.7	36.2	36.1	36.1	36.1	36.1
Margin Under Noise Limit#	-17.1	-16.7	-13.1	-9.0	-7.3	-6.8	-6.9	-6.9	-6.9	-6.9
R4 - Knockburnie										
Background Noise Level	24.5	24.6	24.7	24.9	25.1	25.5	25.9	26.3	26.9	27.5
ETSU-R-97 Derived Noise Limit	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0
Predicted Cumulative Turbine Noise Level	25.0	25.4	29.1	33.2	34.9	35.3	35.3	35.3	35.3	35.3
Margin Under Noise Limit#	-20.0	-19.6	-15.9	-11.8	-10.1	-9.7	-9.7	-9.7	-9.7	-9.7
R5 – Dalleagles										
Background Noise Level	23.5	23.2	23.1	23.2	23.4	23.8	24.4	25.1	26.0	27.1
ETSU-R-97 Derived Noise Limit	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0
Predicted Cumulative Turbine Noise Level	24.9	25.4	29.1	33.1	34.8	35.3	35.3	35.3	35.3	35.3
Margin Under Noise Limit#	-18.1	-17.6	-13.9	-9.9	-8.2	-7.7	-7.7	-7.7	-7.7	-7.7
R6 – Dalleagles Terrace										
Background Noise Level	23.5	23.2	23.1	23.2	23.4	23.8	24.4	25.1	26.0	27.1
ETSU-R-97 Derived Noise Limit	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0
Predicted Cumulative Turbine Noise Level	24.6	25.1	28.8	32.7	34.3	34.8	34.8	34.8	34.8	34.8
Margin Under Noise Limit#	-18.4	-17.9	-14.2	-10.3	-8.7	-8.2	-8.2	-8.2	-8.2	-8.2
R7 - Brockloch										
Background Noise Level	25.4	25.3	25.3	25.5	25.9	26.3	26.9	27.7	28.6	29.6
ETSU-R-97 Derived Noise Limit	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0
Predicted Cumulative Turbine Noise Level	25.9	26.1	30.1	33.3	34.5	34.9	34.9	34.9	34.9	34.9
Margin Under Noise Limit#	-19.1	-18.9	-14.9	-11.7	-10.5	-10.1	-10.1	-10.1	-10.1	-10.1

Noise Parameters, $L_{A90, 10mins}$, dB	Standardised 10m Height Wind Speed (V_{10}) ms^{-1}									
	3	4	5	6	7	8	9	10	11	12
R8 - Laglaff										
Background Noise Level	25.4	25.3	25.3	25.5	25.9	26.3	26.9	27.7	28.6	29.6
ETSU-R-97 Derived Noise Limit	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0
Predicted Cumulative Turbine Noise Level	26.5	26.7	30.7	33.8	34.8	35.1	35.2	35.2	35.1	35.1
Margin Under Noise Limit#	-16.5	-16.3	-12.3	-9.2	-8.2	-7.9	-7.8	-7.8	-7.9	-7.9

Negative values indicate turbine noise lies below noise limit

7.8.5 As shown in **Table 7.14** and **Table 7.15**, the ETSU-R-97 Guidance derived noise limits were met at each of the assessed receptors, when including the predicted noise effects from the Proposed Development cumulatively with the existing, consented and proposed wind developments, as summarised in **Table 7.11**. On this basis, cumulative noise impacts would not have a 'significant' effect upon the closest assessed receptors.

7.8.6 The smallest daytime margin of 3.0 dB was shown to occur at R1 – Meikle Hill at a standardised 10 m height wind speeds of 8 ms^{-1}. The smallest night-time margin of 6.0 dB was shown to occur at R1 – Meikle Hill at a standardised 10 m height wind speeds of 8 ms^{-1}.

7.8.7 The turbine noise immissions presented within **Table 7.14** and **Table 7.15** are representative of those likely to occur when a receptor was downwind of all the considered wind developments operating concurrently. As wind turbine noise immissions are higher when a receptor is downwind of a wind farm than when they are upwind of a wind farm, this approach was considered 'worst-case'. The actual turbine noise immissions at receptors are therefore likely to be lower than those presented within **Table 7.14** and **Table 7.15**.

Other Operational Noise Issues

Infrasound and Low Frequency Noise

7.8.8 Infrasound is generally defined as pressure waves with a frequency below 20 Hz. The human hearing threshold is much reduced below 20 Hz compared to higher frequencies. The exact definition of low frequency noise varies, but generally spans the infrasonic and audible ranges from around 10 Hz to 200 Hz.

7.8.9 Information published by the British Wind Energy Association *'Low Frequency Noise and Wind Turbines'* (BWEA, 2005) presents a review of a number of sources of information on low frequency noise. Based upon these sources, it was concluded that levels for wind turbines lie below the threshold of perception even for those who are particularly sensitive to such noise.

7.8.10 The report *'The Measurement of Low Frequency Noise'* at three UK Wind Farms' (Hayes McKenzie Partnership, 2006) presents the results of a number of measurements taken at wind farm sites throughout the UK. The study concluded that modern wind turbines are not sources of infrasound at levels which could be injurious to the health of a wind farm neighbour. At all of the measurement sites, low frequency noise associated with traffic movement along local roads was greater than that associated with the proposed development and therefore any potential low frequency noise from the Proposed Development would be negligible and could not be considered to represent a significant effect for the purposes of the EIA Regulations.

Excess Amplitude Modulation (EAM)

7.8.11 The noise limits derived following the procedure recommended by the ETSU-R-97 Guidance take into account the phenomenon of excess amplitude modulation (EAM) to a certain extent and thus afford receptors some protection. However, the '*The Measurement of Low Frequency Noise'* at

three UK Wind Farms' (Hayes McKenzie Partnership, 2006), discussed above, as commissioned by the Department of Trade and Industry (DTI) (later The Department for Business, Enterprise and Regulatory Reform (BERR), now the Department of Energy and Climate Change (DECC)) study undertaken by Hayes McKenzie into low frequency noise referred to above also investigated the phenomenon of EAM.

7.8.12 It was found that internal noise levels associated with aerodynamic modulation were above the threshold of audibility at some properties. While measurements within the report indicated these were not high enough to wake occupiers of a room, they could result in difficulties returning to sleep once awoken.

7.8.13 Following publication of the report, the DTI published a guidance note in 2006 'Advice *on findings of the Hayes Mackenzie report on noise arising from wind farms'* to advise planning authorities on the issue (DTI, 2006). It states that concerns apparently relating to the phenomenon have been expressed at five out of the (then) 126 No. operational wind farms throughout the UK. It is categorically stated that the ETSU-R-97 Guidance should continue to be used for the assessment of noise from wind farms and it was not considered necessary to further consider the issue of EAM for the Proposed Development.

7.8.14 The DTI Noise Working Group commissioned the University of Salford to investigate the occurrence of the phenomenon in more detail (University of Salford, 2007). A survey was conducted of local authorities to investigate the extent of EAM, and complaint histories were analysed to determine the number of complainants. The phenomenon was considered to be a factor in four of the sites at which there had been complaints and a possible factor at eight further sites. It was found that meteorological conditions were such that the effect would prevail for between 7-15% of the time and could persist for several days. The report concluded that given the low incidence of EAM and the low numbers of people involved it was difficult to justify further research; however they did state that it may be prudent to attempt to improve our understanding as the phenomenon cannot be predicted at present.

7.8.15 Following publication of the report in 2007, BERR released a statement as follows (BERR, 2007):

"Based on these findings, Government does not consider there to be a compelling case for further work into AM and will not carry out any further research at this time; however it will continue to keep the issue under review."

7.8.16 It is noted that the Institute of Acoustics Noise Working Group (IoA NWG), tasked with putting together the IoA GPG, were unwilling to propose a method for predicting EAM before reviewing the conclusions of the (then) much anticipated RenewableUK report on the matter. The IoA NWG in their July 2012 draft of the IoA GPG stated that they are *"…not able at present time to propose as current good practice methods for the prediction of AM at the Planning state of a wind farm project, or its assessment during operation"*. The final version of the IoA GPG (May 2013) stated *"The evidence in relation to 'Excess' or 'Other' Amplitude Modulation (AM) is still developing. At the time of writing, current practice is not to assign a planning condition to deal with AM".*

7.8.17 Whilst the RenewableUK report was published in December 2013, the IoA is yet to fully endorse the proposed EAM planning condition presented within it, stating that it *"needs a period of testing and validation before it can be considered to be good practice".*

7.8.18 Since the publication of the RenewableUK report, the IoA has formed a working group, which aims to review the methods to quantify and assess AM in wind turbine noise, including the methodology which is included within the RenewableUK proposed planning condition and the "Den Brook" condition. This work is on-going at the time of writing.

7.8.19 Whilst the mechanisms of EAM are well documented, an industry consensus on a methodology for its prediction is yet to be reached. It is noted that at this time Government advice towards the assessment of EAM has not changed from that included within the ETSU-R-97 Guidance, which indicates no specific consideration for EAM is required.

7.9 Mitigation and Enhancement Measures

Construction and Decommissioning Noise

7.9.1 Construction noise is transient in nature and can generally be controlled by following standard industry practices, applying best practicable means and using modern, well-maintained and serviced items of plant.

7.9.2 No significant noise effects are expected during the construction and decommissioning phases, and no specific mitigation is required with regard to construction noise. However, general guidance for controlling construction noise is given in British Standard 5228-1:2009+A1:2014. As good practice, the following embedded mitigation measures concerning construction noise will be implemented:

- Restricted hours of working for most HGV movements (07:00 to 19:00 Monday to Friday, 07:00 - 12:00 Saturdays) to avoid sensitive periods. Any requirement to work outside these periods will only occur through prior agreement with EAC (for example turbine erection requires low wind speed conditions and may require longer working hours if conditions are poor at the time);
- All construction activities will be undertaken in accordance with good practice as set out in BS 5228-1:2009+A1:2014;
- All employees on the construction site will be advised of quieter methods of operating plant and tools, and to report any damage to noise control measures as soon as they are identified;
- Where practicable, for any particular activity, suitable plant, machinery and working practices will be adopted. All equipment will be maintained in good working order and will be fitted with appropriate noise controls at all times (e.g. silencers, mufflers and/or acoustic hoods); and
- Construction plant capable of generating significant noise and vibration levels will be operated in a manner to minimise the duration of the higher magnitude levels.

Operational Noise

7.9.3 No significant noise effects are expected during the operational phase, and no specific mitigation or enhancement measures are required for operational noise, as appropriate operational noise limits have been demonstrated to be complied with.

7.10 Residual Effects

7.10.1 No specific mitigation or enhancement measures are required for construction, decommissioning or operational noise and it is concluded that the Proposed Development will have no significant effects in relation to noise.

Conclusions of Significance Evaluation

Construction Noise Effects

7.10.2 Considering the large separation distance of turbines to receptors, the relatively high distance attenuation involved, and taking into account standard methodologies for site noise control, it is considered that even during the most intense period of engineering works, noise at the receptors will not exceed the most stringent criterion derived from BS 5228-1:2009+A1:2014 and therefore effects will not be significant.

Operational Noise Effects

7.10.3 The assessment has derived daytime and night-time noise limits for the Proposed Development using the methodology specified in ETSU-R-97 *The Assessment and Rating of Noise from Wind*

Farms. As shown in **Table 7.9** and **Table 7.10**, the predicted noise levels from the Proposed Development in isolation lie below the associated noise limits at each assessed receptor (as indicated by negative values in these tables). **Table 7.15**, when considering the cumulative impact of the Proposed Development in addition to existing, consented and application wind developments, the predicted turbine noise levels meet the associated noise limits at each of the assessed receptors.

7.10.4 Consequently, taking into account these facts and other issues discussed in **Section 7.8**, including low frequency noise, wind shear, tonality and amplitude modulation, it was concluded that the Proposed Development will have no significant effects in relation to operational noise.

7.10.5 A summary of the assessed effects and the associated significance is presented in **Table 7.16** below.

Table 7.16 Summary of Effects and Evaluation of Significance

Potential Receptor and Effect	Type of Effect	Probability of Effect Occurring	Significance	Summary Rationale
Construction / Decommissioning Noise	Negative	Likely	Not Significant	Large separation distances between receptors and turbines results in low construction noise immissions at the closest noise sensitive receptors. Assessment methodology advocated within BS 5228-1:2009+A1:2014 complied with.
Operational Noise	Negative	Likely	Not Significant	Scheme complies fully with ETSU-R-97 Guidelines.

7.11 Conclusions

7.11.1 An assessment that considered noise from the construction, operation and decommissioning phases of the Proposed Development was carried out. It was concluded that the large separation between turbines and residential receptors is sufficient to ensure that any construction or decommissioning noise effect will be limited at each of the assessed receptors. The effect of construction noise is therefore considered not significant and no specific mitigation is therefore needed.

7.11.2 Operational noise was assessed in accordance with ETSU-R-97 Guidance. The design of the scheme is such that the operational noise predictions for the noise assessment envelope lie within the ETSU-R-97 Guidance derived noise limits.

7.11.3 An assessment of cumulative noise effects, taking into account existing, consented and application wind farm developments, and in accordance with the ETSU-R-97 Guidance, demonstrated that operational noise levels lie below the associated noise limits.

7.11.4 Consequently, it is concluded that the Proposed Development will have no significant effects in relation to noise.

7.12 References

The Working Group on Noise from Wind Turbines (1996) *The Assessment and Rating from Windfarms*. ETSU Report ETSU-R-97.

Institute of Acoustics *'A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise'*, May 2013

Planning Advice Note 1/2011 (PAN 1/2011) 'Planning and Noise'.

Scottish Government Planning Advice Notes 'On-shore wind turbines', updated 28 May 2014 (http://www.scotland.gov.uk/Resource/0045/00451413.pdf,).

British Standard (BS) 5228:2009+A1:2014 *Noise and Vibration on Construction and Open Sites.*

Highways Agency publication '*Design Manual for Roads and Bridges*' (DMRB) Volume 11 (2011).

Department of Transport publication '*Calculation of Road Traffic Noise*' (CRTN) (1988).

ISO 9613-2 (1996) *Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation.* International Standards Organisation.

J H Bass & A J Bullmore, ETSU W/13/00385/REP (2000) *A Critical Appraisal of Wind Farm Noise Propagation*.

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University of Salford (2007) *Research into aerodynamic modulation of wind turbine noise.* Department of Business Enterprise and Regulatory Reform.

BERR (2007) Government statement regarding the findings of the Salford University report into Aerodynamic Modulation of Wind Turbine Noise.

Wind Turbine Amplitude Modulation: Research to Improve Understanding as to its Cause and Effect, Renewable UK, December 2013

8. Shadow Flicker

8.1 Non-Technical Summary

8.1.1 Under certain combinations of geographical position, time of day and time of year, the sun may pass behind the rotor of a wind turbine and cast a shadow over neighbouring properties. When the blades rotate, the shadow cast upon the ground also rotates. Where the shadow is cast through a window or an open door, it may appear to flicker on and off due to its rotation and this is known as 'shadow flicker'.

8.1.2 As experience from some other wind farm sites has shown that shadow flicker has the potential to cause annoyance to occupants of affected properties under certain circumstances, a study has been undertaken to identify whether shadow flicker is likely to occur at residential properties in the vicinity of the Proposed Development. At UK latitudes, shadow flicker effects are only likely to occur at properties within 10 rotor diameters of a turbine where they are located within 130 degrees either side of north of any turbine.

8.1.3 As there are no residential properties located within 1,110m (10 rotor diameters of up to 106m, plus a 50m tolerance for micrositing) and 130 degrees either side of north of any proposed turbine, shadow flicker is not predicted to occur at any of the nearby residential properties as a result of the Proposed Development.

8.2 Introduction and Overview

8.2.1 This chapter assesses the potential effects that may arise from shadow flicker as a result of the operation of the Proposed Development. It should be read with reference to the scheme description in **Chapter 4 - Description of the Proposed Development**.

8.2.2 The Scottish Government's Online Renewables Planning Advice: *Onshore Wind Turbines* (updated May 2014) outlines how under certain combinations of the time of day and year, and geographical position of receptors, the sun may pass behind a wind turbine and cast a shadow which moves (rotates) as the blades rotate. Where the shadow is cast into a window or open door of a property, it may appear to flicker on and off when viewed from within due to its rotation and this is known as 'shadow flicker'. The phenomenon of shadow flicker has the potential to affect residential amenity.

8.2.3 The likelihood of shadow flicker occurring and its duration depends upon a number of factors including direction and distance of properties from turbines, turbine size, time of day and year and weather conditions (including cloud cover and the prevailing wind direction). Only properties within 130 degrees either side of north, relative to the turbines can be affected at UK latitudes as turbines do not cast shadows on their southern side.

8.2.4 The further the distance between the observer and the turbine the less pronounced the shadow flicker effect will be as the sun is less likely to be sufficiently low to cast a long shadow. At UK latitudes, shadow flicker effects are therefore only likely to occur at properties within 10 rotor diameters of a turbine.

8.3 Methodology and Approach

Policy and Legislative Context

8.3.1 Scottish Planning Policy (SPP) (Scottish Government, 2014), under the subject of policy on onshore wind, lists shadow flicker as an assessment criteria for wind farm developments. Further advice is provided in the Scottish Government's Online Renewables Planning Advice: Onshore Wind Turbines, which states that: *"Under certain combinations of geographical position, time of day and time of year, the sun may pass behind the rotor and cast a shadow over neighbouring*

properties. When the blades rotate, the shadow flicks on and off; the effect is known as shadow flicker. It occurs only within buildings where the flicker appears through a narrow window opening".

8.3.2 The Onshore Wind Turbines Planning Advice goes on to state: *"In most cases however, where separation is provided between wind turbines and nearby dwellings (as a general rule 10 rotor diameters), "shadow flicker" should not be a problem*".

8.3.3 There is no specific guidance on assessment methodology within the Online Renewables Planning Advice: Onshore Wind Turbines.

8.3.4 The assessment criteria within the Online Renewables Planning Advice: Onshore Wind Turbines is based on the now revoked PPS 22 Companion Guide (ODPM, 2004) for England and Wales, which informed current Scottish advice and formed part of the Shadow Flicker study carried out by the Department of Energy and Climate Change (DECC) in 2011. Furthermore, it expands on the information provided in current guidance with regards to shadow flicker.

8.3.5 The current statutory Development Plan applicable to the Development Site comprises the approved Ayrshire Joint Structure Plan 2007 and the adopted East Ayrshire Local Plan 2010. Full details regarding all relevant national and Development Plan policies, including emerging policies, are provided in **Chapter 5 – Planning Policy Context,** together with information regarding other planning material considerations.

8.3.6 In 2011 DECC commissioned a study entitled *An Update of UK Shadow Flicker Evidence Base*. The purpose of this study was to present "*an update of the evidence base which has been produced by carrying out a thorough review of international guidance on shadow flicker, an academic literature review and by investigating current assessment methodologies employed by developers and case study evidence".*

8.3.7 The findings of the study conclude that the recommendation within English and Scottish planning policy and advice to assess shadow flicker impacts within 130 degrees either side of north and 10 rotor diameter distance from the nearest property is appropriate. This guidance is based on the path of the sun across the UK and the potential length of shadows. The study also concludes that it is widely accepted across Europe that at more than 10 rotor diameters from a turbine the potential for shadow flicker is very low.

8.3.8 It should be noted that at the time of this study in 2011, national policy guidance was presented in Planning Advice Note (PAN) 45 *Renewable Energy Technologies* for Scotland and *Planning for Renewable Energy, A Companion Guide* to Planning Policy Statement (PPS) 22 (ODPM, 2004) for England and Wales. Both of these documents have since been revoked and current national guidance on Shadow Flicker is available within Online Renewables Planning Advice: *Onshore Wind Turbines* (Scottish Government, updated May 2014) and the National Policy Statement (NPS) for *Renewable Energy Infrastructure* (EN-3) (DECC, 2011) respectively. Despite these changes in national planning policy frameworks, the policy guidance regarding the assessment of shadow flicker effects has not altered since 2011.

8.3.9 Furthermore, the 2011 study concludes that there have not been extensive issues with shadow flicker in the UK and in circumstances where shadow flicker issues have been raised, these have been resolved using standard mitigation, such as turbine shut down systems. Following publication of the 2011 study, DECC has confirmed that there are no plans to change current guidance on shadow flicker.

8.3.10 **Table 8.1** below sets out applicable national and Development Plan policies related to shadow flicker.

Table 8.1 Relevant National and Development Plan Policies

Policy Document	Summary
Scottish Planning Policy (2014)	Paragraph 169 identifies a number of considerations which are likely to be relevant when determining proposed energy infrastructure developments, including: *"• cumulative impacts ...* *• impacts on communities and individual dwellings, including visual impact, residential amenity,* *• noise and shadow flicker..."*
Ayrshire Joint Structure Plan (2007)	Policy STRAT 1 – Sustainable Development (in particular Schedule 1). Criterion (b) Environmental Quality states that development proposals "*should not have an adverse effect on land, air and water quality or nuisance by way of smell, noise or light…*"
	Policy ENV11 – Air, Noise and Light Pollution This policy seek to protect against new development that would expose large numbers of people to unacceptable levels of air, noise and light pollution.
East Ayrshire Local Plan (2010)	Policy SD1 – General Strategic Policy This policy outlines that new development should not have any unacceptable adverse impact on factors including "*the environment and amenity of local communities and residents of the area…*"
East Ayrshire LDP Proposed Plan (2015)	Overarching Policy OP1 This policy requires all development proposals, where relevant, to comply with multiple environmental, design and amenity related criteria, including *"(iii) Ensure that the size, scale, layout, and design enhances the character and amenity of the area and creates a clear sense of place*".
	Policy RE1 Renewable Energy Developments This policy states that renewable energy proposals will be supported by the Council "where it can be demonstrated that there will be no unacceptable significant adverse impacts on all of the relevant Renewable Energy Assessment Criteria set out in Schedule 1 of the LDP". One of the criterions listed within Schedule 1 is "*impacts on communities and individual dwellings, including visual impact, residential amenity, noise and shadow flicker*".
	Policy RES 11: Residential Amenity This policy seeks to protect existing residential amenity through introducing a general presumption against certain types of development or land use change in specific places. Of relevance to the Proposed Development, criterion (i) introduces a general presumption against "*the establishment of non-residential uses within, or in close proximity to, residential areas which potentially have detrimental effects on local amenity or which cause unacceptable disturbance to local residents*".

Other Relevant Guidance

8.3.11 Whilst not strictly applicable in a Scottish context, the guidance in Northern Ireland provided in the Best *Practice Guidance* to Planning Policy Statement 18 (PPS 18) *Renewable Energy* (Northern Ireland Department of the Environment, 2009) is noteworthy. The guidance accords with the advice provided by DECC (2011) and the Scottish Government (2014), but further recommends that "*shadow flicker at neighbouring offices and dwellings within 500m should not exceed 30 hours per year or 30 minutes per day*." The recommendation is based on a European Union sponsored study undertaken by Predac (2004), an organisation that promotes best practice in energy use and supply.

Photo-sensitive Epilepsy

8.3.12 Research has been carried out to determine whether shadow flicker from wind turbines can cause seizures in photo-sensitive epilepsy sufferers (Harding G, Harding P, and Wilkins A, [2008]). Sufferers are usually sensitive to flickering light at frequencies from 3Hz–60Hz. For a typical 3-blade, 50m rotor diameter wind turbine, the maximum rotational speed will be less than 20 revolutions per minute (rpm) so the blade passing frequency is 60cpm (cycles per minute), or 1 cycle per second (i.e. 1 Hertz (Hz)); this is well below the 3Hz–60Hz sensitivity range of those sensitive to flickering light.

8.3.13 Large modern turbines, as proposed to be installed at the Development Site, will operate at varying speeds, up to 18.4rpm. As the turbine rotors will have three blades, a blade will pass a particular point no more than 55.2 times a minute, which equates to a maximum shadow flicker frequency of 0.92Hz. Again, this is well below the 3-60Hz frequency range generally thought to risk triggering photo-sensitive epilepsy. It is also noted in the DECC Report (2011) that "*on health effects and nuisance of the shadow flicker effect, it is considered that the frequency of the flickering caused by the wind turbine rotation is such that it should not cause a significant risk to health"*. Therefore photo-sensitive epilepsy is not considered further and has been scoped out in this assessment.

Baseline Establishment

8.3.14 A 1,110m study area (10 rotor diameters (up to 106m), plus 50m micrositing allowance) from the proposed turbine locations has been adopted for the consideration of potential shadow flicker effects within this chapter.

8.3.15 In addition, as per national guidance, only properties 130 degrees either side of north within this study area have been considered. The study area is shown in **Figure 8.1**.

8.3.16 The following sources of information outlined in **Table 8.2** were used to inform this assessment.

Table 8.2 Sources of Information

Topic	**Source of Information**
Residential properties	
Location in relation to wind farm	Ordnance Survey (OS) 1:25,000 Mapping Google Earth Street View Bing Maps Birds Eye View
Topography	
Height data	OS 50m Digital Terrain Model (DTM) data

Consultation

8.3.17 The approach to shadow flicker assessment was outlined in the Scoping Report (November 2012) (see **Chapter 2 - Environmental Impact Assessment Process, Appendix 2.A**) and no scoping comments were received in relation to shadow flicker.

Methodology for Establishment of Effects

8.3.18 The shadow flicker assessment comprises numerical modelling of the proposed turbine locations and receptors (i.e. dwellings) within 10 rotor diameters and 130 degrees north of these locations. It is noted that whilst there are a number of computer models available, the DECC study (2011) confirms: "*it has been shown that the outputs of these packages do not have significant differences between them*". It can therefore be concluded that the use of any of a variety of industry standard

software packages (e.g. ReSoft Wind Farm software) would not alter the conclusions of the assessment.

8.3.19 The assessment model assumes a hypothetical worst case scenario based on the sun shining during all daylight hours over the course of a year, with no obscuring features (such as trees, hedges, other buildings) being present, the face of the rotor always being aligned towards the dwelling, and that the rotor is always turning (i.e. the wind is always blowing between 4m/s and 25m/s, and no account is taken of shut down periods for maintenance). This methodology determines the theoretical maximum period that shadow flicker could occur during the course of a year. The assessment also determines the times of day, and dates during the year when shadow flicker could potentially occur at particular receptors.

8.3.20 The software performs calculations to determine the position of the sun throughout the year, and thus, during what times of day it will theoretically cast a shadow across the windows of nearby houses (receptors) within the study area. Data input into the shadow flicker assessment model is as follows:

- The locations of all properties within the study area and 130 degrees either side of north of any turbine;
- The assumed maximum dimensions and orientations of windows facing the Proposed Development;
- The surrounding topography (Ordnance Survey Digital Terrain Model); and
- The locations and dimensions of the turbines.

Significance Evaluation Methodology

8.3.21 Whilst the time and duration of theoretical shadow flicker events can be predicted accurately, the level of the effect is difficult to quantify as this would depend on the location of windows within a property, the use of the rooms affected, the level of shading surrounding the property and how susceptible the receptor is to annoyance as a result of light flicker.

8.3.22 As confirmed by the DECC study (2011), there is no standard Scottish or UK guidance on a threshold for shadow flicker at which effects may be significant. The only guidance providing additional recommendations is in the aforementioned Best Practice Guidance which supplements the Northern Irish PPS 18 (2009) guidance, which recommends that for properties within 500m of the turbines, shadow flicker should not exceed 30 hours per year or 30 minutes per day.

8.4 Baseline Information

Current Baseline

8.4.1 No residential properties, or buildings of any nature, have been identified within the 1,110m study area as shown in **Figure 8.1**.

Predicted Future Baseline

8.4.2 On the basis of the information currently available, there are not anticipated to be any changes to the baseline conditions in the event that the Proposed Development does not proceed.

Cumulative Baseline

8.4.3 A planning application has been submitted for the South Kyle Wind Farm which is located in close proximity to the Proposed Development. The closest distance between the Enoch Hill and South Kyle proposed developments is ~360m between Enoch Hill T19 and South Kyle T07. However as there are no receptors with potential to be affected by shadow flicker from the Proposed Development, there is no potential for any cumulative effects to occur with South Kyle Wind Farm.

8.4.4 There are no other existing or proposed wind turbines located such that they could cause cumulative effects with the Enoch Hill proposed turbines.

Information Gaps

8.4.5 No information gaps have been identified.

8.5 Design Evolution

8.5.1 The proposed locations of the turbines have been determined primarily on technical requirements such as topography and wind resource but also, to an extent, on preliminary environmental constraints known at the time. The final location of the turbines has been chosen to maximise the distance from residential properties so far as possible given other environmental and technical constraints and thereby avoid or minimise effects (such as shadow flicker) on residential amenity.

8.6 Scope of Assessment

Potential Receptors

8.6.1 No receptors have been identified as being located within the 1,110m study area.

Likely Significant Effects

8.6.2 Shadow flicker has only been considered as a potential operational effect of the Proposed Development for the purpose of this assessment. No effects would arise during construction or decommissioning.

8.7 Predicted Effects: Shadow Flicker

During Operation

8.7.1 No shadow flicker effects are expected as no residential properties lie within the study area, i.e. a distance of 1,110m (10 rotor diameters, plus a 50m micrositing allowance) and 130 degrees either side of north from the proposed turbine locations.

8.8 Predicted Effects: Cumulative

8.8.1 No shadow flicker effects as a result of the operation of the Proposed Development are expected and therefore no cumulative effects are expected as a result of the Proposed Development in combination with other wind farm projects (existing or proposed).

8.9 Mitigation and Enhancement Measures

8.9.1 No further mitigation measures are required since no predicted shadow flicker effects have been identified.

8.10 Residual Effects

Conclusions of Significance Evaluation

8.10.1 No shadow flicker effects are predicted as there are no residential properties within the study area surrounding the Proposed Development within which such effects could arise, as such there is no requirement for any further mitigation measures and no residual effects during the operation of the proposed wind turbines.

8.11 References

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9. Landscape and Visual

9.1 Non-Technical Summary

9.1.1 The assessment conforms to the Guidelines for Landscape and Visual Impact Assessment, Third Edition (GLVIA) and has been undertaken by chartered landscape architects at Amec Foster Wheeler Environment and Infrastructure Ltd. The assessment has considered the construction, operation, and decommissioning phases of the Proposed Development and has included design iteration and re-assessment of the residual effects.

9.1.2 The Development Site is located approximately 5km southwest of New Cumnock, predominantly within the Southern Uplands and Forestry landscape character type (LCT) within East Ayrshire.

9.1.3 Consultation arising from the scoping process on landscape and visual assessment has been undertaken with Scottish Natural Heritage (SNH) and East Ayrshire Council (EAC). The advice from consultees has been used to assist the design and assessment process with additional comments provided on viewpoint selection and the cumulative assessment. Strategic landscape planning advice has been considered from the following sources:

- The Ayrshire Joint Structure Plan (2007);
- The EAC Local Plan (2010) and the EAC Local Development Plan: Proposed Plan (2015); and
- The Dumfries and Galloway (DGC) Council Local Development Plan (2014).

9.1.4 In addition, further non-statutory guidance has been sought from:

- SNH's Strategic Locational Guidance for Onshore Wind Farms (March 2009);
- The EAC Draft Planning for Wind Energy Supplementary Guidance (2015);
- The EAC Landscape Wind Capacity Study (2013) (EALCS); and
- The Dumfries and Galloway Wind Farm Landscape Capacity Study (DGLCS).

9.1.5 These latter documents provide the following advice on the Development Site:

9.1.6 The Proposed Development would be located within 'Zone 2' of SNH's Strategic Guidance for Onshore Wind Farms and in an area where there is often scope to accommodate development of an appropriate scale, siting and design, subject to cumulative development.

9.1.7 Both the EAC and DGC landscape capacity studies provide sensitivity analysis of the Southern Uplands and Southern Uplands with Forestry Landscape Character Types (LCTs), which may be considered relevant to the Development Site and collectively they record a high / medium to low, inherent landscape sensitivity to large scale turbine development. The large or extensive scale and simplicity of the landscape character is recognised in both documents as an opportunity for large scale wind farm development, noting that the general lack of settlement and presence of forestry are factors indicating some capacity for large scale wind turbines.

9.1.8 The Development Site is located away from residential properties (none within 1.6km) and would be located within the less sensitive interior hills. As part of the design process the proposed turbines have been positioned into the southern part of the Development Site, providing a generous 'set-back' from the B741 road.

9.1.9 Cumulatively, the Proposed Development has been designed to appear as part of the 'South Kyle Wind Farm' with sufficient similarity in the design approach and visual appearance such that should South Kyle be consented, the Proposed Development would appear visually compatible. Equally however, if the South Kyle application were not consented, the Proposed Development has been designed to appear as a simple, cohesive cluster, sufficiently separate from other cumulative wind

farm development so as to appear 'distinctive' and 'separate' in accordance with the SNH 'Guidance on Siting and Designing Windfarms'.

9.1.10 Drawing from the non-statutory advice of the EALCS and DGLCS, consultation, and the design and assessment process, a number of landscape design objectives for the Proposed Development have been set out as follows:

- Achieve a simple, rational, and cohesive design from most viewpoints avoiding turbine stacking, gaps and outlying turbines so the scheme may be accommodated on a stand-alone basis or cumulatively;
- Turbine development should avoid the front faces of hills overlooked by settlements, roads and residential receptors; instead occupying the less visually sensitive interior hills;
- While not a hard constraint[1], a turbine 'avoidance area' at the north of the Development Site was applied in response to feedback obtained as a result of public consultation and Community Liaison Group meetings. This constraint was applied to minimise effects on residential properties located to the north of the Development Site;
- Maintain the simple landscape character of the Development Site by siting ground based infrastructure in the least visible locations;
- Limit landscape and visual effects on the visual receptors including local residents, roads, recreational routes and visitor / tourist destinations;
- Achieve a design proposal that would be broadly compatible or co-existent with other existing and consented wind farm development within the Study Area. In this respect the design should adopt a clustered layout that is broadly similar to neighbouring wind farm developments in terms of perceived turbine height, number, proportion, 3 bladed design, colour and lighting. For example, the maximum turbine height for the Proposed Development of up to 130m to blade tip compares favourably with the consented turbine height at nearby schemes such as Sanquhar (130m), Dersalloch (125m) and Afton (120m and 100m); and
- Limit cumulative landscape and visual effects including sequential cumulative effects from roads and the sensitive area of landscape character such as the Glen Afton Valley.

Landscape Effects

9.1.11 Landscape effects are concerned with how the Proposed Development would affect the elements that make up the landscape, the aesthetic and perceptual aspects of the landscape and its distinctive character. The Proposed Development Wind Farm would lead to a significant effect on part of the Southern Uplands and Forestry: Enoch Hill LCA. The geographical extent of the significant effects would be limited to the immediate areas of the proposed turbines, within the Development Site itself (and part of the Southern Uplands and Forestry: Enoch Hill LCA) due to the containment of coniferous forestry and landform. Significant landscape effects would also extend north, approximately 2km (affecting the East Ayrshire Southern Uplands: Benty Cowan Hill LCA) due to the upper parts of the turbines appearing beyond the summits of Chang Hill and Benty Cowan Hill. The nature of all of these effects would be long-term (reversible) direct and negative due primarily to the height and scale of the turbines.

9.1.12 This effect would not be significant in terms of the wider East Ayrshire Southern Uplands / Southern Uplands with Forestry which extends further south to include the Southern Uplands / Southern Uplands with Forests: Carsphairn area, in Dumfries and Galloway. The proposed Development would also lead to a significant, indirect effect on the southern views and the backdrop of the Southern Uplands as viewed from the New Cumnock Upland Basin LCA, to the west and northwest of New Cumnock. Much of this area and the associated southern views are already partly characterised by views of wind farm development at Hare Hill and Windy Standard

[1] Hard constraints area considered to be existing infrastructure, residential properties, watercourses, roads, public rights of way, etc.

wind farms and would not appear incongruous. The assessment also notes that part of this area is currently characterised by open cast mining operations, reducing its overall sensitivity to wind farm development. The nature of these effects is further detailed as part of the visual assessment.

9.1.13 The Development Site is designated at a local level as part of the Afton Sensitive Landscape Character Area (SLCA). Although there would be a significant effect on part of the landscape character within the Afton SLCA, it is not considered that the special qualities of the SLCA, its integrity or the reasons for its designation would be significantly affected, and there would be little or no visibility from within the Afton Glen area itself, which forms the focus of the SLCA in this area.

9.1.14 Further, there would be no significant effects on any other locally or nationally designated landscapes including the Galloway Hills Regional Scenic Area (RSA).

Visual Effects

9.1.15 Visual effects are concerned with the effects of development and change on the views and visual amenity likely to be experienced by people within the landscape. A total of 22 viewpoint assessment locations have been selected across the study area and within the ZTV as part of the consultation process with SNH and the local planning authorities. Visualisations (photographs of the existing view, wireframes and photomontages) of the Proposed Development from each of these viewpoint locations are presented in the ES in Volume 2 and their analysis indicates that the likely extent of potential, significant visual effects would extend out in a north and northeast direction, primarily affecting views south from the Upland Basin including open views from the A76 and the south western edge of New Cumnock within approximately 7km from the nearest turbine locations, as indicated by Viewpoints 1 to 7. The predicted visual effects as indicated by Viewpoints 1 to 7 are indicative of a visual effect from a particular location and should not be assumed to translate into effects on the overall visual experience within 7km as they are not representative or typical. For example, due to the landform, intervening vegetation screening and the wind farm design, those residential properties closest to the Proposed Development within approximately 3km would not be significantly affected. The views in other directions to the east, south and west would not be significantly affected due to the intervening landform and forestry.

9.1.16 The Proposed Development would have a significant effect on the views from the small settlement at Burnside and from the south western edge of New Cumnock, along Connel View and at the Cemetery along Afton Road (also promoted as a Scottish Hill Track / Heritage Path). There would also be a significant effect on the views from part of the B741 and two core paths, views from part of Knockshinnock local nature reserve and the hill summits of Blackcraig Hill and Windy Standard.

Conclusions

9.1.17 The Proposed Development has taken account of the non-statutory guidance within the EALCS and the DGLCS and through the preliminary design and assessment process has located the turbines into the southern, least sensitive part of the Development Site in order to mitigate potential effects on views from the New Cumnock Upland Basin area. In doing so, the Proposed Development seeks to exploit landscape characteristics identified within this area as suitable for large scale wind farm development in the EALCS, whilst avoiding those areas which may be considered as of higher sensitivity.

9.1.18 The proposed turbines are located remote from residential properties to the north, within a less sensitive part of the Development Site, providing a generous ‘set-back’ from the adjacent B741 minor road and thus increasing the level of mitigation afforded to landscape and visual receptors in the New Cumnock Upland Basin to the north along the B741 and around the New Cumnock area. In addition, the turbine composition has been visually composed to improve its appearance from the main viewpoints to the north and from within the New Cumnock Upland Basin LCA. In doing so, the Proposed Development has achieved its landscape design objectives in terms of integrating the Proposed Development within its proposed landscape setting and cumulative baseline whilst limiting and mitigating potential landscape and visual effects. In this respect it is notable that the likely significant effects of the Proposed Development would be limited to part of the Southern Uplands / Southern Uplands with Forestry LCT, a typology that is generally considered as more

able of accommodate wind energy development when compared to other LCTs. Further, the significant visual effects would be largely contained to within the New Cumnock, Upland Basin LCA to the west and north of New Cumnock. Whilst there would be no significant effects on the views from the closest residential properties within 3km, there would be significant visual effects on the south western views from Burnside, Knockshinnoch Lagoons local nature reserve and the south western edge of New Cumnock and part of the B741 and 2 local footpaths. All of these receptors are set within the Upland Basin and tend to have a northern or north westerly aspect, viewing across the River Nith to the north and away from the Proposed Development. There would also be significant visual effects on the views from the hill summits of Blackcraig Hill and Windy Standard Hill, experienced in the context of other existing and consented wind farm development located in the intervening fore or middle ground.

9.2 Introduction

9.2.1 The Landscape and Visual Impact Assessment (LVIA) for wind farms forms one of the key components of the EIA process to comply with the Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2000 (as relevant and amended and hereinafter referred to as the 'EIA Regulations'). This allows consideration of the Proposed Development (Enoch Hill Wind Farm) against relevant planning policies, relating to landscape resource and visual amenity.

9.2.2 The Proposed Development is located 5.9km southwest of New Cumnock, predominantly within the Southern Uplands and Southern Uplands with Forests landscape character types (LCT), within East Ayrshire.

9.2.3 The Proposed Development comprises up to 19 wind turbines, each with a maximum height of up to 130m to blade tip. Infrastructure associated with the Proposed Development includes a new site entrance, access tracks with an estimated 25 passing places, 2 wind monitoring masts (including hard standing area), external transformers, up to three borrow pits search areas, up to six culverts, temporary construction works (including concrete batching plant), wind farm control building compounds and Scottish Power Energy Networks (SPEN) substation, along with limited offsite road widening.

9.2.4 The LVIA and cumulative assessment (CLVIA) reported in this chapter has been produced by chartered landscape architects at Amec Foster Wheeler, Environment and Infrastructure UK Ltd (Amec Foster Wheeler). The objective of this assessment has been to determine the landscape and visual effects of the Proposed Development on the existing landscape resource and visual amenity. The following landscape and visual receptors have been assessed:

- Landscape character, key characteristics, and elements;
- Designated landscapes; and
- Views and visual amenity experienced by residents, tourists, visitors, recreational and road users.

9.2.5 The assessment process has encompassed the construction, operation, and decommissioning of the Proposed Development and has included design iteration and re-assessment of the residual effects. The process has sought to achieve an acceptable compromise between energy capture, environmental considerations and achieving an acceptable design in terms of landscape and visual effects.

Chapter Structure

9.2.6 The chapter is structured as follows:

- Section 9.1 – Non Technical Summary;
- Section 9.2 – Introduction;
- Section 9.3 Methodology;

- Defining the Study Area;
- Landscape Policy and Guidance;
- Landscape and Visual Impact Assessment;
- Consultation and Scope of Assessment;
- Zone of Theoretical Visibility (ZTV) and Viewpoint Analysis;

- Section 9.4 Baseline Description;
- Section 9.5 Design Statement and Mitigation;
- Section 9.6 Residual Landscape Effects;
- Section 9.7 Residual Visual Effects;
- Section 9.8 Summary of Residual Landscape and Visual Effects;
- Section 9.9 References;
- Appendices (contained within Volume 3):
  - Appendix 9.A: Methodology and Glossary;
  - Appendix 9.B: Viewpoint Analysis;
  - Appendix 9.C: Residential Visual Amenity Assessment;
  - Appendix 9.D: Descriptions of Landscape Character Units within 10km;
  - Appendix 9.E: Wild Land Assessment; and
  - Appendix 9F: Cumulative Wind Energy Development Excluded from the CLVIA.

9.2.7 A number of figures are provided to illustrate this chapter and they are contained within Volume 2 and include plans and visualisations of the Proposed Development.

9.2.8 In addition a separate Viewpoint Pack, prepared in accordance with the Scottish Natural Heritage (SNH) guidance has been provided in support of the planning application. The Viewpoint Pack should be used as an additional aid to viewing the landscape and the Proposed Development from the assessment viewpoints on site.

9.3 Methodology

9.3.1 The methodology for the LVIA has been undertaken in accordance with best practice guidance and the methodology set out in Volume 3: **Appendix 9.A** and conforms to the Guidelines for Landscape and Visual Impact Assessment (GLVIA) 3rd Edition, Landscape Institute and IEMA May 2013. Additional guidance has been taken from the following key publications:

- Spatial Planning for On-shore Wind Turbines – Natural Heritage Considerations, SNH (June 2015);
- Landscape Capacity Toolkit: A Guide to Commissioning a Landscape Capacity Study, SNH (2015);
- Siting and Designing Windfarms in the Landscape, Version 2, SNH (May 2014);
- Guidance: Assessing the Cumulative Impact of Onshore Wind Energy Developments, SNH (2012);
- Visual Representation of Wind Farms Version 2.1, SNH (December 2014);
- The EIA Handbook, SNH (2013); and

- Visual Assessment of Windfarms: Best Practice, Commissioned Report F01AA303A produced for SNH by the University of Newcastle (2002).

Assessment Parameters

9.3.2 The LVIA and cumulative assessment has assessed the Proposed Development on the basis of the final layout comprising a maximum 19 wind turbines with a maximum height of up to 130m to blade tip. ZTV plots and visualisations have been prepared on the basis of a generic turbine model comprising an 80m hub height and a 100m rotor diameter with an overall blade tip height of up to 130m. It is considered that these assessment parameters would demonstrate the 'worst case' of likely significant landscape and visual effects as required by the EIA process. Whilst a slight alteration to the hub height or rotor diameter, within the overall blade tip limit of 130m is unlikely to alter the conclusions of the LVIA, a change to the hub height or rotor diameter could slightly alter the visual proportions of the wind turbine, with a larger rotor diameter making the turbines appear either slightly 'broader' and / or slightly reducing the overall impression of height. In accordance with SNH guidance on the Sitting and Designing of Wind Farms in the Landscape (May 2014) there is no visual preference or 'worst case' regarding these parameters and individual opinions will vary. The guidance does however, consider that the proposed turbines should appear reasonably compatible with other existing and consented wind turbines, where they would appear nearby or as part of an extension to another wind farm for example. Pre-construction and during procurement the selected turbine model would be agreed with the local planning authority and the exact hub height and rotor dimensions may vary slightly within the overall maximum blade tip height of up to 130m.

9.3.3 In addition, the location of the proposed turbines has been assessed on the basis of the final wind turbine layout, which would normally be subject to a micrositing condition of up to +/-50m. The landscape architects conducting this study have tested the clustered turbine layout and can also confirm that the turbine micrositing would lead to no change to the magnitude and level of effect reported in the LVIA.

Defining the Study Area

9.3.4 The SNH guidance advises that the LVIA Study Area for the heights of the proposed wind turbines should be based on an area of 35km distance from each of the proposed turbine locations. The LVIA Study Area is illustrated in **Figure 9.1**, Volume 2 and covers a circular area of 36,694m radius from the Development Site centre (based on a minimum 35km distance from each of the proposed turbine locations).

9.3.5 It is important to note that the boundary of the Study Area is not the limit of potential visibility in clear weather conditions. Rather it is an area defined by SNH, on the basis of research to determine a suitable Study Area for the assessment of wind farms, which would contain all potential significant landscape and visual effects.

Landscape Planning Policy and Guidance

9.3.6 The LVIA process has taken into account relevant national and local planning policy requirements, as outlined in **Chapter 5 – Planning Policy Context**. Further information on strategic landscape planning guidance from SNH and local planning authorities has been considered from the following statutory sources:

- The Ayrshire Joint Structure Plan (2007);
- The EAC Local Plan (2010) and the EAC Local Development Plan: Proposed Plan (2015); and
- The Dumfries and Galloway (DGC) Council Local Development Plan (2014).

9.3.7 In addition, further non-statutory guidance has been sought from:

- SNH's Strategic Locational Guidance for Onshore Wind Farms (March 2009);

- The EAC Draft Planning for Wind Energy Supplementary Guidance (2015);
- The EAC Landscape Wind Capacity Study (2013) (EALCS); and
- The Dumfries and Galloway Wind Farm Landscape Capacity Study (DGLCS).

Strategic Landscape Guidance

9.3.8 The Proposed Development would be located within 'Zone 2' of SNH's Strategic Guidance for Onshore Wind Farms (March 2009) which is defined as follows:

"Areas with some sensitivities to wind farms. However, by careful choice of location within these areas there is often scope to accommodate development of an appropriate scale, siting and design (again having regard to cumulative effects) in a way which is acceptable in natural heritage terms"

Landscape and Visual Impact Assessment

9.3.9 Landscape Effects are defined by the Landscape Institute in GLVIA 3, paragraphs 5.1 and 5.2 as follows:

9.3.10 "An assessment of landscape effects deals with the effects of change and development on landscape as a resource. The concern ... is with how the proposal will affect the elements that make up the landscape, the aesthetic and perceptual aspects of the landscape and its distinctive character ... The area of landscape that should be covered in assessing landscape effects should include the site itself and the full extent of the wider landscape around it which the Proposed Development may influence in a significant manner."

9.3.11 The potential landscape effects, occurring during the construction, operation and decommissioning period may therefore include, but are not restricted to the following:

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

9.3.12 Development may have a direct (physical) effect on the landscape as well as an indirect effect which would be perceived from the wider landscape, outside the immediate Development Site and associated landscape character.

9.3.13 Visual Effects are concerned wholly with the effect of the development on views, and the general visual amenity and are defined by the Landscape Institute in GLVIA 3, paragraphs 6.1 which states: "*An assessment of visual effects deals with the effects of change and development on views available to people and their visual amenity. The concern ... is with assessing how the surroundings of individuals or groups of people may be specifically affected by changes in the context and character of views."*

9.3.14 Visual effects are identified for different receptors (people) who will experience the view at their places of residence, during recreational activities, at work, or when travelling through the area. The visual effects may include the following:

- Visual effect: a change to an existing static view, sequential views, or wider visual amenity as a result of development or the loss of particular landscape elements or features already present in the view.
- Cumulative visual effects: the cumulative or incremental visibility of similar types of development may combine to have a cumulative visual effect.

9.3.15 Essentially, the level of landscape and/or visual effect (and whether this is significant) is determined through consideration of the 'sensitivity' and 'susceptibility' of the landscape or visual receptor to the Proposed Development and the 'magnitude of change' that would be brought about by the Proposed Development, were it to be constructed. The time period for the assessment covers the construction of the Proposed Development and associated infrastructure, its operation for a period of 25 years, and decommissioning. The assessment process has involved a process of iterative design and re-assessment of any remaining, residual effects that could not otherwise be mitigated or 'designed out'.

9.3.16 Landscape or visual sensitivity specific to the Proposed Development is ranked from high, medium, low to negligible (with negligible as the lowest or least sensitive) and the magnitude of change is ranked from high, medium, low, negligible to zero (with zero indicating no change) as indicated in **Table 9.1**.

9.3.17 The type of effect is also considered and may be direct or indirect; temporary or permanent (reversible); cumulative; and positive, neutral or negative. The landscape and visual assessment unavoidably involves a combination of both quantitative and qualitative assessment and, wherever possible, a consensus of professional opinion has been sought through consultation, internal peer review, and the adoption of a systematic, impartial, and professional approach.

9.3.18 In accordance with the relevant EIA Regulations it is important to determine whether the predicted effects, resulting from the proposed wind farm, are, in the assessor's opinion likely to be significant. Significant landscape and visual effects relate to all those effects that result in a 'Substantial' or a 'Substantial / Moderate' effect as indicated in **Table 9.1**. In some circumstances, 'Moderate' levels of effect also have the potential, subject to the assessor's opinion, to be considered as significant and these exceptions are explained as part of the assessment, where they occur.

Table 9.1 Evaluation of Landscape and Visual Effects

Magnitude of Change	**Landscapes and Visual Sensitivity**			
	High	**Medium**	**Low**	**Negligible**
High	Substantial	Substantial / Moderate	Moderate	Slight
Medium	Substantial / Moderate	Moderate	Slight	Slight / Negligible
Low	Moderate	Slight	Slight / Negligible	Negligible
Negligible	Slight	Slight / Negligible	Negligible	Negligible
Zero	None / No View	None / No View	None / No View	None / No View

9.3.19 Wind turbines and wind farm developments are by their nature tall, visible structures and the Scottish Government's web-based Planning Advice Note (PAN) on Onshore Wind Turbines (May 2014) notes the height of wind turbines as up to "140-150m high" which would inevitably result in significant effects. However that does not mean that a wind farm proposal should automatically be considered unacceptable and consent refused. Rather, the decision makers will then consider the project overall, in terms of the relevant development plan and Government policy such as NPF3 and SPP 2014.

Cumulative Landscape and Visual Impact Assessment

9.3.20 The Cumulative Landscape and Visual Impact Assessment (CLVIA) in accordance with SNH guidance considers the extent to which the Proposed Development, in addition to / or in combination with other wind energy development, may change the landscape resource.

9.3.21 The cumulative Study Area is the same as the Study Area for the main part of the LVIA, but also takes account of other selected wind energy development (existing, under-construction, consented and known planning application sites) from a wider 70km radius Search Area as illustrated in **Figure 9.6a/b**. Those developments at pre-planning or scoping stage are excluded in accordance with SNH guidance unless otherwise requested for inclusion in the assessment by SNH and / or the local planning authority due to their proximity to the Proposed Development for example.

9.3.22 Types of cumulative effect are defined as follows:

- Cumulative Landscape Effects: Where more than one wind development may have an effect on a landscape designation or particular area of landscape character.
- Cumulative Visual Effects: the cumulative or incremental visibility of similar types of development that may combine to have a cumulative visual effect. These can be further defined as follows:
  - Simultaneous or combined: where two or more developments may be viewed from a single fixed viewpoint simultaneously, within the viewer's field of view;
  - Successive: where two or more developments may be viewed from a single viewpoint successively as the viewer turns their head or swivels through 360°; and
  - Sequential: where a number of developments may be viewed sequentially or repeatedly from a range of locations when travelling along a route.

9.3.23 The SNH document 'Siting and Designing Wind farms in the Landscape: Version 2' (May 2014) explains that the development of multiple wind farms within a particular area may create different types of cumulative effect, as follows:

- "The wind farms are seen as separate isolated features within the landscape character type, too infrequent and of insufficient significance to be perceived as a characteristic of the area;
- The wind farms are seen as a key characteristic of the landscape, but not of sufficient dominance to be a defining characteristic of the area; and
- The wind farms appear as a dominant characteristic of the area, seeming to define the character type as a 'wind farm landscape character type."

9.3.24 Cumulative effects have also been interpreted as the 'additional' effect over and above the baseline of other wind farm development as well as the 'combined' cumulative effect of a number of other wind farm developments including the Proposed Development. This cumulative assessment has been prepared to ensure that, as well as the 'additional' cumulative effect of the Proposed Development the 'combined' cumulative effect (taking account of other existing, consented and application wind farm development) is also reported as outlined below. For clarity, where a significant cumulative effect is predicted the responsible wind energy development(s) is/are identified and noted in brackets in the main assessment and summary tables.

- Proposed Development;
- Existing + Consented + the Proposed Development; and
- Existing + Consented + Applications + the Proposed Development.

9.3.25 A full description of the cumulative assessment methodology is provided in **Appendix 9.A**, Volume 3.

Consultation and Scope of Assessment

9.3.26 Consultation relevant to the landscape, visual and cumulative assessment was undertaken with SNH and EAC who commented on aspects of methodology, sources of information, scope of assessment, viewpoint assessment and cumulative development.

9.3.27 DGC were also included in the scoping consultation process, but made no comment on landscape, visual and cumulative assessment. A summary of these consultation responses is provided in **Table 9.2**.

Table 9.2 Summary of Consultation

Consultee	Consultation
Scottish Natural Heritage	Scoping response dated 18 December 2012 Highlighted particular matters for the LVIA to address including: ▶ Local landscape designations: East Ayrshire's Sensitive Landscape Character Areas, and the South Ayrshire Scenic Area; ▶ The nearby towns of New Cumnock, Cumnock and Dalmellington; ▶ Landscape Character with reference to the Ayrshire Landscape Character Assessment Land Use Consultants 1998); ▶ The Southern Upland Way; ▶ The Merrick Search Area for Wild Land; and ▶ The Galloway Hills Regional Scenic Area to the south in Dumfries and Galloway. Confirmed the study area as 35km; requested the provision of both wirelines and photomontages for those viewpoints included within 15km; and clarified the requirement to provide cumulative wind farm analysis.
Scottish Natural Heritage	Email from SNH Officer and Amec Foster Wheeler's Landscape Architect dated 6th June 2014 Confirmed that they were happy for the viewpoints listed in a letter dated 29 April 2014 to be taken forward to support the LVIA for the Proposed Development.
East Ayrshire Council	Scoping response dated 31st January 2013 Highlighted the areas of design, tourism/recreation and public access and amenity issues for consideration; requested that a Residential Visual Amenity Assessment should be provided for every property located within 2km; requested a cumulative assessment and the use of ZTV to influence design.
East Ayrshire Council	Email from EAC Landscape officer to Amec Foster Wheeler's Landscape Architect dated 9th May 2014. Commented on the suggested viewpoint list and suggested additional viewpoints; highlighted that Viewpoint 2 should be moved outside of the Kyle Forest subject to confirmation in the field; asked that potential views from Glen Afton Leisure Park be checked in the field; asked that the viewpoint originally proposed for Dalgig Road which had become redundant due to recent open-cast working be replaced with a new viewpoint within the Upland Basin LCT; requested a viewpoint within the settlement of New Cumnock in the vicinity of the Cemetery or Connell Road; requested photography to be provided from the vicinity of every assessed residential property.
East Ayrshire Council	Telephone conversation between EAC Landscape Officer and Amec Foster Wheeler's Project Manager recorded on 9th May 2014 Further discussions on viewpoint locations on the Craigengillan Estate and agreement that the Nearby Auchenroy Hill should be included as a viewpoint

Viewpoint Selection

9.3.28 EAC and SNH were consulted on the viewpoint selection and all requests for additional or alternative viewpoint locations were considered through the viewpoint analysis and site observation process. As far as possible, viewpoints have been selected to represent the Proposed Development at its most visible, as experienced by a range of receptor groups, from a spread of different directions, and over varying distances.

9.3.29 In total, the illustration of 22 viewpoints were agreed through consultation and these are numbered in **Table 9.3** and highlighted in bold. Other suggested viewpoints which have not been illustrated, but nonetheless suggested and considered as part of the LVIA are also listed in **Table 9.3** (not numbered or highlighted in bold). The viewpoint locations are illustrated on **Figure 9.7** Volume 2 and shown as photographs, wireframes and photomontages in **Figures 9.27a/b/c/d** to **9.52a/b/c/d/e, Volume 2**.

Table 9.3 Viewpoint Location Selection Process

Assessment Viewpoint Name and No.	**Distance (m)**	**Reason for Selection**
Glen Afton Leisure Park		Selected pre-scoping. View from the caravan park at Glen Afton Leisure Park was scoped out due to lack of visibility of the Proposed Development.
1. B741 North East of Dalmellington	1,893	Selected pre-scoping. View from the local B road running between New Cumnock and Dalmellington. Likely receptors would include road users.
2. B741 South West of New Cumnock	3,167	Selected pre-scoping and suggested by EAC. View from the local B road running between New Cumnock and Dalmellington. Likely receptors would include road users.
Laight Farm		Selected pre-scoping. Scoped out as included in initial assessment of residential properties – this is not a settlement as stated in scoping.
Dalgig		Selected pre-scoping. Scoped out, this is now an area an open cast mining and the area is not accessible.
3. Core Path 667 Water of Deugh	4,463	Selected pre-scoping. Water of Deugh core path in close proximity to the Development Site. Original core path number, 448, corrected to 667 as per Dumfries and Galloway Council (DGC) core path plan (change in name only). Likely receptors would include hill walkers.
4. New Cumnock Cemetery	5,639	Selected post-scoping at the request of EAC. Receptors include road users, visitors and walkers along the Core Path route (Also a Scottish Hill Track and Heritage Trail leading into the Glen Afton Valley).
C36 N of Nith Bridge	6,254	Selected post-scoping at request of Community Liaison Group (CLG). Scoped out as a formal viewpoint but wirelines were provided to the CLG for discussion.

Assessment Viewpoint Name and No.	Distance (m)	Reason for Selection
5. Highpoint north of site (near Auchinross)	6,398	Selected post-scoping at request of Community Liaison Group (CLG). Likely receptors would include road users.
6. Blackcraig Hill South of New Cumnock	6,771	Selected pre-scoping as local hill summit noted in the EAC LDP Proposed Plan (2015) as a 'landmark hill'. Likely receptors would include hill walkers.
7. Lochside Hotel	7,080	Selected pre-scoping. View from the Lochside Hotel to the north of New Cumnock. Originally located on the A76 northwest of New Cumnock, the viewpoint was moved to take account of views from a more sensitive receptor. Likely receptors would include tourists and visitors to the hotel.
A713 NW of Dalmellington		Selected pre-scoping. Scoped out as a formal viewpoint, but included in the sequential assessment of A713.
8. Cairnsmore of Carsphairn	8,728	Selected post-scoping as locally prominent hill summit. Likely receptors would include hill walkers
9. Bogton Loch	9,213	Selected post-scoping as local recreational area. Likely receptors would include walkers.
10. Scottish Dark Sky Observatory	9,592	Selected pre-scoping. Initially located within the Craigengillan Estate, but due to limited visibility from the original coordinates the viewpoint was moved to a location of greater visibility as agreed with EAC. Likely receptors would include walkers and tourists.
A713 at Waterside		Selected pre-scoping. Scoped out as a formal viewpoint but included in the sequential assessment of A713.
11. Auchenroy Hill	10,631	Selected post-scoping at the request of EAC and suggested as a replacement of a viewpoint from the Craigengillan Estate. Likely receptors would include hill walkers.
12. Corsencon Hill	11,266	Selected post-scoping as local hill summit noted in the EAC LDP Proposed Plan (2015) as a landmark hill. Likely receptors would include hill walkers.
13. Loch Doon Shore	12,287	Selected pre-scoping. View from a tourist and recreational destination. Likely receptors would include tourists.
A713 at Patna		Selected pre-scoping. Scoped out as a formal viewpoint but included in the sequential assessment of A713. Likely receptors would include road users.

Assessment Viewpoint Name and No.	Distance (m)	Reason for Selection
14. A70 between Cumnock and Prestwick	14,223	Selected pre-scoping. View from the A70 between Ayr and Lanark. Likely receptors would include road users.
15. A76 North of Auchinleck	15,586	Selected pre-scoping. View from the A76 between Kilmarnock and Lanark. Likely receptors would include road users.
16. A70 North East of Cumnock	17,466	Selected pre-scoping. View from the A70 between Ayr and Lanark. Receptors to include road users.
17. A76 South East of Mauchline	19,383	Selected pre-scoping and illustrating views from Mauchline settlement.
Tarlessock High Point (768m)		Selected pre-scoping. Scoped out in favour of Viewpoint 20 Kirriereoch Hill, which is higher and considered to be more popular with hill walkers.
18. Shalloch on Minnoch	22,117	Selected post-scoping as viewpoint from hill summit within the Merrick Wild Land Area. Likely receptors would include hill walkers.
19. Meikle Millyea	23,760	Selected post-scoping as summit within the Rhinns of Kells and the Galloway Hills Regional Scenic Area. Likely receptors would include hill walkers.
20. Kirriereoch Hill	23,952	Selected post-scoping as a popular summit within Merrick Hills and the Merrick WLA. Likely receptors would include hill walkers.
21. Merrick	24,748	Selected post-scoping as viewpoint from summit within Merrick Wild Land Area. Likely receptors would include hill walkers.
Tarbolton		Selected pre-scoping. Scoped out due to the limited visibility due to built form of Tarbolton.
A77 at Maybole		Selected pre-scoping. View from the A77 between Turnberry and Prestwick. Scoped out due to the limited visibility due to intervening built form and vegetation.
Lowther Hill (782m)		Selected pre-scoping. Replaced by Viewpoint 22 East Mount Lowther (631m Above Ordnance Datum [AOD]) as a local hill summit referred to in guides on the Southern Upland Way.
22. East Mount Lowther	29,760	Selected post-scoping. View from a hill summit in the Lowther Hills Regional Scenic Area. Likely receptors would include hill walkers.

Assessment Viewpoint Name and No.	Distance (m)	Reason for Selection
Troon		Selected pre-scoping. Scoped out due to the limited visibility due to built form of Troon, Monkton and Prestwick.

Cumulative Wind Energy Development

9.3.30 SNH guidance suggests other wind energy development within a 60km radius Search Area should be identified and considered for cumulative assessment (CLVIA). Based on the 35km radius search area, a larger 70km Search Area was identified and considered for CLVIA. The 70km radius Search Area, together with the locations for other known wind energy development is illustrated in **Figure 9.6a/b**, Volume 2.

9.3.31 Drawing from the search area and consultation advice from SNH and EAC, all operational, consented and planning application projects above 50m to tip height within 35km have been included as part of the CLVIA. The micro-generation turbines between 25 and 50m to blade tip height have been included within 10km of the Proposed Development.

9.3.32 In accordance with the SNH guidance, projects at the scoping stage have not be included in the CLVIA, although their locations are noted on **Figure 9.6b** where known.

9.3.33 In total, 68 other wind energy developments are included in the CLVIA as listed in **Table 9.4** and illustrated in **Figure 9.7**, Volume 2. The identification number in the table relates to that used in the figures with 'E' referring to existing wind energy development, 'C' referring to consented wind energy development and 'A' referring to applications for wind energy development.

Verification

9.3.34 Wind energy development included within the CLVIA was collected from local planning authority and developer sources in April 2015. Subsequent to completion of the LVIA a further review of the cumulative data was undertaken within 35km of the Development Site to ensure that all wind farm development relevant to the cumulative assessment had been accounted for. The following changes were noted:

- A change in status to the consented Windy Standard Extension, Dersalloch, Whiteside Hill, Galawhistle and Dungavel wind farms which were now constructed;
- A change in status to the Kennoxhead and Mid Brockloch wind farm applications which were now consented;
- A change in status to the following scoping sites: Windy Rig; Sanqhar Six; Glenmuckloch; Bankend Rig Extension; Kirk Hill; and, Cumberhead Wind Farm which have progressed to application status; and
- The addition of a wind farm application: West Dykes.

Table 9.4 Wind Energy Development Included in the CLVIA

Ref	Name	No. of turbines	Hub height (m)	Rotor diameter (m)	Tip height (m)	Approximate distance from Proposed Development (km)
Existing Wind Energy Development included in the CLVIA						
E01	Windy Standard	36	70	45	92.5	5.0
E02	High Park Farm	1	49	52	75	6.0
E03	Hare Hill	20	40	47	63.5	6.5
E04	Wether Hill	14	60	62	91	18.0
E05	Bankend Rig	11	45	62	76	26.5
E06	Nutberry	6	80	90	125	30.0
E07	Hagshaw Hill	26	35	40	55	30.5
E08	Hadyard Hill	52	60	80	100	30.5
E09	Low Bowhill	1	40	54	67	31.5
E10	Hagshaw Hill Extension	20	49	62	80	32.0
E11	Calder Water	14	100	94	147	32.5
Consented Wind Energy Development included in the CLVIA						
C01	Windy Standard Extension (Brockloch Rig)	30	80	80	100-120	2.5
C02	Afton	27	80	80	120 & 100	4.0
C03	Hare Hill Extension	39	60	72	96	7.5

Ref	Name	No. of turbines	Hub height (m)	Rotor diameter (m)	Tip height (m)	Approximate distance from Proposed Development (km)
C04	Mansfield Mains	1	36.6	16.5	44.85	9.0
C05	Sanquhar	12	80	100	130	9.0
C06	Dersalloch	23	80	90	125	13.5
C07	Whiteside Hill	11	80	82.4	121.2	14.0
C08	Torrs Hill	2	64.95	70.1	100	17.5
C09	Sunnyside	2	36	52	62	19.0
C10[2]	Penbreck (duplicated in applications as only part of the scheme in South Lanarkshire Council (SLC) is consented)	6	80	90	125	20.5
C11	Twentyshilling Hill	9	80	90	125	21.0
C12	Knockman Hill	5	55	52	81	25.0
C13	Blackcraig Hill	23	65	90	110	27.5
C14	Galawhistle	22	80	82	110.2 (18T)- 121.2 (4T)	29.5
C15	Andershaw	14	80	90	125	30.5
C16	Dungavel	13	60-80	80	100-120	30.5
C17	Chapelton Farm	3	45	44	67	31.0

[2] Penbreck Wind Farm is included under both consented and application as 6 turbines within the South Lanarkshire Council boundary have been consented, but the 3 turbines within the East Ayrshire Council boundary are yet to be determined.

Ref	Name	No. of turbines	Hub height (m)	Rotor diameter (m)	Tip height (m)	Approximate distance from Proposed Development (km)
C18	Middle Muir	15	84	104	136 (8T) & 152 (7T)	32.5
C19	Hazelside Farm	2	50	48	74	32.5
C20	Kype Muir	26	80	104	132	33.5
C21	Sneddon Law	15	79.5	101	130	34.0
C22	Cleughhead Farm	1	51	56	79	35.0
C23	Yonderton Farm	1	34	34	51	35.0
C24	Dowhill	1	50	54	77	35.0
C25	Netherholm Farm	1	34	34	51	35.5
C26	Auchrobert	12	80	132	132	35.5
Wind Energy Development Applications included in the CLVIA						
A01	South Kyle	50	93	113	149.5	0.5
A02	Pencloe	21	74.5	101	125	2.0
A03	Benbrack	18	80	100	130	5.0
A04	Taiglim farm	1	24	19.2	34.2	8.5
A05	High Cumnock	8	80	104	132	9.0
A06	Polquhairn	9	60	80	100	9.5
A07	Garleffan	6	83	107	135	10.0

Ref	Name	No. of turbines	Hub height (m)	Rotor diameter (m)	Tip height (m)	Approximate distance from Proposed Development (km)
A08	Quantans Hill	19	81	98	130	11.5
A09	Glenmount	19	85	90	130	12.0
A10	Knockshinnoch	2	80	93	126.5	13.0
A11	High Glenmuir	1	35	54	62	13.5
A12	Lethans	26	79 & 95	114	12T-136 & 14T-152	14.0
A13	Keirs Hill	17	96.5	104	149	15.5
A14	Longburn	20	80	108	135	16.0
A15	Ulzieside	12	80	90	125	16.0
A16	Spango	14	89.5	111	145	20.0
A17	Penbreck (duplicated in consented as part of the scheme in SLC is consented)	3	80	90	125	20.5
A18	Fowler Farm	1	40	54	67	21.0
A19	Margree	17	85	90	130	23.0
A20	Linburn Farm	2	40	54	67	24.0
A21	Kennoxhead	26	80	93	126.5	25.5
A22	Loch Urr	26	82.5	90	127.5	28.0
A23	Leadhills (Windy Dod)	14	90	104	137	30.5

Ref	Name	No. of turbines	Hub height (m)	Rotor diameter (m)	Tip height (m)	Approximate distance from Proposed Development (km)
A24	Glentaggart	5	80	104	132	31.5
A25	Feoch	1	40	54	67	32.0
A26	Burnfoot Farm	1	50	54	77	32.0
A27	Mochrum Fell	8	75	100	126.5 and 116.5 (T5)	35.0
Note: Information collected from local planning authority and developer sources in April 2015. **Wind farm development within 35km was reviewed in August 2015 and changes considered against the assessment as identified in paragraph 9.3.34.**						

Cumulative Wind Energy Development Excluded from the CLVIA

9.3.35 The EIA Regulations require identification of likely significant effects and whilst the SNH guidance requires a search of all wind farms within a 60km radius (and in this case a 70km initial Search Area was considered) it is not a requirement to assess all of these in terms of their cumulative effect in relation to the Proposed Development, particularly in those instances where significant cumulative effects would be unlikely to occur.

9.3.36 Many of the other wind energy developments within the wider search area, beyond the 35km radius Study Area, are physically and visually remote, often beyond intervening hills and valleys and within different landscape regions such as the Cairn Table Group, the Lowther Hills and the Galloway Hills, the Galloway Forest and the Carrick Forest. As a consequence, these developments are not particularly visible from within the 35km LVIA Study Area and significant cumulative effects would be unlikely. Those wind energy developments located beyond the 35km Study Area or otherwise excluded from the cumulative assessment are listed in **Appendix 9.F** along with the reasons for their exclusion from the CLVIA.

Zone of Theoretical Visibility and Viewpoint Analysis

9.3.37 The ZTV and viewpoint analysis is used to assist the design and further define the scope of the assessment process. In particular, a threshold or 'limit' indicating the distance from the Proposed Development within which significant effects may be likely has been identified. This has been used to focus the baseline information and detailed reporting of the assessment in this chapter.

9.3.38 The ZTV was calculated using ReSoft WindFarm computer software to produce an area of potential visibility of any part of the proposed wind project calculated to turbine blade-tip and hub-height. The ZTV however, does not take account of built development and vegetation, which can significantly reduce the area and extent of actual visibility in the field and as such provides the limits of the visual assessment Study Area. As a result there may be roads, tracks, and footpaths in the wider setting which, although shown as falling within the ZTV, have restricted viewing opportunities since they are heavily screened or filtered by banks, walls, and vegetation. The ZTVs therefore provide a starting point in the assessment process and accordingly tend towards giving a 'worst-case' or over-estimated impact scenario of the potential visibility of the turbines.

9.3.39 The ZTV maps indicate the areas from where it may be theoretically possible to view all or some of the Proposed Developments wind turbines, calculated to the maximum proposed turbine height of up to 130m to blade tip, based on the hub heights of 80m and a rotor diameter of 100m. A number of ZTV maps illustrated in Volume 2 have been provided as follows:

- Figure 9.2: illustrates the ZTV calculated to blade tip at 1:300,000 scale across the LVIA Study Area and provides an overview of the theoretical extent of visibility;
- Figure 9.3: illustrates the ZTV calculated to hub height at 1:300,000 across the LVIA Study Area with viewpoints;
- Figure 9.4: illustrates the detailed ZTV calculated to blade tip at 1:50,000 out to 10km with cumulative wind farm development;
- Figure 9.5a: (A0 fold-out) illustrates the ZTV calculated to blade tip at 1:100,000 scale across the LVIA Study Area; and
- Figure 9.5b: (A0 fold-out) illustrates the detailed ZTV calculated to blade tip at 1:50,000 scale out to 20km.

9.3.40 The locations of other wind energy development within a 70km radius and a 35km radius of the Proposed Development is illustrated in **Figures 9.6a/b and 9.7**. Further cumulative ZTV maps are illustrated in Figures **9.8a to 9.15** indicating the extent of theoretical cumulative visibility in relation to the Proposed Development and other existing, consented and application wind farms.

ZTV Analysis: Proposed Development

9.3.41 The general visibility of the Proposed Development is limited within the LVIA Study Area as indicated by the percentages of maximum theoretical visibility, which are summarised as follows:

- Total ZTV (to blade tip) coverage accounts for 28.01% of the LVIA Study Area; and
- Total ZTV (to hub height) coverage accounts for 24.68% of the LVIA Study Area.

9.3.42 These percentages would reduce further in reality as they do not take account of the screening effects of vegetation such as the Carsphairn Forest, buildings and other localised screening elements such as manmade landform.

9.3.43 Within 10km the ZTV coverage is largely focused to the north and northwest of the Proposed Development. Much of this theoretical visibility is within the Upland Basin landscape character type and includes some large areas of active open-cast mining, although it is also present along stretches of the A76 and the outer western edges of the settlement of New Cumnock. There is no theoretical visibility of the Proposed Development within the Glen Afton Valley. Although theoretical visibility is present on the western facing slopes of elevated ground to the east of the Glen Afton Valley Sensitive Landscape Character Area; this is an area affected by the existing Hare Hill Wind Farm. Fragmentary theoretical visibility is present to the south of the Proposed Development across elevated summits within the Carsphairn Forest.

9.3.44 Within 10-20km fragmented theoretical visibility is present on elevated ground to the west of the Doon Valley and along elevated summits of the Glenkens. There is very limited fragmented theoretical visibility to the southeast and east of the Proposed Development. Theoretical visibility is more widespread to the north towards the settlements of Cumnock and Mauchline.

9.3.45 Within 20-35km there is little or no theoretical visibility in the south and east. There is limited and fragmented theoretical visibility to the west along elevated ground within the Carrick Forest and along the edge of the coast around Ayr, Prestwick and Troon. More concentrated areas of theoretical visibility are present to the north of Kilmarnock, around Tarbolton and along the A76 and A77, although in reality visibility from these areas would tend to be restricted by higher levels of intervening vegetation and built form.

Cumulative Zone of Theoretical Visibility (ZTV) Analysis

9.3.46 The Cumulative ZTVs have been produced to illustrate the ZTV footprints (limited to 35km radius from each wind farm) of selected wind energy development which have been grouped in relation to planning status or geographical location.

Cumulative ZTV1: Enoch Hill with Existing and Consented wind farms within 10km

9.3.47 **Figure 9.8a/b**, Volume 2 shows the cumulative theoretical visibility of the existing Windy Standard and the consented Windy Standard Extension wind farms, the existing Hare Hill and the consented Hare Hill Extension wind farms, the existing High Park Farm wind turbine and the consented Afton, Mansfield Mains and Sanquhar wind farms combined with the Proposed Development. The cumulative ZTV coverage indicates that there is limited theoretical visibility coverage introduced by the Proposed Development alone. Areas from which all the wind farms are theoretically visible are concentrated mainly to the north of B741 around Dalgig, areas of higher ground north of Airds Moss, around the settlements of Auchinleck, Catrine, Mauchline, Maybole and Prestwick and to the east and south around New Cumnock, Glen Afton and Carsphairn Forest. Further to the south and to the east there are large areas of fragmented theoretical visibility which indicate that the existing and/or consented wind farms would be theoretically visible alone and do not include the Proposed Development. Areas where the Proposed Development increases the area of theoretical visibility include the area to the west of the Development Site, to either side of the B741 towards Dalmellington, the north eastern slopes of the Galloway Hills south of Loch Doon and areas east of Maybole and south of Ayr beyond 25km. There are large areas of theoretical visibility of existing and consented wind farms to the east of the Development Site where there is no theoretical visibility of the Proposed Development.

Cumulative ZTV2: Enoch Hill with Windy Standard & Windy Standard Extension, Hare Hill & Hare Hill Extension and Existing High Park Farm

9.3.48 **Figure 9.9a/b**, Volume 2 shows the cumulative theoretical visibility of the existing Windy Standard and the consented Windy Standard Extension wind farms, the existing Hare Hill and the consented Hare Hill Extension wind farms and the existing High Park Farm wind turbine combined with the proposed Enoch Hill Wind Farm. The cumulative ZTV coverage indicates that there is limited theoretical visibility coverage introduced by Enoch Hill alone, particularly accounting for the screening effects of the Carsphairn Forest. Areas from which all the wind farms are theoretically visible are concentrated mainly to the north of B741 around Dalgig, areas of higher ground north of Airds Moss and the settlements of Auchinleck, Catrine, Mauchline, Maybole and Prestwick. Further to the south and southeast there are large areas of fragmented theoretical visibility which indicate that the Windy Standard and Windy Standard Extension wind farms would be theoretically visible alone and do not include the Proposed Development. Areas where the Proposed Development increases the area of theoretical visibility include the area to the west of the Development Site to either side of the B741 towards Dalmellington and to the northwest at distances beyond 25km.

Cumulative ZTV3: Enoch Hill with Existing Wether Hill and the Consented Afton

9.3.49 **Figure 9.10a/b**, Volume 2 shows the cumulative theoretical visibility of existing turbines at Wether Hill and the consented Afton in combination with the Proposed Development. The Proposed Development alone adds to the ZTV coverage directly around the Development Site, to either side of the B741 as it passes west towards Dalmellington, and out to the northwest beyond Prestwick and Kilmarnock, subject however to the screening effects of the Carsphairn Forest. There is very little cumulative theoretical visibility in combination with the existing Wether Hill Wind Farm and this is located on higher ground within the Glenkens. Combined visibility with the consented Afton Wind Farm is located around the Development Site and to the north with increased visibility of the consented Afton Wind Farm alone to the east.

Cumulative ZTV4: Enoch Hill with Application Wind Farms within 10km

9.3.50 **Figure 9.11a/b**, Volume 2 shows the cumulative theoretical visibility of the South Kyle, Pencloe, Benbrack, Taiglim Farm, High Cumnock, Polquhairn and Garleffan application wind farms in combination with the Proposed Development. The ZTV coverage indicates that the Proposed Development adds very little to the overall theoretical visibility of wind farms within 35km of the Development Site. Areas of theoretical visibility of all of the above wind farms are located along northeast facing elevated ground within the Carrick Forest and along the Glenkens, with an additional area to the north of the B741, the area around Airds Moss and areas around Maybole, Ayr, Prestwick and Kilmarnock. There is an absence of theoretical visibility of the Proposed Development along a large stretch of the A713 and along the Glen Afton Valley.

Cumulative ZTV5: Enoch Hill with South Kyle and Benbrack Application Wind Farms

9.3.51 **Figure 9.12a/b**, Volume 2 shows the cumulative theoretical visibility of the South Kyle and Benbrack application wind farms in combination with the Proposed Development. The ZTV coverage indicates that the Proposed Development adds very little to the overall theoretical visibility of wind farms within 35km of the site. Areas of theoretical visibility of all three wind farms are limited to the area around Maybole, the areas along northeast facing elevated ground within the Carrick Forest and along the Glenkens, with an additional area to the north of Airds Moss.

Cumulative ZTV6: Enoch Hill with Pencloe, Taiglim, High Cumnock and Garleffan Application Wind Farms

9.3.52 **Figure 9.13a/b**, Volume 2 shows the cumulative theoretical visibility of Pencloe and Taiglim Farm combined with High Cumnock and Garleffan Application Wind Farms in combination with the Proposed Development. This shows that the additive theoretical visibility of the Proposed Development is largely located to the west of the Development Site, to either side of the B741 as it passes to Dalmellington and on elevated east-facing summits within the Carrick Forest and the Glenkens.

Cumulative ZTV 7: Enoch Hill and Existing and Consented Wind Farms between 10 – 35km

9.3.53 **Figure 9.14**, Volume 2 shows the cumulative theoretical visibility of existing and consented wind farms at 10 – 35km distance from the Proposed Development. Cumulative theoretical visibility of the existing and consented wind farms would be widespread, whilst theoretical visibility of the Proposed Development would be more limited (28.01% of the LVIA Study Area). Areas of theoretical visibility of the Proposed Development would none-the-less occur as described previously and would affect areas around New Cumnock, with theoretical visibility indicated in the areas around Maybole, Prestwick, Mauchline, Airds Moss and the Carrick and Carsphairn Forests.

Cumulative ZTV 8: Enoch Hill and Application Wind Farms between 10 – 35km

9.3.54 **Figure 9.15**, Volume 2 shows the cumulative theoretical visibility of application wind farms at 10 – 35km distance from the Proposed Development. Cumulative theoretical visibility of the Proposed Development with these application wind farms would affect areas around New Cumnock, and the B741, with theoretical visibility indicated in the areas around Maybole, Prestwick, Mauchline, Airds Moss and the Carrick and Carsphairn Forests with more fragmented areas to the north and west.

Viewpoint and Cumulative Viewpoint Analysis

9.3.55 The viewpoint analysis has been conducted from 22 locations as illustrated in **Figure 9.7** and the views from these locations are illustrated at a 90° and a 53.5° angle or field of view (FoV) in **Figures 9.27a/b/c/d to 9.48a/b/c** with wireframes and photomontages for those viewpoints within 15km of the Proposed Development. **Figures 9.49a/b/c/d/e - 9.52a/b/c/d/e** illustrate the wider 360 degree views from 4 of the elevated or hill top viewpoints within the LVIA Study Area.

9.3.56 Cumulative wind farm development that would be visible within 35km of each viewpoint has been illustrated in the wireframes. In addition, the CLVIA has included a check for any micro-generation

turbines that maybe located close to (within 10km) and potentially visible in the foreground of the illustrated assessment viewpoints, either appearing in the viewpoint photograph or illustrated on the wireframe.

Geographical Extent of Potentially Significant Visual Effects

9.3.57 The viewpoint analysis indicates that the likely extent of potential significant visual effects would extend out in a north and northeast direction, primarily affecting views from the Upland Basin including open views from the A76 and the south western edge of New Cumnock within approximately 7km from the nearest turbine locations, as indicated by Viewpoints 1 to 7. The views in other directions to the east, south and west would not be significantly affected due to the intervening landform and forestry.

9.3.58 The Proposed Development has also been considered in terms of the combined or cumulative visual effects with other existing, consented and application wind farms. The analysis indicates that there would be further potentially significant visual effects at 4 viewpoints (Viewpoint 8: Cairnsmore of Carsphairn, Viewpoint 9: Bogton Loch, Viewpoint 11: Auchenroy Hill and Viewpoint 12: Corsencon Hill) as a result of closer proximity to other proposed wind farms, notably the consented Windy Standard Extension Afton and Dersalloch wind farms and the applications at South Kyle, Keirs Hill, Lethans and Glenmount. These viewpoints would not be significantly affected by the Proposed Development when assessed on a standalone basis.

9.3.59 The predicted levels of effect are indicative of a visual effect on a particular viewpoint location and they should not be assumed to translate into visual effects on the overall visual experience within 7km, as each of the viewpoints have been specifically located where the sensitivity of the receptor and / or the views of the Proposed Development would be greatest. In this sense they are not typical or representative and indicate worst case scenarios, which in many cases are likely to be experienced either within a limited geographical area or by a more limited number of people (e.g. hillwalkers).

9.3.60 The information set out in **Table 9.5** provides a summary of the viewpoint analysis

Sunlight and Weather Conditions

9.3.61 Changing weather patterns and local climatic conditions will influence the visibility of the Proposed Development which will vary from periods of low visibility (fog, low cloud, and bright sunny conditions that are accompanied by haze generated by temperature inversions) as well as periods of high visibility in clear weather. In some instances the Proposed Development may appear 'back-lit' (e.g. appearing darker in colour during sunset/sunrise and periods of pale or white blanket cloud) and in other circumstances may appear to be 'up-lit' (e.g. during stormy periods that combine dark clouds and bright sunshine).

Table 9.5 Summary of Viewpoint Analysis

Viewpoint Number and Name	Distance to nearest turbine (m)	Sensitivity	Assessment: LVIA (Proposed Development only)		Assessment: CLVIA (Proposed Development and other wind farms)			
			Magnitude	Level of Effect	Magnitude (Existing / Consented only)	Cumulative Level of Effect 1: (Existing and Consented and Proposed Development)	Magnitude (Applications only)	Cumulative Level of Effect 2: (All wind farms and Proposed Development)
1. B741 North East of Dalmellington	1,893	High to Medium	Medium	**Substantial / Moderate** to Moderate	None	No cumulative effect	Negligible	**Substantial / Moderate** to Moderate
2. B741 South West of New Cumnock	3,167	High to Medium	High to Medium	**Substantial to Substantial / Moderate**	Low to Negligible	**Substantial to Substantial / Moderate**	Low	**Substantial to Substantial / Moderate**
3. Core Path 667 Water of Deugh	4,463	High	Negligible	Slight	Low	Moderate (due to Windy Standard Extension)	High	**Substantial** (due to South Kyle)
4. New Cumnock Cemetery	5,639	High	Medium	**Substantial / Moderate**	Low	**Substantial / Moderate**	Medium	**Substantial / Moderate** (due to multiple development)
5. Highpoint north of site (near Auchinross)	6,398	Medium	High to Medium	**Substantial / Moderate** to Moderate	Low	**Substantial / Moderate** to Moderate	Medium	**Substantial / Moderate** to Moderate (due to multiple development)
6. Blackcraig Hill S of New Cumnock	6,771	High	Medium	**Substantial / Moderate**	Medium	**Substantial / Moderate** (due to multiple wind farms)	High	**Substantial** (due to South Kyle)
7. Lochside Hotel	7,080	High	Medium	**Substantial / Moderate**	Low	**Substantial / Moderate** (due to multiple wind farms)	Medium	**Substantial / Moderate** (due to multiple development)
8. Cairnsmore of Carsphairn	8,728	High	Low	Moderate	Medium	**Substantial / Moderate** (due to Benbrack and Windy Standard Extension)	Medium	**Substantial / Moderate** (due to multiple development)
9. Bogton Loch	9,213	High	Negligible	Slight	Zero	No cumulative effect	Medium	**Substantial / Moderate** (due to Keirs Hill)
10. Scottish Dark Sky Observatory	9,592	High	Negligible	Slight	Low	Moderate	Low	Moderate

Viewpoint Number and Name	Distance to nearest turbine (m)	Sensitivity	Assessment: LVIA (Proposed Development only)		Assessment: CLVIA (Proposed Development and other wind farms)			
			Magnitude	Level of Effect	Magnitude (Existing / Consented only)	Cumulative Level of Effect 1: (Existing and Consented and Proposed Development)	Magnitude (Applications only)	Cumulative Level of Effect 2: (All wind farms and Proposed Development)
11. Auchenroy Hill	10,631	High	Low	Moderate	High	**Substantial** (due to Dersalloch)	High	**Substantial** (due to multiple development)
12. Corsencon Hill	11,266	High	Low	Moderate	Low	Moderate	High	**Substantial** (due to Lethans)
13. Loch Doon Shore	12,287	High	Negligible	Slight	None	No cumulative effect	Medium	**Substantial / Moderate** to Moderate (due to South Kyle and Benbrack)
14. A70 Between Cumnock and Prestwick	14,223	Medium	Low	Slight	Negligible	Slight	Medium to Low	Moderate to Slight
15. A76 N of Auchinleck	15,586	Medium	Low to Negligible	Slight to Slight / Negligible	Negligible	Slight to Slight / Negligible	Low	Slight
16. A70 NE of Cumnock	17,466	Medium	Zero	No View	N/A	No cumulative effect	N/A	No cumulative effect
17. A76 Mauchline	19,383	Medium	Negligible	Slight / Negligible	Negligible	Slight / Negligible	Negligible	Slight / Negligible
18. Shalloch on Minnoch	22,117	High	Negligible	Slight	Low to Negligible	Moderate to Slight	Low to Negligible	Moderate to Slight
19. Meikle Millyea	23,760	High	Negligible	Slight	Low to Negligible	Moderate to Slight	Low to negligible	Moderate to Slight
20. Kirriereoch Hill	23,952	High	Negligible	Slight	Low to Negligible	Moderate to Slight	Low to Negligible	Moderate to Slight
21. Merrick	24,748	High	Negligible	Slight	Negligible	Slight	Negligible	Slight
22. East Mount Lowther	29,760	High	Negligible	Slight	Low to Negligible	Moderate to Slight	Low to Negligible	Moderate to Slight

9.4 Baseline Description

9.4.1 Information on the existing landscape resource or baseline conditions included in this assessment has been collected from local plans, OS maps, and relevant literature, as well as information gathered from field surveys. This baseline information is set out as an inventory of the existing landscape resource and focuses on those landscape and visual receptors with most potential to be significantly affected.

9.4.2 The baseline inventory is set out as follows:

- Baseline Landscape Receptors:
  - Landscape Character of the Development Site;
  - Landscape Character of the Surrounding Area;
  - Landscape Designations; and
  - Wild Land.
- Baseline Visual Receptors:
  - Settlements and Residential Properties;
  - Transport Routes;
  - Recreational Routes; and
  - Recreational and Tourist Destinations.

Baseline Landscape Receptors

9.4.3 The blade tip ZTV and viewpoint analysis indicates that likely significant visual effects and significant cumulative visual effects would generally be limited to within approximately 7km distance of the Proposed Development. Taking a precautionary approach, the landscape assessment has been focused on those landscape receptors within 10km. Within the wider 10-35km radius of the LVIA Study Area, the assessment has included those receptors which are of national importance.

9.4.4 The landscape receptors included in this assessment include the landscape character units and landscape planning designations identified at a national and local planning level.

9.4.5 The landscape character of the Development Site is classified within the East Ayrshire Landscape Wind Capacity Study (EALCS) Final Main Report, Carol Anderson Landscape Associates 2013, which draws from the earlier Ayrshire Landscape Assessment (Land Use Consultants, SNH Review No. 111, 1998). Further landscape classification of the wider 35km Study Area is provided by the following documents:

- Dumfries and Galloway Wind Farm Landscape Capacity Study, Final Main Report, Carol Anderson in association with Alison Grant, Landscape Architects 2011 (DGLCS);
- South Ayrshire Wind Farm Landscape Capacity Study, Main Study Report, Carol Anderson Landscape Associates, 2013; and
- South Lanarkshire Spatial Framework and Landscape Capacity for Wind Turbines Update, Ironside Farrar, 2013.

9.4.6 In addition, the Development Site and surrounding area has been re-surveyed by chartered landscape architects as part of this assessment at a local level in accordance with guidance provided in the 'Landscape Character Assessment – Guidance for England and Scotland' produced by the University of Sheffield and Landuse Consultants, Countryside Agency and SNH, 2002. This re-surveying at a local level reflects local variations in character and landuse (mainly forestry and

open-cast mining activities) not represented in the national and regional character studies provided above. The localised surveying is described in target notes which are included in **Appendix 9.D**.

9.4.7 Each of the landscape reports divides the landscape into broad Landscape Character Types (LCT) and / or more localised and area specific Landscape Character Areas (LCA) or units. Drawing from these assessments, the landscape character of the Study Area is illustrated in **Figure 9.16**, Volume 2. In addition, **Figure 9.17** illustrates the landscape character of the central 10km of the LVIA Study Area at an enlarged or more detailed scale, taking account of localised surveying as indicated by the target note locations.

9.4.8 Both the EALCS and DGLCS landscape capacity studies provide sensitivity analysis of the Southern Uplands and Southern Uplands with Forestry Landscape Character Types (LCTs), which may be considered relevant to the Development Site and collectively they record a high / medium to low, inherent landscape sensitivity to large scale turbine development. The large or extensive scale and simplicity of the landscape character is recognised in both documents as an opportunity for large scale wind farm development, noting that the general lack of settlement and presence of forestry are factors indicating some capacity for large scale wind turbines.

Landscape Character of the Development Site

9.4.9 The Development Site is predominantly within the Southern Uplands and according to the landscape character boundaries identified in EALCS, 5 of the proposed turbines would be located within the Southern Uplands and Forestry LCT boundary and the remaining 14 turbines would be located within or on the boundary, of the Southern Uplands LCT (without forestry) as shown in **Figure 9.17**. The site boundary also technically includes small areas of Upland Basin and Forest and Opencast Mining LCTs, although no turbines would be located within these areas.

9.4.10 Landscape character boundaries are often diffuse and in reality the transition from one landscape character to another is often gradual, occurring over 1-3km although it can be more abrupt, occurring along a cliff edge or ridgeline, for example. The landscape character across the site area is transitional between the Upland Basin in the north, close to the B741 and the Southern Uplands with or without forestry in the south and also as a result of opencast mining in the area. Consequently, the landscape character across the site area has been reviewed and re-surveyed as part of the assessment and two modifications are suggested as follows:

- Upland Basin with Open-cast Mining - Part of the landscape character of the Upland Basin is influenced by current or recent open–cast mining which affects the area shaded on Figure 9.17.
- Southern Uplands and Forestry: Enoch Hill – The southern part of the site area, within the lee of summit hills (Chang Hill and Benty Cowan Hill) is closer and characterised by nearby coniferous forestry which ‘cups’ around the area of the proposed turbines to the west, south and southeast. Through the design evolution process, the proposed turbines have been restricted, avoiding the north or ‘front’ facing hill slopes overlooking the Upland Basin. As a result, all of the proposed turbine locations would be within an area of Southern Uplands with Forestry landscape character.

Landscape Character within 10km of the Proposed Development

9.4.11 Further landscape character within 10km of the Proposed Development is described in the EALCS and DGLCS and illustrated in **Figure 9.17**, Volume 2. Each of these along with their particular LCA / unit sub-divisions is listed in **Table 9.6**.

Table 9.6 Landscape Character within 10km of the Proposed Development

Landscape Study Source	Ref. No.	Landscape Character Type (LCT) (used in former studies)	Landscape Character Type (LCT) / Unit (used in EALCS / DGLCS)	Landscape Character Area (LCA) (used in this LVIA)
EALCS	20a	Southern Uplands	East Ayrshire Southern Uplands	Benty Cowan Hill
EALCS	20a	Southern Uplands	East Ayrshire Southern Uplands	Blackcraig Hill
DGLCS	19	Southern Uplands	Southern Uplands: Carsphairn	-
EALCS	20c	Southern Uplands and Forestry	Southern Uplands and Forestry	Enoch Hill
DGLCS	19a	Southern Uplands with Forests	Southern Uplands with Forests: Carsphairn	-
DGLCS	19a	Southern Uplands with Forests	Southern Uplands with Forests: Ken	-
EALCS	15	Upland Basin	Upland Basin	New Cumnock Upland Basin with Opencast Mining
EALCS	17a	Foothills with Forestry and Open-cast Mining	Foothills with Forestry and Open-cast Mining	Martyrs Moss
EALCS	10	Upland River Valley	Upland River Valley Upland River Valley	River Doon River Nith
EALCS	21	Rugged Granitic Uplands	Rugged Uplands Lochs and Forest	Loch Doon
EALCS	18a	Plateau Moorlands	East Ayrshire Plateau Moorlands	Wardlaw Hill
EALCS	14	Upland Glen	Upland Glen	Glen Afton
EALCS	7c	Ayrshire Lowlands	East Ayrshire Lowlands	Drongan
DGLCS	9	Upper Dales	Upper Glenkens	-

Baseline Pattern of Wind Farm Development

9.4.12 There are three existing wind farm developments within the 10km Study Area, namely Windy Standard, Hare Hill and a single turbine at High Park Farm. Within 10-20km there is one further existing wind farm development, Wether Hill Wind Farm. The current pattern of development within the 35km study area is illustrated in the Cumulative Baseplan, **Figure 9.6a/b** and is also shown at a local level in **Figures 9.4 and 9.17** with existing and consented wind farm development in this area largely focused on the Southern Uplands and Southern Uplands with Forestry LCT, and located within areas of Hare Hill and the Carsphairn Forest. Some development is also located within Foothills with Forest, Plateau Moorland and Plateau Moorland with Forest LCTs with a preference for mid-level and higher elevation landform. Much of the established development avoids larger areas of remote landscapes, although some development is located within local landscape designations (i.e. the Hare Hill Wind Farm is located within the East Ayrshire Sensitive Landscape Character Area).

9.4.13 Currently it is considered that each of these existing wind farms are or will be experienced as particular features or localised characteristics of the area that would not result in an overall change to the landscape character. To use the SNH terminology, the wind farm development would be "*seen as separate isolated features within the landscape character type, too infrequent and of*

insufficient significance to be perceived as a characteristic of the area" or as a *"key characteristic of the landscape, but not of sufficient dominance to be a defining characteristic of the area".*

Landscape Character within 10km – 35km

9.4.14 No landscape character types of areas, designated at a national or international level are overlapped by the blade tip ZTV within the LVIA Study Area.

Landscape Designations

9.4.15 The location of the Proposed Development is located within the south western edge of the locally designated Afton Sensitive Landscape Character Area (SLCA). The area covers the entire Afton valley as well as the Muirkirk Uplands area to the north of the A76. Landscape designations within the 35km radius Study Area are illustrated in **Figure 9.19**, Volume 2. As noted previously, there are no nationally or internationally designated areas within the 35km study area.

Local Landscape Designations

9.4.16 The following local landscape designations are located within 10km of the Proposed Development and included in the assessment:

- Afton SLCA;
- Doon Valley SLCA; and
- Galloway Hills Regional Scenic Area (RSA).

Wild Land

9.4.17 The Merrick Wild Land Area (WLA) is located at over 18km distance to the west of the Proposed Development as shown in **Figure 9.53**, Volume 2. A Wild Land Assessment has been undertaken and is detailed in **Appendix 9.E**.

Baseline Visual Receptors

9.4.18 The visual assessment draws upon the blade tip ZTV, site visits and viewpoint analysis and assesses the potential visual effects on views and visual amenity likely to be experienced by receptors (people) within the landscape as follows:

- Views from residential properties and settlements;
- Views experienced whilst travelling through the landscape (road users, walkers, horse riders and cyclists for example); and
- Views from tourist and recreational destinations.

9.4.19 The blade tip ZTV and viewpoint analysis indicates that the assessment should be focused on a detailed LVIA Study Area of approximately 10km from the Proposed Development and detailed assessments have covered transport routes, recreational routes and local tourist and outdoor recreational attractions within this area that are overlapped by the blade tip ZTV. The residential properties have been assessed within 3km and core paths within 5km.

9.4.20 Within the wider 10-35km radius LVIA Study Area, the assessment has included receptors of national importance such as Scotland's Great Trails, National Cycle Routes and well known tourist / recreational destinations that are overlapped by the blade tip ZTV.

Visual Receptors: Settlements and Residential Properties

9.4.21 Drawing from the viewpoint analysis, settlements (defined by the relevant development plans) within 10km of the Proposed Development have been included in the baseline search and

illustrated in **Figure 9.22**. The assessment of visual effects likely to be experienced from settlements includes consideration of residential areas, the public realm, and public open spaces within the settlement boundaries that would be frequented by people.

9.4.22 Settlements within 10km, which are included in the assessment as follows:

- Burnside;
- Bankglen;
- Connel Park;
- Leggate;
- New Cumnock;
- Dalmellington; and
- Burnton.

9.4.23 The settlements of Bellsbank and Skares are located within 10km of the Proposed Development, but are outwith the blade tip ZTV and would have no view of the Proposed Development.

9.4.24 Within the wider 35km radius Study Area it should be noted that the settlements of Patna, Carsphairn, Catrine, Sanquhar, Muirkirk, Thornhill, St John's Town of Dalry, New Galloway, Darvel, Newmilns and Galson are all outwith the blade tip ZTV and would have no view of the Proposed Development. Other settlements including Ayr, Kilmarnock, Tarbolton, Drongan and Maybole are overlapped by the blade tip ZTV but all are beyond 15km distance and viewpoint analysis from these areas confirms that the views from these settlements would not be significantly affected, therefore, they have been excluded from the further detailed assessment.

Residential Visual Amenity Assessment

9.4.25 Residential properties included in the Residential Visual Amenity Assessment are illustrated in **Figure 9.23a** and assessed in **Appendix 9.C**. A summary of that assessment is provided in this chapter as part of the visual assessment.

Visual Receptors: Transport Routes

9.4.26 Transport routes within 10km of the Proposed Development which have been included in the assessment are illustrated on **Figure 9.20** and listed as follows:

- B741 between Auchenroy and New Cumnock;
- A76 and Burns Heritage Trail between Cumnock and Burnton east of New Cumnock;
- Afton Road between New Cumnock and Burns Cairn (the road is outwith ZTV further south);
- A713 Galloway Tourist Route, one of Scotland's National Tourist Routes (NTR), between Waterside and Dalmellington;
- B7046 between Darntaggart Plantation and Skares; and
- Glasgow to Carlisle railway line between south of Auchinleck and west of New Cumnock.

9.4.27 Two minor roads in the vicinity of the Proposed Development, namely the part of the C36 Road between Cumnock and New Cumnock and the minor road between B741 at Littlemark and Garallan Bridge on Skares Road (B7046) are no longer accessible due to on-going open cast mining operations now occupying the road area. Restoration plans for the open cast mining operations were available. However, the detail of how the roads will be reinstated and the timeframe for reinstatement are unknown. They have therefore been excluded from the assessment.

9.4.28 Within the wider 35km study area the following 'A' class roads are also overlapped by the ZTV: M77, A70, A71, A76, A77, A78, A713 Galloway National Tourist Route, A719, A735 and A759.

9.4.29 The A76 linking Kilmarnock with Dumfries and the A70 between the M74 and Ayr are also partially overlapped by the blade tip ZTV and the views from these routes have been included in the viewpoint analysis (Viewpoints 15 and 17).The viewpoint analysis confirms that the views from these transport routes beyond 10km would not be significantly affected and they have been excluded from the assessment.

9.4.30 The M77, A71, A77, A78, A719, A735 and A759 are also located in the 35km LVIA Study Area and overlapped by blade tip ZTV, but would have little or no view of the Proposed Development due to screening from intervening built form at Kilmarnock, Ayr, Prestwick and Maybole. They have been excluded from the assessment as no significant effects are likely.

9.4.31 The A713 Galloway National Tourist Route is overlapped by the ZTV outside the 10km buffer for approximately a 500m stretch near Waterside with the remainder of the route outwith the ZTV coverage. The views from this short stretch would, however, be screened by an historical, large spoil heap south of Waterside, which the ZTV does not take account of. This feature has been present for a number of years and should be regarded as a permanent feature. It has therefore been excluded from the assessment. The A702, A712 and A762 are also located within 35km of the Proposed Development, but are not overlapped by the blade tip ZTV and have therefore been excluded from the assessment.

9.4.32 There are two operational railway lines within the wider 35km study area, namely the Glasgow to Stranraer line via Ayr and the Glasgow to Carlisle line via Kilmarnock and Dumfries. There routes have been assessed within the 35km study area and a stretch of the Glasgow to Carlisle line within 10km has also been assessed in more detail.

Visual Receptors: Recreational Routes

9.4.33 The visual assessment has considered the potential visual effects likely to be experienced by people (walkers / cyclists / horse riders / and others) on recreational routes within the LVIA Study Area. The recreational routes within the LVIA Study Area are illustrated in **Figures 9.20 and 9.21**, Volume 2.

9.4.34 The Core Path Network sourced from the EAC and DGC adopted Core Path Plans have been assessed within the 5km LVIA Study Area. In addition, recorded Scottish Hill Tracks and Heritage Paths, promoted by the Scottish Rights of Way and Access Society have been assessed within the 10km study area.

9.4.35 National level recreational routes within the wider 35km radius LVIA Study Area have also been considered for assessment and include Scotland's Great Trails, National Trails and the National Cycle Route network.

9.4.36 There are no bridleways within the 10km Study Area or known long distance horse riding routes within the wider 35km radius LVIA Study Area.

The Core Path Network within 5km

9.4.37 The visual assessment has considered the views from Core Paths within 5km of the Proposed Development. Core Path Plans were created in response to a requirement of the Land Reform (Scotland) Act 2003. They aim to establish and designate a reasonable network of paths to provide access throughout local authority areas in which individual paths may be chosen because they meet at least one objective from a range of purposes, including linking communities, providing access to places of interest and for recreation.

9.4.38 Core Paths included in the assessment are listed as follows:

- DGC Core Path No. 667 Water of Deugh Trail;
- EAC Core Path No. C12: New Cumnock Circular;

- EAC Core Path No. C10: Coalfield Cycle Route; and
- EAC Core Path No. C14: Glen Afton.

Scottish Hill Tracks and Heritage Paths within 10km

9.4.39 Scottish Hill Tracks within 10km included in the assessment are listed as follows:

- Scottish Hill Track 81: Barr to Dalmellington / 78b Glen Trool Village to Dalmellington by Tunskeen; and
- Scottish Hill Track 84: Afton Road / New Cumnock to St John's Town of Dalry by Glen Afton.

9.4.40 Heritage Paths included in the assessment are listed as follows:

- Heritage Path: Afton Road / Old Road from New Cumnock to Dalquhairn.

9.4.41 The Scottish Hill Track 77a: Bargrennan to Dalmellington or Carsphairn / 78a: Glen Trool Village to Dalmellington by Tunskeen and the Loch Doon Heritage Path (both following the same route) are entirely outwith the blade tip ZTV coverage and have been excluded from the assessment.

National Recreational Routes within 35km

9.4.42 The following national level recreational routes are included in the assessment as follows:

- Southern Upland Way; and
- National Cycle Route (NCR) 7.

9.4.43 The River Ayr Way, Ayrshire Coastal Path, NCR Route 74, Robert the Bruce Trail, Galloway Red Kite Trail and Kirkpatrick Macmillan Cycle Trail, which are also located within the wider 35km study area, are entirely outwith the blade tip ZTV and have therefore been excluded from the assessment. The NCR 73 has also been excluded, as the only stretch of this route covered by the ZTV is located within and beyond Kilmarnock which would screen any views.

Visual Receptors: Recreational and Tourist Destinations

9.4.44 Recreational and tourist destinations included in this assessment include those features that appear as prominent landmarks or landscape features and locations associated with passive recreation such as walking and where there is a clear relationship between the feature / destination and the landscape. Gardens and Designed Landscapes (GDLs) would be included where these are open to the public as well as Scottish National Trust gardens/land and Historic Scotland visitor sites. The assessment, for example, excludes locations for sports such as quad biking and team sports or other recreational / tourist destinations where the focus of activity is indoors, for example museums, libraries, and gift shops.

Recreational and Tourist Destinations (within 10km)

9.4.45 Recreational and tourist destinations included in this assessment, within 10km of the Proposed Development include local landscape features and sites of cultural and natural heritage importance, which are open to the public and promoted for tourism purposes including GDLs listed on the Historic Scotland Gardens & Designed Landscapes Inventory as well as the non-inventory gardens shown on the Ayrshire Designed Landscapes Survey map (Ayrshire Joint Planning Steering Group, 2009) and the DGC Historic Environment Viewer maps.

9.4.46 Recreational and tourist destinations within 10km of the Proposed Development include the following:

- Knockshinnock Lagoons - local nature reserve;
- Burn’s Memorial;

- Craigengillan GDL;
- Galloway Forest Park, which doubles as Certified International Dark Sky Park; and
- Loch Doon.

9.4.47 The EAC non-inventory gardens at Camlarg (No.147) and Glaisnock (No.83) are not open to the public and have therefore been excluded from the assessment.

9.4.48 The following hill summits overlapped by ZTV are located within the 10km study area:

- Cairnsmore of Carsphairn 797m AOD (Corbett).
- Blackcraig Hill 700m AOD (Graham); and
- Windy Standard 698m AOD (Graham).

Recreational and Tourist Destinations (within 10-35km)

9.4.49 Within the wider 10-35km radius LVIA Study Area, recreational and tourist destinations of a national or regional level, which are overlapped by the ZTV and have been included in the assessment are listed as follows:

- Dumfries House;
- Blairquhan;
- Kilkerran;
- Rozelle (La Rochelle);
- Loudoun Castle;
- Carnell;
- Culzean Castle and Culzean Country Park (National Trust for Scotland site);
- Dundonald Castle;
- Scottish Industrial Railway Centre, Dalmellington (aka Dunaskin Heritage Centre);
- Andy Goldsworthy's Striding Arches on top of Benbrack, Colt Hill and Bail Hill;
- Dean Castle Country Park;
- Royal Troon, Lochgreen, Darley Golf and Municipal Golf Courses at Troon;
- Barassie Golf Course;
- Prestwick Golf Courses including St Nicholas and St Cuthbert;
- Belleisle and Seafield Golf Courses;
- Roodlea Gold Course; and
- Sorn Castle Golf Club, Catrine.

9.4.50 The following hill summits overlapped by ZTV are located within the 35km study area:

- Corbetts:
  - Merrick 843m AOD;
  - Corserine 814m AOD; and
  - Shalloch on Minnoch 775m AOD.

- Grahams:
  - Mullwharchar 692m AOD;
  - Craignaw 645m AOD;
  - Lamachan Hill 717m AOD; and
  - Green Lowther 732m AOD.

9.4.51 The majority of recreational and tourist destinations of regional and national importance, which are open to the public and are located within the wider 35km LVIA Study Area, are not overlapped by the ZTV and would have no view of the Proposed Development, or are not open to the public and have been excluded from the assessment. These include the following:

- Loch Doon Castle;
- Afton Reservoir;
- Patna Golf Course (Doon Valley Golf Course);
- Skeldon House;
- Bargany;
- Caprington Castle;
- Drumlanrig Castle;
- Maxwelton (Glencairn Castle);
- Scot's Mining Company House;
- Lanfine;
- Roodlea Gold Course;
- Burns National Heritage Park;
- Sanquhar Castle ruin;
- Clatteringshaws Visitor Centre;
- Glentrool Visitor Centre;
- Sanquhar Golf Course;
- Muirkirk Golf Course;
- Leadhills Golf Course;
- Thornhill Golf Course;
- Woodhead Mine;
- New Galloway Golf Course; and
- Turnberry Resort.

Information Gaps

9.4.52 There are no known information gaps within the landscape, visual and cumulative assessments.

Future Baseline

9.4.53 The baseline landscape character and baseline of other cumulative wind farm developments are subject to change over time. Areas of open cast mining and eventual restoration as well as forestry operations for example can alter the underlying landscape character of an area and the likely extent of visibility. The assessment has sought to take account of likely changes in the baseline that could lead to a significant change to the predicted effects where these can be reasonably predicted, for example the presence of a consented wind farm not yet constructed or known forestry operations undertaken as part of a publically available Forestry Design Plan.

9.5 Design Statement and Mitigation

9.5.1 The production of a Design Statement is encouraged by the Scottish Government (PAN 68) and SNH through their document 'Siting and Design of Wind Farm in the Landscape, Version 2' May 2014. SNH explain that Design Statements help to communicate the decision making processes behind the wind farm design and explain why a particular design has been chosen and how this will relate to the underlying landscape and other wind farm development in the area, which may have influenced the design process.

9.5.2 Part of the Design Statement is the establishment of Design Objectives which can also be referred to in future if the scope or circumstances of the proposed wind farm change.

Landscape Design Statement

9.5.3 The Landscape Design Statement which is detailed here has contributed to the wider environmental and technical Design Statement for the Proposed Development which is set out in its entirety in Chapter 3 and in the Design and Access Statement. This statement has drawn from the advice of SNH and EAC during the application process and other technical non-statutory guidance including the EALCS. The design concept has taken account of the SNH 'Guidance on Siting and Designing Windfarms' aiming to achieve a simple, rational, and cohesive design that to a reasonable degree avoids overlapping turbines and gaps within the visual composition.

9.5.4 The inherent nature of wind turbines as tall, modern structures means that the form of the wind farm as a whole is important, and a clear design strategy is necessary. The strategy therefore considered the appearance of the wind farm as an object or composition in the landscape as a factor in generating the layout.

9.5.5 The Landscape Design Objectives for the Proposed Development are provided and followed by an explanation of these, which draws from an analysis of the existing baseline landscape character and capacity for wind farm development, together with other cumulative wind farm development within 10km, and a summary of the design evolution and iterative LVIA assessment process.

Landscape Design Objectives

9.5.6 Key issues to be addressed by the LVIA is the scale and height of the proposed turbines in relation to the local landscape when viewed from the local area as well as the cumulative effects. Drawing from the advice of the EALCS, consultation and the iterative landscape design and LVIA process, the following general design aspirations were developed as follows:

- Proposed Development:
  - Achieve a simple, rational, and cohesive design from most viewpoints avoiding turbine stacking, gaps and outlying turbines so the scheme can be accommodated on a stand-alone basis or cumulatively.
  - Turbine development should avoid the 'front' north facing hill slopes overlooking settlements, roads and residential receptors within the Upland Basin. The hill tops and visually less sensitive interior hills would be preferable in order to maintain a sense of separation between

the lower lying areas and the more elevated Southern Uplands / Southern Uplands with Forestry which are most capable of accommodating wind farm development.

- Ensures that the scale of the Proposed Development is proportionate to the expansive scale of the underlying Southern Uplands with Forestry landscape and in terms of the perceived scale of development when viewed from residential properties, settlements, roads and footpaths within the New Cumnock Upland Basin LCA to the north.
- Maintain the simple landscape character of the Development Site by siting ground based infrastructure in the least visible locations when viewed from receptor locations to the north and north east including New Cumnock, the B741 and the A76.
- Limit landscape and visual effects on the visual receptors including local residents, roads, recreational routes and visitor / tourist destinations.

- Cumulative Design Objectives:
  - Achieve a design proposal that would be broadly compatible or co-existent with other existing and consented wind farm development within the LVIA Study Area. In this respect the design should adopt a clustered layout that is broadly similar to neighbouring wind farm developments in terms of perceived turbine height, number, proportion, three bladed turbine design, colour and lighting.
  - The Proposed Development has a maximum turbine height of up to 130m, which compares reasonably well with the maximum turbine height consented at nearby schemes such as Sanquhar (130m), Dersalloch (125m) and Afton (120m & 100m).
  - Limit cumulative landscape and visual effects including sequential cumulative effects from roads and the sensitive area of landscape character of Glen Afton.

Landscape Design Considerations of the Proposed Development

9.5.7 As noted previously, the Proposed Development would be located within 'Zone 2' of SNH's Strategic Guidance for Onshore Wind Farms (March 2009) which is a broad area with scope to accommodate development of an appropriate scale, siting and design, subject to cumulative development. Both the EALCS in East Ayrshire and the DGLCS in Dumfries and Galloway provide sensitivity analysis of the Southern Uplands and Southern Uplands with Forestry LCTs, which may be considered relevant to the Development Site and collectively they record a high to medium or low inherent landscape sensitivity to large scale turbine development, concluding that the perceived landscape capacity for large scale turbines ranges from 'very limited' to high with scope for 'multiple wind farm' development. However, neither study refers to the Development Site directly but both refer to other named locations within these LCTs in order to explain and justify their conclusions.

9.5.8 Both documents do however refer to the large or extensive scale and simplicity of the landscape character as an opportunity for large scale wind farm development, noting that the general lack of settlement and presence of forestry are factors that indicate some capacity for large scale wind turbines.

9.5.9 Particular references to Glen Afton and Loch Doon / Doon Water and Dalmellington as potential constraints are not relevant to the Proposed Development, due to the limited potential visibility from within these areas. Concerns about visual effects on the views towards the land mark hill summit of Blackcraig Hill and cumulative development close to Hare Hill Wind Farm are also not relevant in this case as indicated by the viewpoint analysis and visualisations. The Proposed Development is located over 6km distance to the west of the existing Hare Hill Wind Farm and its Extension and would not visually interfere with the land mark appearance of Blackcraig Hill. A general reference to the potential visibility of wind farm development from the Upland Basin as a constraint is however a relevant consideration for this Proposed Development and one of the reasons for establishing a northern limit or 'turbine exclusion' zone across the north facing hill slopes of the Development Site. The establishment of a northern limit or 'turbine exclusion' zone across the north

facing hill slopes of the Development Site was also developed in response to feedback obtained as a result of public consultation and Community Liaison Group meetings. This turbine 'exclusion area' ensures that turbines would not be positioned on the 'front' north facing hill slopes. This constraint also had the benefit of minimising potential visual effects on the views from the closest receptors, including residential properties located to the north of the Development Site and more general views from New Cumnock and the Upland Basin area to the north and north east.

9.5.10 The Proposed Development has also been mindful of the design of other existing, consented and proposed wind farm applications in the area within 10km including Hare Hill and Extension, Afton, South Kyle, Pencloe, Sanquhar, Dersalloch and the recently refused application at Ashmark Hill. The design of the Proposed Development draws from the design of existing and consented wind farm development as well as the closest neighbouring applications in order to attain a higher degree of visual compatibility utilising similar clustered layouts, turbine proportion, and relationship to the underlying Southern Uplands and Southern Uplands with Forestry landscape character.

9.5.11 The Proposed Development has purposefully sought to avoid the design strategy adopted by the Ashmark Hill scheme with turbines appearing large In scale and in a linear layout on the 'front' north facing hill slopes of the un-forested Southern Uplands (due to site boundary constraints) in contrast to the perceived scale, layout and landscape location of other existing and consented wind farm development in this area. The Ashmark Hill scheme was also relatively close to the sensitive area of Glen Afton in contrast to this Proposed Development.

Cumulative Landscape Design Considerations of the Proposed Development

9.5.12 It is of primary importance that the Proposed Development can be accommodated alongside other existing and consented development but consideration has also been given to other wind farm applications such as South Kyle and Pencloe in the event that either one or both of these are also consented. The design of the Proposed Development has taken account of these possible cumulative scenarios as part of the turbine composition from a number of the assessment viewpoints, ensuring as far as possible visual compatibility in terms of turbine layout and scale.

9.5.13 Cumulatively, the SNH guidance (Sitting and Design Wind Farms in the Landscape, May 2014) provides wind farm design guidance under a number of topics, each of which is considered, where relevant, as follows.

Relating to Landscape Character

9.5.14 SNH suggest that, "*if windfarms already exist within a particular character type, further windfarm development should be limited to the same or similar types within the neighbouring area".* A key aim of the design evolution has been to locate the Proposed Development within the same or similar Southern Uplands / Southern Uplands with Forestry LCTs and to ensure that the relationship of the Proposed Development to the underlying landscape character is similar to other existing and consented wind farms. In this respect the cluster turbine layout of the Proposed Development compares favourably with other wind farm development within the Southern Uplands and Southern Uplands with Forestry LCTs with proposed turbines limited to the southern part of the Development Site, avoiding northern facing hill slopes.

Relationship between wind farms

9.5.15 The design of the Proposed Development has been mindful of the existing and consented development as well as the South Kyle and Pencloe planning applications close to the Development Site, ensuring that the turbine composition of the Proposed Development would appear visually compatible with either or both of these wind farm applications.

9.5.16 The proposed clustered layout and turbine number would be comparable with other existing, consented and application wind farm development in the area with a clustered turbine layout. The proposed maximum blade tip height of up to 130m is comparable with the turbine proportion and height of turbines at recently consented schemes such as Sanquhar (130m), Dersalloch (125m) and Afton (120m & 100m).

Complementing landform

9.5.17 Through the design process the proposed turbine locations have been 'pushed back' to the south of the Development Site, within an extensive and large scale landscape with an open and simple landscape pattern. As noted above, the Proposed Development would not adversely affect the general visibility and prominence of landmark hills such Blackcraig Hill.

9.5.18 The Proposed Development would avoid the "*lower, interlocking ridges to the west"* and the landmark hills to the east of Glen Afton which are identified as a sensitive landform within the Capacity Study.

Focal point, pattern and scale

9.5.19 As stated above, the nearest 'focal point' is the 'landmark hill' of Blackcraig. Viewpoint assessment and site survey have confirmed that the Proposed Development would not compete with or diminish the landmark hill qualities of Blackcraig. The Proposed Development would be located to the lea of outer hill summits (Chang Hill, Benty Cowan Hill, Rigg Hill and Peat Hill) and set within a large and expansive scale landscape capable of accommodating large scale turbines. The pattern of coniferous forestry 'cups' around the area of the proposed turbines to the west, south and southeast, characterising the area as Southern Uplands and Forestry.

Settlements

9.5.20 There is no settlement within the host landscape or within 3km of the Proposed Development. Viewpoint analysis during the design evolution process has ensured that views from those settlements beyond 3km have been minimised as far as possible.

Design Evolution

9.5.21 The design evolution is illustrated in **Figure 9.26a/b/c/d/e** which shows that the Proposed Development has been 'pushed' south within the interior hills, away from the north-facing hill slopes to reduce visual effects on views from within the Upland Basin and the associated visual receptor locations including the B741, residential properties and the nearby settlement of New Cumnock. The result of this action has been to improve the landscape and visual relationship of the Proposed Development with the underlying landscape and the wider pattern of wind farm development as well as reducing the landscape and visual effects on receptors such as residential properties, roads and settlements. The blade tip height has been dropped from 150m to blade tip to 130m to blade tip to ensure it is comparable to other cumulative wind farm development and to reduce the schemes overall visibility.

9.5.22 **Figures 9.26a/b/c/d/e** illustrated the design evolution from 5 of the assessment viewpoint locations as follows:

- Viewpoint 2: B741 South west of New Cumnock – The design evolution has reduced the horizontal extent of turbines across the horizon and reduced the vertical extent by pushing turbines back from the north-facing hill slopes reducing their prominence in the view. Turbines have been relocated to create a balanced and relatively evenly spaced layout which has been designed to appear in scale with the proposed South Kyle Wind Farm, should this be consented or equally, to appear as a balanced, cohesive group in the case that the South Kyle Wind Farm was not approved.

- Viewpoint 5: High point north of site near Auchinross – Again both the horizontal and vertical extent of turbines across the horizon has been reduced, pushing turbines progressively further south, beyond the north-facing hill slopes and reducing their prominence in the view. In addition, the Proposed Development has been designed to ensure that, whether the nearby Pencloe or South Kyle Wind Farm applications are consented or not, the Proposed Development will appear as a balanced and legible group of turbines.

- Viewpoint 6: Blackcraig Hill south of New Cumnock – The design evolution process has reduced the horizontal extent of turbines to contain the Proposed Development within the

pattern of cumulative wind farm development. The number of overlapping turbines has been reduced and turbines located to ensure they are consistent in scale and spacing relative to cumulative wind farm development also visible in the same area of the landscape. The turbines would appear as a cohesive and legible group that would fit with a range of cumulative wind farm scenarios, subject to the consenting process.

- Viewpoint 7: Lochside Hotel – Starting with a wide horizontal extent and a large number of turbines prominent on the north-facing hill slopes, the design evolution process has gradually reduced the horizontal extent of the Proposed Development. It has removed the majority of turbines from the north-facing hill slopes, pushing them back behind the horizon line reducing their prominence. Similarly, the Proposed Development has been designed to accord with the nearby Pencloe and South Kyle applications to ensure that either cumulatively, or stand-alone the Proposed Development would appear as a simple and balanced group.
- Viewpoint 8: Cairnsmore of Carsphairn – The horizontal extent of the Proposed Development has been reduced and turbines would appear appropriate in scale against the consented Windy Standard Extension, which appears in front of the Proposed Development. The number of overlapping turbines has been significantly reduced with turbines appearing as a compact, simple and legible group.

Mitigation Inherent in Proposed Development

9.5.23 The Proposed Development and associated infrastructure are summarised as follows:

- 19 No. three-bladed, horizontal axis wind turbines (up to a maximum blade tip height of 130m) including concrete turbine foundations, and associated crane pads at each location;
- 2 No. Anemometer Mast, 80m in height and associated crane pads at each location;
- A wind farm Control Building Compound and a SPEN Substation;
- New Site Access and new Internal Access Tracks;
- Watercourse Crossings (6 culverts);
- 25 No. Passing Places;
- Borrow Pits within identified Search Areas (up to 3);
- Underground cabling in cable trenches; and
- During the construction period a temporary construction compound and concrete batching plant would be required.

9.5.24 The construction, operation and decommissioning are anticipated to cover a period of up to 27 years in total, 25 years of which would be for the operation of the wind farm.

Wind Turbines

9.5.25 The proposed turbines would have a maximum turbine height of up to 130m to blade tip (based on an indicative hub height of up to 80m and a rotor diameter of up to 106m, which will be adjusted to ensure that maximum tip height will not exceed 130m). The turbine dimensions would produce a well-proportioned turbine design, constructed from steel and fibreglass producing a smooth and sophisticated aerodynamic form. The turbines would be uniform in colour (pale grey) with a semi-matt finish to reduce their contrast with the background sky, landscape and minimise their reflectivity.

9.5.26 Once erection of the wind turbines is complete, the adjacent crane pad and hard standing (approximately 25m by 50m) would be partially restored with turves or excavated soil and re-seeded to match the existing landscape.

Turbine Transformers

9.5.27 Turbine transformers would be located externally adjacent to the turbine base in a small kiosk (5m x 3m x 3m high), unless a turbine is selected with an internal transformer. These would be of a neutral colour to reduce contrast with the background landscape and specifically located as far as possible to the lea of the turbine, or positioned for least visibility from the B741 minor road in the north. Landscape designed earth modelling would also be employed to 'bed' this development into the hillside as necessary to secure partial screening and grade the construction earthworks into the surrounding contours.

Turbine Lighting

9.5.28 The turbines may require infrared lighting (the latter would not be visible to people without night vision equipment). It is however likely that a small amount of directional security lighting would be required during the construction and decommissioning phases. This lighting would conform to the institute of lighting professionals guidance for Zone E1 (Guidance Notes for the Reduction of Obtrusive Light GN01:2011) and would use a shielded downwards pointing installation.

Turbine Delivery Route to Site

9.5.29 The 'turbine delivery route' (or route for abnormal loads) is illustrated in **Appendix 14.A**, page 16. Minor road-works or alterations to this route are required to allow access and no significant landscape or visual effects are anticipated.

Anemometer Mast

9.5.30 The Proposed Development includes 2 No. anemometry masts, up to 80m high which would be located within the proposed clustered turbine layout, also located south of the 'northern turbine exclusion area' previously referred to in the Landscape Design Statement. The proposed anemometry masts have been modelled in each of the viewpoint visualisations within 5km, ensuring that where visible they would appear as a holistic component of the proposed wind farm design.

Site Entrance and Access Tracks

9.5.31 A new Development Site entrance and junction would be provided off the B741, a short distance to the northeast of Polmathburn Bridge on the north western edge of the Development Site boundary.

9.5.32 The proposed new access tracks have been routed to minimise visibility from the north where road users and residential receptors are located, accessing the turbines and associated infrastructure from the north so as to limit the visual impact of new access tracks on the open landscape.

9.5.33 On completion, the Development Site entrance and access tracks would be cleared of any construction signage and left in a tidy and co-ordinated condition.

Grid Connection: Control Building, Substation and Electrical Cables,

9.5.34 The new onsite control building will sit within a compound with maximum dimensions of approximately 180m x 110m and a single storey building approximately 30 x 20m, which will house switchgear, metering, protection, control equipment, as well as welfare facilities. Final details including external finishes and screen planting will be agreed with EAC. The details of the substation form part of the conditions agreed with Local Energy and Consents formerly the Energy Consents and Deployment Unit (ECDU).

9.5.35 The point of grid connection will be located at the Development Site where the system operator Scottish Power Energy Networks (SPEN) will establish a transformer arrangement with associated switchgear in a substation. This is likely to be connected by ~4km of underground cable to the New Cumnock 132kV substation. **Figure 4.9** shows the potential grid connection location and possible cable route.

9.5.36 All on-site electrical cables linking the turbines, transformers and switchgear building would be underground and buried within a trench alongside the proposed access tracks to minimise ground disturbance.

Temporary Construction Compound

9.5.37 The temporary construction compound and laydown areas would be fully re-instated with stored turfs or excavated soil/peat and re-seeded to match the local contours and existing vegetation. The aggregate forming the compound surface shall be removed from the Development Site.

Borrow Pits

9.5.38 Three potential borrow pit search areas have been identified. Upon completion of construction, the borrow pits will be restored to fit with the surrounding landscape and a detailed reinstatement programme will be developed, drawing upon the advice of a landscape architect and an ecologist, and will be implemented in agreement with EAC, SEPA and SNH. This will ensure that proposed reinstatement materials and techniques are suitable and it may identify appropriate environmental enhancement opportunities. It is anticipated that steep faces would be reduced where possible to fit with the surrounding topography, and disturbed surfaces would be covered with soil and re-seeded or re-turfed.

Construction Mitigation

9.5.39 The development of the wind farm would draw upon the guidance set out in SNH guidance '*Good Practice during Wind farm Construction'*[3]. The key measures that would be implemented, as part of the Construction Method Statement (CMS) and the supporting Construction Environmental Management Plan (CEMP) in order to avoid or reduce potential construction effects include:

- Using designated routes around the Development Site for construction vehicles and operation of construction plant such as cranes. Avoiding the creation of any wheel ruts and subsequent clear up of these.
- Implementation and monitoring of site management procedures, such as regular litter sweeps of the immediate environs to ensure the removal of all litter arising from the construction activities.
- Removal, reinstatement, and clear up of the Construction Compound and any related construction arisings.

Operational Mitigation

9.5.40 The operation of the wind farm would cover a period of 25 years and include site management to ensure the adequate maintenance of site facilities and landscape features such as access tracks, field boundaries, gates, and signage.

Decommissioning Mitigation

9.5.41 As part of the decommissioning process all of the visible, above ground structures (turbines, transformers, substation and control building) would be removed, thereby rendering the vast majority of the landscape and visual effects as reversible. The Development site access tracks would remain as permanent features, and would gradually vegetate according to the level of use and or maintenance by the landowner.

[3] Good Practice during Windfarm Construction, A joint publication by Scottish Renewables, Scottish Natural Heritage, Scottish Environment Protection Agency, and the Forestry Commission Scotland; Version 1, October 2010.

9.6 Residual Landscape Effects

9.6.1 Landscape Effects are defined by the Landscape Institute in GLVIA 3, paragraphs 5.1 and 5.2 as follows.

"An assessment of landscape effects deals with the effects of change and development on landscape as a resource. The concern ... is with how the proposal will affect the elements that make up the landscape, the aesthetic and perceptual aspects of the landscape and its distinctive character. ... The area of landscape that should be covered in assessing landscape effects should include the site itself and the full extent of the wider landscape around it which the Proposed Development may influence in a significant manner."

9.6.2 These effects are assessed by considering the landscape sensitivity (value and susceptibility) against the magnitude of change. The type of effect may also be described as temporary or permanent, direct or indirect, cumulative and positive, neutral, or negative.

9.6.3 The residual landscape effects assessed here are those effects remaining after all of the design mitigation has been taken into account.

Direct Landscape Effects

9.6.4 The Development Site is bounded to the west and south by coniferous forestry (Carsphairn Forest) which extends out from the Proposed Development to Meikle Hill in the east, the settlements of Dalmellington and Bellsbank to the west and to Craig of Knockray and Cairnsmore of Carsphairn to the south. Turbines are located on the lee or southern slopes of Barbeys Hill, High Chang Hill and Benty Cowan Hill. The partial 'containment' of the Development Site area by landform and forestry has contributed to the limited ZTV coverage of the area as illustrated in **Figure 9.2**.

9.6.5 The Development Site falls predominantly within two areas of southern upland hills comprising the Southern Uplands: Benty Cowan Hill LCA and the Southern Uplands and Forestry: Enoch Hill LCA. The primary difference between these two areas is the extent to which they are influenced or characterised by forestry and their relationship to surrounding areas of landscape character such as the East Ayrshire Southern Uplands: Blackcraig Hill, Upland River Valley: Loch Doon, Upland Glen: Glen Afton and the Upland Basin: New Cumnock. Survey and analysis of these two areas has influenced the design evolution of the Proposed Development and all of the proposed turbines would be located within the Southern Uplands and Forestry: Enoch Hill LCA to the south of the Development Site. Within this area, the landscape is influenced by adjacent areas of coniferous forestry which 'cups' around the area of the proposed turbines to the west, south and southeast. The Development Site is also visually remote from surrounding landscapes such as Blackcraig Hill, Loch Doon, Glen Afton and the Upland Basin, indicating an area of localised capacity for wind farm development with reduced landscape sensitivity compared to areas of Southern Uplands (without forestry) further to the north.

9.6.6 The topography is of rounded hills including Benty Cowan Hill (477m AOD), Chang Hill (463m AOD), Ewe Hill (437m AOD) and Enoch Hill (569m AOD), typical of the Southern Uplands LCT split by steep, incised gullies at Dalleagles Burn, Knockburnie Glen and Connel Burn within the northern half of the Development Site, with more gentle, although elevated landform in the southern part of the Development Site (**Figure 9.18**). The landcover is predominantly rough grassland, referred to as 'hill pasture' in the EALCS with coniferous forestry influencing the southern part of the Development Site and forming the eastern and southern Development Site boundaries. The northern part of this area, along the B741 corridor is sparsely settled with scattered properties and small groups, whilst there are not residential properties or settlement in the southern part of the Development Site. There are no particular features of interest within the Development Site boundary and no core paths or other recreational routes.

9.6.7 The two areas of Southern Uplands: Benty Cowan Hill LCA and the Southern Uplands and Forestry: Enoch Hill LCA are described as follows and compared in **Table 9.7**.

Southern Uplands: Benty Cowan Hill LCA

9.6.8 The Southern Uplands: Benty Cowan Hill LCA forms part of an extensive area of East Ayrshire Southern Uplands LCT identified within the EALCS. The key characteristics of East Ayrshire Southern Uplands LCT, identified in that document are described as follows:

- *"Within East Ayrshire, the Southern Uplands form steep-sided, rugged open hills strongly containing the Upland Glen (14) of Glen Afton and providing a dramatic backdrop to the low-lying Upland Basin (15);*
- *Higher and particularly steep-sided and well-defined hills on the eastern edge of Glen Afton form landmark features and include the distinctly rugged Blackcraig Hill and Craigbraneoch Rig;*
- *Lower and relatively narrow ridges occur west of Glen Afton;*
- *Land cover is simple, dominated by grass moorland;*
- *This landscape is not settled although it is highly visible from settlement and roads within the Upland Basin (15) to the north;*
- *The peripheral hills of this character type also form prominent skylines seen from Glen Afton;*
- *The operational Hare Hill wind farm occupies a prominent hill summit seen in views to the north-west; and*
- *The operational wind farm of Windy Hill and its consented extension are also located within the same character type but within neighbouring Dumfries and Galloway and close to the East Ayrshire boundary."*

Southern Uplands and Forestry: Enoch Hill LCA

9.6.9 This landscape extends across the boundary into Dumfries and Galloway where it is described as Southern Uplands with Forests LCT and the two areas together form a larger area of the same overall character type, covering the Carsphairn Forest. For the purposes of this assessment these two areas have been assessed as one landscape character type comprising the areas of Southern Uplands and Forestry 20c and Southern Uplands with Forests 19a, since they are the same overall character type, as illustrated in **Figure 9.16**. The key characteristics identified in the EALCS are described as follows:

- *"This landscape forms a small part of the Southern Uplands with Forestry character type which extends into neighbouring Dumfries and Galloway and overall forms an expansive tract of uplands;*
- *The predominantly rounded hills of this character type are largely covered with commercial coniferous forestry which masks their landform although steep-sided narrow ridges and deep valleys are present;*
- *A few of the highest hill tops are open and these are seen in views from the lower Loch Doon area and also backdrop the settlement of Dalmellington in the Doon Valley;*
- *This landscape is very sparsely settled with occasional farms sited on lower outward-facing slopes;*
- *The B741 and A713 are aligned on the periphery of this landscape although views from these roads are restricted by landform and forestry; and*
- *The operational and consented Windy Standard I and II wind farms are located in this same character type but within Dumfries and Galloway."*

9.6.10 In surveying and comparing the two areas of Southern Uplands: Benty Cowan Hill LCA and the Southern Uplands and Forestry: Enoch Hill LCA the character area boundary, through the Development Site, has been re-drawn between these two areas and is illustrated in **Figure 9.17**.

The southern part of the Development Site has more in common with the Southern Uplands and Forestry LCT with characteristic attributes relating to landform, nearby coniferous forestry and perceptions of remoteness. For these reasons the southern part of the Development Site has been locally described as the 'Southern Uplands and Forestry: Enoch Hill LCA' for the purposes of this LVIA.

Table 9.7 Comparison of LCA Characteristics with the Development Site

Topic	East Ayrshire Southern Uplands: Benty Cowan Hill LCA	Southern Uplands and Forestry: Enoch Hill LCA	The Development Site
Landscape context	*"Higher more defined 'landmark' hills lying east of Afton Glen and lower hills with complex interlocking ridges lying to the west of the glen. These uplands, and particularly the hill which contain the dramatic cleft of Afton Glen, form a scenic backdrop to the settled Upland basin (15)."*	*"These uplands form a backdrop of rounded forested hills to the Upland River Valley (10) of the Doon Valley including the settlement of Dalmellington. These uplands are also visible from the west side of the Loch Doon, including the Craigengillan designed landscape, where they form a relatively simple skyline of rounded forested hills, contrasting with the more dramatic upland scenery of Cairnsmore of Carsphairn and the Rhinns of Kells to the south"*	The Development Site is physically and visually remote from the following more sensitive areas: ▶ Upland Glen: Glen Afton; ▶ Blackcraig Hill identified as a 'landmark hill'; ▶ Upland River Valley: River Doon and would not form the backdrop to the settlement of Dalmellington and Craigengillan; and ▶ Rugged Uplands Lochs and Forest: Loch Doon. The north facing hill slopes of the northern half of the Development Site would be visible from the Upland Basin: New Cumnock LCA.
Scale	*"This landscape forms a relatively narrow band of hills but comprises part of a more extensive upland area where it borders the Southern Uplands and Southern Uplands with Forestry character type lying in both East Ayrshire and neighbouring Dumfries and Galloway."* *"range between 360-700m in height"* *"uplands are not settled and are open with very few scale references"*	*"This landscape comprises part of an extensive upland area where it borders the Southern Uplands and Southern Uplands with Forestry character type both within East Ayrshire and neighbouring Dumfries and Galloway."* *"Expansive and undulating upland plateau generally between 350-500m high although a few individual peaks exceed this height, Scale is significantly reduced in tightly contained valleys including the narrow craggy pass accommodating the A713. This landscape is very sparsely settled with occasional farms sited at the foot of valleys on the periphery of these uplands."*	The Development Site forms part of a wider 'block' of Southern Uplands and the expansive or large scale characteristic is an attribute that is common to both LCAs and the Development Site and surrounding area. The interior of the southern part of the Development Site can feel remote and is sparsely settled or un-inhabited.
Landform	*"These uplands comprise steep-sided hills containing Afton Glen. These hills are higher on the eastern side of Glen Afton and include Hare Hill and the distinctly rugged Blackcraig Hill. These uplands are lower to the west but form a series of interlocking ridges deeply cut by water courses."*	*"The hills are generally smooth with rounded summits although some narrow interlocking ridges also occur. There are a few pronounced peaks….Extensive forestry masks the underlying landform with some more incised burns, crags and steeper slopes occurring on the western edge of these uplands."*	The landform within the southern part of the Development Site has more in common with the Southern Uplands and Forestry: Enoch Hill LCA. Hills within this area are generally smooth with rounded summits and do not form steep-sided, rugged, interlocking ridges as described within the section on the East Ayrshire Southern Uplands which refers to areas closer to Glen Afton and Blackcraig Hill.

Topic	East Ayrshire Southern Uplands: Benty Cowan Hill LCA	Southern Uplands and Forestry: Enoch Hill LCA	The Development Site
Land Cover and Pattern	*"These uplands have a simple land-cover of grass moorland with occasional patchy heather"*	*"Extensive commercial forestry covers much of this landscape….Felling coupes and new planting add transitional textural contrasts across this landscape.* *Some small areas of hill pasture fringe the lower hill slopes and a few higher hill tops are open"*	Although there is no coniferous forestry within the Development Site, the southern part of the Development Site is bounded by forestry to the west, south and southeast. As a result, the southern part of the Development Site is influenced or characterised by the adjacent forestry within approximately 1km.
Settlement and Built Form	*"An unsettled landscape with no public roads but accommodating operational wind farm development and access tracks"*	*"There is very little settlement within this character type"*	The Development Site is uninhabited (except Brockloch Farm) an attribute that is common to both LCAs and the Development Site.
Perceptual qualities	*"The presence of operational wind farm development in these uplands and within close proximity in Dumfries and Galloway, together with nearby extensive commercial forestry inhibits a strong sense of wildness"*	*"While the interiors of this landscape can feel remote due to the distance from settlement and public roads, the presence of extensive commercially managed forestry and wind farm development in the same character type within neighbouring Dumfries and Galloway preclude any sense of naturalness"*	Low perceptions of 'wildness' and 'naturalness' are common to both LCAs and the Development Site and surrounding area due to the influence of adjacent forestry in the south and visibility of the Upland Basin and associated settlement and open-cast mining in the north, towards the B741. The southern part of the Development Site has a sense of remoteness in common with the Southern Uplands and Forestry: Enoch Hill LCA.
Visual Amenity	*"These uplands are unsettled although they are widely visible from roads and settlement within the Upland basin (15) and the Upland River Valley (10) of the Nith Valley. The steep-sided hills which immediately contain Afton Glen are particularly visible from settlement and the minor public road which is aligned through this Upland Glen (14)"*	*"These uplands are sparsely settled and public access is limited. They are however visible from the Upland River Valley (10) of the Doon Valley to the north-west and parts of the Loch Doon area within the Rugged Uplands, Forest and Lochs (21) which is a popular destination for recreation. Visibility into the interior of these uplands is restricted from the B741 and A713 due to forestry and landform."*	The southern part of the Development Site is visible from the Upland Basin in common with the East Ayrshire Southern Uplands: Benty Cowan Hill LCA, but is visually remote from the Upland River Valleys of the Rivers Doon and Nith and the Afton Glen. The northern part of the Development Site is visually remote from all of these areas including the Rugged Uplands, Forest and Lochs LCA and the B741 and A713 due to forestry and landform.

Landscape Susceptibility and Sensitivity

9.6.11 Reading the Southern Uplands as a wider unit and referring to both the EALCS and the DGLCS, a gradient of landscape sensitivity exists across this LCT with low sensitivity and scope for multiple large scale turbine development identified in the south of this wider area and high sensitivity and no scope for such development identified in the north of this wider area as follows:

- Southern Uplands with Forests: Carsphairn LCA – Low landscape sensitivity and scope for multiple large scale turbine development identified in the DGLCS.
- Southern Uplands and Forestry: Enoch Hill LCA – High / Medium landscape sensitivity with very limited scope for large scale turbine development within the eastern part of this area identified in the EALCS.
- Southern Uplands: Benty Cowan Hill LCA – High / Medium landscape sensitivity with no scope for large scale turbine development identified in the EALCS.

9.6.12 Within 10km of the Proposed Development some further limited scope for large scale turbine development is identified in the Foothills with Forestry and Open-cast Mining and the East Ayrshire Plateau Moorlands. High sensitivity and no scope for large scale turbine development is identified for all of the remaining LCTs within 10km of the Proposed Development.

9.6.13 The EALCS describes the sensitivity of Southern Uplands and Forestry to large scale turbine development as follows:

9.6.14 "While the large scale and relatively simple land cover of this character type reduces sensitivity to larger wind turbine typologies, likely effects on views from the Doon Valley and on the setting and views from the Loch Doon area and the settlement of Dalmellington are key constraints. Cumulative effects would also be likely to occur in conjunction with the operational/consented Windy Standard I and II wind farm, particularly where multiple developments were seen on the backdrop of hills which contain Loch Doon. Landscape sensitivity would be High-medium for the large typology (turbines >70m) and Medium for the medium typology (turbines 50-70m), reflecting increased opportunities for minimising intrusion and cumulative effects with smaller turbines."

9.6.15 The detailed assessment contained in the EALCS Appendix states the following with regards to potential large typology developments:

9.6.16 "There may be some very limited scope for this typology to be sited within the eastern part of these hills to avoid significant intrusion on the wider landscape context."

9.6.17 Further to this, the guidance for the development section of the EALCS (2013) states:

9.6.18 "There may be some very limited scope for the large typology (turbines >70m) to be accommodated within this landscape. Turbines should be set well back from the more sensitive western edges of these uplands and should avoid significant impact on the setting of Loch Doon and the upper Doon valley including the settlement of Dalmellington. Potential cumulative effects with the operational Hare Hill, operational and consented Windy Standard I and II wind farms should be considered carefully, especially in views from the Upland Basin (15) and Afton Glen (14) character types. A key cumulative issue to consider will also be any contrasts in design layout that may be obvious in key views between the more clustered form of the nearby operational Hare Hill wind farm located in the adjacent East Ayrshire Southern Uplands (20a) and more linear layouts likely to be adopted in the eastern part of this character type."

9.6.19 Regarding the EALCS guidance it should be noted that the design of the Proposed Development has taken account of this guidance by restricting the turbines to the southern part of the Development Site away from sensitive landscape character in the west, with the layout designed as a cluster to compare favourably with other existing and consented wind farm development and to align with nearby wind farm applications such as South Kyle and Pencloe. Many of the constraints identified, which serve to increase the sensitivity of this landscape relate to Loch Doon, the Upper Doon Valley and Glen Afton, which would not be significantly affected by the Proposed Development and are visually remote from the Development Site. In contrast, the Development

Site has much in common with the Southern Uplands with Forests: Carsphairn LCA (low sensitivity) due to its large scale, gently undulating landform, the influence of coniferous forestry, it's uninhabited nature and the fact it is visually remote from surrounding valleys, glens and basins. However, the Proposed Development turbines would be visible from the Upland Basin, although this area would not form part of the north facing slopes overlooking and containing Glen Afton or the Upland Basin as in the case of the northern part of the Development Site (Southern Uplands: Benty Cowan Hill LCA). Other factors to be considered are listed as follows:

- As already noted, the key characteristics of this LCA (large scale, gently undulating landform, the influence of coniferous forestry, it's uninhabited nature and being visually remote from surrounding valleys, glens and basins) indicate a lower overall sensitivity and susceptibility to the Proposed Development.
- Although the Proposed Development is located within the Afton SLCA local landscape designation it would not affect any of the key qualities or integrity identified by EAC when designating this area. The designation however, does indicate a medium landscape value.
- The condition and management of the landscape is considered to be reasonably good although the landscape quality of this area in terms of its representativeness is considered to be medium overall with the northern part of the site partly transitional into adjacent areas of landscape character which are less well representative of the LCT.
- The main landscape element (grass moorland) which covers the Development Site area within this LCA is considered to be of low landscape sensitivity. The surrounding vegetation type, commercial forestry, is also considered to be of low landscape sensitivity.
- In terms of visual sensitivity, the LCA is largely uninhabited with low levels of settlement occurring around the northern fringes and along the B741 to the north and has limited views. This is shown in the underlying topography and the limited envelope of theoretical visibility. There are also no particular tourist or recreational receptors.

9.6.20 Drawing from this assessment, the sensitivity of the southern part of the Development Site (Southern Uplands and Forestry: Enoch Hill LCA) is assessed as *Medium* and between 'low' and 'medium to high' as identified in the EALCS and DGLCS for the two LCTs on either side. The sensitivity of the northern part of the Development Site (East Ayrshire Southern Uplands: Benty Cowan Hill LCA) is assessed as *High / Medium* in line with the non-statutory EALCS guidance.

Effects during Construction

9.6.21 The construction phase would result in localised direct landscape effects on the Development Site and its component landscape elements. None of these are particularly sensitive (rough grassland / hill pasture of *Low* sensitivity). The construction works would affect localised areas, progressing from *Zero* magnitude of change to High towards the completion of the Proposed Development, the likely landscape effects on the fabric and constituent elements of the landscape would range from **Negligible to Moderate** and would not be significant.

9.6.22 In terms of wider effects on landscape character, the magnitude of change and nature of effect would range progressively from *Zero to High* during the construction phase; primarily as a result of the turbines. Overall, the landscape effects on the Southern Uplands and Forestry: Enoch Hill LCA would range from **None**, increasing to **Substantial / Moderate** and significant upon completion, due to the height and scale of the proposed turbines. The geographical extent of the significant effects would be limited to the immediate areas of the proposed turbines, within the Development Site itself (and part of the Southern Uplands and Forestry: Enoch Hill LCA) due to the containment of coniferous forestry and landform. Landscape effects (None, increasing to Substantial / Moderate) would also extend north, approximately 2km (affecting the East Ayrshire Southern Uplands: Benty Cowan Hill LCA) due to the height of the northern most turbines appearing beyond the summits of Chang Hill and Benty Cowan Hill. Although this area is considered to be more sensitive (High to Medium) some of the effects would be mitigated with much of the lower parts of the turbines screened by intervening landform and forestry as indicated in Viewpoints 1 and 2. The

nature of these effects would be temporary to long-term (reversible) direct and negative due primarily to the height and scale of the turbines.

Effects during Operation

9.6.23 During operation, the completed wind farm would gain a more 'settled' appearance when compared to the same area during the construction period, although the significant landscape effects would continue throughout the operational period as a result of the proposed turbines and the change they would bring to the existing landscape character.

9.6.24 The landscape effects on the Southern Uplands and Forestry: Enoch Hill LCA would be **Substantial / Moderate** and significant due to the height and scale of the proposed turbines. The geographical extent of the significant effects would be limited to the immediate areas of the proposed turbines, within the Development Site itself (and part of the Southern Uplands and Forestry: Enoch Hill LCA) due to the containment of coniferous forestry and landform. Significant landscape effects (Substantial / Moderate) would also extend north, approximately 2km (affecting the East Ayrshire Southern Uplands: Benty Cowan Hill LCA) due to the upper parts of the turbines appearing beyond the summits of Chang Hill and Benty Cowan Hill. There would be a more limited geographical effect on the East Ayrshire Southern Uplands: Benty Cowan Hill LCA as a result of the Development Site access, access track, potential borrow pits and proposed compounds. The nature of all of these effects would be long-term (reversible, excepting access tracks) direct and negative due primarily to the height and scale of the turbines.

9.6.25 This effect would not be significant in terms of the wider East Ayrshire Southern Uplands (with or without forestry) including the area of Southern Uplands with Forests: Carsphairn, in Dumfries and Galloway.

Cumulative Landscape Effects: Existing and Consented Wind Farms

9.6.26 There are no existing or consented wind farms within the Southern Uplands and Forestry: Enoch Hill LCA or the East Ayrshire Southern Uplands: Benty Cowan Hill LCA.

9.6.27 The existing Windy Standard Wind Farm and consented Extension are located approximately 2.5km and 5.5km distance from the Proposed Development to the southeast, within the neighbouring Southern Uplands and Forests: Carsphairn LCA, which is a landscape of low sensitivity. The cumulative effect of these wind farms on the host landscape character would not be significant due to the intervening distance and forestry (Low magnitude) and there would be no change to the assessment. Taking account of the low sensitivity and guidance for significant change, recorded in the DGLCS, the landscape effect on the total area of the Carsphairn Forest would not be significant in overall terms, falling in line with the guidance for development in the EALCS. The nature of these effects would be temporary to long-term (reversible), direct, and negative to neutral.

Cumulative Landscape Effects: Existing and Consented and Application wind farms

9.6.28 There are no other wind farm applications within the East Ayrshire Southern Uplands: Benty Cowan Hill LCA.

9.6.29 The South Kyle application is located directly to the southwest of the Development Site straddling the East Ayrshire and Dumfries and Galloway border and partly within the Southern Uplands and Forestry: Enoch Hill LCA and partly within the Southern Uplands and Forests: Carsphairn LCA. The Benbrack application is located to the southwest of the Proposed Development at a distance of approximately 4.5km within Dumfries and Galloway. The Pencloe application is located to the southeast at a distance of approximately 1.9km. These three applications would have a characterising influence on the Southern Uplands and Forestry: Enoch Hill LCA which would be significant (**Substantial / Moderate**) in respect of these applications alone. The nature of these effects would be temporary to long-term (reversible), direct, and negative to neutral.

Magnitude and Level of Effect: During Decommissioning

9.6.30 During the decommissioning period the Development Site would return to a construction site for a temporary period and as with the construction period, the level of effect would be variable over the Development Site and according to the phase of activity. In overall terms the magnitude would reduce from operational levels to *Negligible* magnitude with the removal of the turbines and associated above ground infrastructure (excepting on-site access tracks). The residual landscape effect would be **Slight / Negligible** and not significant. The nature of these effects would be permanent, direct, and positive when compared to the pre-existing landscape of the local area.

Indirect Effects on the Surrounding Landscape Character

9.6.31 Each of the surrounding LCAs located within 10km of the Proposed Development has been assessed in **Table 9.8**. The assessment has included those wind farms illustrated on **Figure 9.17**.

9.6.32 In summary, this part of the assessment has concluded that there would be no significant, indirect effects on the surrounding landscape character as a result of the Proposed Development. This is due mainly to the size and scale of the host LCT which acts as a buffer around the Proposed Development, separating it from adjacent areas of landscape character. Whist there may be a visual effect on the views from these areas, such as the New Cumnock area of Upland Basin LCA to the north views of the Proposed Development, it would not be so widespread or sufficiently influential so as to significantly change or affect the existing landscape character. Furthermore, there would be no significant effects on the perceptual characteristics such as perceived 'naturalness' or 'wildness'.

9.6.33 The Southern Uplands and Southern Uplands with Forestry LCT associated with the Carsphairn Forest is essentially the same LCT or wider Southern Uplands landmass that crosses the local authority boundary and has consequently been subdivided into a number of smaller constituent LCAs or units as acknowledged by both the EALCS and the DGLCS. The spread of existing and consented wind farm development would affect two areas around Hare Hill and Windy Standard, whilst the Proposed Development would add a third area of development, separated from the other two to the extent that the underlying landscape character would not be overwhelmed, albeit wind farm development would become key characteristic of this landscape. Further wind farm applications including South Kyle and Pencloe would, if consented, act to consolidate the separate areas of development and lead to the creation of a large wind farm group or 'wind farm landscape' affecting much of this wider Southern Uplands and Southern Uplands with Forestry LCT unit. An effect that at least in part, would broadly fall in line with the guidance of both the EALCS and the DGLCS. The EALCS identified some very limited scope for large typology turbines, whilst the DGLCS identified scope for multiple large scale wind farm development, notwithstanding the caveats and constraints identified by those reports.

Table 9.8 Indirect Effects on Surrounding Landscape Character within 10km

Landscape Character Area (LCA)	**Landscape Assessment**
East Ayrshire Windfarm Landscape Capacity Study (EALCS, 2013)	
20a East Ayrshire Southern Uplands: Benty Cowan Hill	Assessed previously as the 'host' LCA 20a East Ayrshire Southern Uplands: Benty Cowan Hill LCA.
20a East Ayrshire Southern Uplands: Blackcraig Hill	East Ayrshire Southern Uplands: Blackcraig Hill LCA forms steep-sided, rugged open hills strongly containing Glen Afton and providing a dramatic backdrop to the Upland Basin LCT. The landscape sensitivity is considered to be High to Medium to wind farm development located within it, which accords with the advice from the EALCS (2013) report.

Landscape Character Area (LCA)	Landscape Assessment
	Assessment: Proposed Development The Proposed Development would be located approximately 4.8km distance to the west at its closest point. Theoretical visibility is present on the upper parts of west facing slopes. Viewpoint 6: Blackcraig Hill south of New Cumnock is located within the LCA. It is not considered that the Proposed Development would significantly alter the key characteristics of this landscape from which views of similarly designed existing wind farm development are already present (Hare Hill Wind Farm and the consented Extension as well as views of Windy Standard and the consented Extension and Afton wind farms). The magnitude of change would be Low and the addition of the Proposed Development would lead to a Moderate to Slight level of effect on landscape character which would not be significant. The nature of these effects would be long-term (reversible) indirect and neutral to negative. Cumulative Assessment: Proposed Development + Existing + Consented Sites The existing Hare Hill Wind Farm and the consented Hare Hill Extension and Afton wind farms are present within this LCA and there would be further views of the existing Windy Standard and the consented extension wind farms. The cumulative magnitude of change is already High as a result of these developments and the addition of the Proposed Development (Low magnitude) would not lead to a further significant effect. However, the cumulative level of effect would be **Substantial to Substantial / Moderate** and significant. The nature of these effects would be long-term (reversible) indirect and neutral to negative. Cumulative Assessment: Proposed Development + Existing + Consented + Applications There are no other wind farm applications within this LCA. Views of the Pencloe and Kyle applications would further add to the characterising influence of wind farms on this landscape. The cumulative level of effect would be **Substantial to Substantial / Moderate** and significant. The nature of these effects would be long-term (reversible) indirect and neutral to negative.
15 Upland Basin: New Cumnock	The Upland Basin: New Cumnock LCA forms a low-lying, small-scale landscape. In **Figure 9.18b** this area has been adjusted to account for observations made whilst undertaking site visits. An area to the west has been identified as containing substantial areas of recent open-cast mining which has changed the topography and landscape character this area. The landscape sensitivity of the Upland Basin to wind farm development located within it is considered to be High by the EALCS (2013) report. However, the western areas have been strongly influenced by current and recent open-cast mining reducing the landscape sensitivity to wind farm development due to its unsettled nature and the extent of large scale earthworks changing the topography and character of this part of the LCA. Whilst other parts of the Upland Basin remain relatively unaffected there are higher levels of intervening vegetation screening within this lowland area. For these reasons the landscape sensitivity of the New Cumnock Upland Basin to the Proposed Development is considered to be Medium. Assessment: Proposed Development The Proposed Development would be located between approximately 2-9km to the south of the LCA. The ZTV coverage within this area is widespread, although within approximately 2-3km distance, visibility of the Proposed Development would be limited by intervening topography and from elsewhere within the LCA theoretical visibility would often be reduced by intervening vegetation screening. Viewpoints 2, 4, 5, and 7 are located within this LCA although numbers 2, 4, and 5 are not particularly representative and illustrate the views from locations of maximum visibility. Much of this area and the associated southern views are already partly characterised by views of wind farm development at Hare Hill and Windy Standard wind farms and the Proposed Development would not appear incongruous in that respect or otherwise significantly affect perceived characteristics of 'naturalness' or 'wildness'. The Proposed Development would however, be clearly visible in the southern views of the Southern Uplands from this area, where there are clear and open views in that direction. Views in other directions approaching from the south and southwest would not be affected The magnitude of change would be Medium and the addition of the Proposed Development would lead to a Moderate effect which would not be significant. The Proposed Development would not add a 'new' characteristic feature to the southern horizon in terms of landscape character or otherwise significantly change or affect the landscape character of this area, although there would be significant visual effects on views from some locations. The nature of these effects would be long-term (reversible) indirect and negative. Cumulative Assessment: Proposed Development + Existing + Consented Sites There are no other existing or consented wind farms within this LCA. Other wind farm development including Hare Hill and Extension (Low magnitude), Afton and Windy Standard (Negligible magnitude) would be, or are visible from this area and have a characterising influence on the southern horizons, the effect of which is Moderate and not significant. The Proposed Development (Medium magnitude) would not lead to a further significant effect and the cumulative effect of the existing, consented and Proposed Development would be Moderate and not significant. The nature of these effects would be long-term (reversible) indirect and negative.

Landscape Character Area (LCA)	Landscape Assessment
	Cumulative Assessment: Proposed Development + Existing + Consented + Applications There are no other wind farm applications within this LCA. Other wind farm applications (South Kyle and Pencloe and Garleffan and High Cumnock to the north) would further reinforce the appearance of wind farm development on the surrounding horizons of the Upland Basin (Medium magnitude). The Proposed Development (Medium magnitude) would not lead to a further significant effect. However, the cumulative magnitude of change would be High to Medium and the level of effect would be **Substantial / Moderate** and significant. The nature of these effects would be long-term (reversible) indirect and negative.
17a Foothills with Forestry and Opencast Mining: Martyrs Moss	The Foothills with Forest and Opencast Mining: Martyrs Moss LCA forms an extensive upland plateau to the northwest of the Proposed Development. The landscape sensitivity of this LCA is considered to be Medium, which accords with the advice from the EALCS (2013) report. Assessment: Proposed Development The Proposed Development would be located approximately 2km distance to the south-east at its closest point. The ZTV coverage of this area is fairly widespread although views would be limited by the screening effects of intervening large-scale open-cast mining and the presence of commercial forestry. It is not considered that the Proposed Development would significantly alter the key characteristics of the wider landscape. The magnitude of change would be Low and the Proposed Development would lead to a Slight effect that would not be significant. The nature of these effects would be long-term (reversible), cumulative, indirect and neutral to negative. Cumulative Assessment: Proposed Development + Existing + Consented Sites There are no other existing or consented wind farms within this LCA and there would be no change to the assessment. Visibility of other wind farm development from the surrounding areas (Negligible to Zero magnitude) would not have a significant characterising influence on this landscape character (Slight level of effect). The nature of these effects would be long-term (reversible) cumulative, indirect and neutral. Cumulative Assessment: Proposed Development + Existing + Consented + Applications There is a single application, Polquhairn, consisting of 9 turbines within this LCA and at a distance of approximately 9.6km from the Proposed Development. This would have a localised significant effect on a small part of this LCA within 1-2km of the proposed turbine locations (High magnitude) leading to a localised **Substantial / Moderate** effect that would be locally significant as a result of Polquhairn. The addition of the Proposed Development would not lead to a significant effect. The nature of these effects would be long-term (reversible) cumulative, indirect and neutral to negative.
10 Upland River Valley (River Doon)	The Upland River Valley: River Doon LCA forms a relatively broad valley strongly contained by elevated landform within adjacent LCT. It is formed by open flat floodplains patterned with wetlands and waterbodies such as Loch Doon. The landscape sensitivity of this LCA is considered to be High in accordance with the EALCS (2013) report. Assessment: Proposed Development The Proposed Development would be located at approximately 6km to the east at its closest point. Whilst there is some theoretical visibility this is generally screened by intervening vegetation and built form at Dalmellington. Viewpoint 9: Bogton Loch is located within this LCA. It is not considered that the Proposed Development would significantly alter the key perceptual characteristics of this landscape. The magnitude of change would be Negligible and the Proposed Development would lead to a Slight level of effect that would not be significant. The nature of these effects would be long-term (reversible), indirect and neutral. Cumulative Assessment: Proposed Development + Existing + Consented Sites There are no other existing or consented wind farms within this LCA and there would be no change to the assessment. Visibility of other wind farm development from the surrounding areas would not have a characterising influence on this landscape. Cumulative Assessment: Proposed Development + Existing + Consented + Applications There are no other wind farm applications within this LCA and there would be no change to the assessment.
10 Upland River Valley (River Nith)	The Upland River Valley: River Nith LCA is a broad valley strip of landscape to the west of the Proposed Development. The landscape sensitivity of this LCA is considered to be High, which accords with the advice from the EALCS (2013) report.

Landscape Character Area (LCA)	Landscape Assessment
	Assessment: Proposed Development The Proposed Development would be located approximately 5km distance to the east at its closest point. The ZTV coverage of this area is limited to the area to the northeast of New Cumnock and views of the Proposed Development would be further limited by intervening vegetation and built form. It is not considered that the Proposed Development would significantly alter the key perceptual characteristics of the wider landscape. The magnitude of change would be Negligible and the Proposed Development would lead to a Slight effect that would not be significant. The nature of these effects would be long-term (reversible), cumulative, indirect and neutral. Cumulative Assessment: Proposed Development + Existing + Consented Sites There are no other existing wind farms within this LCA, there is one consented single turbine at Mansfield Mains which is not assessed as significant. Other wind farm development including Hare Hill and Extension (Low magnitude) would or are visible from this area and have a characterising influence on the southern horizons, the effect of which is Moderate and not significant. The nature of these effects would be long-term (reversible) cumulative, indirect and neutral. Cumulative Assessment: Proposed Development + Existing + Consented + Applications There are no other wind farm applications within this LCA. Other wind farm applications (Lethans, Garleffan and High Cumnock to the north) would lead to further change visible from within this LCA. The Proposed Development (Negligible magnitude) would not lead to a further significant effect. However, the cumulative magnitude of change would be Medium leading to a **Substantial / Moderate** and significant effect as a result of other wind farm development. The nature of these effects would be long-term (reversible), indirect and neutral to negative.
21 Rugged Uplands, Lochs and Forest: Loch Doon	The Rugged Uplands, Lochs and Forest: Loch Doon LCA encompasses an extensive upland tract which includes the summits of Merrick and the Rhinns of Kells. The landscape sensitivity is considered to be High, which accords with the advice from the EALCS (2013) report. Assessment: Proposed Development The Proposed Development would be located approximately 6.9km distance to the northeast at its closest point. The ZTV coverage of the Proposed Development within 10km is extremely limited with small fragments present on limited summits. It is not considered that the Proposed Development would significantly alter the key perceptual characteristics of this landscape. The magnitude of change would be Negligible and the addition of the Proposed Development would lead to a Slight and not significant level of effect. The nature of these effects would be long-term (reversible), indirect and neutral. Cumulative Assessment: Proposed Development + Existing + Consented Sites There are no other existing or consented wind farms within this LCA. Visibility of other wind farm development from the surrounding areas (Negligible to Zero magnitude) would not have a significant characterising influence on this landscape character (Slight level of effect). The nature of these effects would be long-term (reversible) cumulative, indirect and neutral. Cumulative Assessment: Proposed Development + Existing + Consented + Applications The Glenmount application is located within this LCA and the magnitude of change would be High leading to a **Substantial** and significant effect. The Proposed Development (Negligible magnitude) would not lead to a further significant effect. However, the cumulative effect would be significant effect as a result of other wind farm development. The nature of these effects would be long-term (reversible), indirect and neutral to negative.
18a Plateau Moorlands: Wardlaw Hill	The Plateau Moorlands: Wardlaw Hill LCA forms an extensive undulating upland plateau of rounded hills and shallow basins. The landscape sensitivity is considered to be High to Medium, which accords with the advice from the EALCS (2013) report. Assessment: Proposed Development The Proposed Development would be located at a distance of approximately 8.4km distance to the southwest at its closest point. The ZTV coverage of this area overall is limited, with theoretical visibility present on the western slopes of Cairnscadden, Avisyard and Airds Hill. It is not considered that the Proposed Development would significantly alter the key perceptual characteristics of this landscape. The magnitude of change would be Negligible leading to a Slight to Slight/Negligible effect that would not be significant. The nature of these effects would be long-term (reversible), indirect and neutral.

Landscape Character Area (LCA)	Landscape Assessment
	Cumulative Assessment: Proposed Development + Existing + Consented Sites There are no other existing or consented wind farms within this LCA. Visibility of other wind farm development from the surrounding areas (Negligible magnitude) would not have a significant characterising influence on this landscape character (Slight to Slight/Negligible level of effect). The nature of these effects would be long-term (reversible) cumulative, indirect and neutral. Cumulative Assessment: Proposed Development + Existing + Consented + Applications The High Cumnock, Lethans and Garleffan applications are located within this LCA and the magnitude of change would be High leading to a **Substantial to Substantial/Moderate** and significant effect. The Proposed Development (Negligible magnitude) would not lead to a further significant effect. However, the cumulative effect would be significant as a result of other wind farm development. The nature of these effects would be long-term (reversible), indirect and neutral to negative.
14 Upland Glen: Glen Afton	The Upland Glen: Glen Afton LCA is narrow and strongly enclosed by steep sides rising to irregular and prominent ridgelines. The landscape sensitivity of this LCA is considered to be high, which accords with the advice from the EALCS (2013) report. Assessment: Proposed Development Through the design evolution process the level of theoretical visibility has been reduced until there are only small fragments at the northern head of the Glen on the western summit of Yarngellows Knowe. It is not considered that the addition of the Proposed Development would significantly alter the key perceptual characteristics of the wider landscape. The magnitude of change would be Negligible and the addition of the Proposed Development would lead to a Slight effect that would not be significant. The nature of these effects would be long-term (reversible), cumulative, indirect and neutral. Cumulative Assessment: Proposed Development + Existing + Consented Sites The consented Afton Wind Farm would be partly within this LCA (Medium magnitude) and would have a significant characterising influence on part of this landscape character leading to a **Substantial / Moderate** level of effect). The nature of these effects would be long-term (reversible) cumulative, indirect and neutral to negative. Cumulative Assessment: Proposed Development + Existing + Consented + Applications There are no other wind farm applications within this LCA. Visibility of the Pencloe application from the surrounding area (Negligible magnitude) would not have a significant characterising influence on this landscape character (Slight level of effect). The Proposed Development (Negligible magnitude) would not lead to a further significant effect. However, the cumulative effect would be a significant effect as a result of the consented Afton Wind Farm. The combined cumulative effect on landscape character would remain **Substantial / Moderate**. The nature of these effects would be long-term (reversible) cumulative, indirect and neutral.
7c East Ayrshire Lowlands: Drongan	The East Ayrshire Lowlands: Drongan LCA is an area of landscape of variable, undulating, landform stretching east to west from the A77 to the A76 between the edge of Ayr and Cumnock. It is a small scale landscape with small pastures, hedgerows, woodland and a regular pattern of small farms. The landscape sensitivity of this LCA is considered to be High in accordance with the EALCS (2013) report. Assessment: Proposed Development The Proposed Development would be located at approximately 8km to the south at its closest point. Theoretical visibility is extremely limited and fragmentary. It is not considered that the Proposed Development would significantly alter the key perceptual characteristics of this landscape. The magnitude of change would be Negligible and the addition of the Proposed Development would lead to a Slight level of effect that would not be significant. The nature of these effects would be long-term (reversible) indirect and neutral. Cumulative Assessment: Proposed Development + Existing + Consented Sites There are no other existing or consented wind farms within this LCA Visibility of other wind farm development from the surrounding areas (Negligible to Zero magnitude) would not have a significant characterising influence on this landscape character (Slight level of effect). The nature of these effects would be long-term (reversible) cumulative, indirect and neutral.

Landscape Character Area (LCA)	Landscape Assessment
	Cumulative Assessment: Proposed Development + Existing + Consented + Applications There are no other wind farm applications within this LCA. The High Cumnock and Garleffan applications are located nearby and the magnitude of change would be Low leading to a Moderate effect. The nature of these effects would be long-term (reversible) indirect and neutral to negative.
Dumfries and Galloway Landscape wind farm Capacity Study (DGLCS, 2011)	
19 Southern Uplands: Carsphairn	The Southern Uplands: Carsphairn LCA is an extensive area of upland moorland to the south and south-east of the Proposed Development. The landscape sensitivity of this LCA is considered to be High to wind farm development located within it, which accords with the advice from the DGLCS (2011) report. Assessment: Proposed Development The Proposed Development would be located at approximately 6km distance to the northwest at its closest point. The ZTV coverage of this area is fragmented, and limited to the north western facing slopes of Cairnsmore of Carsphairn. Viewpoint 8 illustrates the view from the summit of Cairnsmore of Carsphairn. The Proposed Development would not significantly alter the key characteristics of this landscape. The magnitude of change would be Negligible and the addition of Proposed Development would lead to a Slight effect that would not be significant. The nature of these effects would be long-term (reversible), indirect and neutral to negative. Cumulative Assessment: Proposed Development + Existing + Consented Sites The existing Windy Standard and consented extension are partly located within this landscape and other wind farm development (Hare Hill, Hare Hill Extension and Afton) would be visible nearby within similar landscape character. The Proposed Development (Negligible magnitude) would not lead to a further significant effect. However, the cumulative level of effect would be High to Medium as a result of these other developments and the level of effect would be **Substantial to Substantial / Moderate** and significant. The nature of these effects would be long-term (reversible) indirect and neutral to negative. Cumulative Assessment: Proposed Development + Existing + Consented + Applications The Quantans Hill application is located within this LCA and would have a localised significant effect on a small part of this LCA within 1-2km of the proposed Quantans Hill turbine locations. The cumulative level of effect would be **Substantial to Substantial / Moderate** and significant close to the Quantans Hill application, although the Proposed Development (Negligible magnitude) would not lead to a further or additional significant effect. The nature of these effects would be long-term (reversible) cumulative, indirect and neutral to negative.
19a Southern Uplands and Forestry: Carsphairn	This area is contiguous with the 'host' LCA: 19a Southern Uplands with Forests: Enoch Hill LCA, assessed previously. The Southern Uplands and Forestry: Carsphairn LCA is an extensive area of forestry to the south of the Proposed Development. The landscape sensitivity of this LCA is considered to be Low, which accords with the advice from the DGLCS (2011) report. Assessment: Proposed Development The Proposed Development would be located at approximately 2km distance to the north at its closest point. The Proposed Development would not significantly alter the key characteristics of this landscape due to the intervening landform and forestry. The magnitude of change would be Negligible and the addition of Proposed Development would lead to a Negligible effect that would not be significant. The nature of these effects would be long-term (reversible) indirect and neutral. Cumulative Assessment: Proposed Development + Existing + Consented Sites The existing Windy Standard and consented extension are partly located within this landscape and other wind farm development (Hare Hill, Hare Hill Extension and Afton) would be visible nearby within similar landscape character. The Proposed Development (Negligible magnitude) would not lead to a further significant effect. However, the cumulative magnitude of change would be Medium as a result of these developments and the level of effect would be Moderate to Slight and not significant. The nature of these effects would be long-term (reversible) indirect and neutral to negative. Cumulative Assessment: Proposed Development + Existing + Consented + Applications The South Kyle and Benbrack applications are located within this LCA and would have a significant effect on this LCA (High). The Proposed Development (Negligible magnitude) would not lead to a further significant effect. However, the cumulative magnitude of change would be High as a result of the South Kyle application in particular, and the level of effect would be **Substantial / Moderate** and significant in this case. The nature of these effects would be long-term (reversible) indirect and neutral to negative.

Landscape Character Area (LCA)	Landscape Assessment
19a Southern Uplands with Forests: Ken	The key characteristics of the Southern Uplands with Forest: Ken are a predominantly expansive, gently undulating landform and simple extensive commercially managed forest cover which reduces sensitivity wind farm development. The landscape sensitivity is considered to be Low, which accords with the advice from the DGLCS (2011) report. Assessment: Proposed Development The Proposed Development would be located approximately 8km distance to the northwest at its closest point. The ZTV coverage of this area is very limited. It is not considered that the Proposed Development would significantly alter the key perceptual characteristics of this landscape. The magnitude of change would be Negligible and the addition of the Proposed Development would lead to a Negligible level of effect that would not be significant. The nature of these effects would be long-term (reversible), indirect and neutral. Cumulative Assessment: Proposed Development + Existing + Consented Sites There are no other existing wind farms within this LCA. The consented Sanquhar Wind Farm is located within this LCA. Cumulative Assessment: Proposed Development + Existing + Consented + Applications There are no other wind farm applications within this LCA.
9 Upper Dale: Upper Glenkens	The Upper Dale: Upper Glenkens LCA covers a strip of landscape of lower elevation along the A713 from Lamford, down towards Carsphairn to the south. The landscape sensitivity is considered to be High, which accords with the advice from the DGLCS (2011) report. Assessment: Proposed Development The Proposed Development would be located approximately 7.5km distance to the north east of the LCA at its closest point. The ZTV coverage of this area is very limited. It is not considered that the Proposed Development would affect the key characteristics of this landscape and the level of effect would be None. Cumulative Assessment: Proposed Development + Existing + Consented Sites There are no other existing or consented wind farms within this LCA and there would be no change to the assessment. Cumulative Assessment: Proposed Development + Existing + Consented + Applications There are no other wind farm applications within this LCA. Visibility of other wind farm development from the surrounding areas (Negligible magnitude) would not have a significant characterising influence on this landscape character (Slight level of effect).

Landscape Designations: Afton SLCA

9.6.34 The vast majority of the Development Site including all of the proposed turbines would be located within the locally designated Afton Sensitive Landscape Character Area (SLCA). The area covers the entire Afton valley as well as the Muirkirk Uplands area to the north of the A76.

9.6.35 SLCA are designated within the Ayrshire Joint Structure Plan (2007) to 'provide protection for high quality landscapes'.

9.6.36 The blade tip ZTV for the Proposed Development is almost constant within 2km of the Proposed Development with fragments where there is no theoretical visibility beyond Maneight Hill, Strandlud Hill, Ewe Hill, Hillend Hill and Stony Knowes Hill. Thereafter, theoretical visibility becomes increasingly more fragmentary and is present along the west-facing slopes of the East Ayrshire Southern Uplands to the east of the Development Site such as those of The Knipe (575m) and Blackcraig Hill (700m), and on the southern slopes of Muirkirk Uplands to the north of the A76. Elsewhere in the SLCA there is fragmented theoretical visibility on facing slopes and hill summits at higher elevations.

9.6.37 As part of their Local Development Plan: Proposed Plan (2015), EAC undertook a review of SLCA in East Ayrshire formalised in the 'Background Paper: Sensitive Landscape Areas' (March 2015). Table 1 of this document describes the '*Characteristics and Sensitivities of the Landscape Character Areas included within the Sensitive Landscape Area*' describing the key characteristics and why the area is sensitive.

9.6.38 The document defines the key qualities of the East Ayrshire Southern Uplands LCT and the East Ayrshire Southern Uplands with Forestry LCT which warranted their inclusion within the SLCA as follows: the "*well defined, steep-sided hills on the eastern edge of Glen Afton, Blackcraig and Craigbraneoch*" are "*important landmark features"* which provide *"spectacular views"* and which include the area of Southern Uplands to the east of Glen Afton as an important area for recreation and hillwalking; the eastern edge of the 'Southern Uplands with Forestry' to provide "*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*"; and, "*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*".

9.6.39 Much of the sensitivity of the SLCA, within which the Proposed Development is located is determined by potential effects on the Glen Afton valley. Analysis of the ZTV, confirmed by field survey, has determined that the Proposed Development would have little to no effect on the Glen Afton valley landscape due to the lack of visibility of the proposed turbines. Whilst there would be some views from the summits of landmark hills (Blackcraig Hill) there are no particular opportunities to view the Proposed Development against these landmark features and so the qualities of these, which are described as, "*well defined, steep-sided hills*" would not be affected.

9.6.40 Similarly, whilst limited sequential views of the Proposed Development may be available to the west of the summits of Blackcraig Hill, Hare Hill and Laglass Hill, there would be no visibility to the east of these summits within the wider area of this part of the East Ayrshire Southern Uplands. It is not considered that the extent of available views would affect the overall experience of walking in the landscape.

9.6.41 Although there would be a significant effect on part of the landscape character within the Afton SLCA, this LCT is not particularly referred to as part of the special quality of the SLCA. Whilst certain views available from the "*adjacent low-lying upland basin"* towards the "*backdrop of the Southern Uplands*" would be significantly affected (for example, Viewpoint 4: New Cumnock Cemetery and Viewpoint 7 Lochside Hotel), field survey has confirmed that despite the wide-spread theoretical visibility indicated by the ZTV, the higher degree of screening afforded by intervening built form and vegetation generally would ensure that these particular views and visual effects are not representative, where visible the proposal would be experienced in a wide visual context or panorama.

9.6.42 Although there would be a significant effect on part of the landscape character within the Afton SLCA, it is not considered that the special qualities of the SLCA, its integrity or the reasons for its designation would be significantly affected, and there would be little or no visibility from within the Afton Glen area itself, which forms the focus of the SLCA in this area. The magnitude of change is assessed as Low and the level of effect on the SLCA would be Moderate and not significant. The nature of these effects would be indirect, long-term (reversible), negative to neutral, and cumulative.

Cumulative Assessment: Proposed Development + Existing + Consented Sites

9.6.43 There would be successive views with the existing Hare Hill scheme to the northeast (Medium to Low magnitude) at a distance of approximately 4km, with the existing Windy Standard scheme to the southwest (Low magnitude) at a distance of approximately 6.25km and with the existing Wether Hill scheme to the southeast (Negligible magnitude) at a distance of approximately 14.5km.

9.6.44 There would also be successive views with the existing Bankend Rig scheme to the north (Negligible magnitude) at a distance of approximately 27.5km.

9.6.45 There would be simultaneous views with the consented Windy Standard Extension to the southwest (Medium magnitude), the consented Afton Wind Farm to the southwest (High to medium magnitude) at a distance of approximately 3km and the Dersalloch scheme to the west (Negligible magnitude) at a distance of approximately 5km.

9.6.46 The combined cumulative magnitude of these wind farms, including the Proposed Development is assessed as Medium to Negligible, leading to a significant baseline effect (**Substantial** to Slight) which already occurs or is occurring on part of the SLCA, including Afton Glen due to other multiple developments. It is not however, considered that the special qualities of the SLCA would be significantly affected.

Cumulative Assessment: Proposed Development + Existing + Consented + Applications

9.6.47 There would be simultaneous views with the South Kyle application site (High to Medium magnitude), the Pencloe application site (Medium magnitude) the Keirs Hills application site (low magnitude), the Benbrack Application site (Medium magnitude) and the Quantans Hill application site (High to Medium magnitude) to the southwest at a distance of between approximately 3km and 22.5km.

9.6.48 There would be successive views with the High Glenmuir application site to the northwest (Negligible magnitude), the High Cumnock scheme to the northwest (Low magnitude), the Garleffan scheme to the northwest (Medium to Low magnitude) and Loch Urr, Margree and Longburn schemes to the south (Negligible magnitude) at a distance of between approximately 5km and 34km. The combined magnitude of these wind farms is assessed as High to Negligible, leading to a significant effect (**Substantial** to Slight) on part of the SLCA, including Afton Glen due to multiple wind farm development. It is not considered that the special qualities of the SLCA, would be significantly affected.

Other Landscape Designations

9.6.49 There are two further landscape designations within 10km of the Proposed Development. These are assessed in **Table 9.9** below.

9.6.50 The sensitivity of all of these designations has been assessed as *High*.

Table 9.9 Indirect Effects on Local Landscape Designations

Landscape Designation	Landscape Assessment
Galloway Hills RSA	The Galloway Hills RSA covers a large area of Dumfries and Galloway, from the A714 in the west, on the western edge of the Galloway Forest Park, to Wigtown Bay in the south, the A713 in the east and Cairnsmore of Carsphairn and Loch Doon in the north. It is located approximately 5.5km to the southwest of the Proposed Development at its closest point. Viewpoint 8: Cairnsmore of Carsphairn, Viewpoint 19: Meikle Millyea, Viewpoint 20: Kirriereoch Hill and Viewpoint 21: Merrick are located within the RSA. Assessment: Proposed Development The ZTV coverage of this area is fragmented and largely focused on mountain summits and east facing slopes as illustrated in assessment Viewpoint 8 where the visual effects are assessed as Moderate and not significant. The majority of the scenic area lies outwith the ZTV and is some distance from the Proposed Development and it is not considered that these would be significantly affected and the level of effect would be Slight and not significant. The nature of these effects would be indirect, long-term (reversible) neutral, and cumulative. Cumulative Assessment: Proposed Development + Existing + Consented Sites There would be simultaneous views with the existing Windy Standard Wind Farm (Low magnitude) at a distance of approximately 4km and the existing Hare Hill Wind Farm (Negligible magnitude) to the northwest at a distance of approximately 13km. There would be simultaneous views of the consented Windy Standard Extension (High to Medium magnitude) and the consented Afton Wind Farm (Medium to Low magnitude) at a distance of approximately 3km.

Landscape Designation	Landscape Assessment
	There would be successive views with the existing Wether Hill Wind Farm (Negligible magnitude), with the consented Dersalloch Wind Farm (Negligible magnitude), with the consented Sanquhar Wind Farm (Low to Negligible magnitude) and with the consented Hare Hill Extension (Low to Negligible magnitude) at a distance of between approximately 3.5km and 33km. The Proposed Development (Negligible magnitude) would not lead to a further significant effect. However, the cumulative magnitude is assessed as High to Negligible, leading to a significant effect (ranging from **Substantial** to Slight) on part of the RSA due to other wind farm developments. The nature of these effects would be indirect, long-term (reversible) negative and cumulative. <u>Cumulative Assessment: Proposed Development + Existing + Consented + Applications</u> There would be simultaneous views with South Kyle (High to Medium magnitude), Polquhairn (Low magnitude) and Taiglim (Negligible magnitude) High Cumnock (Low magnitude), Pencloe (Medium to Low magnitude), High Glenmuir (Negligible magnitude), Garleffan (Negligible magnitude), Keirs Hill (Low magnitude) application sites towards at a distance of between approximately 6km and 19km. There would be successive views with the Longburn (Negligible magnitude), Penbreck (Negligible magnitude), Kennoxhead (Negligible magnitude), Loch Urr (Negligible magnitude), Margree (Negligible magnitude) and Longburn (Negligible magnitude) application sites and the Loch Hill (Negligible magnitude) application site to the southeast at a distance of between approximately 5km and 19km. The Proposed Development (Negligible magnitude) would not lead to a further significant effect. However, the cumulative magnitude is assessed as High to Negligible, leading to a significant effect (ranging from **Substantial** to Slight) on part of the RSA due to other wind farm developments. The combined magnitude of these wind farms is assessed as High to Negligible, leading to a significant effect (**Substantial** to Slight) on part of the RSA due to these other developments. The nature of these effects would be indirect, long-term (reversible) negative and cumulative.
Doon Valley SLCA	The Doon Valley SLCA extends along the Lowland River Valley and into the Upland River Valley character types beyond Patna and Dalmellington, before moving south to Loch Doon in the Foothills and further to the Rugged Granite Uplands with patches of forestry. <u>Assessment: Proposed Development</u> The ZTV coverage of this area is fragmented. It is most extensive beyond 10km where the SLCA extends across the east facing slopes of hills beyond Loch Doon. Visual effects are illustrated by ES assessment Viewpoints 9, 10, 11 and 13 where the visual effects are assessed as ranging from Low to Negligible. It is not considered that the special qualities of the SLCA would be significantly affected by the Proposed Development. The level of effect would range from Moderate to Slight and not significant. The nature of these effects would be indirect, long-term (reversible) negative to neutral, and cumulative. <u>Cumulative Assessment: Proposed Development + Existing + Consented Sites</u> There would be limited visibility of existing or consented wind farms (Negligible magnitude) and the level of effect would be unchanged. <u>Cumulative Assessment: Proposed Development + Existing + Consented + Applications</u> There would be simultaneous views with the Glenmount (High magnitude) and South Kyle application sites (Low magnitude) and with the Benbrack application site (Low magnitude). There would be successive views with Keirs Hill application site (High to Medium magnitude). The Proposed Development (Low to Negligible magnitude) would not lead to a further significant effect. However, the cumulative magnitude of these wind farms is assessed as High to Low and the level of cumulative effect **Substantial** to Slight and significant, mainly as a result of the Glenmount application. The nature of these effects would be indirect, long-term (reversible) negative and cumulative.

Wild Land Assessment

9.6.51 The Merrick Wild Land Area (WLA) is located to the west of the Proposed Development as shown in **Figure 9.56**, Volume 2. A Wild Land Assessment has been undertaken and is detailed in **Appendix 9.E**.

9.6.52 The Proposed Development would not be located within or close to the Merrick WLA, which is located at a distance of approximately 18.6km at the nearest point on the WLA boundary. The assessment concludes that the introduction of the Proposed Development into the baseline landscape, in which other wind farm development already exists or is consented, would not lead to a significant effect on the WLA or the wild land characteristics and special qualities. This would be due mainly to the large intervening distances, affecting a similar area and angle of view. The Proposed Development would also appear visually compatible with the consented Windy Standard Extension Wind Farm, Dersalloch Wind Farm and other existing and consented wind farm development within the views to the northeast.

9.6.53 The Proposed Development would not introduce wind turbines into an area where they do not currently exist.

9.6.54 The Proposed Development would appear mostly below the horizon, and because of the intervening distances, the Proposed Development would tend to appear 'recessive' in the landscape.

9.6.55 Cumulatively, the Proposed Development would not lead to a significant 'additional' or 'in combination' effect on the WLA, characteristics or special qualities.

9.7 Residual Visual Effects

9.7.1 The visual assessment draws from the site visits and viewpoint analysis and assesses the potential visual effects on views and visual amenity likely to be experienced by receptors (people) within the landscape. The visual assessment has been set out as follows:

- Visual Effects during Construction, Operation and Decommissioning;
- Visual Effects on Views from Settlements and Residential Properties;
- Visual Effects on Views from Transport Routes;
- Visual Effects on Views from Recreational Routes; and
- Visual Effects on Views from Recreational and Tourist Destinations.

9.7.2 The ZTV and viewpoint analysis indicates that the assessment should be focused on a detailed Study Area of approximately 7km from the Proposed Development. Detailed assessments of core paths overlapped by the blade tip ZTV have been undertaken within a 5km study area, while the Scottish Hill Tracks, Heritage Paths and local tourist and outdoor recreational attractions overlapped by the blade tip ZTV have been assessed within a 10km study area. Residential properties have been assessed within 3km taking a precautionary approach.

9.7.3 The visual assessment has also focused on other key receptors within the wider 35km radius Study Area, which are overlapped by the blade tip ZTV such as main settlements, transport routes and other receptors of national importance such as Scotland's Great Trails, National Cycle Routes and well known tourist / recreational destinations.

Visual Effects during Construction, Operation and Decommissioning

9.7.4 In general terms, visual effects associated with the construction phase would increase from zero at the start of construction and progressively increase until completion and the operational phase of the Proposed Development.

9.7.5 During operation, the appearance of the Development Site would recover a 'calmer' visual character with negligible levels of maintenance activity visible on-site from the nearest visual receptors. It is during this period that the majority of significant visual effects would be experienced as a result of the proposed turbines. This is discussed in detail in relation to each of the visual receptor groups within the remainder of this chapter.

9.7.6 During decommissioning the wind farm would return to a construction site for a temporary period and the level of visual effect would gradually reduce with the removal of the turbines and the control building and substation compound thus rendering the visual effects of the Proposed Development as predominantly reversible and not significant on completion of decommissioning. The internal tracks and Development Site access would remain as permanent features for use by the landowner, but would 'grass over' subject to the level of use. In overall terms the level of visual effect would reduce to non-significant levels (Negligible magnitude) and the nature of these effects would be permanent, direct, and neutral.

Visual Receptors: Settlements and Residential Properties

9.7.7 Settlement within 10km of the Proposed Development, defined by the EAC Local Plan and DGC LDP, has been included in the assessment and identified on **Figure 9.22**. The visual effects likely to be experienced from settlements include consideration of residential areas, the public realm, and public open spaces within the settlement boundaries that would be frequented by people.

9.7.8 A residential visual amenity assessment has been included for those properties within 3km and the adjacent area as illustrated in **Figure 9.23a** and this is detailed in **Appendix 9.C**.

9.7.9 The sensitivity of residential receptors and settlements has been assessed as *High.*

Visual Effects on Views from Settlements

9.7.10 There are seven settlements overlapped to varying extents by the blade tip ZTV within 10km of the Proposed Development which are included in the assessment and this is reported in **Table 9.10**.

9.7.11 In summary, there would be significant visual effects on some views from two of the seven settlements included in the assessment at Burnside and along the southwest edge of New Cumnock at Connel View and the Cemetery. There would be significant cumulative effects on the views experienced from Dalmellington and Burnton due primarily to successive views with Keirs Hill and Glenmount wind farms. Where visible, the visual effects of the Proposed Development would be proportionate to the large scale landscape in the view and would not visually dominate the views from settlements or residential properties, including the public realm and related public open spaces as a result of any predicted landscape or visual effects.

9.7.12 None of the properties would be affected in terms of their living standards or in a manner that would render any of these properties as an unattractive place to live (as opposed to less attractive) when judged objectively and in the public interest as a result of the addition of the Proposed Development. This is because of the intervening distances, partial screening and combinations of the property setting, orientation, and the visual composition and manner in which the Proposed Development would be experienced, such that the turbines would not overshadow the properties or appear oppressive or surrounding on all sides.

9.7.13 Viewpoint analysis at A76 north of Auchinleck (**Figure 9.41**: Viewpoint 15), A76 near Mauchline (**Figure 9.43**: Viewpoint 17) and the A76 sequential route assessment near Cumnock (**Figure 9.25**) further indicate that there would be no other significant visual effects from settlements within the wider 35km radius Study Area.

Table 9.10 Visual Effects on Views from Settlements

Settlement	Description of Effect
Burnside	Burnside is a collection of approximately 15 houses to the southwest of New Cumnock along the B741 at a distance of approximately 3.2km to the northeast of the nearest turbine. The settlement could be described as having a north-facing aspect, located as it is to the 'foot' of the Southern Uplands further to the south. ES Viewpoint 2: B741 South West of New Cumnock (**Figure 9.28**) is located at a distance of approximately 160m to the southwest of Burnside and the level of effect in relation to that viewpoint is assessed as **Substantial to Substantial / Moderate** and Significant. The blade tip ZTV indicates that Burnside residents would potentially view between 14 and 19 turbines, although in practice visibility from the settlement would be restricted to the areas of south-western views up-hill, towards the slopes of the Southern Uplands and the Proposed Development, which are not otherwise obstructed by buildings, local landform and vegetation. The wireline indicates that the Proposed Development would be visible across the horizon with approximately 13 hubs visible. Field survey confirmed that a number of intervening telegraph poles and lamp posts would be visible from Burnside at close range and would appear 'larger' in comparison to the turbines due to the effects of perspective. The magnitude of visual change experienced by residents would be *High to Medium*. The visual effect on Burnside would be **Substantial to Substantial / Moderate** and significant and the nature of these effects would be long-term (reversible), indirect, cumulative and negative to neutral.

Settlement	Description of Effect
	Cumulative Assessment: Existing + Consented Sites There will be successive views with the existing High Park Farm wind turbine to the east at a distance of approximately 4km although the magnitude of change would be *Negligible to Zero* and the contribution would not be significant. The existing Hare Hill Wind Farm (*Low to Negligible* magnitude of change) and the consented Hare Hill Extension Wind Farm (*Negligible* magnitude of change) will also be visible in a successive view at a distance of approximately 5.7km and 7km respectively although the contribution would not be significant. There would be no change to the assessment. Cumulative Assessment: Existing + Consented Sites + Applications There would be simultaneous views with the South Kyle application site to the south (*Medium* magnitude of change) and Pencloe application site to the southwest (*Negligible* magnitude of change) at a distance of approximately 5km and 4.6km. There would also be successive views with High Cumnock south (*Medium to Low* magnitude of change) and Garleffan application schemes (*Low* magnitude of change) to the north at a distance of approximately 5.4km and 7km respectively. In addition, Lethans application scheme would be visible in a successive view to the northeast at a distance of approximately 9km although the magnitude of change would be *Low to Negligible* and the contribution would not be significant. There would be no change to the assessment.
Bankglen	Bankglen (also spelt Bank Glen) is a small rural settlement in East Ayrshire located to the southwest of New Cumnock along the B741 at a distance of approximately 4.8km to the northeast of the nearest turbine. The blade tip ZTV indicates that residents would potentially view between 0 and 19 turbines, with the majority theoretically viewing between 14 and 19 turbines. In practice visibility from the settlement would be restricted to the areas where views towards the Proposed Development are not obstructed by buildings, localised landform and vegetation, such as Glen Park. Wirelines indicate that the Proposed Development would be visible across the horizon with approximately 16 hubs visible. Field survey confirmed that roadside and garden vegetation would screen the majority of views from this settlement. The magnitude of visual change experienced by residents would range from *Zero* to *Low*. The visual effect on Bankglen would range from **No View** to **Moderate** and not significant and the nature of these effects would be long-term (reversible), indirect, cumulative and negative to neutral. Cumulative Assessment: Existing + Consented Sites There will be simultaneous views with the existing Windy Standard Wind Farm and the consented Windy Standard Extension (Phase II) Wind Farm to the south (both *Negligible* magnitude of change) at a distance of approximately 9.2km and 8.1km respectively. There will be successive views with the consented Afton Wind Farm to the south at a distance of approximately 6.6km (*Low* magnitude of change). The existing High Park Farm wind turbine (*Low* magnitude of change) and the existing Hare Hill Wind Farm (*Low to Negligible* magnitude of change) to the east) will also be visible in a successive view at a distance of approximately 2.8km and 4.9km respectively although the contribution would not be significant. Mansfield Mains consented wind turbine will also be visible in a successive view to the northeast at a distance of approximately 4.2km (*Negligible* magnitude of change). There would be no change to the assessment. Cumulative Assessment: Existing + Consented Sites + Applications There would be simultaneous views with the South Kyle application site (*Low* magnitude of change) and Pencloe application site (*Low* magnitude of change) to the south at a distance of approximately 4.6km and 5.3km respectively. There would also be successive views with Taiglim Farm Wind Turbine (*Negligible* magnitude of change), High Cumnock and Garleffan application schemes (both *Medium to Low* magnitude of change) to the north at a distance of approximately 4.2km, 3.9km and 5.2km respectively. Lethans and Spango application schemes would be visible in a successive view to the east at a distance of approximately 7.3km and 15.5km respectively, although the magnitude of change would be *Low* and *Negligible* respectively and the contribution would not be significant. The combined cumulative visual effect on views from Bankglen would range from **No View** to **Substantial / Moderate** and significant and the nature of these effects would be long-term (reversible), indirect, cumulative and negative.
Connel Park	Connel Park is a small rural settlement in East Ayrshire located to the southwest of New Cumnock on the B741 at a distance of approximately 5.1km to the northeast of the nearest turbine. The blade tip ZTV indicates that residents would potentially view between 14 and 19 turbines, although in practice visibility from the settlement would be restricted to the areas where views towards the Proposed Development are not obstructed by buildings, local landform and vegetation. Wirelines indicate that the Proposed Development would be visible across the horizon with approximately 16 to 17 hubs visible. The magnitude of visual change experienced by residents would range from *Low to Zero*. The visual effect on Connel Park would range from **Moderate** to No View and not significant and the nature of these effects would be long-term (reversible), indirect, cumulative and negative to neutral.

Settlement	Description of Effect
	Cumulative Assessment: Existing + Consented Sites There will be simultaneous views with the consented Afton Wind Farm (*Low to Negligible* magnitude of change) at a distance of approximately 6.8km. The existing High Park Farm Wind Turbine (*Low* magnitude of change) and the existing Hare Hill Wind Farm (*Low to Negligible* magnitude of change) will also be visible in a successive view to the southeast at a distance of approximately 2.2km and 4.km respectively although the contribution would not be significant. There will also be successive views with the consented Mansfield Mains Wind Turbine to the northeast at a distance of approximately 3.1km (*Negligible* magnitude of change). There would be no change to the assessment. Cumulative Assessment: Existing + Consented Sites + Applications There would be simultaneous views with Pencloe application site (*Medium to Low* magnitude of change) to the south and South Kyle application site (*Low* magnitude of change) to the southwest at a distance of approximately 5.2km and 7.1km respectively. There would also be successive views with Taiglim Farm Wind Turbine (*Negligible* magnitude of change), High Cumnock and Garleffan application schemes (both *Medium* magnitude of change) to the north at a distance of approximately 3.7km and 4.7km respectively. Lethans and Spango application schemes would be visible in a successive view to the east at a distance of approximately 6.7km and 14.9km respectively, although the magnitude of change would be *Low to Negligible* and *Negligible* respectively and the contribution would not be significant. There would be no change to the assessment.
Leggate	Leggate is a small rural settlement in East Ayrshire located immediately to the northeast of Connel Park on the B741 at a distance of approximately 5.5km to the northeast of the nearest turbine. The blade tip ZTV indicates that residents would potentially view between 14 and 19 turbines, although in practice visibility from the settlement would be restricted to the areas where views towards the Proposed Development are not obstructed by buildings, local landform and vegetation. Wirelines indicate that the Proposed Development would be visible across the horizon with approximately 18 hubs visible. Field survey confirms that built form, roadside vegetation and blocks of dense woodland south and west of Knockshinnoch Farm would screen the majority of views. The magnitude of visual change experienced by residents would range from *Zero to Low*. The visual effect on Leggate would range from **No View** to **Moderate** and not significant and the nature of these effects would be long-term (reversible), indirect, cumulative and negative to neutral. Cumulative Assessment: Existing + Consented Sites There will be simultaneous views with the consented Afton Wind Farm (*Negligible* magnitude of change) to the south at a distance of approximately 5.6km. The existing High Park Farm Wind Turbine (*Low* magnitude of change) and the existing Hare Hill Wind Farm (*Low to Negligible* magnitude of change) will be visible in a successive view to the southeast at a distance of approximately 2.3km and 4.3km respectively although the contribution would not be significant. There will also be successive views with the consented Mansfield Mains wind turbine to the northeast at a distance of approximately 3.6km (*Negligible* magnitude of change). There would be no change to the assessment. Cumulative Assessment: Existing + Consented Sites + Applications There would be simultaneous views with Pencloe application site *(Low* magnitude of change) to the south and South Kyle application site (*Low to Negligible* magnitude of change) to the southwest at a distance of approximately 5.6km and 7.7km respectively. There would also be successive views with Taiglim Farm Wind Turbine (*Negligible* magnitude of change), High Cumnock and Garleffan application schemes (both *Medium* magnitude of change) to the north at a distance of approximately 4.5km, 3.5km and 4.3km respectively. Lethans and Spango application schemes would be visible in a successive view to the east at a distance of approximately 6.2km and 14.5km respectively, although the magnitude of change would be *Low* and *Negligible* respectively and the contribution would not be significant. There would be no change to the assessment.
New Cumnock	New Cumnock is a small town located along the A76 trunk road south of Cumnock at a distance of approximately 5.9km to the northeast of the nearest turbine. The settlement is located at the 'foot' of the Southern Uplands with a north facing aspect, viewing across the Upland Basin to the north. The ES assessment viewpoint 4: New Cumnock Cemetery (**Figure 9.30**) is located in close vicinity to New Cumnock at a distance of approximately 5.6km from the nearest turbine. The level of effect is assessed as **Substantial/Moderate to Moderate and significant.** The blade tip ZTV for New Cumnock indicates that residents would potentially view between zero and 19 turbines. In practice visibility from the settlement would be restricted to the areas on the south western edges of the village, viewing across the lower slopes of the Southern Uplands where views towards the Proposed Development are not obstructed by buildings, local landform and vegetation.

Settlement	Description of Effect
	Wirelines indicate that the Proposed Development would be visible across the horizon. The magnitude of visual change experienced by residents would be *Medium to Zero.* With the areas of highest visibility affecting the views from Connel View and the Cemetery. The overall visual effect on the views from New Cumnock would be Moderate to Slight and not significant. There would however be significant visual effects on the views from Connel View and the Cemetery **Substantial/Moderate** and the nature of these effects would be long-term (reversible), indirect, cumulative and negative to neutral. Cumulative Assessment: Existing + Consented Sites There will be simultaneous views with the consented Afton Wind Farm (*Low to Negligible* magnitude of change), the existing Windy Standard Wind Farm (*Negligible* magnitude of change) and the consented Windy Standard Extension (Phase II) Wind Farm to the south (*Negligible* magnitude of change) at a distance of approximately 6.4km, 9.5km and 8.7km respectively. There will be successive views with consented Mansfield Mains wind turbine (*Low to Negligible* magnitude of change) and Sunnyside wind turbines to the east at a distance of approximately 1.6km and 14.1km respectively. The existing High Park Farm wind turbine (*Low* magnitude of change) and the existing Hare Hill Wind Farm (*Low to Negligible* magnitude of change) will also be visible in a successive view to the southeast at a distance of approximately 1km and 3.1km respectively although the contribution would not be significant. There would be no change to the assessment. Cumulative Assessment: Existing + Consented Sites + Applications There would be simultaneous views with Pencloe application site (*Medium to Low* magnitude of change) to the south and South Kyle application site (*Low* magnitude of change) to the southwest at a distance of approximately 5.2km and 7.8km respectively. There would also be successive views with Taiglim Farm Wind Turbine (*Negligible* magnitude of change), High Cumnock and Garleffan application schemes (both *High to Medium* magnitude of change) to the north at a distance of approximately 2.1km and 2.4km respectively. Lethans (*Medium to Low* magnitude of change) and Spango (*Negligible* magnitude of change) application schemes would be visible in a successive view to the east at a distance of approximately 4.6km and 13.1km respectively. The cumulative visual effect on New Cumnock would range up to **Substantial** and significant from some locations due to High Cumnock and Garleffan and the nature of these effects would be long-term (reversible), indirect, cumulative and negative to neutral.
Dalmellington	Dalmellington is East Ayrshire's southernmost town. It is located at the junction of the B741 and the A713 National Tourist Route and lies at a distance of approximately 7.1km to the west of the Proposed Development. The nearest ES assessment viewpoint to Dalmellington is Viewpoint 11: Auchenroy Hill (**Figure 9.37**) located on elevated ground and with clearer views at a distance of approximately 2.6km from the western edge of the town and 8.1km from the nearest turbine. The level of effect is assessed as **Slight** and not Significant. The blade tip ZTV indicates that views of the Proposed Development would only be available from the northern edges of the town. Whilst potentially between 1 and 14 turbines would be visible from Dalmellington, in practice visibility from the settlement would be restricted to the where views towards the Proposed Development are not obstructed by buildings, local landform and vegetation. Wirelines indicate that the upper parts of the proposed turbines would be visible across the horizon with up to three hubs showing. The magnitude of visual change experienced by residents would range from *Negligible* to *Zero*. The visual effect on Dalmellington would range from **Slight** and not significant to **No View** and the nature of these effects would be long-term (reversible), indirect, cumulative and negative to neutral. Cumulative Assessment: Existing + Consented Sites There will be successive views with the consented Dersalloch Wind Farm to the west at a distance of approximately 4.2km (*Negligible* magnitude of change). There would be no change to the assessment. Cumulative Assessment: Existing + Consented Sites + Applications There would be simultaneous views with South Kyle application site (*Low to Negligible* magnitude of change) to the southwest at a distance of approximately 5km. There would also be successive views with Keirs Hill Wind Farm (*High to Medium* magnitude of change) to the west at a distance of approximately 4km. Glenmount application scheme (*Low* magnitude of change) may be visible is successive views to the south at a distance of approximately 6.4km. The cumulative visual effect on Dalmellington would be **Substantial** and significant due to Keirs Hill Wind Farm and the nature of these effects would be long-term (reversible), indirect, cumulative and negative to neutral.
Burnton	Burnton is a small village located north of Dalmellington at a distance of approximately 7.5km to the west of the nearest turbine. The blade tip ZTV indicates that residents would theoretically view between 5 and 14 turbines, although in practice visibility from the village would be restricted to east facing views from the edge of the settlement, towards the proposed wind farm development which are not otherwise obstructed by buildings, local landform and vegetation.

Settlement	Description of Effect
	Wirelines indicate that the Proposed Development would be visible across the horizon. The magnitude of visual change experienced by residents would range from Low to Zero. The visual effect on Burnton would range from **Moderate to No View** and not significant and the nature of these effects would be long-term (reversible), indirect, cumulative and negative to neutral. Cumulative Assessment: Existing + Consented Sites There will be successive views with the consented Dersalloch Wind Farm to the west at a distance of approximately 4.2km (*Low* magnitude of change). There would be no change to the assessment. Cumulative Assessment: Existing + Consented Sites + Applications There would be simultaneous views with South Kyle application site (*Low to Negligible* magnitude of change) to the southwest at a distance of approximately 4.9km. There would also be successive views with Keirs Hill Wind Farm (*High to Medium* magnitude of change) to the west at a distance of approximately 4km. The cumulative visual effect on Burnton would be **Substantial to Substantial/Moderate** and significant due to Keirs Hill Wind Farm and the nature of these effects would be long-term (reversible), indirect, cumulative and negative to neutral.

Visual Effects on Views from Residential Properties

9.7.14 None of the 24 individual residential properties included in the assessment (including the group of 8 properties in Dalleagles Terrace) would experience a significant visual effect (i.e. a Substantial or Substantial/Moderate level of effect) as a result of the Proposed Development. This assessment may be further summarised as follows:

- There are no residential properties within 1km of the proposed turbines;
- There are four residential properties within 1-2km of the proposed turbines – two would have no view of the Proposed Development and the views from the remaining two would not be significantly affected by the proposed turbines;
- There are 20 residential properties beyond the 2km study area which have been included in the assessment as a precaution. Of these 11[4] would be at least moderately, but not significantly affected by the proposed turbines, whilst six would experience a slight effect and two would have no view of the Proposed Development; and
- Within the wider vicinity there is one further residential property just beyond 3km, but this would not be significantly affected.

9.7.15 The experience of a prominent view of the Proposed Development, or a significant change to a view, is not the same as an unacceptable effect in the public interest as described previously. None of the properties would be affected in terms of their living standards or in a manner that would render any of these properties as an unattractive place to live (as opposed to less attractive) when judged objectively and in the public interest as a result of the addition of the Proposed Development. This is because of the intervening distances (all in excess of 1.6km) and combinations of the property setting, partial screening, orientation and the visual composition and manner in which the Proposed Development would be experienced, such that the turbines would not overshadow the properties or appear oppressive or surrounding on all sides. Examination of previous appeal decisions considering residential visual amenity and large wind farm development shows that unacceptable effects usually occur within and up to approximately 800m – 1km distance from the nearest turbine and very rarely beyond approximately 1.5km. The nature of these effects would be indirect, long term (reversible), cumulative and negative.

Visual Effects on Views from Transport Routes

9.7.16 This section of the assessment considers the visual effects on the views from transport routes within the Study Area illustrated on **Figure 9.20**, as set out in **Table 9.11** and listed as follows:

[4] Two of these properties are involved with the application.

- Within the 10km Study Area:
  - The B741 between Auchenroy and New Cumnock (this route has been assessed in detail);
  - A76 between Cumnock and Burnton east of New Cumnock (this section of the route has been assessed in detail);
  - Afton Road between New Cumnock and Burns Cairn (the road is outwith ZTV further south);
  - A713 NTR between Waterside and Dalmellington (the road is outwith ZTV further south);
  - B7046 between Burnton and Skares (Skares Road); and
  - Glasgow to Carlisle railway line between south of Auchinleck and west of New Cumnock.
- Within the wider 35km radius Study Area:
  - The Glasgow to Stranraer railway line via Ayr; and
  - The Glasgow to Carlisle railway line via Kilmarnock and Dumfries.

9.7.17 The views from these routes would be experienced sequentially and transiently by road users (mainly drivers and where appropriate cyclists and walkers) and railway passengers who would experience the Proposed Development as part of the changing sequence of views experienced from the route. The sensitivity of these receptors is considered to be medium, except for the A713 NTR and Afton Road, due mainly to the speed of travel and the activity of driving, although it is recognised that some of the roads may be used by cyclists and walkers who would be of higher sensitivity, particularly if the road is part of a promoted route or has a dedicated footpath or cycle path that may be travelled by higher numbers of walkers or cyclists. The A713 NTR has been assessed as having high sensitivity due to its status as a National Tourist Route and its scenic nature. Afton Road is also considered to be of high sensitivity due to it being a scenic drive used by the hikers to access the hill walks and by the tourists visiting the Afton Reservoir.

9.7.18 Those routes entirely outside the blade tip ZTV have not been included in the assessment.

9.7.19 In summary, there would be significant visual effects on the views from part of the B741 within approximately 4.5km of the Proposed Development along intermittent lengths of approximately 2km in total. Much of this road is screened by localised landform intervening roadside vegetation, commercial forestry and built form. Beyond 4.5km there would be no significant effects due to intervening distance, and screening from landform, vegetation and built form. Whilst areas of coniferous forestry are subject to ongoing felling, there is also substantial restocking as part of the overall forestry management plan and so any significant visual effect would remain intermittent.

9.7.20 The Proposed Development would also be visible from limited sections of Afton Road, resulting in significant effects along an overall length of approximately 625m of the road at a distance of approximately 6.3km and 5.5km near the Cemetery.

9.7.21 None of the other transport routes would be significantly affected by views of the Proposed Development within the 35km radius Study Area. The Proposed Development would only be visible from the A76 when approaching New Cumnock from the north and east within the 10km study area. These views would be experienced intermittently and transiently, from a moving position, experienced as part of a much wider context, with the views restricted to southbound road users travelling at speed, and for these reasons the visual effects are not assessed as significant.

Table 9.11 Visual Effects on Views from Transport Routes

Transport Route	Description of Effect
Transport Routes within 10km	
B741 between Auchenroy and New Cumnock	The B741 runs southwest from New Cumnock to Girvan Mains where it links with the A77. The sensitivity of this route is considered to be Medium. The section of this route within a 10km radius of the Proposed Development is approximately 18km in length and has been assessed in detail between Auchenroy and New Cumnock and illustrated in **Figure 9.24**. There would be widespread theoretical visibility of the Proposed Development along this route however in reality, views would be limited to the upper parts of the wind farm, experienced intermittently and obliquely from a moving position along the road and subject to further intermittent screening from vegetation and built form at between an approximately 2-10km distance. Sequential viewpoints 1 to 4 (Figures 9.24b-c) illustrate views of the Proposed Development from Auchenroy towards Dalmellington. Travelling east from Auchenroy towards Dalmellington the route would be within the blade tip ZTV for approximately 2km. All of the proposed turbines would be theoretically visible for approximately 550m along the road at a distance of between approximately 10km and 9.5km, although roadside vegetation would screen most views in the summer months. Gradually, the turbine bases would disappear behind the hills to the east of Dalmellington, with the upper parts of 14 turbines visible from Doon Bridge, 11 turbines from the bridge over Muck Water and 9 turbines from the junction with the A713. The magnitude of change would range from Low to Negligible and the level of effect from Slight to Slight/Negligible and not significant. At this point the B741 follows the route of the A713 (Ayr Road) (assessed below) southeast along the outskirts of Dalmellington for about 650m. Sequential viewpoint 5 (Figure 9.24d) illustrates views of the Proposed Development from Dalmellington to Pennyvenie Farm. The B741 then continues northeast, initially along Dalmellington's Main Street and High Main Street where there would be no visibility for approximately 750m. Just before crossing the Cumnock Burn, approximately 7.3km from the Proposed Development, the route of the B741 re-enters the ZTV for a stretch of approximately 1.7km where the uppermost parts of between 3 and 10 turbines would be theoretically visible. In practice, however, there would be little or no view from this section of the route due to intervening roadside vegetation, the large trees of Camlarg Plantation non-inventory designed landscape and commercially managed forestry in the distance. The magnitude of change would range from Low to Negligible and the level of effect from Slight to Slight/Negligible and not significant. Sequential viewpoints 6 and 7 (Figures 9.24d-e) illustrate views of the Proposed Development from the B741 near Pennyvenie Farm. Leaving Dalmellington and travelling towards Pennyvenie Farm the dense woodland around Cumnock Burn would initially screen all views of the Proposed Development. Then open, but partial views of the Proposed Development would be available, such as near Pennyvenie Farm approximately 6km from the Proposed Development. The magnitude of change would range from Zero to Negligible and the level of effect from None to Slight / Negligible and not significant. Sequential viewpoints 8 to 11 (Figures 9.24e-f) illustrate views of the Proposed Development from between Pennyvenie Farm to Meiklehill. Continuing northeast from Pennyvenie Farm, the route of the B741 would be outwith the ZTV for approximately 500m until Pennyvenie Bridge west of Clawfin. From there, the Proposed Development would be theoretically visible for approximately 4.4km to just beyond the access track to Meiklehill. In reality, 2.8km of that part of the route would be screened by coniferous forestry and a new substation The magnitude of change within this section of the route would range from Zero to Negligible and the level of effect from None to Slight/Negligible and not significant.

Transport Route	Description of Effect
	Sequential viewpoint 12 (Figure 9.24g) illustrates views of the Proposed Development from the section of the route near Meiklehill. The route of the B741 emerges from the forestry approximately 400m before the access track to Meiklehill. From there road users would briefly view up to 5 of the proposed turbines at approximately 2.1km from the Proposed Development when travelling northeast, with the turbines progressively disappearing beyond the brow of Maneight Hill before Nith Lodge. The magnitude of change within this stretch would range from High to Negligible and the level of effect would range from **Substantial** (and significant) to Slight / Negligible (and not significant). Sequential viewpoints 13 to 14 (Figure 9.24h) illustrate views of the Proposed Development from the section of the route near Maneight Farm and Polmathburn Bridge. The route of the B741 would be outwith the ZTV between Nith Lodge and Maneight Farm for a distance of approximately 830m. From Maneight Farm there would theoretical visibility of the Proposed Development whilst travelling northeast for approximately 780m. Initially, only the uppermost parts of up to 3-4 turbines would be visible beyond coniferous forestry. ES Viewpoint 1 is located beyond this point near Polmathburn Bridge and represents a significant visual effect on the views from approximately 350m of the B741, viewing up to 14 turbines to the southeast at approximately 1.9km distance. Beyond this point the turbines would gradually disappear behind the intervening Peat Hill. The magnitude of change within this 350m stretch would range from High to Negligible and the level of effect from **Substantial/Moderate** and significant to Slight/Negligible. Sequential viewpoint 15 (Figure 9.24h) illustrates views of the Proposed Development from the access track to Lanehead, west of Knockburnie. The road would be outwith the ZTV for approximately 1.1km from near to the access track to Castle Hill to 400m before the access track to Lanehead. Beyond this point there would be clear, although oblique views of the upper parts of the proposed turbines at approximately 2.5km to the south for approximately 1.3km beyond the slopes of Rigg Hill and Chang Hill. Apart from the built form and associated roadside vegetation at Knockburnie there would be nothing else to screen the views. The magnitude of change within this stretch would be Medium where turbines are visible, and the level of effect would be Moderate and not significant. Sequential viewpoint 16 (Figure 9.24h) illustrates views of the Proposed Development from the section of the route between Marshallmark and Straid Farm. The road would be outwith the ZTV for approximately 110m just before the property at Marshallmark. The views are available again for approximately 3.9km from just before the junction with the minor road to the north at Dalleagles Houses until midway through Bankglen. Riparian woodland along Dalleagles Burn, Straid Burn and Redhall Burn, as well as built form at Dalleagles and Straid Farm, with associated vegetation, would screen most views of the proposed turbines allowing only brief and occasional glimpses of the upper parts of turbines. The magnitude of change within this stretch would range from High to Negligible and the level of effect from Substantial / Moderate (and significant) to Slight/Negligible (and not significant). Sequential viewpoints 17 to 20 (Figures 9.24j-k) illustrate views of the Proposed Development from the area southwest of Bankglen to Old School B&B. Travelling southwest from Bankglen towards Straid Farm, clear views would be available from a short stretch of the road southwest of Burnside near where the ES Viewpoint 2: B741 Southwest of New Cumnock is located. The upper parts of the turbines including most hubs would appear relatively evenly spaced across the horizon at a distance of approximately 3km to 3.4km. The magnitude of change would be High to Medium and the level of effect would be Substantial/Moderate to Moderate and significant. Built form would screen most views from Burnside, however clear open views at mid-range (4km) would be available from the elevated section of the road northeast of Burnside around Cascaya and south of Bankglen for approximately 1.5km when travelling southwest. Sequential viewpoints 21 to 22 (Figure 9.24l) illustrate views of the Proposed Development from the Bankglen to New Cumnock. There is theoretical visibility from New Cumnock for approximately 1.5km when travelling southwest until the eastern end of Bankglen where there is no visibility for approximately 150m. However, views from the outskirts of New Cumnock and the settlements of Leggate, Connel Park and Bankglen would be limited to occasional glimpses of the proposed turbines at a distance (between 5km and 6.4km) due to intervening built form and vegetation. In between the settlements, clear and open views of the Proposed Development would be available but at distances of between approximately 5km and 6.4km. The magnitude of change within this stretch of the route would range from Medium to Negligible and the level of effect from Moderate to Slight/Negligible and not significant.

Transport Route	Description of Effect
	The overall magnitude of change would range from *Zero to High* and the overall level of effect would range from **No View** to **Substantial / Moderate** and significant, with significant effects only arising where there are clear views from within approximately 4.5km of the Proposed Development along intermittent lengths of approximately 2km in total. The nature of these effects would be long-term (reversible), cumulative, indirect and negative to neutral. Cumulative Assessment: Existing + Consented Sites Little existing or consented wind farm development would be simultaneously visible within proximity to the Proposed Development. The existing Windy Standard Wind Farm and the consented Windy Standard Extension and Afton schemes may be occasionally simultaneously visible to the south at a distance of approximately 7km, 10km and 9.5km respectively from the stretch of the B741 southwest of New Cumnock (magnitude of change *Low to Negligible*). The existing High Park Farm Wind Turbine, Hare Hill Wind Farm and Bankend Rig Wind Farm as well as the consented Dersalloch Wind Farm, Mansfield Mains wind turbines and Hare Hill Extension Wind Farm may be visible in successive views (all *Low to Zero* magnitude of change). There would be no change to the assessment. Cumulative Assessment: + Existing + Consented Sites + Applications The South Kyle application scheme would frequently be simultaneously visible in proximity to the Proposed Development. From most sections the neighbouring South Kyle application scheme (*Zero to High* magnitude of change) is visible in front of, or behind, as well as to the side of the Proposed Development additionally extending the horizontal angle of view. The Pencloe application scheme would occasionally be visible in a simultaneous view with the Proposed Development (*Zero to High* magnitude of change). The Glenmount (*Low to Zero* magnitude of change) and Polquhairn, Penbreck, Lethans, Taiglim, Spango and Linburn Farm (all *Negligible to Zero* magnitude of change) application schemes may be visible in successive views. There would be no change to the assessment.
A76 between Cumnock and Burnton east of New Cumnock / Burns Heritage Trail	The section of A76 / Burns Heritage Trail within a 10km radius of the Proposed Development has been assessed in detail between the southern edges of Cumnock and Burnton east of New Cumnock The sensitivity of this route is considered to be Medium and it should be noted that there are no Burns Heritage features of interest to stop at along this part of the route. This section of the route within 10km is approximately 8.8km in length and there would be widespread theoretical visibility of the Proposed Development, however, in reality, intervening vegetation and built form would reduce this as detailed below. Any potential views of the Proposed Development would be experienced obliquely when travelling southeast and south from Cumnock towards New Cumnock and when travelling west from Kirkonnel towards New Cumnock at a distance of between approximately 6.4 and 10km from the Proposed Development. Sequential viewpoints 1 and 2 (Figure 9.25b) illustrate views of the Proposed Development from the A76 east of New Cumnock. Travelling west from the edge of the 10km study area there would be no theoretical visibility until west of Burnton. Continuing west, the Proposed Development would be theoretically visible from west of Burnton until West Polquhirter for approximately 740m although, in practice, Burnton Wood, roadside vegetation and dry stone walls screen turbines. There would be no theoretical visibility between West Polquhirter and the eastern edge of New Cumnock. The magnitude of change between the edge of the study area and New Cumnock would be Zero and the level of effect None. Sequential viewpoints 3 and 4 (Figure 9.25c) illustrate views of the Proposed Development from New Cumnock. There would be widespread theoretical visibility along the A76 through most of New Cumnock, however, the vast majority of views from the route within New Cumnock would be entirely screened by the built form and garden vegetation. Glimpses of the Proposed Development may be available from the section of the route near New Cumnock train station. The magnitude of change within New Cumnock would range from Zero to Low and the level of effect would range from None to Slight and not significant. The remainder of the route within 10km would experience views of the Proposed Development, where available, but only when travelling southeast from Cumnock towards New Cumnock.

Transport Route	Description of Effect
	Sequential viewpoint 10 (Figure 9.25f) illustrates views of the Proposed Development from the section of the route south of Cumnock. Travelling southeast from Cumnock, the Proposed Development is theoretically visible for a length of approximately 1km from the southern edges of Cumnock (near the minor road to Logan) to Boreland by the reservoirs. There would be occasional screening by roadside vegetation and built form but in general clear or partial views of the Proposed Development would be available across the horizon at a distance of between approximately 10km and 9.6km. The magnitude of change from the section of the route south of Cumnock would range from Zero to Low and the level of effect would range from No View to Slight and not significant. Sequential viewpoints 5 to 9 (Figures 9.25d-f) illustrate views of the Proposed Development from the section of the road northwest of New Cumnock. From Boreland there is no visibility for approximately 300m. Beyond this the Proposed Development is theoretically visible for approximately 5.8km up to where it reaches New Cumnock. Within that stretch of road, intermittent, clear views, of the Proposed Development would be available when not screened by the roadside vegetation and built form at distances of between 9.1km and 6.4km. The magnitude of change would range from Zero to Medium and the level of effect would range from No View to Moderate and not significant. The overall magnitude of change would range from *Medium to* Zero and the overall level of effect would range from **Moderate** to **No View** and not significant. The nature of these effects would be long-term (reversible), cumulative, indirect, cumulative and negative to neutral. Cumulative Assessment: Existing + Consented Sites The existing High Park Wind Turbine would be simultaneously visible from many sections of the route to the east of New Cumnock (Medium to Low magnitude of change). The existing Windy Standard Wind Farm and the consented Windy Standard Extension (both *Negligible* magnitude of change) and Afton Wind Farm (*Low* to *Negligible* magnitude of change) would often be visible in a simultaneous view. The existing Hare Hill Wind Farm and the consented Hare Hill extension Wind Farm and Sanquhar Wind Farm would be visible in the successive view (*Low to Negligible* magnitude of change) There would be no change to the assessment. Cumulative Assessment: + Existing + Consented Sites + Applications The South Kyle, Pencloe and Benbrack application schemes would be simultaneously visible in proximity to the Proposed Development. From most sections of the route, the neighbouring South Kyle application scheme (Zero to High magnitude of change) is visible behind, as well as to the side of the Proposed Development additionally extending the horizontal angle of view. The Pencloe application scheme would occasionally be visible in a simultaneous view with the Proposed Development (Zero to High magnitude of change). The High Cumnock and Garleffan application schemes would occasionally be visible in successive views (*High* magnitude of change). The Lethans and Spango application schemes as well as Taiglim Wind Turbine would also be visible in successive views (*Negligible* magnitude of change). The cumulative level of effect would be **Substantial/Moderate and significant** due to High Cumnock and Garleffan application schemes.
Afton Road (Also promoted as a Scottish Hill Track and Heritage Path)	Afton Road runs broadly south from New Cumnock to Craigdarroch (north of the Afton Reservoir) on the western banks of Afton Water. The route is approximately 7.2km long and is located entirely within the 10km study area. The sensitivity of this route is considered to be High (for reasons explained at 9.7.17 above). Of its 7.2km length, only 1.3km is covered by the blade tip ZTV, which amounts to 18% of the route. There are three sections of the road located within the zone of theoretical visibility before the road. Beyond the Burns Memorial the route is entirely outwith the blade tip ZTV. The first section of theoretical visibility, immediately south of New Cumnock is approximately 125m in length and there will be a brief view of between 15 and 19 turbines across the horizon. The magnitude of change would be Medium and the level of effect would be **Substantial/Moderate** and significant. The second section of theoretical visibility is approximately 850m in length and starts north of the cemetery and ends before the access track to Laight Farm. There would be clear open views of the Proposed Development available from this section of the road at a distance of approximately 5km. ES Viewpoint 4: New Cumnock Cemetery (**Figure 9.30**) illustrates the view from this section of the route at a distance of approximately 5.6km to the northeast of the Proposed Development. The magnitude of change for this viewpoint is assessed as High to Medium and the level of effect would range from Substantial to Substantial/Moderate and significant. However, the transient nature of the view, the intervening distance and the fact that the section of the route from where views would be available, is approximately 500m in length, the magnitude of change is assessed as Medium and the level of effect and Substantial/Moderate and significant.

Transport Route	Description of Effect
	The last section of the road with theoretical visibility is located just south of the access track to Laight Farm and is approximately 300m in length. Field survey confirms there would be no views of the Proposed Development from this section of the road due to screening by dense woodland vegetation. The overall magnitude of change would be *Medium to Zero* and the level of effect would range from **Substantial/Moderate** and significant for an overall length of approximately 625m to No View. The nature of these effects would be long-term (reversible), cumulative, indirect and negative to neutral. <u>Cumulative Assessment: Existing + Consented Sites</u> The existing Windy Standard Wind Farm and the consented Windy Standard Extension and Afton schemes may be occasionally simultaneously visible to the south at a distance of approximately 7km, 10km and 9.5km respectively (*Low to Negligible* magnitude of change). The existing High Park Farm Wind Turbine (*Medium to Zero* magnitude of change) and the existing Hare Hill Wind Farm as well as the consented Mansfield Mains wind turbines may be visible in successive views (*Low to Zero* magnitude of change). There would be no change to the assessment. <u>Cumulative Assessment: + Existing + Consented Sites + Applications</u> The South Kyle application scheme would frequently be simultaneously visible in proximity to the Proposed Development. From most sections the neighbouring South Kyle application scheme (*Zero to Medium* magnitude of change) is visible behind, as well as to the side of the Proposed Development additionally extending the horizontal angle of view. The Pencloe application scheme would occasionally be visible in a simultaneous view with the Proposed Development (*Zero to Medium magnitude* of change). Lethans, Taiglim (*Low to Zero* magnitude of change), Penbreck, Garleffan and High Cumnock application schemes (*Medium to Zero* magnitude of change) may be also visible is successive views. There would be no change to the assessment.
A713 NTR between Waterside and Dalmellington	The National Tourist Route (Galloway) is a tourist route from the A74 (M) to Ayr, running across the southern part of Dumfriesshire and eastern Kirkcudbrightshire before heading north through Galloway. The route is approximately 154.5km long. The sensitivity of this route, as a tourist route, is considered to be High. Of its 154.5km length, 15km lie within the 35km study area. Of this, there is theoretical visibility of the Proposed Development along the two sections of the route east of Dalmellington amounting 17% (or 2.5km) of the route. The nearest of these sections is at 8km distance from the Proposed Development. Between Waterside and Dalmellington where the theoretical visibility is at times present, the route runs southeast on the northern side of River Doon and field survey confirms that roadside vegetation would screen the majority of the views towards the Proposed Development in the east. The overall magnitude of change would range from *Zero to Low* and the level of effect would range from **No View to Moderate** and not significant. The nature of these effects would be long-term (reversible), cumulative, indirect and negative to neutral. <u>Cumulative Assessment: Existing + Consented Sites</u> The consented Dersalloch Wind Farm may be visible in the successive view (Negligible magnitude of change). There would be no change to the assessment. <u>Cumulative Assessment: + Existing + Consented Sites + Applications</u> The South Kyle, Pencloe and Benbrack application schemes (all low to negligible magnitude of change) may be simultaneously visible in proximity to the Proposed Development. There may be successive views of Keirs Hill (High magnitude of change). The combined cumulative level of effect would be **Substantial** and significant due to Keirs Hill application scheme.
B7046 between Darntaggart Plantation and Skares	The B7046 (aka Skares Road) is located to the north of the Proposed Development at 9.5km at its closest point. The ZTV analysis indicates that potential views of the Proposed Development would be available from only a short east-west section of the route west of Skares (the upper parts of up to 4 turbines). In practice, the intervening commercial forestry to the south of the route would screen all views of the Proposed Development.

Transport Route	Description of Effect
Glasgow to Carlisle railway line between south of Auchinleck and west of New Cumnock	The Glasgow to Carlisle railway line is located to the northeast of the Proposed Development at a distance of approximately 7.2km at its closest point. The ZTV analysis indicates that the majority of the route within the 10km study area is within the blade tip ZTV with up to all 19 turbines theoretically visible from most sections of the route. Clear, open views of the Proposed Development would be available from much of this part of the route. . In practice, the Proposed Development would only be viewed by rail passengers viewing from sections of the railway line that would be broadly perpendicular to the Proposed Development and not subject to the intervening screening of landform, cuttings, vegetation and built form. The magnitude of change would range from *Medium* to *Zero* and the overall level of effect would range from **Moderate** and not significant to **No View**. The nature of these effects would be long-term (reversible), cumulative, indirect, cumulative and negative to neutral. <u>Cumulative Assessment: Existing + Consented Sites</u> The existing High Park Wind Turbine would be simultaneously visible from many sections of the route to the east of New Cumnock (*Medium* magnitude of change). The existing Windy Standard Wind Farm and the consented Windy Standard Extension (both *Negligible* magnitude of change) and Afton Wind Farm (*Low* to *Negligible* magnitude of change) would often be visible in a simultaneous view. The existing Hare Hill Wind Farm and the consented Hare Hill extension Wind Farm and Sanquhar Wind Farm would be visible in the successive view (*Low to Negligible* magnitude of change) There would be no change to the assessment. <u>Cumulative Assessment: + Existing + Consented Sites + Applications</u> The South Kyle, Pencloe and Benbrack application schemes would be simultaneously visible in proximity to the Proposed Development. From most sections of the route, the neighbouring South Kyle application scheme (*Zero to Medium* magnitude of change) is visible behind, as well as to the side of the Proposed Development additionally extending the horizontal angle of view. The Pencloe application scheme would occasionally be visible in a simultaneous view with the Proposed Development (*Zero to Medium* magnitude of change). The High Cumnock and Garleffan application schemes would occasionally be visible in successive views (*High* magnitude of change). The Lethans and Spango application schemes as well as Taiglim wind turbine would also be visible in successive views (*Negligible* magnitude of change). The cumulative level of effect would be **Substantial/Moderate and significant** due to High Cumnock and Garleffan application schemes.
Other Transport Routes within 10-35km	
Glasgow to Carlisle railway line	The Glasgow to Carlisle railway line is located to the northeast of the Proposed Development. The ZTV analysis indicates that about a quarter of the route within the 10-35km study area is covered by the blade tip ZTV with up to all 19 turbines theoretically visible in the distance. In practice, the Proposed Development would only be viewed by rail passengers viewing from sections of the railway line that would be broadly perpendicular to the Proposed Development and not subject to the intervening screening of landform, cuttings, vegetation and built form. Potential views of the Proposed Development would further be experienced transiently and from a moving position over long distances. There would be no significant effects.
Glasgow to Stranraer railway line via Ayr	The Glasgow to Stranraer railway line via Ayr is located to the west of the Proposed Development at a distance of approximately 21.3km at its closest point. The ZTV analysis indicates that the majority of the route within the 35km study area is covered by the blade tip ZTV with up to 19 turbines visible in the far distance. In practice, the Proposed Development would only be viewed by rail passengers viewing from sections of the railway line that would be broadly perpendicular to the Proposed Development and not subject to the intervening screening of landform, cuttings, vegetation and built form. Potential views of the Proposed Development would further be experienced transiently and from a moving position over long distances. There would be no significant effects.

Visual Receptors: Recreational Routes

9.7.22 The visual assessment has considered the potential visual effects likely to be experienced by people on recreational routes and includes National Cycle Routes (NCR), Core Paths, Rights of Way, Heritage Paths and Scottish Hill Tracks. All of these route assessments consider the cumulative sequential effects of other wind farms (existing, consented and applications). The sensitivity of the receptors on these routes (walkers, cyclists, horse riders and joggers) has been assessed as High. Detailed assessment is provided in **Tables 9.12** and **9.13** and the routes are illustrated in **Figures 9.20** and **9.21**.

9.7.23 In summary, significant visual effects would affect some views from part of 2 core paths, one Scottish Hill Track and one Heritage Path as follows:

- DGC Core Path No. 667: Water of Deugh Trail - affecting up to approximately 1.3km of this route;
- EAC Core Path No. C12: New Cumnock Circular affecting the majority of the 6.2km route near Cascaya, Lanemark and Hungry Hill;
- Scottish Hill Track 81 Barr to Dalmellington / 78b Glen Trool Village to Dalmellington by Tunskeen would experience a significant combined cumulative effect due to successive views with Keirs Hill; and
- Old Road from New Cumnock to Dalquhairn Heritage Path which follows the same route as the Scottish Hill Track above.

9.7.24 There would be no significant visual effects resulting from the Proposed Development on the views from long distant routes or NCRs.

Table 9.12 Visual Effects on Views from Core Paths within 5km and Scottish Hill Tracks and Heritage Paths within 10km

Local Recreational Route	**Description of Effect**
DGC Core Path No. 667 Water of Deugh Trail	The DGC Core Path 667 is formed mostly by forest roads and is a circular route in the Carsphairn Forest of approximately 7.8km length. The route is located at a distance of approximately 2.8km at its closest point. ES Viewpoint 3: Core Path 667 Water of Deugh (**Figure 9.29**) illustrates a short stretch of the core path where clear views are available at approximately 4.5km distance to the Proposed Development. The rest of the route is almost entirely through commercially managed coniferous woodland and only glimpses of the Proposed Development would be visible in the midst of dense forestry. Views are largely screened by coniferous woodland and/or are outwith the ZTV. The magnitude of change would range from *Zero* to *Medium* (at the routes closest point to the Proposed Development) and the level of effect would range from **No View** to **Substantial/Moderate** and significant. The nature of these effects would be long-term (reversible), cumulative, indirect and neutral to negative. <u>Cumulative Assessment: Existing + Consented Sites</u> Views are heavily enclosed by coniferous forestry. There may be simultaneous views of the consented Afton Wind Farm (*Zero to Medium* magnitude of change). There may be successive views of the existing Windy Standard Wind Farm (*Zero to Low* magnitude of change) and the consented Windy Standard Extension (*Zero to High* magnitude of change) The combined level of effect would be **Substantial** and significant to **No View** due to the consented Windy Standard Extension Wind Farm. <u>Cumulative Assessment: Existing + Consented Sites + Applications</u> There may be simultaneous views of the South Kyle (*Zero to High* magnitude of change) and Pencloe (*Low to Zero* magnitude of change) application schemes. The combined level of effect would be **Substantial** and significant due to South Kyle application scheme.
EAC Core Path No. C12: New Cumnock Circular	The EAC Core Path 12 is located at a distance of approximately 3.9km at its closest point. It starts at the junction of the B741 with Boig Road west of New Cumnock (beyond the 5km study area) and follows a loop round the southern edges of Bankglen, then through Cascaya, Lanemark, Hungry Hill before joining the B741 back at Bankglen. The ZTV analysis suggests that views of the Proposed Development would be available from the entire route within 5km. In practice, the built form and vegetation would screen the views from Bankglen, but clear open views of the Proposed Development would be available from the majority of the route. The magnitude of change would range from Zero to Medium and the level of visual effect would range from **Substantial/Moderate** and significant to **No View**. The nature of these effects would be long-term (reversible) indirect, cumulative and negative to neutral. <u>Cumulative Assessment: Existing + Consented Sites</u> There will be simultaneous views with the existing Windy Standard Wind Farm and the consented Windy Standard Extension (Phase II) Wind Farm to the south (both *Negligible* magnitude of change) at a distance of approximately 8.2 and 7km respectively. There will be successive views with the consented Afton Wind Farm to the south at a distance of approximately 6km (*Low* magnitude of change).

Local Recreational Route	Description of Effect
	The existing High Park Farm Wind Turbine (*Low to Negligible* magnitude of change) and the existing Hare Hill Wind Farm (*Low to Negligible* magnitude of change) to the east) will also be visible in a successive view at a distance of approximately 2.8km and 4.9km respectively although the contribution would not be significant. Mansfield Mains consented Wind Turbine will also be visible in a successive view to the northeast at a distance of approximately 4.2km (*Negligible* magnitude of change). There would be no change to the assessment. Cumulative Assessment: Existing + Consented Sites + Applications There would be simultaneous views with the South Kyle application site (*Low* magnitude of change) and Pencloe application site (*Medium to Low* magnitude of change) to the south at a distance of approximately 5.4km and 4km respectively. There would also be successive views with Taiglim Farm Wind Turbine (*Negligible* magnitude of change), High Cumnock and Garleffan application schemes (both *Medium to Low* magnitude of change) to the north at a distance of approximately 4.2km, 3.9km and 5.2km respectively. Lethans and Spango application schemes would be visible in a successive view to the east at a distance of approximately 7.3km and 15.5km respectively, although the magnitude of change would be *Low* and *Negligible* respectively and the contribution would not be significant. There would be no change to the assessment.
EAC Core Path No. C10: Coalfield Cycle Route	The EAC Core Path 10 is located at a distance of approximately 4.2km at its closest point. It follows Afton Road south of Cumnock until the Afton Reservoir which is located beyond the 5km study area. The only stretch of the route within 5km which is covered by the blade tip ZTV is a 250m section of the path located east of Laight Farm although roadside and riparian vegetation would screen most views of the Proposed Development. The remainder of the path within 5km would not experience any views of the Proposed Development. The magnitude of change would be *Negligible to Zero* and the level of effect would be **Slight to No View** and not significant. The nature of these effects would be long-term (reversible), cumulative, indirect and negative to neutral. Cumulative Assessment: Existing + Consented Sites The existing Windy Standard Wind Farm and the consented Windy Standard Extension and Afton schemes may be occasionally simultaneously visible to the south at a distance of approximately 7km, 10km and 9.5km respectively (*Low to Negligible* magnitude of change). The existing High Park Farm Wind Turbine (*Medium to Zero* magnitude of change) and the existing Hare Hill Wind Farm as well as the consented Mansfield Mains wind turbines may be visible in successive views (*Low to Zero* magnitude of change). The combined level of effect would be **Substantial / Moderate** and significant due to High Park Farm Wind Turbine. Cumulative Assessment: + Existing + Consented Sites + Applications The South Kyle application scheme would frequently be simultaneously visible in proximity to the Proposed Development. From most sections the neighbouring South Kyle application scheme (*Zero to Medium* magnitude of change) is visible behind, as well as to the side of the Proposed Development additionally extending the horizontal angle of view. The Pencloe application scheme would occasionally be visible in a simultaneous view with the Proposed Development (*Zero to Medium magnitude* of change). Lethans, Taiglim (*Low to Zero* magnitude of change), Garleffan and High Cumnock application schemes (*Medium to Zero* magnitude of change) may be also visible in successive views. The combined level of effect would be **Substantial / Moderate** and significant due to existing High Park Farm Wind Turbine and the South Kyle, Pencloe, Garleffan and High Cumnock application sites.
EAC Core Path No. C14: Glen Afton	The EAC Core Path 14 is located at a distance of approximately 4.5km at its closest point. It starts at the A76 in New Cumnock and follows Mason Avenue and then the Afton River on its eastern bank until it joins Path 10 via Dalhanna Farm track. The intervening riparian vegetation along Afton Water would screen all views of the Proposed Development.
Scottish Hill Track 81 Barr to Dalmellington / 78b Glen Trool Village to Dalmellington by Tunskeen	The Scottish Hill Track 81 / 78b is located at a distance of approximately 8.1km to the west of the Proposed Development. The B741 sequential assessment viewpoints 2, 3 and 4 illustrate the views from part of this track overlapping with the B741. The majority of the 4.2km long section of the track within the 10km study area is covered by the blade tip ZTV. Due to limited screening over the intervening Bogton Loch, walkers would experience views of the Proposed Development with up to 19 turbines visible at a distance across the horizon, although from most sections of the track only the upper parts of between one and 14 turbines would be visible. The intervening roadside vegetation and commercial forestry would wholly or partly screen the views in many instances, especially in the summer months. The magnitude of change would range from *Low to Zero* and the level of effect experienced by walkers would range from **Moderate to No View** and not significant. The nature of these effects would be long-term (reversible) indirect, cumulative and negative to neutral.

Local Recreational Route	Description of Effect
	Cumulative Assessment: Existing + Consented Sites Little or no existing or consented wind farm development would be simultaneously or successively visible within proximity to the Proposed Development. There would be no change to the assessment. Cumulative Assessment: + Existing + Consented Sites + Applications The South Kyle application scheme would frequently be simultaneously visible in proximity to the Proposed Development. From most sections the neighbouring South Kyle application scheme (*Zero to Low* magnitude of change) is visible in front of, as well as to the side of the Proposed Development additionally extending the horizontal angle of view. The Benbrack application scheme would occasionally be visible in a simultaneous view with the Proposed Development (*Zero to Low* magnitude of change). Keirs Hill application scheme may also be visible in successive views (*Zero to Medium* magnitude of change). There would be no change to the assessment. The combined level of effect would range from **Substantial/Moderate** and significant due to Keirs Hill application scheme to **No View.** The nature of these effects would be long-term (reversible) indirect, cumulative and negative to neutral.
Scottish Hill Track 84 New Cumnock to St John's Town of Dalry by Glen Afton	The Scottish Hill Track 84 is located at a distance of approximately 4.2km at its closest point. It follows the same route as Afton Road up until Craigdarroch and then heads south on the western side of the Afton Reservoir. The only stretch of the route within 10km which is covered by the blade tip ZTV is a 250m section of the path located east of Laight Farm although roadside and riparian vegetation would screen most views of the Proposed Development. Please see above for the assessment of this section within the assessment of Afton Road under Transport Routes. The remainder of the path within 10km would not experience any views of the Proposed Development.
Heritage Path: **Old Road from New Cumnock to Dalquhairn**	The Old Road from New Cumnock to Dalquhairn follows the same route as the Afton Road and is located at a distance of approximately 4.2km at its closest point. Beyond the southern end of Afton Road it follows the same route as Scottish Hill Track 84. The only stretch of the route within 10km which is covered by the blade tip ZTV is a 250m section of the path located east of Laight Farm although roadside and riparian vegetation would screen most views of the Proposed Development. Please see above for the assessment of this section within the assessment of Afton Road under Transport Routes. The remainder of the path within 10km would not experience any views of the Proposed Development.

Table 9.13 Visual Effects on Views from Long Distance Routes within 35km

Long distance routes within 35km	Description of Effect
Southern Upland Way	The Southern Upland Way (SUW) is one of Scotland's Great Trails and is routed 'coast to coast' from Port Patrick in the west to Cockburnspath Path in the east. The route is 341km in length and the sensitivity of the route is assessed as High. Of its 341km length, 164km lies within the 35km study area. Within this part, there is theoretical visibility of the Proposed Development along a few short sections in Lowther Hills, which amount to under 3% of the route length within the LVSA. The nearest of these sections is at 23.3km distance from the Proposed Development. ES viewpoint 22 illustrates available views from East Mount Lowther close to the section of theoretical visibility near Lowther Hill and Wanlockhead. The viewpoint is at a distance of approximately 29.7km from the Proposed Development and up to 16 turbines (13 hubs) would be visible. The magnitude of change is assessed as Negligible and the level of effect as Slight and not significant. The overall magnitude of change would range from *Negligible to Zero* and the level of effect would be **Slight to No View** and not significant. The nature of these effects would be long-term (reversible), indirect, cumulative and neutral to negative. <u>Cumulative Assessment: Existing + Consented Sites</u> The consented Whiteside Hill Wind Farm (*High* magnitude) would be visible at a close range from sections of the route not covered by the blade tip ZTV for the Proposed Development. The addition of the Proposed Development (Slight effect) would not be significant in terms of further cumulative sequential effects on this route. <u>Cumulative Assessment: Existing + Consented Sites + Applications</u> The Ulzieside and Longburn applications sites would be visible at a very close range from sections of the route not covered by the blade tip ZTV for the Proposed Development. The addition of the Proposed Development (Slight effect) would not be significant in terms of further cumulative sequential effects on this route.
National Cycle Route (NCR) Route 7	National Route 7 links Sunderland and Inverness. It forms two-thirds of the famous Coast to Coast (C2C) cycle route before heading north to Glasgow via the Ayrshire coast and Glen Trool Forest, before passing through two National Parks - Loch Lomond & The Trossachs and Cairngorms. The overall length of the route is 967km and the sensitivity of this route is assessed as High. Of its 967km length, 115km lie within the 35km study area. Of this, there is theoretical visibility of the Proposed Development along several sections of the route amounting to 41% of the route. The nearest of these sections is at 23.8km distance from the Proposed Development. The two largest sections of theoretical visibility are present where the route passes through the settlement of Maybole and out towards the coast to the settlement of Ayr beyond. Field survey has confirmed that, where views are available and not screened by built form, localised landform such as bunding alongside roads and roadside vegetation, the intervening distance ensures that views are not significant. The overall magnitude of change would range from *Negligible to Zero* and the level of effect would be **Slight to No View** and not significant. The nature of these effects would be long-term (reversible), indirect, cumulative and neutral to negative. <u>Cumulative Assessment: Existing + Consented Sites</u> The addition of the Proposed Development (Slight effect) would not be significant in terms of further cumulative sequential effects on this route. <u>Cumulative Assessment: Existing + Consented Sites + Applications</u> The addition of the Proposed Development (Slight effect) would not be significant in terms of further cumulative sequential effects on this route.

Visual Effects on Views from Recreational and Tourist Destinations

9.7.25 Beyond the local recreational routes listed above there are few outdoor recreational and tourist attractions within the local area and the 10km radius Study Area that overlaps with the blade tip ZTV. Recreational and tourist destinations within the 10km radius Study area are assessed in **Table 9.14** and those within a 35km radius Study Area are assessed in **Table 9.15**. The sensitivity of the receptors has been assessed as High.

9.7.26 In summary, there would be significant effects on views from the Knockshinnock Lagoons local nature reserve (although views from the north/north-eastern parts would be screened in summer) and the summits of Blackcraig Hill and Windy Standard, both of which are already in close vicinity to existing wind farms (Hare Hill and Windy Standard, respectively).

9.7.27 No other recreational or tourist destinations within the wider 35km radius Study Area, included in this assessment would be significantly affected by the Proposed Development.

Table 9.14 Visual Effects on Views from Recreational and Tourist Destinations (within 10km)

Recreational and Tourist Destinations	Description of Effect
Knockshinnoch Lagoons	Knockshinnoch Lagoons is a former coal mine bing which has been allowed to re-vegetate to various stages across the lagoons, from bare soil to birch woodland. Access is available from both the B741 close to Connel Park and from Castlehill road off the A76. It is considered a haven for breeding and wintering birds and other wildlife. The area is open to the public throughout the year and there is a limited network of paths within the reserve routed around the edges, with one crossing through the middle of the reserve. The blade tip ZTV indicates that views of the Proposed Development would be available throughout the site. However, some views (especially in the north and north eastern parts of the reserve) of the Proposed Development would be screened in summer where birch woodland has been allowed to vegetate close to the edges of the path. Built form at New Cumnock and Connell Park would further screen views. The magnitude of change is assessed as Medium where views are available. The level of effect would range from **Substantial / Moderate** (and significant) to No View. The nature of these effects would be long-term (reversible), cumulative, indirect and neutral to negative. <u>Cumulative Assessment: Existing + Consented Sites</u> There will be simultaneous views with the consented Afton Wind Farm (Low to Negligible magnitude of change), the existing Windy Standard Wind Farm (Negligible magnitude of change) and the consented Windy Standard Extension (Phase II) Wind Farm to the south (Negligible magnitude of change) at a distance of approximately 7km, 10km and 9.5km respectively. There will be successive views with consented Mansfield Mains Wind Turbine (Low to Negligible magnitude of change) and Sunnyside wind turbines to the east at a distance of approximately 3km and 15.5km respectively. The existing High Park Farm Wind Turbine (Low magnitude of change) and the existing Hare Hill Wind Farm (Low to Negligible magnitude of change) will also be visible in a successive view to the southeast at a distance of approximately 2km and 4.5km respectively although the contribution would not be significant. There would be no change to the assessment. <u>Cumulative Assessment: Existing + Consented Sites + Applications</u> There would be simultaneous views with Pencloe application site (Medium to Low magnitude of change) to the south and South Kyle application site (Medium to Low magnitude of change) to the southwest at a distance of approximately 6km and 8km respectively. There would also be successive views with Taiglim Farm Wind Turbine (Negligible magnitude of change), High Cumnock and Garleffan application schemes (both Medium magnitude of change) to the north at a distance of approximately 4km, 3km and 3.5km respectively. Lethans (Medium to Low magnitude of change) and Spango (Negligible magnitude of change) application schemes would be visible in a successive view to the east at a distance of approximately 6km and 14km respectively. The cumulative visual effect on New Cumnock would be **Substantial / Moderate** and significant due to the Proposed Development, High Cumnock and Garleffan wind farms and the nature of these effects would be long-term (reversible), indirect, cumulative and negative to neutral.

Recreational and Tourist Destinations	Description of Effect
Burn's Memorial	A cairn was built by members of the New Cumnock Burns Club in 1973 to mark the 50th anniversary of the club. It is located along the Afton Road and picnic benches have been located adjacent to it to allow views of the Afton Glen. The ZTV indicates that there would be visibility of up to nine blades (no hubs), however, both sides of the Afton Road at this point, and the area around the cairn and picnic benches, are planted with mature broadleaved trees which screens views to the west towards the Proposed Development. Views from the cairn are orientated east towards the Glen Afton Water. It is unlikely that any views would be available in summer and in winter only glimpses of the Proposed Development may be available. The magnitude of change is assessed as Negligible where views are available. The level of effect would range from Slight to No View and not significant. The nature of these effects would be long-term (reversible), cumulative, indirect and neutral. <u>Cumulative Assessment: Existing + Consented Sites</u> The consented Afton Wind Farm would be theoretically visible in a successive view to the south at a distance of approximately 5.5km. However, views would be screened by mature broadleaved trees and it is unlikely any views would be available. There would be no change to the level of assessment <u>Cumulative Assessment: Existing + Consented Sites + Applications</u> There would be simultaneous views with the Pencloe application site to the south at a distance of approximately 4km. There would also be successive views with High Cumnock application to the north and Garleffan application to the northwest at a distance of approximately 5km and 13.5km respectively. However, views would be screened by mature broadleaved trees and it is unlikely any views would be available. There would be no change to the level of assessment.
Craigengillan GDL	The Craigengillan GDL is set amidst the hills of the Southern Uplands. It was first established as an estate in 1580, when it encompassed over 30,000 acres and stretched as far as Carsphairn. The estate changed hands in early 2000 and the new owner embarked on a restoration programme to encourage public access and to protect and enhance the landscape and the nature conservation interest. It is open year round for various activities. The main house is at a distance of approximately 9.7km from the Proposed Development. The ZTV indicates that there would be views of 15 to 19 turbines from the western part of the estate gradually reducing to none along the eastern boundary. There would be very limited theoretical visibility from estate properties and wireframes confirm that views of one blade tip would be theoretically visible from the estate house. Other potential views are heavily screened by mature broadleaf estate trees and woodland. Views would be available from the facing slopes and summits of hills rising behind the estate house. ES viewpoint 11: Auchenroy Hill illustrates the view from the nearby hill summit located within the GDL from which 19 of the proposed turbines including 16 hubs would be partially visible and the level of effect is assessed as Moderate. The overall magnitude of change would be range from *Low to Zero* and the level of effect would be **Moderate to No view** and not significant. The nature of these effects would be long-term (reversible), cumulative, indirect and neutral to negative. <u>Cumulative Assessment: Existing + Consented Sites</u> No existing or consented wind farms would be visible. There would be successive views with the consented Dersalloch Wind Farm to the west from some parts of the estate (Medium magnitude of change) at a distance of approximately 1.4km. The combined level of effect would range from **Substantial/Moderate** and significant (due to the consented Dersalloch Wind Farm) to **No View**. <u>Cumulative Assessment: Existing + Consented Sites + Applications</u> There may be simultaneous views with the South Kyle application site to the east (*Low* magnitude) and Benbrack application site to the southeast (both *Low* magnitude) at a distance of approximately 9km and 4.7km respectively. There may be successive views with Keirs Hill application site to the northwest (*High* magnitude) and Glenmount application site to the south (*High to Medium* magnitude) at a distance of approximately 1.6km and 2.7km. The combined level of effect would range from **Substantial** and significant (due to Keirs Hill and Glenmount application sites) to **No View**.

Recreational and Tourist Destinations	Description of Effect
Galloway Forest Park	The Galloway Forest Park is 300 square miles of forestry and wider landscape within Dumfries and Galloway managed by Forestry Commission Scotland. It is Britain's largest forest park. The main area of the Galloway Forest Park is located at a distance of approximately 10.6km from the Proposed Development at its closest point. Theoretical visibility across the park is fragmented and limited almost solely to the hill summits including Corserine, Merrick and Shalloch on Minnoch. A number of ES viewpoints illustrate potential views of the Proposed Development from within the Forest Park including viewpoints 18, 19, 20 and 21. The magnitude of change would range from Negligible to Zero due mainly to the intervening distances and the limited visibility as indicated by the fragmented ZTV. The overall level of effect would be **Slight to No View** and not significant. The nature of these effects would be long-term (reversible), cumulative, indirect and neutral to negative. <u>Cumulative Assessment: Existing + Consented Sites</u> There would be simultaneous views with the existing Bankend Rig, Hare Hill and Windy Standard wind farms and the consented Windy Standard Extension, Hare Hill, Afton and Sanquhar wind farms to the northeast although their contribution would not be significant. There would be successive views of the existing Hadyard Hill Wind Farm (*Negligible* magnitude of change) and the consented Dersalloch Wind Farm (*Medium to Zero* magnitude of change) to the north at a distance of approximately 27km and 12.4km respectively. The combined level of effect would range from **Substantial/Moderate** and significant (due to the consented Dersalloch Wind Farm) to **No View** Dersalloch Wind Farm. <u>Cumulative Assessment: Existing + Consented Sites + Applications</u> There would be simultaneous views with the Glenmount application site to the north (High magnitude of change) at a distance of approximately 500m. There would be simultaneous views with the Linburn Farm, High Cumnock, Garleffan, South Kyle, Pencloe, Benbrack, Spango, Keirs Hill and Knockshinnoch application sites although their contribution would not be significant. The combined level of effect would range from **Substantial** and significant (due to the Glenmount application site) to **No View**.
Loch Doon	Loch Doon is a freshwater loch in the Galloway Forest Park to the southwest of the Proposed Development. The loch was dammed in the 1930s, raising the water some 27 feet. It is at a distance of approximately 9.6km from the Proposed Development at its closest point. The blade tip ZTV indicates that view of the Proposed Development would only be available from the south western shores of the Loch, beyond the 10km study area. ES viewpoint 13 illustrates views from the south western shores of Loch Doon. The magnitude of change is assessed as *Negligible to Zero.* The level of effect would range from **Slight to No View** and not significant. The nature of these effects would be long-term (reversible), cumulative, indirect and neutral to negative. <u>Cumulative Assessment: Existing + Consented Sites</u> The existing and consented Windy Standard wind farms as well as the consented Afton Wind Farm would be visible in a simultaneous view to the east at a distance of approximately 10.3km, 11.8km and 14.1km respectively. There would be successive views of the consented Dersalloch Wind Farm to the northwest at a distance of approximately 7.5km (*Negligible* magnitude of change). There would be no change to the assessment. <u>Cumulative Assessment: Existing + Consented Sites + Applications</u> The South Kyle (*Low* magnitude of change) and Benbrack (*Medium* magnitude of change) application sites would be simultaneously visible to the northeast at a distance of approximately 6.5km and 5km respectively. There would be successive views of the Glenmount application site (*High* magnitude of change) to the west at a distance of approximately 1.4km. The combined level of effect would be **Substantial** and significant due to the Glenmount application site.
Blackcraig Hill 700m AOD (see also Figure 9.34) (Graham)	Blackcraig Hill (700m) is a hill in the Southern Uplands located to the south of New Cumnock and to the northeast of the Proposed Development. ES Viewpoint 6: Blackcraig Hill illustrates the views from this summit. The Proposed Development would appear partially across the horizon and against the landscape at a distance of 6.7km. All of the proposed turbines (including all hubs) would be visible to the southwest and would appear as a simple and cohesive design with minimal overlapping. The magnitude of change would be *Medium* and the level of effect would be **Substantial/Moderate** and Significant. The nature of these effects would be long-term (reversible), indirect, cumulative and neutral to negative.

Recreational and Tourist Destinations	Description of Effect
	Cumulative Assessment: Existing + Consented Sites There would be simultaneous views with the consented Afton site to the southwest (*High to Medium* magnitude) at a distance of approximately 3km. There would be successive views with existing Hare Hill (*Medium to Low* magnitude) and the consented Hare Hill Extension schemes to the northeast (*High to Medium* magnitude) at a distance of approximately 3.9km and 1.7km respectively, with the existing Windy Standard scheme to the southwest (*Low* magnitude) at a distance of approximately 6.27 km and with the existing Wether Hill scheme to the southeast (*Negligible* magnitude) at a distance of approximately 14.3km. There would also be successive views with the existing Bankend Rig to the north (*Negligible* magnitude) at a distance of approximately 27.5km. There would be simultaneous views with the consented Windy Standard Extension to the southwest (*Medium* magnitude) and the Dersalloch scheme to the west (*Negligible* magnitude) at a distance of approximately 5km. There would be successive views with the consented Sanquhar scheme to the east (High to Medium magnitude) at a distance of approximately 2.5km. There would also be successive views with the consented Sunnyside, Whiteside Hill and Twentyshilling Hill schemes although their contribution would not be significant. The combined magnitude of these wind farms is assessed as *Medium to Negligible.* The combined level of effect would be **Substantial** and significant due to the consented Hare Hill Extension, Sanquhar and Afton wind farms. Cumulative Assessment: Existing + Consented Sites + Applications There would also be simultaneous views with the South Kyle application site (*High to Medium* magnitude), the Pencloe application site (*High to Medium* magnitude) the Keirs Hills application site (*Low* magnitude), the Benbrack application site (*Medium* magnitude) and the Quantans Hill application site (*High to Medium* magnitude) to the southwest) at a distance of between approximately 3km and 22.7km. There would also be simultaneous views with the Polquhairn application site (Negligible magnitude), Knockshinnoch application site (Negligible magnitude) although their contribution would not be significant. There would be successive views with the High Glenmuir application site to the northwest (*Negligible* magnitude), High Cumnock scheme to the northwest (*Low* magnitude), Garleffan scheme to the northwest (*Medium to Low* magnitude) and Loch Urr, Margree and Longburn schemes to the south (*Negligible* magnitude) at a distance of between approximately 4.9km and 33.9km. There would also be successive views with Ulzieside (Low to Negligible magnitude) application sites to the east at a distance of approximately 5.3km and 7.9km. There would also be successive views with the Taiglim, Linburn Farm, Lethans, Penbreck, Kennoxhead and Spango schemes (all Negligible magnitude) although their contribution would not be significant. The combined magnitude of these wind farms is assessed as *High to Negligible*. The combined level of effect would be **Substantial** and significant due to the consented Hare Hill Extension, Sanquhar and Afton wind farms and the South Kyle, Pencloe and Quantans Hill application sites.
Windy Standard 698m AOD (Graham)	Windy Standard is a hill summit in the Southern Uplands located to the southeast of the Afton Reservoir and approximately 7km southeast of the Proposed Development. The summit and much of its slopes to the north-west are covered with the turbines of the existing Windy Standard Wind Farm. The Proposed Development would appear behind the existing turbines in the foreground, partially across the horizon and against the landscape at a distance of 7km. All of the 19 proposed turbines (including 17 hubs) would be visible and would appear as a simple and cohesive design with minimal overlapping. The magnitude of change would be *Medium* and the level of effect would be **Substantial / Moderate** and significant. The nature of these effects would be long-term (reversible), indirect, cumulative and neutral to negative. Cumulative Assessment: Existing + Consented Sites There would be simultaneous views with the existing Windy Standard Wind Farm and the consented Windy Standard Extension site to the northwest and west (both High magnitude). There would also be simultaneous views with the consented Afton Wind Farm to the north (*High to Medium* magnitude) at a distance of approximately 1.1km and the consented Dersalloch Wind Farm to the west although its contribution would not be significant. There would be simultaneous views with the existing High Park farm and Bankend Rig wind farms to the north although their contribution would not be significant. There would be successive views with existing Hare Hill and the consented Hare Hill Extension schemes to the northeast (*Negligible* magnitude) at a distance of approximately 8.3km and 7.3km respectively. The existing Hadyard Hill Wind Farm and the consented Chapelton Farm Wind Farm (both *Negligible* magnitude) would be visible in a successive view to the west at a distance of 32.2km and 37.5km respectively. There would be successive views with the consented Blackcraig and Knockman Hill wind farms to the southeast although their contribution would not be significant. Successive views of the existing Wether Hill Wind Farm would also be available to the southeast (*Negligible* magnitude) at a distance of approximately 10.2km to the southeast. There would also be successive views with the consented Sanquhar, Whiteside Hill and Twentyshilling Hill schemes to the east although their contribution would not be significant. The combined magnitude of these wind farms is assessed as *Medium to Negligible.* The combined level of effect would be **Substantial** and significant due to the consented Hare Hill Extension, Sanquhar and Afton wind farms.

Recreational and Tourist Destinations	Description of Effect
	Cumulative Assessment: Existing + Consented Sites + Applications There would also be simultaneous views with the South Kyle application site (*High to Medium* magnitude), the Pencloe application site (*High to Medium* magnitude), the Keirs Hills application site (*Negligible* magnitude), the Benbrack application site (*Medium to Low* magnitude) and the Polquhairn application site (*Negligible* magnitude) to the northwest at a distance of between approximately 3.8km and 17.6km. There would also be simultaneous views with the Fowler Farm, Taiglim, High Cumnock, Garleffan, Linburn Farm, Kennoxhead, Sandy Knowe, Spango, Ulzieside, Loch Urr, Margree, Longburn and Glenmount application sites although their contribution would not be significant. The combined magnitude of these wind farms is assessed as *High to Negligible*. The combined level of effect would be **Substantial** and significant due to the Existing Windy Standard scheme, the consented Windy Standard Extension, the consented Afton Wind Farm and the South Kyle, Pencloe and Benbrack application sites.
Cairnsmore of Carsphairn (see also Figure 9.36) (Corbett)	Cairnsmore of Carsphairn is a hill summit located to the south-east of Dalmellington. ES Viewpoint 8: Cairnsmore of Carsphairn illustrates the views from this summit. The Proposed Development would appear against the landscape at a distance of approximately 8.7km to the north, All of the 19 proposed turbines (including 18 hubs) would be visible and would appear as a simple and cohesive design with minimal overlapping. The magnitude of change would be *Low* and the level of effect would be **Moderate** and not significant. The nature of these effects would be long-term (reversible), indirect, cumulative and neutral to negative. Cumulative Assessment: Existing + Consented Sites There would be simultaneous views with the existing Windy Standard Wind Farm (*Low* magnitude) at a distance of approximately 4km and the existing Hare Hill Wind Farm (*Negligible* magnitude) scheme to the northwest at a distance of approximately 13km. There would be simultaneous views of the consented Windy Standard Extension (*High to Medium* magnitude) and the consented Afton Wind Farm (*Medium to Low* magnitude) at a distance of approximately 3km. There would be successive views with the existing Wether Hill Wind Farm (*Negligible* magnitude), with the consented Dersalloch Wind Farm (*Negligible* magnitude), with the consented Sanquhar Wind Farm (*Low to Negligible* magnitude) and with the consented Hare Hill Extension (*Low to Negligible magnitude*) at a distance of between approximately 3.6km and 33.1 km. The combined magnitude of these wind farms is assessed as *High to Negligible*. The combined level of effect would be **Substantial** and significant due to the consented Windy Standard Extension Wind Farm. Cumulative Assessment: Existing + Consented Sites + Applications There would be simultaneous views with South Kyle, Glenmount, Keirs Hill and NHS Ailsa Hospital application sites and successive views with High Cumnock, Garleffan, Twentyshilling Hill, Penbreck, Kennoxhead, Blackwood, Auchencairn, Leadhills, Longburn and Margree application sites. The combined magnitude of these wind farms is assessed as *Medium* and the level of effect as **Substantial** and significant due to the consented Windy Standard Extension Wind Farm.

Table 9.15 Visual Effects on Views from Recreational and Tourist Destinations (within 10-35km)

Recreational and Tourist Destinations	Description of Effect
Dumfries House GDL	Dumfries House GDL is located approximately 11.1km to the north of the Proposed Development. It is open year round to the public. The ZTV analysis indicates that views of the Proposed Development would be theoretically available from the northern edge and the south western corner of the site. The upper parts of up to 15 turbines including 10 hubs would be potentially visible in the distance across the horizon. In practice most views of the Proposed Development would be screened by intervening blocks of dense woodland, though glimpses between the trees may be available from the elevated northern part of the estate near Auchinleck. The overall magnitude of change would range from *Negligible to Zero* and the level of effect would range from **Slight** and not significant to **No View**. The nature of these effects would be long-term (reversible), indirect, cumulative and neutral to negative. <u>Cumulative Assessment: Existing + Consented Sites</u> The existing Windy Standard Wind Farm and the consented Windy Standard Extension (both *Negligible* magnitude of change) and the consented Afton Wind Farm (*Negligible* magnitude of change) may be visible in a simultaneous view at a distance of approximately 16km and 13km respectively to the south. The existing Hare Hill Wind Farm and the existing High Park Wind Turbine may be simultaneously visible (both *Negligible* magnitude of change) at a distance of approximately 13km and 7km respectively to the southeast. The consented Hare Hill extension Wind Farm and Sanquhar Wind Farm may also be visible in the simultaneous view (both *Negligible* magnitude of change) at a distance of approximately 12km and 15km respectively to the southeast. There may be successive views of the upper parts of the Penbreck consented turbines (*Negligible* magnitude/ of change) to the east at a distance of approximately 18km. The combined level of effect would be **Moderate** and not significant due to Afton Wind Farm. <u>Cumulative Assessment: + Existing + Consented Sites + Applications</u> The South Kyle application scheme may be simultaneously visible behind and immediately to the west of the Proposed Development at a distance of approximately 11.5km (*Negligible* magnitude of change). The Pencloe application scheme may also be visible in a simultaneous view immediately to the east of the Proposed Development (*Negligible* magnitude of change) at a distance of approximately 13km. The High Cumnock (*Low* magnitude of change) application scheme may be visible in the simultaneous view to the southeast at a distance of approximately 6km and 15km respectively. The Taiglim application site may also be visible in the simultaneous view to the southeast at a distance of approximately 4.5km (*Negligible* magnitude of change). The Polquhairn and Knockshinnoch applications sites (Negligible magnitude) may be visible in the successive views to the southwest at a distance of approximately 7km and 12km respectively. There may be views of the Garleffan application site to the southeast (*Low to Negligible* magnitude) at a distance of approximately 5km. The Penbreck application turbines to the east and the Lethans and Spango application schemes to the southeast may also be visible in successive views (all *Negligible* magnitude of change) at a distance of approximately 17km, 12km and 20km respectively. The overall level of effect would be **Moderate** and not significant due to High Cumnock application site.
Andy Goldsworthy's Striding Arches on top of Benbrack, Colt Hill and Bail Hill	Striding Arches are land art sandstone sculptures located on the summits of Benbrack, Colt Hill and Bail Hill around Cairnhead. The closest one is located at a distance of approximately 14.4km to the southeast (the one on the summit of Benbrack at an altitude of 580m AOD). The ZTV and wireframes analysis indicates that the upper parts of up to 3 turbines and no hubs would be visible from the summits where the sculptures are located. In practice, the views of these blade tips would be screened by the intervening commercial forestry and no views of the Proposed Development would be available.
Blairquhan GDL	The Blairquhan GDL is located 18km to the west of the Proposed Development. The estate is not normally open to the public but provides a venue for weddings and filming. It is open to visitors on occasional days, or by appointment. The gardens are open to the public for tours in the summer. The ZTV analysis indicates that views of the Proposed Development would only be theoretically visible from the south western corner of the site (the upper parts of two turbines and no hubs). As this corner of the site is densely wooded no views of the Proposed Development would be available in practice.
Kilkerran GDL	The Kilkerran GDL is located 23km to the west of the Proposed Development. The only part of the estate open to the public is the Walled Garden which is now run as a touring caravan park. The ZTV analysis indicates that views of the Proposed Development would only be theoretically visible from a small area at the eastern end of the site (the upper parts of two turbines and no hubs). As this part of the site is densely wooded no views of the Proposed Development would be available in practice.

Recreational and Tourist Destinations	Description of Effect
Rozelle (La Rochelle) GDL	The Rozelle GDL is located 24km to the northwest of the Proposed Development. It is run by the Council and open year round. The ZTV analysis indicates that views of the Proposed Development would only be theoretically visible from the western edge of the site (one blade tip and no hubs). As this site is located within the densely built up area of Ayr no views of the Proposed Development would be available in practice due to screening by the surrounding built form.
Carnell GDL	The Carnell GDL is located 25km to the north of the Proposed Development. It is a privately owned residence and visitation is strictly by appointment only. Accommodation for shooting and golfing is available. The ZTV analysis indicates that views of the Proposed Development would only be theoretically visible from the southern tip of the site. As this corner of the site is bordered by a block of dense woodland no views of the Proposed Development would be available in practice.
Loudoun Castle GDL	The Loudoun Castle GDL is located 31km to the north of the Proposed Development. Loudoun Castle is a closed theme park currently being transformed into a 5* hotel, golf course with academy, new whisky distillery, with housing, retail, food and drink developments. The ZTV analysis indicates that views of the Proposed Development would theoretically be visible from the north and north western edges of the site (up to 17 turbines and 15 hubs). In practice, views from these areas would be screened by the dense woodland strips and no views of the Proposed Development would be available.
Culzean Castle GDL and Culzean Country Park (National Trust for Scotland site)	The Culzean Castle and Country Park is located 29km to the west of the Proposed Development. It is open all year round. The ZTV analysis indicates that views of the Proposed Development would only be theoretically available from the north eastern tip of the site. As this corner of the site is densely wooded no views of the Proposed Development would be available in practice.
Dundonald Castle	Dundonald Castle is located on a small hill approximately 34km to the west of the Development site. It is open all year round. The ZTV analysis indicates that all of the turbines may be visible from the site in the far distance on days with very good weather and visibility only. The magnitude of change would be *Negligible* and the Level of effect would be **Slight** and not significant. The nature of these effects would be long-term (reversible), indirect, cumulative and neutral to negative. Due to the intervening distance, the Proposed Development would not contribute to any significant cumulative effects. <u>Cumulative Assessment: Existing + Consented Sites</u> The existing High Park Farm, Hare Hill Wind Farm and the consented Hare Hill Extension, Sanquhar, Twentyshilling Hill and Penbreck turbines may be visible in the simultaneous view (all *Negligible* magnitude of change). The existing and consented GSK turbines at Shewalton Moss would also be visible in a successive view (Medium magnitude of change). The combined level of effect would be **Substantial / Moderate** and significant due to GSK / Shewalton Moss turbines. <u>Cumulative Assessment: Existing + Consented Sites + Applications</u> There would be simultaneous views of the South Kyle, Benbrack, Polquhairn, Lethans and Garleffan application sites (all *Negligible* magnitude). The combined level of effect would be **Substantial / Moderate** and significant due to GSK / Shewalton Moss turbines.
Scottish Industrial Railway Centre, Dalmellington (aka Dunaskin Heritage Centre)	The Scottish Industrial Railway Centre is an industrial heritage museum operated by the Ayrshire Railway Preservation Group located between Dalmellington and Waterside on the A713. The purpose of the railway centre is to house and showcase a number of steam and diesel locomotives. It is open all year round. The ZTV analysis indicates that up to four turbines would be theoretically visible, however, within the Development Site itself, a large industrial, historical building which houses the locomotives screens the majority of views. The centre is located at a distance of approximately 10.8km from the Proposed Development. Where views of the Proposed Development are available up to four turbines would be visible emerging from behind the horizon. The magnitude of change is assessed as *Negligible* and the level of effect is assessed as *Slight* and not significant. <u>Cumulative Assessment: Existing + Consented Sites</u> No existing or consented wind farms would be simultaneously visible and little other existing or consented wind energy development would be visible in successive views. There would be no change to the assessment.

Recreational and Tourist Destinations	Description of Effect
	Cumulative Assessment: Existing + Consented Sites + Applications There would be simultaneous views of the South Kyle, Pencloe and Benbrack application sites (*Negligible* magnitude). *The Keirs Hill application site may be visible in a successive view (High magnitude).* The combined level of effect would be **Substantial** and significant due to Keirs Hill application site.
Dean Castle Country Park	There would be no significant effects resulting from the views of the Proposed Development due to intervening screening by built form of Kilmarnock and the intervening distance.
Royal Troon Golf Course	There would be no significant effects resulting from the views of the Proposed Development due to intervening screening by built form of Troon and the intervening distance.
Barassie Golf Course	There would be no significant effects resulting from the views of the Proposed Development due to intervening screening by built form of Troon and the intervening distance.
Prestwick Golf Courses (including St Nicholas and St Cuthbert)	There would be no significant effects resulting from the views of the Proposed Development due to intervening screening by built form of Prestwick and the intervening distance.
Belleisle and Seafield Golf Courses	There would be no significant effects resulting from the views of the Proposed Development due to intervening screening by built form of Ayr and the intervening distance.
Roodlea Gold Course	There would be no significant effects resulting from the views of the Proposed Development due to intervening screening by built form of Drongan and the intervening distance.
Sorn Castle Golf Club, Catrine	There would be no significant effects resulting from the views of the Proposed Development due to the intervening distance and the screening by riparian vegetation.
Merrick 843m AOD (see also Figures 9.47 and 9.52) (Corbett)	Please see **Appendix 9.B**: Viewpoint Assessment - Viewpoint 21 for the assessment of views from this hill summit. To summarise, the nearest turbine would be at a distance of 25km and the magnitude of change would be Negligible. The level of effect would be **Slight** and not significant. Considering the cumulative picture, the Proposed Development would not contribute to any significant effects from this location.
Corserine 814m AOD	Corserine is the highest summit of the Rhinns of Kells in Galloway. The summit is a clear grassy ridge with forestry plantations on either side. The summit of Corserine is at a distance of approximately 20.3km from the nearest turbine, turbine 19. The view is orientated broadly north-east and looks out over the Rhinns of Kells, the Galloway Forest Park and the Glenkens valley. All of the proposed turbines including 18 hubs would be visible, mostly underneath the horizon. The magnitude of change would be Negligible and the level of effect would be **Slight** and not significant. The nature of these effects would be long-term (reversible) indirect and negative to neutral. Cumulative Assessment: Existing + Consented Sites The Proposed Development would not contribute to significant cumulative effects at a Slight level of effect. Cumulative Assessment: Existing + Consented Sites + Applications The Proposed Development would not contribute to significant cumulative effects at a Slight level of effect.
Shalloch on Minnoch 775m AOD (see also Figure 9.51) (Corbett)	Please see **Appendix 9.B**: Viewpoint Assessment - Viewpoint 18 for the assessment of views from this hill summit. To summarise, the nearest turbine would be at a distance of 22km and the magnitude of change would be Negligible. The level of effect would be **Slight** and not significant. Considering the cumulative picture, the Proposed Development would not contribute to any significant effects from this location.
Mullwharchar 692m AOD (Graham)	Mullwharchar is a remote rounded summit in the Galloway Hills of the Southern Uplands to the northeast of Loch Enoch. The nearest turbine would be Turbine 19 at a distance of approximately 22.5km to the northeast. All 19 turbines including all hubs would be visible in the far distance, mostly across the horizon. Viewpoint 21: Merrick (**Figure 9.47a/b/c**) is located approximately 2.8km to the southwest and illustrates the views from this part of Galloway Hills. The magnitude of change would be Negligible and the level of effect would be **Slight** and not significant. The nature of these effects would be long-term (reversible) indirect and negative to neutral.

Recreational and Tourist Destinations	Description of Effect
	Cumulative Assessment: Existing + Consented Sites The Proposed Development would not contribute to significant cumulative effects from this location. Cumulative Assessment: Existing + Consented Sites + Applications The Proposed Development would not contribute to significant cumulative effects from this location.
Craignaw 645m AOD (Graham)	Craignaw is a bare rock summit in the Galloway Hills of the Southern Uplands to the southeast of Loch Enoch. The nearest turbine would be Turbine 19 at a distance of approximately 22.5km to the northeast. 14 of the proposed turbines including 9 hubs would be visible in the far distance across the horizon. Viewpoint 21: Merrick (**Figure 9.47a/b/c**) is located approximately 3.8km to the northwest and illustrates the views from this part of the Galloway Hills. The magnitude of change would be Negligible and the level of effect would be **Slight** and not significant. The nature of these effects would be long-term (reversible) indirect and negative to neutral. Cumulative Assessment: Existing + Consented Sites The Proposed Development would not contribute to significant cumulative effects from this location. Cumulative Assessment: Existing + Consented Sites + Applications The Proposed Development would not contribute to significant cumulative effects from this location.
Lamachan Hill 717m AOD (Graham)	Lamachan Hill is a crescent shaped hill to the south of Glen Trool in the Galloway Hills of the Southern Uplands. The nearest turbine would be Turbine 19 at a distance of approximately 32km to the northeast. 13 of the proposed turbines including 9 hubs would be visible in the far distance across the horizon. The magnitude of change would be Negligible and the level of effect would be **Slight** and not significant. The nature of these effects would be long-term (reversible) indirect and negative to neutral. Cumulative Assessment: Existing + Consented Sites The Proposed Development would not contribute to significant cumulative effects from this location. Cumulative Assessment: Existing + Consented Sites + Applications The Proposed Development would not contribute to significant cumulative effects from this location.
Green Lowther 732m AOD (Graham)	Green Lowther is the highest of the Lowther Hills. There are masts and transmitters on the summit, which can be reached by a private tarred road. The nearest turbine would be Turbine 18 at a distance of approximately 32km to the east. All 19 turbines and 18 hubs would be visible in the far distance, mostly across the horizon. Viewpoint 22: East Mount Lowther (**Figure 9.48a/b/c**) is located approximately 3km to the southwest and illustrates the views from Lowther Hills. The magnitude of change would be Negligible and the level of effect would be **Slight** and not significant. The nature of these effects would be long-term (reversible) indirect and negative to neutral. Cumulative Assessment: Existing + Consented Sites The Proposed Development would not contribute to significant cumulative effects from this location. Cumulative Assessment: Existing + Consented Sites + Applications The Proposed Development would not contribute to significant cumulative effects from this location.

9.8 Summary of Residual Landscape and Visual Effects

Summary of Landscape Effects

9.8.1 Landscape effects are concerned with how the Proposed Development would affect the elements that make up the landscape, the aesthetic and perceptual aspects of the landscape and its distinctive character. The Proposed Development would lead to a significant effect on part of the Southern Uplands and Forestry: Enoch Hill LCA. The geographical extent of the significant effects would be limited to the immediate areas of the proposed turbines, within the Development Site itself (and part of the Southern Uplands and Forestry: Enoch Hill LCA) due to the containment of coniferous forestry and landform. Significant landscape effects would also extend north, approximately 2km (affecting the East Ayrshire Southern Uplands: Benty Cowan Hill LCA) due to

the upper parts of the turbines appearing beyond the summits of Chang Hill and Benty Cowan Hill. The nature of all of these effects would be long-term (reversible) direct and negative due primarily to the height and scale of the turbines.

9.8.2 This effect would not be significant in terms of the wider East Ayrshire Southern Uplands / Southern Uplands with Forestry which extends further south to include the Southern Uplands / Southern Uplands with Forests: Carsphairn area, in Dumfries and Galloway. The Proposed Development would also lead to a significant, indirect effect on the southern views and the backdrop of the Southern Uplands as viewed from the New Cumnock Upland Basin LCA, to the west and northwest of New Cumnock. Much of this area and the associated southern views are already partly characterised by views of wind farm development at Hare Hill and Windy Standard wind farms and would not appear incongruous. The assessment also notes that part of this area is currently characterised by open cast mining operations, reducing its overall sensitivity to wind farm development. The nature of these effects is further detailed as part of the visual assessment.

9.8.3 The Development Site is designated at a local level as part of the Afton Sensitive Landscape Character Area (SLCA). Although there would be a significant effect on part of the landscape character within the Afton SLCA, it is not considered that the special qualities of the SLCA or the reasons for its designation would be significantly affected, and there would be little or no visibility from within the Afton Glen area itself, which forms the focus of the SLCA in this area.

9.8.4 Further, there would be no significant effects on any other locally or nationally designated landscapes including the Galloway Hills Regional Scenic Area (RSA).

9.8.5 As identified in **Section 9.3**, subsequent to completion of the LVIA, a further review of the cumulative data was undertaken within 35km of the Development Site to ensure that all wind farm development relevant to the cumulative assessment had been accounted for.

9.8.6 Where there has been a change in status of consented or application wind farm development the cumulative effect of the individual wind farm has already been considered within the cumulative assessment and the significance of effect of each would remain unchanged.

9.8.7 The scoping sites Windy Rig; Sanqhar Six; Glenmuckloch; Bankend Rig Extension; Kirk Hill; and, Cumberhead Wind Farm have progressed to application status. Each of these has been considered against the receptors identified in the landscape baseline and none of these are considered to have a material effect on the significance of cumulative effects already considered.

9.8.8 The addition of the wind farm application, West Dykes, to the cumulative baseline is not considered to have a material effect on the significance of cumulative effects already considered as this is at a distance of over 25km from the Proposed Development.

Summary of Visual Effects

9.8.9 Visual effects are concerned with the effects of development and change on the views and visual amenity likely to be experienced by people within the landscape. A total of 22 viewpoint assessment locations have been selected across the study area and within the ZTV as part of the consultation process with SNH and the local planning authorities. Visualisations (photographs of the existing view, wireframes and photomontages) of the Proposed Development from each of these viewpoint locations are presented in the ES in Volume 2 and their analysis indicates that the likely extent of potential, significant visual effects would extend out in a north and northeast direction, primarily affecting views south from the Upland Basin including open views from the A76 and the south western edge of New Cumnock within approximately 7km from the nearest turbine locations, as indicated by Viewpoints 1 to 7. The predicted visual effects as indicated by Viewpoints 1 to 7 are indicative of a visual effect from a particular location and should not be assumed to translate into effects on the overall visual experience within 7km as they are not representative or typical. For example, due to the landform, intervening vegetation screening and the wind farm design, those residential properties closest to the Proposed Development within approximately 3km would not be significantly affected. The views in other directions to the east, south and west would not be significantly affected due to the intervening landform and forestry.

9.8.10 The Proposed Development would have a significant effect on the views from the small settlement at Burnside and from the south western edge of New Cumnock, along Connel View and at the Cemetery along Afton Road (also promoted as a Scottish Hill Track / Heritage Path). There would also be a significant effect on the views from part of the B741 and two core paths, views from part of Knockshinnock local nature reserve and the hill summits of Blackcraig Hill and Windy Standard.

9.8.11 As identified in **Section 9.3**, subsequent to completion of the LVIA, a further review of the cumulative data was undertaken within 35km of the Development Site to ensure that all wind farm development relevant to the cumulative assessment had been accounted for.

9.8.12 Where there has been a change in status of consented or application wind farm development, the cumulative effect of the individual wind farm has already been considered within the cumulative assessment and the significance of effect of each would remain unchanged.

9.8.13 The scoping sites Windy Rig; Sanqhar Six; Glenmuckloch; Bankend Rig Extension; Kirk Hill; and, Cumberhead Wind Farm have progressed to application status. Each of these has been considered against the receptors identified in the visual baseline and none of these are considered to have a material effect on the significance of cumulative effects already considered.

9.8.14 The addition of the wind farm application, West Dykes, to the cumulative baseline is not considered to have a material effect on the significance of cumulative effects already considered as this is at a distance of over 25km from the Proposed Development.

Summary Tables

9.8.15 A summary of the landscape and visual effects for each receptor is provided in **Tables 9.16** and **9.17**.

9.8.16 The information set out in **Tables 9.16 and 9.17** lists the main receptors included in this assessment and provides a summary of the landscape and visual effects of the Proposed Development as well as the cumulative effects as follows:

- Level of Effect: Proposed Development Wind Farm:
  - Sensitivity: The sensitivity of the receptor is recorded (ranging from high, medium, low, to negligible) in accordance with the methodology in **Appendix 9.A**, Volume 3.
  - Magnitude (Proposed Development Wind Farm only): The magnitude of change for the Proposed Development Wind Farm is recorded, ranging from high, medium, low to negligible in accordance with the methodology.
  - Level of Effect (Proposed Development Wind Farm only): The level of effect resulting from the Proposed Development is recorded (taking account of the sensitivity and magnitude in accordance with the methodology). Those levels of effect shown in bold relate to significant effects in accordance with the relevant EIA Regulations.
- Cumulative Level of Effect (including Proposed Development Wind Farm):
  - Magnitude (Existing and Consented wind farms): The magnitude of change, taking account of other existing and consented wind farms is recorded (ranging from high, medium, low, negligible, and zero) in accordance with the methodology.
  - Cumulative Level of Effect 1: The level of effect, taking account of the other existing, consented / under construction wind farms and the Proposed Development, is recorded (taking account of the sensitivity and magnitude in accordance with the methodology). Those levels of effect shown in bold relate to significant effects in accordance with the relevant EIA Regulations and the wind farm contributing most to the cumulative effects is recorded in brackets.
  - Magnitude (Other Application wind farms): The magnitude of change, taking account of other wind farm applications is recorded (ranging from high, medium, low, negligible, and zero) in accordance with the methodology.

- Cumulative Level of Effect 2: The level of effect, taking account of the other existing, consented / under construction, application wind farms and the Proposed Development, is recorded (taking account of the sensitivity and magnitude in accordance with the methodology). Those levels of effect shown in bold relate to significant effects in accordance with the relevant EIA Regulations and the wind farm contributing most to the cumulative effects is recorded in brackets.

Table 9.16 Summary and Evaluation of the Predicted Landscape Effects

Receptor	**Level of Effect: Proposed Development Wind Farm**			**Cumulative Level of Effect (Proposed Development Wind Farm)**			
	Sensitivity	**Magnitude**	**Level of Effect (Proposed Development Wind Farm only)**	**Magnitude (Existing and Consented wind farms)**	**Level of Effect: 1 (Existing and Consented wind farms and the Proposed Development)**	**Magnitude (Other Application wind farms)**	**Level of Effect: 2 (Existing Consented and Application wind farms and the Proposed Development)**
Direct Landscape Effects on the 'Host' Landscape: Southern Uplands and Forestry: Enoch Hill LCA							
Construction Effects: Enoch Hill LCA	Medium	Zero to High	None, increasing to **Substantial / Moderate**	-	-	-	-
Operational Effects: Enoch Hill LCA	Medium	High	**Substantial / Moderate** (within 2km of the turbine locations)	Low	**Substantial / Moderate** (within 2km of the turbine locations)	High	**Substantial / Moderate** (Kyle, Pencloe and the Proposed Development)
Decommissioning Effects: Enoch Hill LCA	Medium	Negligible	Slight / Negligible	-	-	-	-
Direct and Indirect Landscape Effects: East Ayrshire Southern Uplands: Benty Cowan Hill LCA							
Construction Effects: Benty Cowan Hill LCA	High / Medium	Zero to High	None, increasing to **Substantial / Moderate**				
Operational Effects: Benty Cowan Hill LCA	High / Medium	High	**Substantial / Moderate** (within 2km of the turbine locations)	Low	**Substantial / Moderate** (within 2km of the turbine locations)	High	**Substantial / Moderate** (Kyle, Pencloe and the Proposed Development)
Decommissioning Effects: Benty Cowan Hill LCA	High / Medium	Negligible	Slight / Negligible				

Receptor	Level of Effect: Proposed Development Wind Farm			Cumulative Level of Effect (Proposed Development Wind Farm)			
	Sensitivity	**Magnitude**	**Level of Effect (Proposed Development Wind Farm only)**	**Magnitude (Existing and Consented wind farms)**	**Level of Effect: 1 (Existing and Consented wind farms and the Proposed Development)**	**Magnitude (Other Application wind farms)**	**Level of Effect: 2 (Existing Consented and Application wind farms and the Proposed Development)**
Indirect Landscape Effects on the Surrounding Landscape Character Types within 10km – East Ayrshire							
20a East Ayrshire Southern Uplands (Blackcraig Hill)	High to Medium	Low	Moderate to Slight	High	**Substantial to Substantial / Moderate** (Proposed Development, Hare Hill and Hare Hill Extension)	High	**Substantial to Substantial / Moderate** (Multiple development)
15 Upland Basin (New Cumnock)	Medium	Medium	Moderate	Low	Moderate	High to Medium	**Substantial / Moderate** (Multiple development)
10 Upland River Valley (River Doon)	High	Negligible	Slight	Zero	Slight	Zero	Slight
10 Upland River Valley (River Nith)	High	Negligible	Slight	Low	Moderate	Medium	**Substantial / Moderate** (Lethans and Garleffan)
17a Foothills with Forest and Opencast Mining (Martyrs Moss)	Medium	Low	Slight	Negligible to Zero	Slight	High (within 1-2km of the proposed Polquhairn turbine locations)	**Substantial / Moderate** (Polquhairn)
21 Rugged Uplands with Lochs and Forest (Loch Doon)	High	Negligible	Slight	Negligible to Zero	Slight	High	**Substantial** (Glenmount)

Receptor	Level of Effect: Proposed Development Wind Farm			Cumulative Level of Effect (Proposed Development Wind Farm)			
	Sensitivity	**Magnitude**	**Level of Effect (Proposed Development Wind Farm only)**	**Magnitude (Existing and Consented wind farms)**	**Level of Effect: 1 (Existing and Consented wind farms and the Proposed Development)**	**Magnitude (Other Application wind farms)**	**Level of Effect: 2 (Existing Consented and Application wind farms and the Proposed Development)**
18a Plateau Moorlands (Wardlaw Hill)	High to Medium	Negligible	Slight to Slight / Negligible	Negligible	Slight to Slight / Negligible	High (within 1-2km of the proposed High Cumnock Wind Farm)	**Substantial** to **Substantial / Moderate** (High Cumnock, Lethans and Garleffan)
14 Upland Glen (Glen Afton)	High	Negligible	Slight	Medium	**Substantial / Moderate** (Afton)	Negligible	**Substantial / Moderate** (Afton)
7c East Ayrshire Lowlands (Drongan)	High	Negligible	Slight	Negligible to Zero	Slight	Low	Moderate
9 Upper Dale LCT (Upper Glenkens)	High	Zero	None	Zero	None	Negligible	Slight
Indirect Landscape Effects on the Surrounding Landscape Character Types within 10km – Dumfries and Galloway							
19 Southern Uplands (Carsphairn)	High	Negligible	Slight	High to Medium	**Substantial to Substantial / Moderate** (Windy Standard)	High to Medium	**Substantial to Substantial / Moderate** (Windy Standard and) Quantans Hill)
19a Southern Uplands with Forests (Carsphairn)	Low	Negligible	Negligible	Medium	Moderate to Slight*	High	**Substantial / Moderate*** (South Kyle and Windy Standard)
*Note: In the assessors opinion these effects would be significant – although the landscape sensitivity is considered to be Low the magnitude of change would be High.							
19a Southern Uplands with Forests (Ken)	Low	Negligible	Negligible	Negligible	Negligible	Zero	Negligible

Receptor	Level of Effect: Proposed Development Wind Farm			Cumulative Level of Effect (Proposed Development Wind Farm)			
	Sensitivity	**Magnitude**	**Level of Effect (Proposed Development Wind Farm only)**	**Magnitude (Existing and Consented wind farms)**	**Level of Effect: 1 (Existing and Consented wind farms and the Proposed Development)**	**Magnitude (Other Application wind farms)**	**Level of Effect: 2 (Existing Consented and Application wind farms and the Proposed Development)**
9 Upper Dale: Upper Glenkens	High	Zero	None	-	No cumulative effect	-	No cumulative effect
Indirect Effects on Local Landscape Designations							
Afton SLCA	High	Low	Moderate	Medium to Negligible	**Substantial** to Slight	High to Negligible	**Substantial** to Slight
Galloway Hills RSA	High	Negligible	Slight	High to Negligible	**Substantial** to Slight (Windy Standard Extension)	High to Medium	**Substantial** to Slight (Windy Standard Extension and South Kyle)
Doon Valley SLCA	High	Low to Negligible	Moderate to Slight	Negligible	Moderate to Slight	High	**Substantial** (Glenmount)

Table 9.17 Summary and Evaluation of the Predicted Visual Effects

Receptor	**Level of Effect: Proposed Development Wind Farm**			**Cumulative Level of Effect (Proposed Development Wind Farm)**			
	Sensitivity	**Magnitude**	**Level of Effect (Proposed Development Wind Farm only)**	**Magnitude (Existing and Consented wind farms)**	**Level of Effect: 1 (Existing and Consented wind farms and the Proposed Development)**	**Magnitude (Other Application wind farms)**	**Level of Effect: 2 (Existing Consented and Application wind farms and the Proposed Development)**
Visual Effects on Views from Settlements within 10km							
Burnside	High	High to Medium	**Substantial to Substantial/Moderate**	Low	**Substantial to Substantial/Moderate**	Medium	**Substantial to Substantial/Moderate**
Bankglen	High	Low	Moderate To No View	Low	Moderate To No View	Medium	**Substantial/Moderate** (High Cumnock and Garleffan)
Connel Park	High	Low	Moderate To No View	Low	Moderate To No View	Low	Moderate To No View
Leggate	High	Low	Moderate To No View	Low	Moderate To No View	Low	Moderate To No View
New Cumnock	High	Medium to Zero	**Substantial/Moderate** to No View (Connel View and Cemetery)	Low to negligible	**Substantial/Moderate** to No View	High	**Substantial** (High Cumnock and Garleffan)
Dalmellington	High	Negligible to Zero	Slight to No View	Negligible	Slight to No View	High to Medium	**Substantial** (Keirs Hill)
Burnton	High	Low to Zero	Moderate to No View	Low	Moderate to No View	High to Medium	**Substantial to Substantial/Moderate** (Keirs Hill)

Receptor	Level of Effect: Proposed Development Wind Farm			Cumulative Level of Effect (Proposed Development Wind Farm)			
	Sensitivity	**Magnitude**	**Level of Effect (Proposed Development Wind Farm only)**	**Magnitude (Existing and Consented wind farms)**	**Level of Effect: 1 (Existing and Consented wind farms and the Proposed Development)**	**Magnitude (Other Application wind farms)**	**Level of Effect: 2 (Existing Consented and Application wind farms and the Proposed Development)**
Visual Effects on Views from Transport Routes within 10km							
B741 between Auchenroy and New Cumnock	Medium	High to Zero	**Substantial / Moderate** to No View	Low	**Substantial / Moderate** to No View	High to Zero	**Substantial / Moderate** to No View (Proposed Development, South Kyle and Pencloe)
A76 between Cumnock and Burnton east of New Cumnock / Burns Heritage Trail	Medium	Medium to Zero	Moderate to No View	Medium to Low	Moderate to No View (High Park Farm)	High	**Substantial / Moderate** to No View (High Cumnock and Garleffan)
Afton Road (Also promoted as a Scottish Hill Track and Heritage Path)	High	Medium to Zero	**Substantial/Moderate** to No View	Medium to Zero	**Substantial/Moderate** to No View	Medium to Zero	**Substantial/Moderate** to No View
A713 NTR between Waterside and Dalmellington	High	Low to Zero	Moderate to No View	Negligible	Moderate to No View	High	**Substantial** (Keirs Hill)
B7046 between Darntaggart Plantation and Skares	Medium	Zero	No View	No cumulative effect			
Glasgow to Carlisle railway line between south of Auchinleck and west of New Cumnock	Medium	Medium to Zero	Moderate to No View	Medium	Moderate	High	**Substantial** (High Cumnock and Garleffan)

Receptor	Level of Effect: Proposed Development Wind Farm			Cumulative Level of Effect (Proposed Development Wind Farm)			
	Sensitivity	**Magnitude**	**Level of Effect (Proposed Development Wind Farm only)**	**Magnitude (Existing and Consented wind farms)**	**Level of Effect: 1 (Existing and Consented wind farms and the Proposed Development)**	**Magnitude (Other Application wind farms)**	**Level of Effect: 2 (Existing Consented and Application wind farms and the Proposed Development)**
Visual Effects on Views from Transport Routes within 10-35km							
Glasgow to Carlisle railway line	Medium	Negligible to Zero	Slight / Negligible to No View	Negligible to Zero	Slight / Negligible to No View	Negligible to Zero	Slight / Negligible to No View
Glasgow to Stranraer line via Ayr	Medium	Negligible to Zero	Slight / Negligible to No View	Negligible to Zero	Slight / Negligible to No View	Negligible to Zero	Slight / Negligible to No View
Visual Effects on Views from Recreational Routes: Core Paths within 5km							
DGC Core Path No. 667 Water of Deugh Trail	High	Medium to Zero	**Substantial/Moderate** to No View	High	**Substantial** to No View (Windy Standard Extension)	High	**Substantial** to No View (South Kyle)
EAC Core Path No. C12: New Cumnock Circular	High	Medium to Zero	**Substantial/Moderate** to No View	Low	**Substantial/Moderate** to No View	Medium to Low	**Substantial/Moderate** to No View
EAC Core Path No. C10: Coalfield Cycle Route	High	Negligible to Zero	Slight to No View	Medium to Zero	**Substantial/Moderate** to No View (High Park Farm Wind Turbine)	Medium to Zero	**Substantial / Moderate** (South Kyle, Pencloe, Garleffan and High Cumnock
EAC Core Path No. C14: Glen Afton	High	Zero	No View	No cumulative effect			
Visual Effects on Views from Recreational Routes: Scottish Hill Tracks and Heritage Paths within 10km							
Scottish Hill Track 81 Barr to Dalmellington / 78b Glen Trool Village to Dalmellington by Tunskeen	High	Low to Zero	Moderate to No View	Negligible to Zero	Moderate to No View	Medium to Zero	Substantial / Moderate (Keirs Hill)

Receptor	Level of Effect: Proposed Development Wind Farm			Cumulative Level of Effect (Proposed Development Wind Farm)			
	Sensitivity	**Magnitude**	**Level of Effect (Proposed Development Wind Farm only)**	**Magnitude (Existing and Consented wind farms)**	**Level of Effect: 1 (Existing and Consented wind farms and the Proposed Development)**	**Magnitude (Other Application wind farms)**	**Level of Effect: 2 (Existing Consented and Application wind farms and the Proposed Development)**
Afton Road / Scottish Hill Track 84 New Cumnock to St John's Town of Dalry by Glen Afton as per transport route	High	Medium to Zero	**Substantial/Moderate** to No View	Medium to Zero	**Substantial/Moderate** to No View	Medium to Zero	**Substantial/Moderate** to No View
Afton Road / Heritage Path: Old Road from New Cumnock to Dalquhairn as per transport route	High	Medium to Zero	**Substantial/Moderate** to No View	Medium to Zero	**Substantial/Moderate** to No View	Medium to Zero	**Substantial/Moderate** to No View
Visual Effects on Views from Recreational Routes: Long Distance Routes within 35km							
Southern Upland Way	High	Negligible to Zero	Slight to No View	High	**Substantial** (Whiteside Hill)	High	**Substantial** (Whiteside Hill, Ulzieside and Longburn)
National Cycle Route (NCR) Route 7	High	Negligible to Zero	Slight to No View	Negligible to Zero	Slight to No View	Negligible to Zero	Slight to No View
Visual Effects on Views from Recreational and Tourist Destinations within 10km							
Knockshinnoch Lagoons	High	Medium to Zero	**Substantial / Moderate** to No View	Low	**Substantial / Moderate** to No View	Medium to Zero	**Substantial / Moderate** to No View
Burn's Memorial	High	Negligible	Slight to No View	Negligible	Slight to No View	Negligible	Slight to No View
Craigengillan GDL	High	Low to Zero	Moderate to No View	Medium	**Substantial/Moderate** to No View (Dersalloch)	High	**Substantial** to No View (Keirs Hill and Glenmount)

Receptor	Level of Effect: Proposed Development Wind Farm			Cumulative Level of Effect (Proposed Development Wind Farm)			
	Sensitivity	**Magnitude**	**Level of Effect (Proposed Development Wind Farm only)**	**Magnitude (Existing and Consented wind farms)**	**Level of Effect: 1 (Existing and Consented wind farms and the Proposed Development)**	**Magnitude (Other Application wind farms)**	**Level of Effect: 2 (Existing Consented and Application wind farms and the Proposed Development)**
Galloway Forest Park	High	Negligible to Zero	Slight to No View	Medium	**Substantial/Moderate** to No View (Dersalloch)	High	**Substantial** to No View (Glenmount)
Loch Doon	High	Negligible to Zero	Slight to No View	Negligible	Slight to No View	High	**Substantial** (Glenmount)
Blackcraig Hill	High	Medium	**Substantial/Moderate**	High	**Substantial** (Hare Hill Extension, Sanquhar and Afton)	High	**Substantial** (Hare Hill Extension, Sanquhar, Afton, South Kyle, Pencloe and Quantans Hill)
Windy Standard	High	Medium	**Substantial/Moderate**	High	**Substantial** (Hare Hill Extension, Sanquhar and Afton)	High	**Substantial** (Windy Standard, Windy Standard Extension, Afton, South Kyle, Pencloe and Benbrack)
Cairnsmore of Carsphairn	High	Low	Moderate	High	**Substantial** (Windy Standard Extension)	High	**Substantial** (Windy Standard Extension)
Visual Effects on Views from Recreational and Tourist Destinations (within 10-35km)							
Dumfries House GDL	High	Negligible to Zero	Slight to No View	Negligible to Zero	Moderate (Afton)	Low	Moderate (High Cumnock)
Andy Goldsworthy's Striding Arches on top of Benbrack, Colt Hill and Bail Hill	High	Zero	No View	No cumulative effect			
Blairquhan GDL	High	Zero	No View	No cumulative effect			
Kilkerran GDL	High	Zero	No View	No cumulative effect			

Receptor	Level of Effect: Proposed Development Wind Farm			Cumulative Level of Effect (Proposed Development Wind Farm)			
	Sensitivity	**Magnitude**	**Level of Effect (Proposed Development Wind Farm only)**	**Magnitude (Existing and Consented wind farms)**	**Level of Effect: 1 (Existing and Consented wind farms and the Proposed Development)**	**Magnitude (Other Application wind farms)**	**Level of Effect: 2 (Existing Consented and Application wind farms and the Proposed Development)**
Rozelle (La Rochelle) GDL	High	Zero	No View	No cumulative effect			
Carnell GDL	High	Zero	No View	No cumulative effect			
Loudoun Castle GDL	High	Zero	No View	No cumulative effect			
Culzean Castle GDL and Culzean Country Park (National Trust for Scotland site)	High	Zero	No View	No cumulative effect			
Dundonald Castle	High	Negligible	Slight	Medium	**Substantial / Moderate** and (GSK / Shewalton Moss)	Negligible	**Substantial / Moderate** and (GSK / Shewalton Moss)
Scottish Industrial Railway Centre, Dalmellington (aka Dunaskin Heritage Centre)	High	Negligible	Slight	Negligible	Slight	High	**Substantial** (Keirs Hill)
Dean Castle Country Park	High	Zero	No View	No cumulative effect			
Royal Troon Golf Course	High	Zero	No View	No cumulative effect			
Barassie Golf Course	High	Zero	No View	No cumulative effect			
Prestwick Golf Course (including St Nicholas and St Cuthbert)	High	Zero	No View	No cumulative effect			
Belleisle and Seafield Golf Courses	High	Zero	No View	No cumulative effect			

Receptor	Level of Effect: Proposed Development Wind Farm			Cumulative Level of Effect (Proposed Development Wind Farm)			
	Sensitivity	Magnitude	Level of Effect (Proposed Development Wind Farm only)	Magnitude (Existing and Consented wind farms)	Level of Effect: 1 (Existing and Consented wind farms and the Proposed Development)	Magnitude (Other Application wind farms)	Level of Effect: 2 (Existing Consented and Application wind farms and the Proposed Development)
Roodlea Gold Course	High	Zero	No View	No cumulative effect			
Sorn Castle Golf Club, Catrine	High	Zero	No View	No cumulative effect			
Merrick 843m AOD	High	Negligible	Slight	No cumulative effect			
Corserine 814m AOD	High	Negligible	Slight	No cumulative effect			
Shalloch on Minnoch 775m AOD	High	Negligible	Slight	No cumulative effect			
Mullwharchar 692m AOD	High	Negligible	Slight	No cumulative effect			
Craignaw 645m AOD (Graham)	High	Negligible	Slight	No cumulative effect			
Lamachan Hill 717m AOD (Graham)	High	Negligible	Slight	No cumulative effect			
Green Lowther 732m AOD (Graham)	High	Negligible	Slight	No cumulative effect			

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10. Historic Environment

10.1 Non-technical Summary

10.1.1 This chapter assesses the potential effects of the Proposed Development on the historic environment.

10.1.2 Direct effects on heritage assets, as well as indirect effects on the setting of off-site heritage assets and the wider historic landscape, have been considered in in the Historic Environment assessment.

10.1.3 There are a number of non-designated archaeological features across the Development Site, comprised of previously known assets recorded within the West of Scotland Archaeology Service Historic Environment Record together with potential assets identified through this assessment. Peat deposits which may have value for the study of past environments are also present.

10.1.4 While most previously known assets would not be affected by the Proposed Development, an earthwork boundary bank would probably be partially disturbed by the scheme. This asset would be considered of local importance at best and therefore not give rise to a significant effect. Previously unrecorded archaeological features and peat deposits could also be affected by the Proposed Development. However, appropriate mitigation measures such as photographic recording and/or archaeological watching briefs within areas of disturbance, would ensure that any adverse residual effects would be not significant.

10.1.5 Indirect (visual) effects on the settings of designated heritage assets within the wider area, including listed buildings, scheduled monuments and garden and designed landscapes, were assessed (including Craigengillan and Dumfries House garden and designed landscapes and the Beoch and Fardenreoch prehistoric cairns). Non-designated assets with the potential to be of national importance were also considered in this regard. The assessment concludes that indirect effects on designated heritage assets, and potentially nationally important assets, within the wider area would not be significant.

10.2 Introduction and overview

10.2.1 This chapter considers the potential impact of the Proposed Development on the ‘historic environment’ following Scottish Planning Policy (SPP) and Scottish Historic Environment Policy (SHEP). The historic environment includes standing buildings, earthwork monuments, industrial features, sub surface archaeological remains and artefact scatters. It also includes landscapes and their constituent features which have been shaped by human occupation, from planned features such as gardens and designed landscapes (GDL), field boundaries and plantations, to areas that have historical significance for their location such as battlefields. Tangible cultural heritage features can be described as ‘assets’, ‘heritage assets’ or ‘historic assets’, although not all physical remains of cultural heritage interest will constitute an asset . A broad definition of cultural heritage or the historic environment also encompasses less tangible cultural aspects, such as traditions, customs, beliefs and language.

10.2.2 Assessment of any direct effects on heritage assets as well as effects on the setting of off-site assets and the wider historic environment has been undertaken.

10.2.3 **Figure 10.1** shows an overview of the Development Site and the layout of the Proposed Development. It also shows the study area, which is defined as the total area extending to a 500m radius from the Development Site boundary, together with the non-designated assets contained therein.

10.2.4 **Figure 10.2** shows the locations of designated assets and assets of potential national importance within the extended study area (defined as a radius of 10km from the Development Site boundary).

10.2.5 This chapter has been produced following the Chartered Institute for Archaeology (CIfA) *Standard and Guidance for Commissioning Work or Providing Consultancy Advice on Archaeology and the Historic Environment* (CIfA 2014a).

10.3 Methodology and approach

Policy and Legislative Context

10.3.1 Certain assets that are deemed to be of particular importance are given legal protection. The importance of heritage assets and the protection of these and their settings is recognised in legislation as well as national, regional and local planning policy.

Statutory Provisions

10.3.2 The Ancient Monuments and Archaeological Areas Act 1979 (AMAAA) provides for a schedule of monuments which are protected and sets out measures for the protection and management of these monuments, provisions amended by the Historic Environment (Amendment) (Scotland) Act 2011. This act also provides a statutory basis for the inventory of gardens and designed landscapes and for the creation of a new inventory of historic battlefields.

10.3.3 The Planning (Listed Buildings and Conservation Areas) (Scotland) Act 1997 provides for the definition and protection of a list of buildings and areas of architectural and historical interest, including Conservation Areas. The Act sets out a requirement to have special regard to the desirability of preserving the integrity and setting of listed buildings and conservation areas in considering any proposed development.

National Planning Policies

10.3.4 As detailed in **Table 10.1**, the 'Valuing the Historic Environment' Subject Policy within the Scottish Planning Policy (SPP, 2014) provides the national planning policy context for the historic environment encompassing designated heritage assets (scheduled monuments, listed buildings, conservation areas, designated wreck sites, world heritage sites, inventory battlefields and inventory gardens and designed landscapes) together with non-designated heritage assets.

Table 10.1 Relevant provisions within the 'Valuing the Historic Environment' Subject Policy, SPP

Policy Area	**Overview**
Listed Buildings	The SPP states that "*where planning permission and listed building consent are sought for development to, or affecting, a listed building, special regard must be given to the importance of preserving and enhancing the building, its setting and any features of special architectural or historic interest…*" (paragraph 141).
Scheduled Ancient Monuments	The SPP 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...*" (paragraph 145).
Gardens and Designed Landscapes	The SPP states that "*planning authorities should protect and, where appropriate, seek to enhance gardens and designed landscapes included in the Inventory of Gardens and Designed Landscapes and designed landscapes of regional and local importance*" (paragraph 148).

Policy Area	Overview
Archaeology	The SPP states that "*planning authorities should protect archaeological sites and monuments as an important, finite and non-renewable resource and preserve them in situ wherever possible*". Insitu preservation is encouraged, but in cases where this is not possible conditions or legal obligations should be used to ensure archaeological assets are recorded and analysed before development proceeds.
Non Statutory Historic Assets	In relation to historic assets which are not afforded statutory protection, the SPP states that "*planning authorities should protect and preserve significant resources as far as possible, in situ wherever feasible*" (paragraph 151).

10.3.5 Detailed advice on the implementation of SPP is provided in Planning Advice Notes (PAN), including PAN 2/2011 *Planning and Archaeology*, and in the Historic Scotland *Managing Change in the Historic Environment* series of guidance notes.

Development Plan Policies

10.3.6 The statutory Development Plan applicable to the site comprises the approved Ayrshire Joint Structure Plan (2007) and the adopted East Ayrshire Local Plan (2010). Development Plan policies of relevance to this technical assessment are detailed in **Table 10.2**.

Table 10.2 Relevant Development Plan Policies

Policy Title	Summary
Ayrshire Joint Structure Plan 2007	
ECON 7: Wind Farms	**Section E:** Outside the Areas of Search: all wind farm proposals will be assessed against the Historic Environment, any positive or adverse effects on this and how the latter can be overcome or minimised. **Section G:** In all cases, applications for wind farms should be assessed in relation to criteria including the historic environment.
ENV 1: Landscape Quality	The quality of Ayrshire's landscape and its distinctive local characteristics shall be maintained and enhanced. In providing for new development, particular care shall be taken to conserve those features that contribute to local distinctiveness including historic landscapes.
ENV 6: Protection of the Built Heritage	Development proposals considered to have an adverse effect on the following heritage resources shall not conform to the structure plan. A) Listed buildings of architectural and historic interest; B) Designated conservation areas; C) Historic gardens and designed landscapes; and D) Archaeological locations and landscapes. Local Plans shall prepare detailed policies to protect and enhance built heritage resources.
The East Ayrshire Local Plan 2010	
Policy CS12: Renewable Energy Developments General	The Council will positively support and promote the development of sympathetic renewable energy proposals both in stand-alone locations and as integral parts of new and existing developments where it can be demonstrated that there will be no significant, unacceptable adverse impact, including adverse cumulative impact with other renewable energy developments or other renewable energy developments which are consented or under construction on any recognised built heritage resources, including Listed Buildings, Conservation Areas, Scheduled Ancient Monuments, archaeological sites and landscapes and Historic Gardens and Designed Landscapes and their individual settings.

Policy Title	Summary
Policy CS14: Wind Energy Developments	The Council will assess all applications for wind farm developments, including extensions to existing, consented and / or operational wind farms, against the provisions of Policy ECON 7 of the approved Ayrshire Joint Structure Plan: Growing Sustainable Ayrshire and any future supplementary planning guidance to be prepared relating to cumulative impact.
Strategic Policy ENV1	The Council will seek to protect, preserve and enhance all built heritage resources requiring conservation including Listed Buildings and Conservation Areas, together with their respective settings, Historic Gardens and Designed Landscapes, Scheduled Ancient Monuments and Archaeological and Industrial Archaeological Sites and Landscape.
Policy ENV8: Historic Gardens and Designed Landscapes	Development affecting Historic Gardens and Designed Landscapes shall protect, preserve and enhance such places and shall not impact adversely upon their character, upon important views to, from and within them, or upon the site or setting of component features which contribute to their value. In instances where a proposed development affects a Historic Garden or Designed Landscape which is included in the 'Inventory of Historic Gardens and Designed Landscapes in Scotland' a landscape management plan will require to be submitted to the Council for consideration. Applications for planning permission in principle for such developments will not be accepted by the Council.
Policy ENV17	In assessing development proposals relating to land within the rural area which has not been identified as specific development opportunity sites on local plan maps, the Council shall ensure that these have minimum impact on the rural environment. There will be a general presumption against any development which would have significant unacceptable adverse impact or cause irreparable damage to built heritage resources requiring conservation of their settings including listed buildings, conservation areas, historic gardens and designed landscapes, scheduled ancient monuments, archaeological and industrial archaeological site.

Other Policy Considerations

10.3.7 East Ayrshire Council are currently preparing the East Ayrshire Local Development Plan (LDP), which once adopted will replace the current Structure and Local Plans as the statutory Development Plan for East Ayrshire. The East Ayrshire LDP Proposed Plan was published for consultation between March and April 2015. Proposed Plan policies of relevance to this technical assessment are outlined in **Table 10.3**.

Table 10.3 Relevant Proposed Policies within the East Ayrshire LDP Proposed Plan (2015)

Policy Title	Summary
Overarching Policy OP1	This policy requires all development proposals, where relevant, to comply with multiple environmental, design and amenity related criteria, including the protection of natural and built heritage.
Policy RE1 Renewable Energy Developments	This policy sets out the overarching criteria for all renewable energy proposals. This policy states that such proposals will be supported by the Council "*where it can be demonstrated that there will be no unacceptable significant adverse impacts on all of the relevant Renewable Energy Assessment Criteria set out in Schedule 1 of the LDP, that the scale of the proposal and its relationship with the surrounding area are appropriate and that all other relevant LDP policies are met*…". The assessment criteria listed in Schedule 1 to the LDP Proposed Plan relate closely to the development management criteria for renewable energy proposals listed within the SPP at paragraph 169.
Policy RE3: Wind Energy Proposals over 50 Metres in Height	In relation to the proposed spatial framework within the LDP Proposed Plan, this policy states that significant protection will be afforded to Group 2 areas. In these areas, wind energy developments must demonstrate that "*any significant effects on the qualities of these areas can be substantially overcome by siting, design or other mitigation and where the proposal is acceptable in terms of all applicable Renewable Energy criteria set out in Schedule 1*". This policy also provides support for proposed wind energy developments in Group 3 areas "*where it can be demonstrated that they are acceptable in terms of all applicable Renewable Energy Assessment Criteria set out in Schedule 1*".

Policy Title	Summary
Policy ENV2 Scheduled Monuments and Archaeological Resources	This policy states: "*Development that would have an adverse effect on Scheduled Monuments or on their settings shall not be supported unless there are exceptional overriding circumstances*".
Policy ENV4 Gardens and Designed Landscapes	This policy states: "*Gardens and Designed Landscapes included in the National Inventory, and those of regional and local importance, are protected and their enhancement encouraged. Development will not be supported where it will have significant adverse impacts upon (i) its character; (ii) important views to, from and within it and; (iii) important features that contribute to its value and that justify its designation, where applicable*".

10.3.8 Although the Proposed Development is located within the East Ayrshire Council area, the Dumfries and Galloway Development Plan is a valid consideration considering the proximity of the Development Site to its administrative boundary. The Dumfries and Galloway Development Plan comprises the Dumfries & Galloway LDP (adopted 2014) and associated Statutory Supplementary Guidance. Policies within the Dumfries & Galloway LDP of relevance to this technical assessment are Policy HE1: Listed Buildings and Policy HE6: Historic Gardens and Designed Landscapes.

Baseline Establishment

10.3.9 To establish the baseline for the assessment of direct effects, data was collected for both designated and non-designated heritage assets for an area extending to a 500m radius from the Development Site boundary, referred to as the 'study area'. An extended study area of 10km radius from the Development Site boundary was used to collect data on heritage assets of regional or potentially national importance together with designated sites which had the potential to be indirectly affected by the Proposed Development (referred to as the 'extended study area'). For the purpose of this desk-based assessment (DBA), the following sources were consulted:

- National and County-based registers of known archaeological and historical sites;
- Cartographic and historic documents;
- Aerial photographs;
- Historic Landuse Assessment (HLA) mapping;
- Geological mapping;
- Published sources; and
- Internet sources.

10.3.10 These were obtained from the following organisations:

- Royal Commission on the Ancient and Historical Monuments of Scotland (RCAHMS) - National Monuments Record Scotland (NMRS);
- The West of Scotland Archaeology Service (WoSAS) Historic Environment Record (HER), including their Non Statutory Register (NSR);
- Historic Scotland;
- The National Archives of Scotland;
- National Library of Scotland Map Library; and
- The British Geological Survey (BGS).

10.3.11 A site walkover was carried out and site visits were made to selected assets in the extended study area.

10.3.12 The assessment has been carried out in accordance with the principles laid down in the (CIfA) *Standard and Guidance for Historic Environment Desk-Based Assessments* (CIfA 2014b).

Consultation

10.3.13 A scoping report was submitted to ECDU which proposed scoping out the requirement to assess all direct effects on designated assets. Indirect effects on designated heritage assets were also proposed to be scoped out for assets located beyond 5km of the site boundary.

10.3.14 Historic Scotland responded to the scoping report on the 11th January 2013 stating that they considered that the Proposed Development would be unlikely to have any direct effects on designated assets within their remit (scheduled monuments, Category A listed buildings, inventory GDLs and inventory battlefields). With regards to indirect effects, Historic Scotland urged caution with regards to the proposed 5km extended study area and requested that Craigengillan House (LB A 18793), Craigengillan Stable Block (LB A 18794) and the associated Craigengillan GDL were assessed further. For assets outwith their remit they requested further consultation with WoSAS. Due to the passage of time between the scoping report and commencement of assessment, further consultation with Historic Scotland was undertaken on the 25th April 2014 to verify that their scoping response remained valid; which it confirmed was the case.

10.3.15 Informal consultation was undertaken with WoSAS on the 6th of November 2013 with a subsequent formal reply to the scoping report being supplied on the 18th of December 2013. This initial response expressed a concern with regards to direct effects occurring beyond the development footprint through changes to the hydrology of the area, dewatering of peat or vibration. WoSAS were consulted further between 10th-14th April 2014 and a search for sites of potential national importance identified within the WoSAS HER within 10km of the site was requested, with effects on all assets of regional or potential national importance within 5km being assessed. As a result, all assets of potentially regional or national importance including those of potentially-schedulable quality were assessed out to a search area of 10km.

10.3.16 Effects on the setting of heritage assets of potentially national importance located within Dumfries and Galloway were also considered at this stage. Initial appraisal demonstrated that visibility of the Proposed Development from Dumfries and Galloway would be severely restricted by the topography and forestry cover. Combined with the separation of the Proposed Development from any such assets, the potential for any significant adverse effects was considered to be minimal and as such these assets were not considered further.

10.3.17 As a result of consultation with Historic Scotland and WoSAS, the extended study area was extended from 5km to 10km with a preliminary assessment of non-designated heritage assets in conjunction with the use of a Zone of Theoretical Visibility (ZTV) produced as **Figure 9.2** of **Chapter 9, Landscape and Visual Assessment.**

10.3.18 Four assets were identified within this study area for further assessment as shown in **Table 10.4** below. Details of the initial assessment of the potentially nationally important assets are presented in **Appendix 10.B**.

Table 10.4 Assets identified for further assessment through consultation

Reference	Description	Rationale	Location	
			X	Y
Craigengillan GDL	The Craigengillan Inventory Garden and Designed Landscape including Craigengillan House (LB A 18793) and Craigengillan Stable Block (LB A 18794).	On request from Historic Scotland	246391	604198
Dumfries House GDL	Dumfries House Garden and Designed Landscape.	Comments from Historic Scotland with regards to the 5km search area.	254413	620411

Reference	Description	Rationale	Location	
			X	Y
Beoch Cairn (HER 7989)	The remains of this prominent kerbed cairn measuring 11.0m in diameter and 0.5m maximum height are situated in moorland.	Proximity to site and WoSAS comments that although previously excavated and disturbed by forestry ploughing, any surviving elements may be of schedulable quality.	252225	608495
Fardenreoch Cairn (HER 8018)	A heavily robbed, entirely turf covered burial cairn situated on a low rise above an unnamed stream, it measures 17.0m in diameter and, where best preserved around the N and E, survives to a height of 0.8m.	Potential visibility of turbines and WoSAS comments that this asset is almost certainly of national importance.	256075	614640

Methodology for Establishment of Effects

Desk-based Assessment

10.3.19 In order to gauge the potential for the Proposed Development to affect the historic environment, a DBA, which is presented in this chapter and supporting appendices, has been undertaken in accordance with the principles laid down in the CIfA *Standard and Guidance for Historic Environment Desk-Based Assessments* (CIfA 2014b).

10.3.20 In completing a DBA of the effects of any development on cultural heritage it is important to identify the known and potential nature of assets that may be involved. This requires consideration of a number of factors as follows:

- Development can affect heritage assets not only through direct impacts (e.g. land take) but also indirect impacts, such as harm to the setting of heritage assets;
- DBA involves a review of current information only and there may be further features within the application area that are not yet known. The potential for this may be assessed from ground conditions, features within the wider area and a history of land use within the area of proposed development; and
- Not all heritage assets are considered of equal importance and it is important to identify the significance of these assets with reference to legislation, policy guidance and professional judgement.

Direct Effects

10.3.21 In order to understand the significance of direct effects, the baseline will establish the presence of any features that are known to be, or could potentially be, within the area that will be disturbed by the Proposed Development. Comparison of the distribution of known and potential archaeological features with the proposed site layout allows the potential extent and nature of any direct disturbance to be characterised.

10.3.22 In some cases further evaluative work may also be undertaken in order to test the understanding of the archaeological potential of the site or to answer questions posed by the DBA. This may include methods such as geophysical survey or trial trenching.

Indirect Effects

10.3.23 The methodology adopted for the assessment of effects on setting follows the approach set out in Historic Scotland (2010) *Managing Change in the Historic Environment: Setting*. This assessment follows Historic Scotland's (2010) definition of setting as a perceptual and experiential relationship between the asset and the specific values which contribute to the importance of that asset.

10.3.24 The potential for change to the setting of heritage assets is most likely to occur as a result of intervisibility or direct views between an asset and a proposed development. Change to views of an asset from a third viewpoint, even where there is no direct intervisibility between a proposed development and an asset, may also be relevant. In addition to purely visual considerations, other effects of wind turbines, such as noise or the movement of turbines, may also have an effect on the setting of an asset, although this is normally more relevant to assets in close proximity to turbines.

10.3.25 Change to the setting of a heritage asset may be positive and enhance the setting of the asset, may be neutral or it may be harmful, depending on the qualities of the setting of a given asset and how these contribute to the importance of the asset. These effects should be understood in terms of the relationship of the asset with its current setting rather than any conjectured sense of historic setting, although the extent to which the current setting of the asset reflects a perceived original or designed setting may be considered (Historic Scotland 2010).

10.3.26 Historic Scotland (2010) sets out a range of factors which might form part of the setting of an historic structure. These include the:

- Current landscape or townscape context;
- Visual envelope, incorporating views to, from and across the historic structure;
- Key vistas, framed by rows of trees, buildings or natural features that give a structure a context, whether or not intentional;
- The historic structure's prominence in views throughout the surrounding area;
- Character of the surrounding landscape;
- General and specific views including foregrounds and backdrops;
- Relationships between both built and natural features;
- Aesthetic qualities;
- Other non-visual factors such as historical, artistic, literary, linguistic, or scenic associations, intellectual relationships (e.g. to a theory, plan or design), or sensory factors; and
- Sense of Place: the overall effect formed by the above factors.

10.3.27 Issues of general visual and residential amenity are dealt with where considered relevant by the Landscape and Visual Impact Assessment (LVIA) at **Chapter 9**.

10.3.28 Factors which may qualify harm to the setting of a heritage asset include:

- The scale of the proposed development, its layout and appearance;
- The extent, scale and/or prominence of the asset in relation to the development;
- The distance between the development and a given asset; and
- The presence of any intervening buildings, vegetation or local topography, which may affect the visibility and prominence of the development from an asset.

Significance Evaluation Methodology

10.3.29 The assessment of significance of any effect is a product of the importance of an asset, as informed by legislation and policy, and the magnitude of the impact on it, qualified by professional judgement.

10.3.30 The policy importance of assets discussed in this section has been assessed using professional judgement with reference to defined categories which are summarised at **Table 10.5**.

Table 10.5 Categorisation of Importance

Importance	Rationale
National and International	World heritage sites are designated on the basis of 'Outstanding Universal Value' and would normally be considered of international importance. By legal definition, scheduled monuments are considered as being of national importance. As the process of scheduling is ongoing and as scheduling is a representative designation, there are further assets which are not scheduled but which may be of equivalent importance. Category A listed buildings are described by SHEP as of national or international importance. Sites recorded in the inventories of historic battlefields and gardens and designed landscapes are, by legal definition, of national importance. Conservation areas rated by Historic Scotland as of outstanding quality (where such appraisals have been made) could be considered as being of national importance.
Regional	These include archaeological sites which do not merit scheduling but which are nevertheless of interest or which could make a substantial contribution to established regional research agendas. SHEP describes category B listed buildings as of regional or more than local importance. The principles of selection for designation of Conservation areas do not explicitly include valuations of national, regional or local importance, although most examples would be of importance on a regional level.
Local	SHEP describes buildings listed at Category C as of local importance and lesser examples of any period, style or building type. The majority of non-designated assets would normally be considered of local importance.
Lesser	These include includes those features which are no longer extant, where there are no further known or surviving remains (e.g. locations of previous archaeological work), or where assets may have minimal importance, such as modern quarries.

10.3.31 Categorisation of the relative importance of those assets which are of less than national importance relies on professional judgement.

10.3.32 Effects on receptors are assigned to one of four classes of magnitude, defined in **Table 10.6**.

Table 10.6 Definition of Magnitude

Magnitude	Definition
High	Total or substantial change to an asset or complete alteration of the characteristics of an asset's setting.
Medium	Partial alteration of an asset. Substantial change to the key characteristics of an asset's setting, or a more total alteration which is temporary and/or reversible.
Low	Minor alteration of an asset. Changes to a setting which do not affect the key characteristics, or which is short term and/or reversible.
Negligible	Minor alteration of an asset. Minor and short term or very minor and reversible changes to its setting which do not affect the key characteristics.

10.3.33 As noted above, the assessment of magnitude of an effect in Environmental Impact Assessment (EIA) terms largely relies on professional judgement in the light of relevant legislation and policy rather than any scoring of criteria. With respect to potential effects on the setting of designated assets, the magnitude of an effect reflects the extent to which the contribution of the setting to the importance of the asset will be altered.

10.3.34 Effects are considered to be significant or not significant according to the matrix below (**Table 10.7**). However, this matrix is used as a guide only and the assessment of the significance of an

effect on a heritage asset or its setting is dependent on the exercise of professional judgement, as previously noted under 'indirect effects', above.

Table 10.7 Matrix of Significance

	Policy Importance		
Magnitude	**National**	**Regional**	**Local or Lesser**
High	Significant	Significant	Not Significant
Medium	Significant	Not significant	Not significant
Low	Not significant	Not significant	Not significant
Negligible	Not significant	Not significant	Not significant

10.4 Baseline Information

Current Baseline

Site Description and Geology

10.4.1 The Development Site is comprised of moorland and rough grazing and is bordered to the south and west by commercial forestry with further rough grazing to the east and small areas of rectilinear fields to the north. The area forms part of the Southern Uplands Group as identified within the Ayrshire Landscape Assessment (Land Use Consultants 1998), characterised by steep, smooth slopes which rise to rounded summits.

10.4.2 The underlying solid geology within the site is predominantly formed by the Leadhills Supergroup consisting of wacke and mudstone sedimentary bedrocks with the areas of Carrick Volcanic Formation basalt and basaltic andesite present to the west and Marchburn Formation wacke sedimentary bedrock in the east. This solid geology is overlain by peat within the south and Devensian till to the north (BGS 1:50,000 mapping).

Existing Cultural Heritage Baseline

10.4.3 Assets referred to in this section are shown on **Figures 10.1** and **10.2** and are listed in **Appendix 10.A**.

Designated Assets

10.4.4 There are no World Heritage Sites within the extended study area.

10.4.5 There are no scheduled monuments located within the Development Site boundary, with a total of nine within the extended study area, the closest of which is The King's Cairn (SM 1046), located *c.* 5km south of the site boundary.

10.4.6 There are 84 listed buildings within the extended (10km) study area, none of which are within the (500m) study area. These comprise a mixture of urban residential, industrial and ecclesiastical buildings together with transport structures and occasional isolated houses and farmsteads. The closest is the Category C listed Mossmark of Oldmill (LB C 14249) which consists of a courtyard type farm with associated mill buildings to the rear. This is located on the southern fringe of New Cumnock in close proximity to four further listed buildings, *c.* 2.5km from the study area.

10.4.7 Two inventory garden and designed landscapes are located on the outer extremities of the extended study area, with Craigengillan GDL covering an area between 7km and 11.5km to the west of the study area and Dumfries House GDL located between 8.5km and 11km to the north.

10.4.8 There are three conservation areas in the wider study area, the closest of which is Dalmellington, located over 6.5km west of the Development Site.

10.4.9 There are no designated historic battlefields within the extended study area.

Other Recorded Features

10.4.10 WoSAS Historic Environment Record (HER) identified 18 recorded heritage assets within the study area, seven of which are within the Development Site. Their non-statutory register (NSR) which identifies sites of potential national or national importance, identified a further 13 heritage assets within the extended study area, predominantly consisting of cairns and castles.

Other Sources

Historic mapping

10.4.11 The general area around the Development Site is shown on county mapping of Kirkcudbrightshire dating back to Pont's Atlas of the later-16th century, though the first map to show the Development Site in any detail is Roy's military map of 1747-55. The Development Site is shown as undulating moorland with a lead mine within its north-western extent and settlements, including *Dalaglas* (DBA9, DBA13 and DBA15), along its northern boundary. Subsequent pre-Ordnance Survey mapping shows no further change within the Development Site with the exception of Armstrong's new map of Ayrshire of 1775 which annotates multiple lead mines in the same vicinity as the original one.

10.4.12 The first edition Ordnance Survey (OS) mapping (6"-1 mile: 1853-60) is the first record of the post-improvement landscape. The Development Site itself apparently remained predominantly uncultivated moorland at this time. There are further small scale settlements are shown along the northern boundary with the addition of sheepfolds and further mining features such as air shafts spread across the northern half of the study area (HER 47354, DBA1, DBA5, DBA8, DBA10, DBA14, DBA21, DBA23, DBA26 and DBA27). This stage of development largely reflects what is seen within the study area today. The biggest distinction between first edition OS mapping and present day, however, is the presence of New Cumnock Iron Works with its associated railways, coal pits and other associated structures (DBA22 and DBA35), which are shown to the north-east of the Development Site.

10.4.13 This area of development within the north-eastern part of the study area is added to further by the time of the second edition OS mapping (25"-1 mile 1898) by Afton No. 1 Colliery (HER 22044) and further workers cottages at Burnfoot Row with an associated football pitch (DBA24). These structures and industries are no longer present, although later 20th-century additions to the housing are still present at Burnside. The original industries and structures are still visible on OS mapping of 1957.

Aerial Photography

10.4.14 Aerial photography held by the RCAHMS, ranging in date from 1948 to 1988, was inspected. Many were small scale and none provided evidence of further assets within the Development Site.

10.4.15 One further additional asset, a circular enclosure (DBA39), was noted from modern aerial photography used by UK Grid Reference Finder (http://gridreferencefinder.com).

Site Walkover

10.4.16 The site walkover was conducted on 4th June 2014 by two Amec Foster Wheeler Archaeologists. Previously identified archaeological features including those identified through the desk-based research as well as those identified by the WoSAS HER, within the development area were visited to confirm ground conditions. The locations of known features and those identified within the walkover were recorded using a hand-held GPS with an accuracy of ±5m.

10.4.17 In general, the vegetation was primarily moorland with some patches of much boggier ground and tussocky grass. Some rocky outcrops were observed. The site is divided up by streams and burns running within incised channels which display tills of varying depths in the exposed sections.

10.4.18 Few identifiable archaeological remains were observed. These related primarily to previously recorded assets (HER 47363, DBA12, DBA27 and DBA32). Three further possible archaeological features were observed consisting of a sheepfold with associated boundary wall (DBA36), a cairn that appeared to have been built upon a natural outcrop of rock (DBA38), and as such has been interpreted as a more recent clearance cairn, and a circular enclosure formed by drainage ditches (DBA39). The features identified through the site walkover are of local or lesser importance.

Site Chronology

Prehistoric Periods

10.4.19 There is no recorded evidence of prehistoric activity within the study area.

10.4.20 Within the extended study area, evidence of prehistoric activity is largely provided by a number of cairns, including two scheduled monuments (SM 1034 and 1046), and six NSR assets (NSR 7162, 7173, 7175, 7989, 7994 and 8018). The King's Cairn (SM 1046), having already been robbed out down to the chamber levels in antiquity, the excavation did not produce any artefactual remains (Curle 1930) although it has been identified as an example of the Bargrennan-type of early Bronze Age cairns (Henshall 1972, Cummings and Fowler 2007).

10.4.21 Of the NSR cairns, four are identified as being almost certainly of national importance (NSR 7162, 7173, 7994 and 8018) and two considered to be of probable national importance (NSR 7175 and 7989), all have undergone previous disturbance. Beoch cairn (NSR 7989) was visited during the site walkover. No clearly identifiable remains were visible other than a small depression, possibly the result of previous investigations, located on the north-east fringe of the forestry.

10.4.22 Further assets that have been attributed to this period consist of a possible ploughed-out barrow at Doon Bridge (NSR 7113) and possible crannog settlement known as Elizabeth Isle (NSR 7115).

Medieval Period

10.4.23 There are no medieval assets recorded within the study area.

10.4.24 A number of castles and associated features originating from the medieval period are seen within the extended study area including Dalmellington Motte (SM 3009), Kyle Castel (SM 3311), Auchencloigh Castle (SM 5393), Laight Castle (SM 7690), Dame Helen's Castle (NSR 7132) and Terringzean Castle (LB B 14423) which is within the Dumfries House GDL. These are accompanied by a medieval farmstead and field system at Dalnean Hill (SM 4390). The closest assets of this period are found in Dalmellington, *c.* 7km to the west of the study area.

Post Medieval and Industrial Period

10.4.25 The post medieval occupation of the study area appears to be primarily related to agricultural and pastoral activity as would be expected as a result of the improvement period. Elements of this land use are still present within the north of the study area as demonstrated by a series of boundary banks (HER 7988 and HER 8022). This is further evidenced within the Old Statistical Account (OSA) 1791-99 which describes a parish of a purely agricultural nature.

10.4.26 Within the study area and the extended study area, the late-18th and early-19th centuries saw significant change, which can be characterised as:

- Abandonment of earlier forms of subsistence farming based on transhumant pasturage and intensification of agricultural and pastoral activity;
- Consolidation and engrossment of landed estates; and
- Introduction of new industrial activities.

10.4.27 The changes are further evidenced in the New Statistical Account (NSA) 1834-45 which describes the drainage and reclamation of land within this region and describes the coal seams that were then known within the area together with their mining. The clearest evidence of the expansion in industry at this time however is most clearly evidenced through early OS mapping as discussed in paragraphs 10.4.11 - 10.4.13 above.

Modern Period

10.4.28 Within the study area, changes to land use have been very small and localised with the main differences being a reversion to former agricultural land use and the disappearance of industrial features such as the colliery railway (DBA35) and associated housing (DBA24). Within the extended study area, land use has remained remarkably consistent, with any changes occurring around settlements and quarry sites or as localised activity. The planting of commercial forestry around the Development Site represents the most significant land use change within the extended study area since the publication of the first edition Ordnance Survey mapping in the 1860s.

Predicted Future Baseline

10.4.29 In the absence of the Proposed Development within the site, any change to the baseline can be expected to be minimal. Within the study area and extended study area, the principal change will be the cyclical maturing, felling and restocking of forestry plantation, resulting in views being periodically opened up and obscured. Small piecemeal expansions of quarries within the area may also be expected.

Information Gaps

10.4.30 No intrusive archaeological surveys or geophysical surveys have been undertaken, and as a result, conclusions on the potential presence of archaeological features within the site have not been fully tested.

10.5 Design Evolution

10.5.1 In terms of responding to features of the historic environment, design evolution has been minimal as the original site selection process described in **Chapter 3** purposely took account of such potential constraints.

10.5.2 Subsequent phases of baseline study and assessment confirmed that the importance of the assets contained within the Development Site, particularly the scarcity of heritage assets within the proposed turbine array meant that any direct effects on known assets within the Development Site would be avoided or minimised.

10.6 Scope of Assessment

Potential Receptors

Direct Effects

10.6.1 Direct effects may arise on known and previously unrecorded heritage assets within the Development Site as a result of disturbance arising from intrusive ground works, such as the construction of turbine bases, new access tracks and other site infrastructure. Consequently, only heritage assets within the Development Site have the potential to be directly affected by the Proposed Development. The greater part of the land within the Development Site will not be directly affected by the Proposed Development as direct effects will be restricted to the footprint of the proposed wind farm infrastructure and related working areas during construction.

10.6.2 There are only three previously recorded heritage asset within the Development Site, comprised of the Crocradie Burn Sheepfold (HER 47363), and the Peat Hill boundary banks (HER 7988 and 8022). The sheepfold was depicted on the first edition 6-inch Ordnance Survey mapping as two

unroofed structures, one of which had two compartments, and an attached enclosure, this asset is located on the south-eastern bank of the Crocadie Burn and not within an area of development. The boundary banks, located within the northwest of the Development Site, are assets of local importance at best and consist of ditchless banks that represent an old land boundary.

10.6.3 The site walkover identified a further four potential heritage assets within the Development Site: two sheepfolds (DBA12 and DBA34); a cairn of probable modern date (DBA38); and a possible enclosure defined by drainage channels (DBA39).

10.6.4 As with many development proposal, there is a potential for previously unrecorded heritage assets to be affected by the Proposed Development. Other than the agricultural features noted above, existing documentary and archaeological evidence does not suggest the presence of any specific archaeological heritage assets within the developable area. However, the general lack of such evidence may derive from an absence of observational/unearthed evidence rather than necessarily meaning the absence of archaeological features. It is worth noting that the northern half of the study area is dominated by assets of modern date associated with the nearby colliery and this does raise the potential for associated features such as air shafts occurring within the developable area.

10.6.5 Localised areas of peat and blanket bog are present on the Development Site. These deposits have the potential to provide information about the past environment (palaeoecology) and climate that can help to set pre-improvement heritage assets into context. These deposits can also offer favourable conditions for the survival of archaeological material.

10.6.6 Effects on these deposits can be expected to arise from physical removal or disturbance by intrusive works, particularly deeper excavations around turbine bases or by dewatering as a result of change to drainage.

10.6.7 The intrusive elements of the Proposed Development, namely turbine foundations, crane pads, new access tracks, the temporary construction compound and control building compound would be expected to remove any heritage assets that may be present in the directly affected areas. Expected archaeological conditions at each work location are set out in **Table 10.8**.

Table 10.8 Expected Archaeological Conditions at Turbine and Infrastructure Locations

Location	Archaeological Potential	Rationale
T1	Low	No identified heritage assets within 250m of turbine.
T2	Medium	No identified heritage assets within 250m of turbine, though it is located in area of 1.5-2m-deep peat.
T3	Medium	No identified heritage assets within 250m of turbine, though it is located on the edge of an area of up to 0.5m-deep peat.
T4	Medium	No identified heritage assets within 250m of turbine, though it is located in area of 0.5-1m-deep peat.
T5	Low	No identified heritage assets within 250m of turbine.
T6	Medium	Turbine is within 105m of a cairn of probable modern date and located on the edge of an area of up to 0.5m-deep peat. It is unlikely that features associated with the cairn are present at turbine location.
T7	Medium	No identified heritage assets within 250m of turbine but turbine is located in area of 0.5-1m-deep peat.
T8	Medium	No identified heritage assets within 250m of turbine, though it is located in area of 0.5-1m-deep peat.
T9	Low	No identified heritage assets within 250m of turbine.
T10	Low	No identified heritage assets within 250m of turbine.
T11	Low	No identified heritage assets within 250m of turbine.
T12	Medium	No identified heritage assets within 250m of turbine, though it is located in area of up to 0.5m-deep peat.
T13	Medium	No identified heritage assets within 250m of turbine, though it is located in area of up to 0.5m-deep peat.
T14	Low	No identified heritage assets within 250m of turbine.
T15	Medium	No identified heritage assets within 250m of turbine, though it is located in area of up to 0.5m-deep peat.
T16	Low	No identified heritage assets within 250m of turbine.
T17	Medium	No identified heritage assets within 250m of turbine, though it is located in area of 1.5-2m-deep peat.
T18	Low	No identified heritage assets within 250m of turbine.
T19	Medium	No identified heritage assets within 250m of turbine, though it is located in area of 2-3m-deep peat.
Permanent Meteorological Mast North	Medium	No identified heritage assets within 250m of turbine, though it is located on the edge of an area of 0.5-1m deep peat.
Permanent Meteorological Mast South	Low	No identified heritage assets within 250m of turbine.
Temporary Construction Compound	Medium	Small localised areas of deep peat have been identified within the footprint of this compound.

Location	Archaeological Potential	Rationale
SPEN and EON Substation Compound	Medium	Small localised areas of deep peat have been identified within the footprint of this compound.
Access Track to Temporary Construction Compound	High	The Peat Hill boundary bank (HER7988) runs through this area. Deep peat has also been identified within the area.
Access Track to Borrow Pit Search Area SE	Medium	A historic sheepfold (DBA12) is located 160m to the east of the end of this track but is separated from the track by the Littlechang Burn. Small localised areas of deep peat have also been identified within the area.
Access Track between Turbine 6 and Turbine 9	Medium	This track runs 60m from a modern cairn (DBA37). The track also passes across an area of deep peat.
Access Tracks between Turbines 9-11 and 9-12.	Low	No identified heritage assets within 250m of tracks and no deep peat identified.
All other access tracks	Medium	Areas of deep peat have been identified along parts of the remaining access tracks.
Borrow Pit Search Area North	High	The Peat Hill boundary bank (HER7988) runs through this area. Small localised areas of deep peat have also been identified within the area.
Borrow Pit Search Area North SE	Medium	Historic sheepfolds (DBA12 and HER47363) are located within 250m of the search area, these assets are closely linked to the Crocadie/Littlechang Burn that passes to the east. Small localised areas of deep peat have also been identified within the area.
Borrow Pit Search Area North SW	Medium	No identified heritage assets within 250m of turbine but deep peat has been identified within the area.
All watercourse crossings	Low	No identified heritage assets within 250m of locations.

High – presence of heritage assets at or adjacent to work location confirmed.
Medium – presence of heritage assets at or adjacent to work location likely (or possible where deep peat is present).
Low – no evidence of specific heritage assets at or close to work location.
Negligible – heritage assets are demonstrably absent.

Indirect Effects

10.6.8 Indirect effects during the operational phase of the Proposed Development may arise as a result of change to the settings of heritage assets. These effects can be expected to be primarily visual, although non-visual aspects of the operation of the proposed wind farm may also contribute to experiential change of the heritage assets setting.

10.6.9 An assessment has been undertaken of the potential for effects on the setting of those heritage assets identified through consultation with Historic Scotland and WoSAS as discussed in **Section 10.3** and identified within **Table 10.4**. Full lists of designated and potentially regionally or nationally important non-designated assets considered as a result of consultation are presented in **Appendix 10.A**, which includes receptors within the extended (10km) study area. **Appendix 10.B** provides the initial assessment of all assets of potentially regional or national importance within the extended study area. These heritage assets have been reviewed with reference to the historic landscape character of the area and the ZTV.

10.6.10 The following section describes in more detail the baseline setting characteristics of the identified heritage assets and the extent to which significance is influenced by these characteristics. **Tables**

10.9 to 10.12 provide the relevant data, which supports the further description of each individual asset setting.

10.6.11 The results of the initial appraisal and scoping consultation identified the following assets to be taken forward for further assessment:

- Craigengillan Inventory Garden and Designed Landscape and associated listed buildings and designated heritage assets;
- Dumfries House Garden and Designed Landscape and associated listed buildings;
- Beoch Cairn, included within the WoSAS NSR; and
- Fardenreoch Cairn, included within the WoSAS NSR.

10.6.12 This represents Stage 1 of the assessment process set out in Historic Scotland (2010).

Table 10.9 Craigengillan Inventory Garden and Designed Landscape, Craigengillan House (LB A 18793) and Craigengillan Stable Block (LB A 18794): Analysis of key aspects of setting (Stage 2: Historic Scotland 2010)

Location Factors	
Topography	Located within a valley created by the River Doon and including Auchenroy Hill to the west. The site is surrounded by a wider southern upland landscape.
Screening	The House and Stable Block within the wider designated designed landscape are heavily screened to the north, west and south by surrounding Craighead Wood. The wider designation is further screened from the east by the Bogton Plantations and the west by forestry plantation. The natural valley also provides a degree of screening from these outlying directions.
Landscape context	Designed landscape dating from the latter half of the 18th century which incorporates listed buildings, formal gardens, glens, woodland and lochs together with numerous non-designated historic buildings and a scheduled monument. The surrounding areas consist of forestry planting, moorland and rough grazing and urban areas on its eastern edge.
Other	Asset contains designed walking routes and a number of tourist attractions.
Type/Scale/ Massing/ Prominence	
Proximity	7.7km from T16
Prominence	Boundaries of the inventory garden and designed landscape are visually indiscernible from surrounding areas. The House and Stable block are visible in long views from the east on the Loch Doon Galloway Forest Drive.
Scale	Designed landscape occupying *c.* 1,162ha.
Non-visible characteristics	Possible associations with prehistoric funerary practices through presence of prehistoric funerary features. Direct associations with the McAdam family and subsequent associations with Robert Burns and improvement period agricultural practices. Associations with interior designers Maison Jenson, and landscape designers James Pulham and Sons.
Design Factors	
Formal design values	In addition to the design value of individual elements such as the listed buildings, Pulhamite garden and the Ladies Walk through Ness Glen, design value also resides in individual elements contributing to a coherent overall scheme.
Fortuitous aesthetic values	A strong sense of continuity and inclusion with natural and archaeological features within the wider landscape being built into the design of the estate.
Visual harmony or congruity	Assets are entirely congruous with the wider historic development and social context of the area around the parkland and reflect important developments in those contexts.

Accessibility	
Public appreciation/ access	The estate core is not generally accessible to the public, though it is crossed by established and well-used paths and elements of the GDL are used for businesses, events and activities.

Table 10.10 Dumfries House Inventory Garden and Designed Landscape: Analysis of key aspects of setting (Stage 2: Historic Scotland 2010)

Location Factors	
Topography	This garden and designed landscape and its associated assets are located within the broad Lugar Valley along the banks of the Lugar Water and the north and south facing slopes of that rise from this.
Screening	The landscape itself is not distinct from the surrounding landscape to the north, south and east and many elements are only visible in smaller discrete contexts.
Landscape context	Designed landscape with elements dating back to before Roy's military map of 1750. The estate incorporates listed buildings, watercourse, parkland woodland and gardens and, due to its size and layout, the landscape makes a significant contribution to the surrounding area.
Other	Open access to the public.
Type/Scale/ Massing/ Prominence	
Proximity	11.1km from T16
Prominence	Boundaries of the inventory garden and designed landscape are not readily discernible but the general location is identifiable through the higher quantity of woodland contained within the boundary. The main house is not visible from outside of the estate whilst other assets are clearly visible in passing views from the A70 and A76.
Scale	Designed landscape occupying *c.* 535ha.
Non-visible characteristics	Associations with the Earls of Dumfries, the architects John, Robert and James Adam and more recently linked to the Prince of Wales.
Design Factors	
Formal design values	In addition to the design value of individual elements such as the listed buildings, gardens and walks, design value also resides in individual elements contributing to a coherent overall scheme. This is an historically designed landscape.
Fortuitous aesthetic values	Sense of rural isolation resulting from the broad valley location and screening from woodland within the estate.
Visual harmony or congruity	Asset is compatible with its surroundings, largely due to the estate itself providing a significant contribution to the wider landscape. External elements of modern occupation and industry appear less congruous than the more rural aspects of the landscape.
Accessibility	
Public appreciation/ access	General admittance to the estate is free to the public with car parking provided. Guided tours are also available.

Table 10.11 Beoch Cairn (HER 7989): Analysis of key aspects of setting (Stage 2: Historic Scotland 2010)

Location Factors	
Topography	The cairn is located within a shallow valley on the periphery of forestry planting with outlying moorland close to the B741 carriageway.
Screening	Asset was not readily discernible upon inspection, this may be the result of overlying peat formation and the forestry encroaching into the moorland. The location is heavily screened in all directions by the surrounding forestry.
Landscape context	On the periphery of forestry planting. Small areas of moorland survive along the edges of the B741 carriageway which passes close by the assets location to the north.
Other	
Proximity	3km from T16
Prominence	Difficult to discern even in close views due to overlying moorland vegetation and forestry planting.
Scale	Recorded as a prominent kerbed cairn but not visible upon site visit.
Non-visible characteristics	Associations with prehistoric funerary practices. Previously excavated in 1937 revealing at least 3 cists.
Design Factors	
Formal design values	Design values reside in form and possibly siting of monuments. Present understanding and perceptibility of these values is poor.
Fortuitous aesthetic values	Sense of dislocation resulting from location within forestry surroundings.
Visual harmony or congruity	Monument is characteristic of the region but commercial forestry plantation is visually incongruous with the asset.
Public appreciation/ access	Beoch Cairn is not promoted and not readily accessible at the present time due to forestation.

Table 10.12 Fardenreoch Cairn (HER 8018): Analysis of key aspects of setting (Stage 2: Historic Scotland 2010)

Location Factors	
Topography	This cairn is situated on the western bank of a minor steam on a low rise within the surrounding rough grazing. The land slopes upwards to the west of the asset.
Screening	Asset is within open moorland with screening provided in longer views by forestry located 0.5km to the west and modern quarrying earthworks 0.4km to the south.
Landscape context	Within an area of rough grazing on the bank of a minor stream. Agricultural features including dykes and sheepfolds are within close proximity to the asset.
Other	
Proximity	6.5km from T16
Prominence	This location was not accessible for inspection at the time of the site visit, however, a survey carried out in 2011 (Mudie 2011) explains that the outline of a cairn some 16-17m in diameter can be made out on the ground, defined by slight turf mounds, and a slight arc of bank around the southwest arc.
Scale	Although this asset is of a reasonable size (17m in diameter) and does have visible earthwork remains, the quantity of disturbance to the cairn does diminish the sense of scale.
Non-visible characteristics	

Design Factors	
Formal design values	Design values reside in form and possibly siting of monuments. Present understanding of these values is poor.
Fortuitous aesthetic values	Sense of dislocation through the presence of modern forestry plantation to the west, quarrying to the south and the remains of more recent agricultural features in the surrounding area.
Visual harmony or congruity	Monument is characteristic of the region and does blend into the immediate surrounding rough grazing. The more modern landscape in the wider area is however incongruous with the asset.
Public appreciation/ access	Fardenreoch Cairn is not promoted and not readily accessible at the present time.

10.7 Predicted Effects: Construction

Direct Effects on known heritage assets

Previously recorded heritage assets

10.7.1 Heritage assets have been recorded close to or on the sites of some intrusive elements of the scheme design.

10.7.2 The only heritage asset which will necessarily be disturbed is the southern section of the Peat Hill boundary banks (HER7988). This asset is of local importance, primarily as an element of the historic landscape and has relatively little value for informing study of the past.

10.7.3 This will be crossed by the access track as it enters the Development Site and close to the location of the temporary construction compound. The bank is also largely contained within a borrow pit search area. The effect of the intrusion caused by the access track would be to remove a short length of the bank. The borrow pit(s) to be excavated within the search area have the potential to remove more of this asset, but it is expected that this would at worst remove a further short section of the asset. Any damage can be mitigated through photographic recording of the boundary prior to the development and monitoring of intrusive works where the boundary is removed. At worst (as all borrow pit search areas may not contain suitable material), there is the potential for the borrow pit(s) to cause a medium magnitude of change which will not give rise to a significant adverse effect.

10.7.4 Turbine 6 and the associated access track leading to Turbine 9 are close (*c.* 60m at closest point) to a modern cairn (DBA37). This is of lesser importance as a historic landscape feature and for potentially informing an understanding of the past. The separation is likely to be sufficient that the identified asset will not be affected unless micro-siting should occur within the area reducing the separation, in which case any disturbance could be mitigated through photographic recording or archaeological monitoring of construction works. Due to the modern appearance of this asset, it is not expected to have further associated as yet unrecorded below surface remains within this area. Any effects that were to occur, even at a high magnitude, will not give rise to a significant adverse effect.

10.7.5 The presence of peats and blanket bog on the site indicates the potential for survival of deposits of palaeoecological interest. In this case, these assets will comprise soils where plant and insect (macrofossil) and pollen (microfossil) remains are preserved in waterlogged contexts which can be securely dated through scientific dating techniques. Such deposits are important for understanding past environments and allowing anthropogenic features to be set in an environmental context on a regional scale. Disturbance is likely to be confined to very small proportions of much more extensive deposits and will therefore present a change of negligible to low magnitude and unlikely to give rise to a significant adverse effect.

Direct Effects on previously unrecorded heritage assets

10.7.6 With the exception of the access track leading to the temporary construction compound, any disturbance to occur through the Proposed Development is contained within the southern half of

the Development Site. The assets contained within this area consist of sheepfolds, modern cairns and a possible enclosure, which are not suggestive of the presence of further archaeological features. The burns that run through the site do provide a higher concentration of assets with the intermediate areas having less potential for as yet unknown archaeological remains.

10.7.7 Visibility and preservation of archaeological features is generally good within the Development Site as a result of the absence of intensive cultivation and archaeological features may be concealed by peat and bog deposits or obscured by the tussocky grasses.

10.7.8 In this case, the heritage assets recorded within the Development Site are not suggestive of the presence of extensive archaeological remains, and away from identified assets, it is unlikely that such features will be present except as isolated survivals. In the existence of an agreed mitigation strategy which will allow for the identification, recording and where appropriate, avoidance of previously unrecorded heritage assets, any harm to such assets is likely to be of a negligible or low magnitude and unlikely to give rise to a significant adverse effect.

10.8 Predicted Effects: Operation

Craigengillan Designated GDL, Craigengillan House (LB A 18793) and Craigengillan Stable Block (LB A 18794)

Importance of Asset

10.8.1 Craigengillan is an inventory garden and designed landscape that contains several further designated assets. There are two category A listed buildings, Craigengillan House (LB A 18793) and the associated stable block (LB A 18794), three category B listed buildings, the lodge at the entrance to Craigengillan (LB B 1086), an adjacent bridge (LB B 1087) and the Linn River Bridge (LB B 1088), together with the category C listed Dalcairney Bridge (LB C 49506). The remains of a medieval or later farmstead and field at Dalnean Hill are also located within the designed landscape and are designated as a scheduled monument (SM 4390).

10.8.2 The inventory listing for Craigengillan GDL states that the asset is important for its outstanding value of historical, arboricultural, architectural and archaeological interest as well as having outstanding value for its scenic properties and as a work of art. As a result the inventory garden and designed landscape and the assets within it have been considered as a coherent group of assets of national importance for the purposes of this assessment.

10.8.3 A number of these identified values of the asset group have the potential to be harmed through change to the setting of the asset group, most notably the scenic importance and value as a work of art of the designed landscape.

10.8.4 Aspects of the designed landscape which contribute to a scenic value rated by Historic Scotland within the inventory description as Outstanding are:

- Contribution to the villages of Bellbank and Dalmellington;
- Composition and integrity of the designed landscape;
- Contribution to the approach to Loch Doon; and
- Enrichment of local landscape which has been affected by industrial uses.

10.8.5 Contributing factors to the work of art value (rated by Historic Scotland as Outstanding) which relate to the setting of the asset are:

- The blending of the designed landscape into the wider landscape; and
- The picturesque qualities of the overall composition.

10.8.6 Contributing factors to the architectural value (rated by Historic Scotland as Outstanding) of the asset are:

- The Category A listed 18th century house and stable block; and
- Home Farm, the Gatehouse and several garden buildings and structures including the unique form of drystone wall.

10.8.7 Contributing factors to the archaeological value (rated by Historic Scotland as Outstanding) of the asset are:

- The scheduled monument of Dalnean Hill; and
- Further designated and non-designated assets contained within the garden and designed landscape.

Present Setting

10.8.8 Craigengillan GDL is located close to the western boundary of East Ayrshire and occupies an irregular area covering 1,162ha. The site is bounded by a mixture of urban settlement at Dalmellington and Bellsbank to the east, forestry planting to the east and west, and open moorland to the north and south. The wider landscape is largely agricultural but contains elements that are the result of the 19th and 20th century coal and quarrying industry, most notably large opencast quarry pits.

10.8.9 While there are no identifiable designed views towards specific distant structures or landmarks, the surrounding hills serve to place the designed landscape into a regional context and sequential views from different points along routes through the designed landscape, while fortuitously created, have been exploited to contribute to the overall effect of the designed scheme. There are few clear views into the designed landscape, reinforcing the sense of privacy and seclusion; the most important views being glimpsed views of the house and estate centre from the Loch Doon Road between Bellsbank Plantation and Gaw Glen Burn.

10.8.10 To a certain extent, the designed landscape defines the setting of the associated estate buildings by creating an architectural and landscape composition in which the structures were intended to be seen and enjoyed. In this context, the policy woodland and underlying landform around Craigengillan House and Stables creates a tightly-defined and controlled space; screening views of the house in the principal approach from the north until the viewer is presented with a dramatic revealed view on arrival, and creating an intimate space around the lawn to the west of the house. This characteristic of the estate core appears likely to result from the late 19th century replanting of the estate, and is characteristic of this period.

Change to Setting

10.8.11 Turbines are likely to be visible in views from different parts of the designed landscape to varying degrees, ranging from no visibility in lower-lying areas around Craigengillan House (**Figures 10.3a and 10.3b**), the core of the estate and the Ness Glen, to clear though distant visibility of upper elements of turbines from more elevated parts of the estate to the north and west of the House.

10.8.12 The Proposed Development will not affect the scenic values identified by the inventory description. Specifically:

- The contribution of the asset to the villages of Bellbank and Dalmellington and to the approach to Loch Doon will not be affected. Some visibility of turbines will be possible from elevated parts of the asset looking towards these settlements, however, they would appear as small and distant features on an already broken horizon and turbines would not appear in the sequential views on the approach to the asset through these villages. Similarly, turbines may be visible in a small number of glimpsed and passing views from the approach to Loch Doon, but these would appear as peripheral features and would not be visible with the asset.
- The contribution of the asset to the wider landscape would also not be affected, as this contribution is intrinsic to the asset.
- The composition and integrity of the designed landscape will not be affected in that none of the elements of that landscape will be directly affected and turbines will not intervene in views to or from viewpoints intended to provide specific views of the estate.

10.8.13 The picturesque qualities of the overall composition again relate primarily to the character of the asset and its immediate surroundings, including the approach to Loch Doon. Even so, the scale of the Proposed Development and the presence of a number of long-distance views from within the designed landscape mean that this characteristic has been considered further.

10.8.14 The work of art values considered in the inventory description may be affected to a degree by the Proposed Development:

- Visibility of the turbines from key points within the designed landscape, including elements that contribute to the architectural and archaeological value of the landscape such as the Dalnean Hill Scheduled Monument, and in sequential and successive views as the viewer passes through the landscape could potentially give rise to harmful effects, and this potential is considered further below.
- The blending of the designed landscape into the wider landscape relates, by definition, primarily to the area immediately surrounding the designated landscape. The magnitude of any adverse effect will fall off rapidly with distance from the designated asset as the landscape changes from one of deliberate design to one that includes intrusive and incongruous elements such as forestry plantation, modern structures and modern industrial activities as discussed further below.
- The proposed turbines would be visible to varying degrees in longer views which contribute towards the work of art importance of the Craigengillan garden and designed landscape. In all these views, they would be visible as distant background elements which are clearly separated from the designed landscape by distance and the intervening hills and forestry. Consequently, the viewer's ability to understand and appreciate the asset would remain.
- The views from established routes around Bogton Loch would be heavily restricted and further broken by intervening forestry, whilst views from higher ground such as Dalnean Hill, which is occupied by a farmstead and field system (SM4390), would have visibility of a higher number of turbines. These views would not affect the understanding of this asset and due to the distance from the Proposed Development (~9km to the nearest turbine) they would have a sense of separation from the assets through intervening settlements and forestry plantation.

10.8.15 Turbines would not be visible in views which contribute to the architectural value of the asset as expressed in the inventory description. Similarly, in terms of archaeological importance, the ZTV shows that views from designated heritage assets within the inventory designed landscape which could be affected by distant views of turbine would be almost entirely precluded with the exception of the scheduled monument at Dalnean Hill, which contains the remains of two rectangular buildings and associated field systems.

Significance of Effect

10.8.16 Wireframe visualisations show no theoretical blade-tip visibility from Craigengillan House and stables, either at ground level or from upper floors (**Figure 10.3a and 10.3b**). The Proposed Development will appear in sequential views as the viewer moves around the landscape, but always as an element to the background of views and behind the enclosing higher ground to east of the designed landscape, and would not discernibly affect the key values of the asset. Consequently, this change is considered to be of low magnitude and will not give rise to a significant adverse effect on the setting of the asset.

10.8.17 The Dalnean Hill Scheduled Monument is of a specifically agricultural nature, and its setting is defined by its immediate surroundings. While turbines would be visible as distant background features in some views from the asset, this visibility would not affect the key characteristics of the scheduled monument and would therefore present a low magnitude of change, which would not give rise to a significant effect on the setting of the asset. Dumfries House Designated Garden and Designed Landscape

Importance of Asset

10.8.18 Dumfries House is an inventory garden and designed landscape that contains several listed buildings and HER assets, although a number of these buildings are at a distance of beyond 10km from the Development Site. There are four category A listed buildings, The Temple (LB A 96), Dumfries House (LB A 14413), Lugar Water (LB A 14414) and the Dovecot (LB A 14416). Six buildings are category B listed, the Sundial (LB B 14415), an ice house (LB B 14419), the Coach Houses (LB B 14420), the Westgates Lodges and Gateway (LB B 14421), the Stockiehill Lodges and Gateway (LB B 14422) and Taringzean Castle (LB B 14423). Two category C listed buildings are also present, Lady's Bridge (LB C 14417) and Waterloo Bridge (LB C 14418).

10.8.19 The inventory description for Dumfries House GDL states that the asset is important for its outstanding value of historical and architectural interest as well as having outstanding value for its scenic properties. It is also classed as having a high value as a work of art. As a result, this asset is considered to be of national importance.

10.8.20 A number of these aspects have the potential for harm through change in the setting of the designed landscape, most notably its scenic importance, as a result of the GDL's contribution to the surrounding landscape which is influenced by its size and layout.

10.8.21 Contributing factors to the architectural value (rated by Historic Scotland as Outstanding) of the asset are:

- The Adam designed house; and
- Several other listed structures, particularly the Avenue Bridge and the Temple.

10.8.22 Contributing factors to the historical value (rated by Historic Scotland as Outstanding) of the asset are:

- Part of the pattern of the designed landscape dates from before General Roy's map of 1750;
- There is a good collection of plans and records kept by the estate; and
- Associations with the Dalrymple family and the Marquesses of Bute.

Present Setting

10.8.23 Dumfries House lies in the valley of the Lugar Water and occupies an irregular area covering 535ha. The site is bounded by a mixture of urban settlement at Auchinleck and Cumnock to the north and east, and farmland to the west and south. The wider landscape, although largely agricultural, contains elements that are the result of the 19th and 20th century coal and quarrying industries, most notably large opencast quarry pits. Forestry planting is also present sporadically throughout the wider area.

10.8.24 Historically, the designed views within the landscape have focused on an east to west alignment, initially through avenue planting depicted on Roy's map of 1750 and later through an avenue with a bowling green that runs to the east of Dumfries House, although this later view is no longer maintained. Further views are designed to look inwards toward the House from the outer edges of the estate, with the exception of the roundels which were planted to provide a view from within the park. Although some aspects of the estate can be clearly viewed from outside, especially towards the east, the house and core of the designed landscape is heavily screened to the south through the natural topography and surviving woodland that makes up part of the estate.

10.8.25 To a certain extent, the designed landscape defines the setting of the associated estate buildings by creating an architectural and landscape composition in which the structures were intended to be seen and enjoyed. In this context, the policy woodland and underlying landform around Dumfries House creates a self-reflective space; focusing primarily on the views from the edges of the estate towards the centre.

Change to Setting

10.8.26 The ZTV suggests that turbines are only likely to be visible in views from the northern extent of the Garden and Designed landscape with the only building to have any visibility being the Temple (LB A 96), which itself is located outside of the extended study area, ~13km away from the closest turbine.

10.8.27 The Proposed Development would not affect the composition of the designed landscape in that none of the elements of that landscape would be directly affected and turbines would not intervene in any views which contribute to the overall composition of the inventory landscape. Visibility of the turbines from key points within the designed landscape could arguably give rise to harmful effects, and this has been considered further below. These include elements that contribute to the architectural scenic value of the landscape such as the views across the designed landscape, including those from the Temple.

10.8.28 The remaining listed structures and the historical importance of Dumfries House GDL would not be affected by the Proposed Development and have not been considered further.

10.8.29 The ZTV indicates partial visibility of the proposed turbine array from the Temple and a higher degree of visibility from the north-eastern parts of the designed landscape. The central areas and southern extents, including all further listed buildings are not expected to have any visibility of the Proposed Development.

10.8.30 The areas of higher visibility in the north-east of the designed landscape are bounded to the north and east by the B7036 and B7083 carriageways together with the settlements of Holmhead and Auchinleck. Taken together with the A76 carriageway, which runs through the designed landscape in this area and the presence of modern buildings including the East Ayrshire Roads and Transport Depot, give the northeast portion of the designed landscape a transitional feel between rural and urban areas. Visibility of turbines from these areas would be in glimpsed and passing views, in which turbines would be visible as very distant background features either through existing planting or low on a horizon broken by strong and higher vertical elements.

10.8.31 The Temple (LB A 96), originally constructed as a gate house in *c.* 1827, was never used as such because access from the main road was denied by the owner of the intervening land. It quickly became a decorative feature and started being referred to as a Temple. It was used as accommodation for a time but latterly it has fallen into disrepair (Dumfries House website). The Temple now appears on the Buildings at Risk Register and has been visited further in 2014 after it secured grant-aid funding from Historic Scotland's Building Repair Fund (Buildings at Risk Register for Scotland website).

10.8.32 Since this time, two planning applications have been submitted for the restoration of the gatehouse and for the creation of memorial garden and use of the folly (the Temple) as interpretative point and garden store (planning applications 14/0358/LB and 14/0420/PP respectively, both of which have been approved with conditions). As part of these applications, a Conservation and Design Statement (Buccleuch 2014a) and a location plan of the proposed restoration (Buccleuch 2014b) were provided. These documents state that the memorial garden, of which Temple would be a focal point, will be located within a wooded area that exists directly south of the listed building. This restoration and development of the Temple suggests that a new setting for the Temple will be established as that of the memorial garden. The plan shows that much of this woodland would remain intact and, as such, would screen the garden and Temple from long views of the Proposed Development. Any visibility that could occur, possibly through the winter months, would be heavily filtered, with turbines appearing behind trees as distant and broken features.

Significance of Effect

10.8.33 The restricted visibility of turbines from the assets, primarily glimpsed and variously filtered views from peripheral areas of the inventory landscape, would not discernibly affect understanding or experience of the asset and are assessed as being of negligible magnitude which would not give rise to a significant effect on the setting of the asset.

Beoch Cairn (HER 7989)

Importance of Asset

10.8.34 Beoch Cairn is identified by the WoSAS Non-Statutory Register (NSR) as of probable national importance.

10.8.35 The NSR assessment is not recognised by any subsequent formal designation, however, the SPP states that non-designated monuments are an important part of Scotland's heritage and that Government policy is to protect and preserve these wherever feasible. In order to protect this monument and establish its importance, Annex 1 of SHEP provides criteria and guidance on the determination of 'national importance' for scheduling, which has been used to inform the following assessment.

10.8.36 In order to assess the monuments importance, its condition must be taken into account. The cairn was excavated in 1937 where it was recorded as circular, measuring 35 feet (c. 11m) in diameter with nine large stones projecting above the ground or partially exposed around the kerb (McLeod 1938). This excavation recorded the remains of three, possibly four, cists within the cairn and artefacts recovered included beaker and cinerary urn fragments and ring marked stone. The cairn was subsequently revisited in 1976 and 1980 by the Ordnance Survey, the later visit recorded that forestry ploughing had displaced a number of stones by this time, however, the general outline of the kerb and the presence of a double cist could still be identified. A survey carried out by CFA Archaeology in 2004 as part of the Kyle Wind Farm EIA noted that the remains of an oval stone setting measuring c. 9m NE-SW and 4m across could be identified with an open cist evident in the SE side. It also stated that a tree marked the location of the cairn to the NE. During a visit to this location on the 3rd June 2014 no traces of the cairn could be definitively identified and it is probable that the forestry and undergrowth has encroached to a degree that the monument is now predominantly covered by the plantation.

10.8.37 The cultural understanding of a monument can be based in its intrinsic, contextual or associative characteristics or a mix of all of these. In the case of the Beoch Cairn, it can be considered that there is a level of each of these characteristics.

10.8.38 The intrinsic value of the asset has been greatly diminished since the time of the original excavation with the condition now appearing in a poor state with the potential for heavy root disturbance below ground together with plough and planting damage on the surface. As a result, although there is still a degree of archaeological potential for the site, it is likely that the findings of any future investigations would not be as informative as they may have once been.

10.8.39 The contextual characteristics of Beoch Cairn are more ambiguous as although it is a known burial monument, its original setting and relationship to the wider landscape at that time are not known. Cairns are recorded throughout the region and although the presence of the cists do make this monument less common, the survival of these at this location is now questionable.

10.8.40 The associative characteristics of the monument are based in the understanding within the national consciousness, or from the descendants of people who used the monument, together with the associations of the monument with historical and traditional events. As this is a prehistoric cairn, the descendants of the creators are unknown. However, funerary ritual and tradition are better understood and although these have changed over the intervening millennia, the national consciousness is still respectful of human burial in any form. It was however noted during the 1937 excavations that no bones or cremations were located.

10.8.41 Annex 1 of SHEP sets out the criteria needed to define a monument as of national importance. Taking these terms into account, and given the current appearance and likely disturbance of above and below ground remains of the cairn, the absence of any definable contribution to the historic landscape together with the lack of known human remains, this monument, although once being of a higher quality, is considered unlikely to of schedulable condition. Due to its poor condition, Beoch Cairn is considered to be of regional importance for this assessment due to the rarity of these kinds of cists.

Present Setting

10.8.42 The cairn is located close to the B741 carriageway on the edge of forestry planting that extends in all directions. It is not visible in long or close views due to the forestry encroaching upon the location and the only clear views from the cairn itself are of the adjacent road.

Change to Setting

10.8.43 Although the ZTV suggest a high visibility of the proposed turbines, views to the east from the asset will screened due to the existing forestry. Turbines will be visible from the B741 but will be clearly separated from the asset due to the planting. As the cairn is not clearly visible from this location given the current setting, the turbines will not affect the characteristics of the setting or the understanding of the asset.

10.8.44 The programme of felling in this area is uncertain at present due to the South Kyle Wind Farm application. If the land were to be clear felled and not replanted, visibility from the asset would increase substantially as demonstrated by the wireframe projections shown in **Figure 10.4**. It is, however, current forestry practice to fell plantation in coupes, with a relatively short interval of fallow before restocking, meaning that this 'worst case' is unlikely to occur and that the cairn will remain in a landscape context which remains defined by forestry plantation.

Significance of Effect

10.8.45 With the current setting of the asset, turbines would not be visible in simultaneous views of the asset from north on the B741 and would not affect the key characteristics of the setting, leading to a negligible magnitude of change. Should the area be clear felled within the lifetime of the Proposed Development, visibility from the asset would be increased. Turbines at the Development Site would however remain separated from the asset by an area of clear-felled or restocked woodland, although the proximity of the Proposed Development would make them prominent features in the view. This would give rise to a medium magnitude of change at worst, rapidly reducing to negligible as the intervening plantation matures. As a result, no significant adverse effect on the setting of the asset would arise.

Fardenreoch Cairn (HER 8018)

Importance of Asset

10.8.46 Fardenreoch Cairn is identified by the WoSAS NSR as almost certainly of national importance (although the NSR assessment is not recognised by any subsequent formal designation as noted).

10.8.47 This asset has been reassessed since the time of this classification as part of a cultural heritage assessment (Mudie 2011) for the extension of the Greenhill Surface Mine located 0.5km to the south of this asset. This assessment stated that the WoSAS NSR attribution of almost certainly of national importance was given to the cairn as part of a desk-based project that did not incorporate a site visit in order to confirm the character and condition of the asset at the time. A site visit carried out in 2011 as part of the cultural heritage assessment for the Greenhill Surface Mine found that the cairn appeared to have been robbed of most, if not all, of its stone content. The outline of the cairn could be made out on the ground, defined by a slight turf mounds and a slight arc of a bank around the southwest. The assessment further describes the land as being used for cultivation or pasture during the 19th and 20th centuries, resulting in little probability of a significant buried component surviving, although archaeological evidence of Bronze Age burial practices may remain. As a result of these observations, the cairn was considered to be of regional importance.

Present Setting

10.8.48 This cairn is situated on the western bank of a minor steam on a low rise within the surrounding rough grazing. The land slopes upwards to the west of the asset. Within the immediate surroundings there is evidence of later agricultural activity through the remains of a dyke and

farmstead, whilst in the wider area commercial forestry is present 0.5km to the west and the earthworks of Greenhill Mine are present 0.5km to the south.

Change to Setting

10.8.49 The ZTV suggests a visibility of the proposed turbines in views from the asset looking south, though it is probable that the earthworks associated with the neighbouring surface mine would partially screen the Proposed Development. Should this not be the case, turbines would appear as distant features (6.5km to the nearest turbine) within an already industrial landscape due to the presence of the intervening Greenhill and House of Water surface mines.

Significance of Effect

10.8.50 Views of the proposed turbines from this asset would be partially screened by the earthworks associated with the Greenhill Surface Mine. The remaining visibility of turbines at this distance (6.5km) would not affect the key characteristics of the assets setting and would produce a negligible magnitude of change giving no rise to significant effects on the setting of the asset.

10.9 Predicted Effects: Decommissioning

10.9.1 The decommissioning of the Proposed Development will effectively reverse any indirect effects of the scheme and will not give rise to any adverse changes.

10.10 Predicted Effects: Cumulative

10.10.1 There are a large number of operational, consented or proposed wind energy developments in the area around the Development Site. In order to consider the effects of the Proposed Development when taken in combination with other wind energy developments, the cumulative baseline established for the Landscape and Visual Impact Assessment (**Chapter 9**) has been used.

Direct effects

10.10.2 There is expected to be no additional direct impacts within the Development Site through the wind farms displayed within **Figure 9.8**, although South Kyle Wind Farm (application wind farm A01) could contribute to the dewatering of peat in the area.

Indirect effects

Craigengillan Designated GDL, Craigengillan House (LB A 18793) and Craigengillan Stable Block (LB A 18794)

10.10.3 The potential for significant adverse cumulative effects on the Craigengillan designated designed landscape arising from the addition of the Proposed Development to a cumulative baseline comprising the South Kyle, Benbrack, Dersalloch and Kiers Hill Wind Farms has been subject to detailed assessment.

10.10.4 As there is no visibility of the Proposed Development from Craigengillan House and Stable Block, as can be seen on **Figure 10.3a**, it will have no further cumulative effects on these structures and these have not been considered further.

10.10.5 Turbines from the Proposed Development and the proposed South Kyle Wind Farm (application wind farm A01 on **Figure 9.8)** would be visible in the same views as distant features beyond the intervening settlements at Bellsbank and Dalmellington and the intervening forestry planting from some areas of the designed landscape, in particular the scheduled monument at Dalnean Hill. The turbines of the Proposed Development would be set behind the proposed South Kyle turbines from this location and would present a small incremental increase to the number of turbines visible, although this would not occupy a wider proportion of the view than that already occupied by the South Kyle array. Given the greater scale and proximity of the South Kyle array, the proposed

turbines would be visible only behind the South Kyle array, and would produce a negligible magnitude of cumulative change.

10.10.6 Visibility of the proposed Benbrack Wind Farm (A03, **Figure 9.8**) turbines would be expected from various locations throughout the designed landscape. These views would comprise long distance views of turbines that are clearly separated from the designed landscape by the intervening forestry. In the absence of South Kyle, addition of the Proposed Development to Benbrack Wind Farm would slightly increase the proportion of eastward views occupied by turbines from some locations, particularly Dalnean Hill. This additional visibility of turbines in long views would not affect the key characteristics of the scheduled monument or the garden and designed landscape due to the distance involved and the separation of the area through settlement and forestry. This would present a low magnitude of cumulative change and would not give rise to a significant effect on the setting of the asset.

10.10.7 Taken with both the proposed Benbrack and South Kyle Wind Farms, the addition of turbines from the Proposed Development would present a small incremental increase to the number of turbines visible, although this would not occupy a wider proportion of the view than that already occupied. This would produce a negligible magnitude of change and no significant adverse effect on the setting of the asset, would arise.

10.10.8 The consented Dersalloch Wind Farm (C06, **Figure 9.8**) turbines would not appear in any simultaneous views with the Proposed Development from the designed landscape. Consequently, effects would primarily arise from successive views of the two arrays seen from the area around the designed landscape. Views of both arrays from the Dalnean Hill Scheduled Monument are not expected to occur as the ZTV supplied as part of the Dersalloch Wind Farm 2012 ES Addendum (Scottish Power Renewables 2013) demonstrates that there is no visibility of the consented scheme from this location. Consequently, effects would primarily arise from successive views of the two arrays seen from less sensitive areas of the designed landscape and the magnitude of cumulative change would be of negligible magnitude. No significant adverse effect on the setting of the asset, would arise.

10.10.9 The proposed Kiers Hill Wind Farm (A13, **Figure 9.8)** turbines would similarly not appear in any simultaneous views with the Proposed Development from the designed landscape. There is the possibility of visibility towards the proposed Kiers Hill Wind Farm from the western edge of Dalnean Hill, although the ZTV (RES UK & Ireland Ltd 2013) suggests that this would be confined to heavily filtered, partial views. Effects would also arise from successive views of the two arrays seen from small isolated, less sensitive areas of the designed landscape where long distance sequential views of the Proposed Development would have a negligible magnitude of change. No significant adverse effect on the setting of the asset would arise.

10.10.10 Any cumulative effects arising from the addition of the Proposed Development would be of insufficient magnitude to give rise to a significant adverse cumulative effect on the setting of the asset. Dumfries House Designated Garden and Designed Landscape

10.10.11 The potential for significant adverse cumulative effects on the Dumfries House designated garden and designed landscape arising from the addition of the Proposed Development to a cumulative baseline comprising the South Kyle, and Bankend Rig wind farms together with the single turbine at Taiglim Farm has been subject to detailed assessment.

10.10.12 Turbines from the Proposed Development and the proposed South Kyle (A01, **Figure 9.8**) arrays would be visible in the same views as distant features that mirror those discussed within paragraphs 10.8.29-10.8.31 above. The information provided in the LVIA chapter of the South Kyle ES (Vattenfall 2013) suggests that these views are expected to be of blade tip visibility only. The views from the northern extents of the designed landscape would occupy a wider arc of view, but as distant features, with the blade tips only being visible over intervening forestry and woodland, which would screen any views from the Temple. This would produce a negligible magnitude of change and no significant adverse effect on the setting of the asset, would arise.

10.10.13 The existing Bankend Rig (E05, **Figure 9.8**) Wind Farm turbines would not appear in any simultaneous views with the Proposed Development from the designed landscape. Consequently, effects would primarily arise from successive views of the two arrays seen from small isolated

areas within the northern extent of the designed landscape and the additional views of the Proposed Development would create a change of a negligible magnitude. No significant adverse effect on the setting of the asset, would arise.

10.10.14 The single turbine application at Taiglim Farm (A04, **Figure 9.8)** would be potentially visible in the same arc of view looking south from the northern extents of the garden and designed landscape, although these turbines would be on the periphery of the view. If the turbines were visible, the addition of the Proposed Development could perceptually extend this array further west. The additional distance between the single turbine and the Proposed Development means that the Proposed Development would not be more prominent than the single turbine. Consequently, the effect would be an incremental change of a low magnitude. No significant adverse effect on the setting of the asset, would arise.

10.10.15 Any cumulative effects arising from the addition of the Proposed Development would be of insufficient magnitude to give rise to a significant adverse cumulative effect on the setting of the asset.

Beoch Cairn (HER 7989)

10.10.16 The potential for significant adverse cumulative effects on Beoch Cairn arising from the addition of the Proposed Development to a cumulative baseline comprising the South Kyle, Benbrack, Pencloe, Keirs Hill and Dersalloch wind farms has been subject to detailed assessment.

10.10.17 Turbines from the Proposed Development and the proposed South Kyle (A01, **Figure 9.8**) arrays would be visible in the same views, extending the arc of view to the east. However, the majority of the Proposed Development would be set behind the northern extent of the South Kyle array. The assessment provided in Archaeology and Cultural Heritage chapter of the South Kyle ES (Vattenfall 2013) found that there would be a small magnitude of change (equivalent to a low magnitude using the definitions within this assessment). As explained in paragraph 10.8.45, views of turbines at this distance are considered to form a medium magnitude of change should the intervening forestry be removed. Consequently, given the slightly increased arc of view occupied by turbines, an incremental change would be produced through the addition of the Proposed Development. This would, however, be insufficient to give rise to a high magnitude of change and the overall change would remain of a medium magnitude. No significant adverse effect on the setting of the asset, would therefore arise.

10.10.18 Turbines from the proposed Benbrack (A03, **Figure 9.8**) array would not be visible from Beoch Cairn according to the ZTV provided as part of the LVIA chapter of the Benbrack Wind Farm ES (E.ON 2014). Consequently, there would be no cumulative effects on Beoch Cairn from the Proposed Development in conjunction with the proposed Benbrack Wind Farm.

10.10.19 Turbines from the proposed Pencloe (A02, **Figure 9.8**) array would not be visible from Beoch Cairn according to the ZTV provided as part of Pencloe Wind Farm ES (Jacobs 2014). Consequently, there would be no cumulative effects on Beoch Cairn from the Proposed Development in conjunction with the proposed Pencloe Wind Farm.

10.10.20 Neither the consented Dersalloch (C06, **Figure 9.8**) nor the proposed Keirs Hill (A13, **Figure 9.8**) Wind Farms would appear in any simultaneous views with the Proposed Development from Beoch Cairn. Consequently, effects would primarily arise from sequential views of the arrays seen from the cairn. Views of these two wind farms, both located to the west would be of restricted views of distant turbines (over 10km to the west of the cairn) at most and additional views of the Proposed Development would create a change of a negligible magnitude. No significant adverse effect on the setting of the asset, would arise.

10.10.21 Any cumulative effects arising from the addition of the Proposed Development with other existing, proposed or under construction developments would be of insufficient magnitude to give rise to significant adverse cumulative effects on the setting of the asset.

Fardenreoch Cairn (HER 8018)

10.10.22 The potential for significant adverse cumulative effects on Fardenreoch Cairn arising from the addition of the Proposed Development to a cumulative baseline comprising the South Kyle, Benbrack and Pencloe Wind Farms together with the single turbine at Taiglim Farm, has been subject to detailed assessment.

10.10.23 Turbines from the Proposed Development and the proposed South Kyle, A01, **Figure 9.8**, Benbrack, A03, **Figure 9.8**, and Pencloe, A02, **Figure 9.8**, arrays would be visible in the same views, extending the arc of view in which turbines are visible to the east or west respectively with the Proposed Development appearing in the foreground in all cases. Although the ZTV of all proposed developments suggest visibility of turbines to varying degrees from the cairn, the modern surface mine earthworks would potentially provide partial screening of each of these developments, and in all cases these developments would be seen over the existing surface mine workings. Consequently, given the slightly widened arc of view, an incremental change would be produced through the addition of the Proposed Development turbines to the cumulative baseline and the magnitude of any cumulative change would be of low magnitude.

10.10.24 The single turbine application at Taiglim Farm, A04, **Figure 9.8**, would not be visible in the same view from Fardenreoch Cairn. Consequently, effects would primarily arise from sequential views of this turbine seen from the cairn. The small scale of the single turbine development and its distance from the asset means that any cumulative change would be of a low magnitude.

10.10.25 Any cumulative effects arising from the addition of the Proposed Development would be of insufficient magnitude to give rise to a significant adverse cumulative effect on the setting of the asset.

10.11 Mitigation and Enhancement Measures

Direct Effects

10.11.1 Potential direct effects can be effectively mitigated by an agreed programme of archaeological work to be overseen by an Archaeological or Environmental Clerk of Works (ACoW/ECoW). The details of this work will be contained within a Written Scheme of Investigation including a Post-Excavation and Research Design (PERD) to be agreed with WoSAS, but in principle it will comprise the following elements:

- Micro-siting of access tracks to avoid/minimise direct effects;
- Photographic survey and recording of the Peat Hill boundary bank (HER 7988) including identification of areas of poor preservation that may be utilised as a crossing point;
- Monitoring of intrusive groundworks within areas of deep peat;
- Archaeological Recording: any archaeological features or deposits of archaeological or palaeoenvironmental importance which cannot be preserved in situ will be excavated to standards agreed with WoSAS; and
- Analysis, archival, reporting and dissemination: standards for analysis and archival of archaeological and palaeoenvironmental material with subsequent reporting.

10.12 Residual Effects

Conclusions of Significance Evaluation

Table 10.13 Summary of Residual Effects

Potential Receptor and Effect	Magnitude of Change	Receptor Sensitivity	Significance	Cumulative Significance	Summary Rationale
Disturbance of previously recorded heritage assets within the Development Site	Low	Local	NS	N/A	Known features have been avoided, with the exception of a localised isolated area of the Peat Hill boundary bank. Effect can be mitigated by recording.
Disturbance of previously unrecorded heritage assets within the Development Site	Low	Lesser-National	NS	N/A	Features anticipated to be of lesser-regional importance and sparsely distributed. These are expected to predominantly relate to peat deposits and burns within the Development Site. Effect can be mitigated by recording.
Effect on character and setting of Craigengillan Garden and Designed Landscape and associated designated assets	Low	National	NS	NS	Turbines will appear in distant sequential views as the viewer moves around the landscape, but always as an element to the background of views; no visibility is expected from the house or stable block.
Change character and setting of Dumfries House Garden and Designed Landscape	Low	National	NS	NS	Turbines would only appear as distant features within a broken view from less sensitive areas towards the northern extent of the landscape with the only designated buildings to have potential visibility being screened by woodland.
Change to setting of Beoch Cairn	Medium	Regional	NS	NS	The proximity of turbines to this asset would form a substantial change should the intervening forestry be removed. If the forestry remains visibility would be greatly reduced. The asset has been disturbed through forestry ploughing and is no longer considered to be of a schedulable quality.
Change to Setting of Fardenreoch Cairn	Negligible	Regional	NS	NS	Visibility of turbines at this distance would not affect the key characteristics of the assets setting and may be partially screened by intervening earthworks.

Key/Footnotes:

High
Medium
Low
Negligible

S = Significant
NS = Not Significant

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11. Ecology

11.1 Non-Technical Summary

11.1.1 The scope of the ecological assessment was determined through a review of existing biological data relating to the Development Site and the surrounding area, together with consultations with relevant nature conservation organisations. Based on the outcome of the desk study and the consultation exercise, various ecological surveys were carried out, the results of which determined the final scope of the assessment.

11.1.2 Ecological surveys that were undertaken included detailed vegetation surveys to identify plant communities of higher nature conservation value and/or those that may be sustained by groundwater along with detailed protected species surveys for badger, otter, water vole and bats. A fisheries habitat survey, electrofishing surveys, and a targeted survey for freshwater pearl mussels were also undertaken. The potential for effects on great crested newt, pine marten and red squirrel was scoped out following a combination of consultation, desk studies and field surveys.

11.1.3 The Development Site is dominated by dry modified bog, wet modified bog and marshy grassland, all of which are affected by sheep grazing and artificial drainage which have degraded the conservation value of the habitats present. No significant effects are predicted on any plant communities of high nature conservation value.

11.1.4 No statutory designated or non-statutory sites are located within the Development Site or within 2km of the survey area. However, several small areas of native woodland (each covering at most a few hectares in area) recorded by the Native Woodland Survey of Scotland (NWSS) are located close to the northern edge of the survey area. However, no significant effects on any statutory designated sites are predicted to occur.

11.1.5 Signs of otter activity were recorded during surveys, including spraints, slides and nine potential resting sites, which were found along a number of burns, both within but mainly adjacent to, the Development Site; some (limited) field signs indicating water vole presence were also identified adjacent to the Development Site with limited potential for the Development Site to be used by this species. No evidence of badger presence was found on the Development Site and overall suitability was considered to be low. No amphibians, reptiles or signs of their presence, field signs indicating the presence of red squirrel, or signs of any other notable species were found

11.1.6 Bats from four genera are present within the Development Site: *Pipistrellus, Myotis, Plecotus* and *Nyctalus*. No bat roosts have been identified within the Development Site and the habitat is considered generally unsuitable for providing roosting habitat. 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 and within the area of sheltered woodland along Dalleagles Burn to the north of the Development Site. Similarly, the overall activity levels recorded during the static detector surveys at ground level during 2013 within the Development Site were generally considered to be low. In general, very low levels of bat activity were recorded at the met masts during 2014, with bat activity within the control sites (near to ground level) being higher than observed at the met masts on the Development Site. The survey results suggest that low numbers of low risk bat species and a low number of high risk bat species occur at the Development Site.

11.1.7 Suitable habitat for freshwater fish was recorded, with salmon, trout, stone loach, minnow and lamprey being recorded (though the latter three species were not present within the Development Site). The results of the habitat surveys at the six proposed water crossings showed that these burns, even under higher water conditions, would be unlikely to hold juvenile salmonids due to the lack of/limited suitable spawning material or in-stream cover from substrate although habitat for juveniles and limited spawning substrate was available at Knockburnie Burn. Freshwater pearl mussels were not recorded during surveying and there was a general lack of suitable habitat for the species.

11.1.8 No significant effects are predicted on any animal species of high nature conservation value or any legally protected animal species.

11.1.9 No significant cumulative effects on ecological receptors are predicted to occur.

11.2 Introduction and Overview

11.2.1 This section describes and evaluates the aspects of ecology and nature conservation interest relevant to the Proposed Development. A description of the Proposed Development is provided within **Chapter 4** - **Description of the Proposed Development**, with the location and extent of this shown in **Figures 1.1** and **Figure 1.2**.

11.2.2 In order to determine the potential significant ecological effects of the Proposed Development, this section describes the current ecological condition within the Development Site and the immediately surrounding area (baseline conditions). Baseline ecological information has been gathered from various site-specific surveys, desk-based information searches and consultations (**Section 11.3**), the full results of which are presented in **Section 11.4**. **Sections 11.6-11.8** go on to assess the potential significant effects of the Proposed Development on ecological and nature conservation interests, the cumulative effects on terrestrial ecology within a 10km radius of the Site are outlined in **Section 11.9**, **Section 11.10** proposes mitigation measures to address significant adverse effects and **Section 11.11** concludes what the residual effects would be once mitigation is implemented.

11.2.3 Effects during construction and operation of the Proposed Development are assessed. Potential effects arising during decommissioning of the Proposed Development are likely to be very similar to the effects arising from the construction phase, albeit they will be on a lesser scale in terms of duration and intensity (on the assumption that all sub surface infrastructure, foundations below 1m and all buried cables, and access tracks remain *in situ*). As the removal of above surface wind farm components will be less intrusive than installation of foundations and associated infrastructure, the level of any effect on ecological receptors is likely to be reduced. A worst case scenario is however applied to this particular assessment, as the exact approach to decommissioning is yet to be determined (**Section 4.6**) and the decommissioning stage is therefore assumed to produce the same level of ecological effects as the construction phase.

11.2.4 By its nature, ecology is closely inter-linked with a number of environmental topics which are addressed in other sections of the ES and cross-references are made where appropriate, particularly for ornithological interests (**Chapter 12**) and hydrological interests (**Chapter 13**).

11.2.5 Supporting baseline information and background/technical reports are presented in the following Technical Appendices:

- Technical Appendix 11.A NVC Survey Report 2014 (May 2015);
- Technical Appendix 11.B Protected Species (2013-2014) Baseline Report (January 2015);
- Technical Appendix 11.C Autumn Bat Survey Report (November 2013);
- Technical Appendix 11.D Bat Survey Report 2013 (April 2014);
- Technical Appendix 11.E Bat Survey Report 2014 (February 2015);
- Technical Appendix 11.F Fisheries Baseline Study (January 2014);
- Technical Appendix 11.G Electrofishing Survey Results (September 2013);
- Technical Appendix 11.H Freshwater Pearl Mussel Report (May 2015); and
- Technical Appendix 11.I Otter and Water Vole Survey Technical Note (September 2015).

11.2.6 Scientific plant and animal names are provided in the Technical Appendices following standard nomenclature and a list of relevant terminology and abbreviations used in this chapter are presented in **Appendix 1.A**.

11.3 Methodology and Approach

Policy and Legislative Context

11.3.1 All relevant national, Development Plan and other planning policies are outlined in **Chapter 5 – Planning Policy Context**. This chapter pays regard to the requirements of all relevant planning policy considerations and takes account of relevant statutory provisions and advice, as listed in **Table 11.1**.

Table 11.1 Relevant Legislation, Policy and Guidance

Policy / Guidance	Context
International Legislation and Policy Context	
EC Directive on the Conservation of Natural Habitats and Wild Flora and Fauna, 92/43/EEC, 1992	The primary international legislation that sets out international policy in terms of ecology is Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora ('Habitats Directive'). The Habitats Directive promotes the maintenance of biodiversity in Europe. This Directive provides for the creation of a network of protected areas across the continent, designated by Member States as Special Areas of Conservation (SACs). Together with Special Protection Areas (SPAs) designated under Council Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds ('Birds Directive'), SACs form a network of pan-European protected areas known as Natura 2000. The annexes to the Directive list the various habitats and species considered important in a European-wide context. Annex I of the Directive comprises a list of 189 habitat types for which Member States must consider designation for SACs. A sub-set of the Annex I habitat types are defined as 'priority' habitats because they are considered to be particularly vulnerable and are mainly, or exclusively, found within the European Union. Annex II of the Directive comprises a list of species for which Member States must consider designation for SACs. Member States are required to ensure strict protection of species listed in Annex IV.
EC Water Framework Directive (Directive 2000/60/EC)	EC Directive 2000/60/EC, the Water Framework Directive (WFD) is a framework for the protection of inland surface waters (rivers and lakes), transitional waters, coastal waters and groundwater. The Directive outlines criteria for assessing the ecological and chemical condition of water bodies and, where relevant, aims to set targets for the maintenance and improvement of water bodies.
Legislative Context	
Electricity Act 1989	Under section 36 of the Electricity Act 1989, consent is required from the Scottish Ministers for the construction and operation of all power generating plant that would have an installed capacity of more than 50MW. When considering section 36 applications Scottish Ministers must satisfy themselves that the requirements of Schedule 9 (paragraph 3(2)) of the Electricity Act 1989 (as amended) have been met. As applied in practice in Scotland, this requires applicants/licence holders to consider the "*desirability of preserving natural beauty, of conserving flora, fauna and geological or physiographical features of special interest and of protecting sites, buildings and objects of architectural, historic or archaeological interest*". The Scottish Ministers are also required to consider the extent to which the developer has fulfilled the requirement to "*do what he reasonably can to mitigate any effect which the proposals would have on the natural beauty of the countryside or on any such flora, fauna, features, sites, buildings or objects*". In addition, in Scotland the Act also requires that "*a licence holder, a person authorised by an exemption to generate or supply electricity and the Secretary of State shall avoid, so far as possible, causing injury to fisheries or to the stock of fish in any waters".*
Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2000 (as amended)	These regulations (the EIA Regulations) apply to section 36 applications. Schedule 4 of the EIA Regulations specifies that the ES should describe those: "*aspects of the environment likely to be significantly affected by the development, including, in particular, population, fauna, flora, soil, water, air, climatic factors, material assets, including the architectural and archaeological heritage, landscape and the inter-relationship between the above factors*."
The Conservation (Natural Habitats & c.) Regulations 1994 (as amended)	These regulations transpose Council Directive 92/43/EEC into national law. The Habitats Regulations provide for the designation of Natura 2000 sites, the protection of European protected species (EPS), and the adaptation of planning and other controls for the protection of Natura 2000 sites.
The Wildlife and Countryside Act 1981 (as amended)	The Wildlife and Countryside Act is the primary legislation for the protection of wildlife in the UK. The Act provides for the designation of protected areas through the designation of Sites of Special Scientific Interest (SSSI), which are selected for their nationally important assemblages of habitats, species and geological interest. The Act provides additional protection for certain plants and animals, including water vole and red squirrel.

Policy / Guidance	Context
Nature Conservation (Scotland) Act 2004	This Act places duties on public bodies in relation to the conservation of biodiversity and strengthens protection for SSSIs and wildlife enforcement. The Act places a duty on every public body to further the conservation of biodiversity in a manner consistent with the proper exercise of their functions.
Wildlife and Natural Environment (Scotland) Act 2011	This Act amended a number of other pieces of legislation including the Wildlife and Countryside Act 1981 and the Deer (Scotland) Act 1996. The Act introduced new wildlife offences (including vicarious liability), created a new regime for regulating invasive and non-native species, made changes to the licensing system for protected species, amended current arrangements for deer management and deer stalking, strengthened protection for badgers and made changes to the management of SSSIs.
Protection of Badgers Act 1992	This Act provides protection for badgers and their habitats. It makes it an offence to wilfully take, kill, injure or ill-treat a badger; to obstruct, destroy or damage a badger sett or to disturb badgers whilst they are in a sett.
Water Environment and Water Services (Scotland) Act 2003 (WEWS Act)	This transposes the EC Water Framework Directive into Scottish legislation and seeks to protect both surface waters and groundwater, including groundwater dependent terrestrial ecosystems (GWDTEs).
Water Environment (River Basin Management Planning: etc. (Miscellaneous Amendments) (Scotland) Regulations 2015/211.	These Regulations will come fully into force on 15 September 2015 and apply to Scotland only. They amend the Water Environment (River Basin Management Planning: Further Provision) (Scotland) Regulations SSI 2013/323 and the Water Environment (Controlled Activities) (Scotland) Regulations SSI 2011/209 to further protect the water environment. This transposes the EC Water Framework Directive into Scottish legislation and seeks to protect both surface waters and groundwater, including groundwater dependent terrestrial ecosystems (GWDTEs).
Salmon and Freshwater Fisheries (Consolidation) (Scotland) Act 2003	This Act provides the legal basis behind protection of rivers with fisheries interests and grants powers to district salmon fisheries boards to enforce this protection.
National Planning Policy – The Scottish Planning Policy (2014)	
Valuing the Environment Subject Policy (paragraphs 193-218)	The "Valuing the Natural Environment" subject policy within the SPP (2014) sets out detailed policy provisions relating to the protection and enhancement of different types of natural resources and natural heritage assets, as detailed below.
Natural Heritage Planning Principles (paragraph 194)	The SPP identifies a number of planning principles related to natural heritage protection and ecological resilience. Principles of relevance to the Proposed Development include that planning should: ▶ "Facilitate positive change while maintaining and enhancing distinctive landscape character; ▶ Conserve and enhance protected sites and species... ▶ Promote protection and improvement of the water environment...in a sustainable and co-ordinated way; ▶ Seek to protect soils from damage... ▶ Protect and enhance ancient semi-natural woodland as an important and irreplaceable resource, together with other native or long-established woods, hedgerows and individual trees with high nature conservation or landscape value; ▶ Seek benefits for biodiversity from new development where possible...
Protecting Designated Sites (paragraph 196)	The SPP requires designated areas and sites to be identified and appropriately protected through development plans, without the use of buffer zones (paragraph 196). Within the same paragraph the SPP states that "*the level of protection given to local designations should not be as high as that given to international or national designations*".
Development Management Decisions (paragraphs 202-206)	The SPP states that planning decisions "*should take account of potential effects on landscapes and the natural and water environment, including cumulative effects*". The SPP further states that "*planning permission should be refused where the nature or scale of proposed development would have an unacceptable impact on the natural environment*". It is noted in the same paragraph that whilst effects on statutorily protected sites will be an important consideration, this "*does not impose an automatic prohibition on development*".

Policy / Guidance	Context
Non-Native Species (paragraph 206)	The SPP states that "*where non-native species are present on site, or where planting is planned as part of a development, developers should take into account the provisions of the Wildlife and Countryside Act 1981 relating to non-native species*".
Protected Species (paragraph 214)	The SPP notes that "*the presence (or potential presence) of a legally protected species is an important consideration in decisions on planning applications. If there is evidence to suggest that a protected species is present on site or may be affected by a proposed development, steps must be taken to establish their presence. The level of protection afforded by legislation must be factored into the planning and design of the development and any impacts must be fully considered prior to the determination of the application*".
Woodland (paragraph 216)	The SPP notes that the Scottish Government's Control of Woodland Removal Policy "*includes a presumption in favour of protecting woodland. Removal should only be permitted where it would achieve significant and clearly defined additional public benefits*". The SPP also confirms that where woodland is removed in association with a proposed development, compensatory planting will generally be expected.
National Planning Advice & Guidance	
Scottish Government Planning Advice Note 60 (PAN 60)	Planning Advice Note (PAN) 60: Planning for Natural Heritage (Scottish Government, 2000, updated 2008) sets out advice provided by the Scottish Government regarding planning for natural heritage.
Spatial Planning for Onshore Wind Turbines – Natural Heritage Considerations (SNH, June 2015)	Part 3 – Development Management within this guidance document identifies natural heritage considerations relevant to spatial frameworks and development plan policy for wind energy developments.
Biodiversity Policy	
UK Biodiversity Action Plan (UK BAP) / UK Post-2010 Biodiversity Framework (UKBAP)	The UK BAP, produced in 1994 by the UK Government, was a national strategy for the conservation of biodiversity. It was the UK Government's response to the Convention on Biological Diversity (CBD) signed in 1992. The Convention called for the development and enforcement of national strategies and associated action plans to identify, conserve and protect existing biological diversity, and to enhance it wherever possible. Action plans for the most threatened species and habitats were set out to aid recovery and achieve the significant reduction in biodiversity loss called for by the CBD.
	The UK BAP was replaced by the 'UK Post-2010 Biodiversity Framework' (July 2012) which covers the period 2011-2020. This framework is implemented individually by each of the four UK countries. Following the publication of the new framework, the UK BAP partnership no longer operates but many of the tools and resources originally developed under the UK BAP still remain in use. Within Scotland, the UK Post-2010 Biodiversity Framework is co-ordinated through the Biodiversity Action Reporting System (BARS) which is an online tool which contains a list of Scottish priority habitats and species (The Scottish Biodiversity List [SBL]).
Scottish Biodiversity List (SBL)	The SBL is a list of flora, fauna and habitats considered by the Scottish Ministers to be of principal importance for biodiversity conservation and its publication was a requirement of Section 2(4) of The Nature Conservation (Scotland) Act 2004. The main aim of the list and associated initiatives is to halt the loss of biodiversity and continue to reverse previous losses through targeted actions for species. These targets implement the 25 year strategy outlined in 'Scotland's Biodiversity: It's in Your Hands' , which has been extended by '2020 Challenge for Scotland's Biodiversity - A Strategy for the conservation and enhancement of biodiversity in Scotland'. The two documents together comprise the 'Scottish Biodiversity Strategy'.
Ayrshire Local Biodiversity Action Plan (2007-2010)(LBAP)	The Ayrshire LBAP sets out nature conservation objectives and aims for the region. These include Action Plans for various semi-natural habitats and highly modified habitats; species statements, and lists of local priority habitats and species.
Regional / Local Policy	
Approved Ayrshire Joint Structure Plan (2007)	The Ayrshire Joint Structure Plan (the Structure Plan) seeks to provide a strategic land use context to guide development across Ayrshire up to 2025. Development management policies from the Structure Plan of relevance to the Proposed Development and to this EIA are outlined in Chapter 5 – Planning Policy Context.

Policy / Guidance	Context
East Ayrshire Local Plan (2010)	The East Ayrshire Local Plan 2010 (the Local Plan) was adopted by East Ayrshire Council (EAC) on 26th October 2010. Volume 1 of the Local Plan sets out an overall strategy for the development of East Ayrshire up to 2017 and Volume 2 provides a suite of development management policies for the determination of planning applications. Policies of relevance to the Proposed Development and to this EIA are outlined in Chapter 5 – Planning Policy Context but include Policy ENV 2 – Natural Heritage, ENV24 – Water Environment and Policy M6.
East Ayrshire Local Development Plan (Proposed Plan) 2015 (LDP)	EAC are currently preparing a Local Development Plan (LDP). Once adopted this LDP will constitute the statutory Development Plan for East Ayrshire and will replace the current Structure Plan and Local Plan. The LDP Proposed Plan was subject to public consultation from 13th March 2015 – 24th April 2015 and is expected to undergo a formal examination by Reporters appointed by Scottish Ministers in autumn 2015. The LDP Proposed Plan contains a suite of proposed development management policies for the determination of planning applications. Proposed policies of relevance to the Proposed Development and to this EIA are outlined in Chapter 5 – Planning Policy Context but include policies such as ENV6 – Nature Conservation, ENV10 – Carbon Rich Soils and ENV12 – Water, Air and Noise Pollution.
Other Guidance	
	▶ Bats and wind turbines (Version 2 - June 2012). Compiled by: Kat Walsh (Natural England), Jean Matthews (Countryside Council for Wales) and Rob Raynor (Scottish Natural Heritage (SNH))1; ▶ Hundt, L (2012) Bat Surveys: Good Practice Guidelines, 2nd edition, ▶ Scottish Environment Protection Agency (SEPA) (2014). Land Use Planning System - SEPA Guidance Note 4: Planning Guidance on Wind Farm Developments; ▶ Scottish Renewables et al. (2010). Good Practice during Wind Farm Construction; ▶ SNH (2012). Planning for Development: What to consider and include in Habitat Management Plans; ▶ SNH (2013). Constructed Tracks in Scottish Uplands; ▶ Scottish Executive Environment and Rural Affairs Department (2001). European Protected Species, Development Sites and the Planning System. Interim guidance for local authorities on licensing arrangements; and ▶ 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.

Baseline Establishment

Desk Study

11.3.2 Baseline data on the nature conservation interest of the Development Site and the surrounding 2km, including information on designated sites and protected species records, were collated from the following sources:

- ▶ SNH's interactive map facility at (http://www.snh.gov.uk/publications-data-and-research/snhi-information-service/map/);
- ▶ National Biodiversity Network (NBN) gateway's information service (http://data.nbn.org.uk)[2];
- ▶ Forestry Commission online map (showing Ancient Woodland Inventory areas) (http://map.environment.scotland.gov.uk/landinformationsearch/lis_map.html);
- ▶ Bat Conservation Trust (BCT) website for the distribution of noctule[3] bat in Scotland;

[1] http://www.snh.gov.uk/docs/B999258.pdf: accessed May 2015.

[2] Due to data protection issues regarding the reproduction of NBN data, NBN records are not re-produced; nonetheless the search of the NBN was undertaken to provide an indication of the species likely to be present. Accessed May 2015.

- Battersby, J. (Edited and compiled) (2005). UK Mammals: Species Status and Population Trends, JNCC/Tracking Mammals Partnership 2005;
- Cathrine, C. (2012): Scottish Grass Snake Distribution Poster, Clyde Amphibian and Reptile Group, and Caledonian Conservation Ltd. http://www.caledonianconservation.co.uk/scottishgrasssnakeposter2012.pdf;
- Croose, E., Birks, J.D.S. & Schofield, H.W. (2013). Expansion zone survey of pine marten (*Martes martes*) distribution in Scotland. Scottish Natural Heritage Commissioned Report No. 520;
- Haddow, J (2012). Scottish Leisler's Bat Project 2010-2012[4];
- Harris, S.; Yalden, D. W. (2008). Mammals of the British Isles handbook (4th ed.). Southampton. The Mammal Society;
- Preston, C. D., Pearman D. A. and Dines, T. D. (eds.) (2002). New atlas of the British and Irish flora. An atlas of the vascular plants of Britain, Ireland, the Isle of Man and the Channel Islands;
- Richardson, P. (2000). Distribution atlas of bats in Britain and Ireland 1980-1999. Bat Conservation Trust, London;
- Russ J. M., Hutson A. M., Montgomery W. I., Racey P. A and J. R. Speakman (2001). The status of Nathusius' pipistrelle (*Pipistrellus nathusii* Keyserling & Blasius, 1839) in the British Isles. J. Zool., Lond. 254, 91-100. Since this publication, records have been reported from around the UK and have been added to a web-based distribution map[5];
- Strachan, R. (2007). National survey of otter *Lutra* distribution in Scotland 2003–04. Scottish Natural Heritage Commissioned Report No. 211 (ROAME No. F03AC309);
- Wilkinson, J.W. & Arnell, A.P. (2013). National Amphibian & Reptile Recording Scheme (NARRS) Report 2007 – 2012: Establishing the Baseline (HWM Edition). ARC Research Report 13/01;
- East Ayrshire Council for details regarding local designations, protected and notable (nationally or locally rare) species[6];
- International Union for Conservation of Nature (IUCN) Red Data Book UK Reports collated on the Joint Nature Conservation Committee (JNCC) website[7]; and
- Large-scale 1:10,000 Ordnance Survey (OS) maps in conjunction with colour 1:25,000 OS map (to determine presence of ponds, potential bat roosts and other features of nature conservation interest).

Consultation

11.3.3 A scoping report was submitted in November 2012 to the then Energy Consents Deployment Unit (ECDU), now the Local Energy and Consents division, of the Scottish Government, along with requests for confirmation of the requirement of an EIA and an opinion (Scoping Opinion) as to the information to be supplied within the ES. Scoping responses relevant to ecology are summarised in **Table 11.2.** Full details of the information provided in the scoping report and the responses received are provided in **Table 2.2** Summary of EIA Scope and **Table 2.3** Scoping Responses.

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[3] http://www.bats.org.uk/pages/noctule_bat.html#Distribution; Accessed May 2015.

[4]http://www.bats.org.uk/data/files/Scottish_BW_Conference_2012/Leislers_poster_Nov_2012.pdf: Accessed May 2015.

[5] http://www.nathusius.org.uk/Distribution.htm: Accessed May 2015.

[6] This request for data from DGERC was made during early 2012. As part of the 2013 update data search, it was confirmed with DGERC (October 2013) that no further records had been received since the data request in 2012.

[7] http://jncc.defra.gov.uk/page-3352: Accessed May 2015.

11.3.4 SNH was consulted separately following issue of the Scoping Opinion. This allowed formal agreement on the scope of the bat[8] and fish[9] surveys being undertaken, which were viewed as adequate for the purposes of the EIA.

Table 11.2 Summary of Relevant Consultee Scoping Responses and ES Response

Consultee	Comment / Concern	ES Response
SNH	In SNH's response to the scoping report they stated that they were content with the desk based studies and site surveys undertaken to date and noted that additional surveys were planned for bats during the winter period of 2012/2013 and that the Ayrshire Rivers Trust (ART) will be consulted regarding salmonid watercourse survey requirements. SNH also noted that there was nothing further to comment on in respect of ecology.	Desk studies and site surveys presented in Technical **Appendices 11.A-11.I**,
SEPA	Phase 1 habitat survey should be carried out for the whole Development Site and the guidance 'A Functional Wetland Typology for Scotland' should be used to help identify all wetland areas with National Vegetation Classification (NVC) completed for any wetlands identified. Results of the NVC survey (which is also applicable to other types of developments) and planning guidance on wind farm developments to be used to identify if wetlands are groundwater dependent terrestrial ecosystems (GWDTEs). Buffers of 100m for roads, tracks or trenches and 250m for borrow pits or foundations were also stated, with mitigation information requested in the ES for where these cannot be achieved.	NVC surveys were completed to determine locations of potential GWDTEs - Technical **Appendix 11.A**. NVC study area covered buffer areas required by SEPA where wetland areas were concerned. Baseline characterisation of potential GWDTEs is provided in detail in **Chapter 13 - Hydrology, Geology and Hydrogeology** and also summarised in this chapter. Assessment of effects upon GWDTEs is provided in detail in **Chapter 13 - Hydrology, Geology and Hydrogeology** and also summarised in this chapter.
Marine Scotland (MS)	MS did not comment directly on the Proposed Development but provided recommendations for the preparation of the ES during which careful consideration should be given to activities which can have an impact on fisheries. MS noted that the information should be provided to them on all species and the abundance of fish within the Proposed Development in order for an assessment to be made. In addition, MS recommended baseline surveys on the freshwater environment for salmonids and eels one year prior to construction.	Desk studies and site surveys presented in Technical **Appendices 11.A-11.I**. Nith District Salmon Fisheries Board (NDSFB) Fisheries Habitat Survey and Electrofishing Survey Results presented in Technical **Appendix 11.H**. Potential design and construction impacts have informed the design, as well as mitigation, pre-construction surveys and monitoring requirements.
East Ayrshire Council (EAC)	EAC provided comment on the requirement for survey and assessment of the significance of the short and long term impacts of the development upon protected species.	Desk studies and site surveys presented in Technical **Appendices 11.A-11.I**.

[8] Bat activity transect surveys, automated activity surveys and at height surveys (using met masts) were undertaken at various times between 2012 and 2013 according to a protocol agreed in writing with SNH by letter dated 29 March 2013.

[9] Communication with SNH agreed that fish habitat surveys would be adequate and that electrofishing surveys would not be necessary at the EIA stage, but could be undertaken pre-construction (email dated 16 July 2014).

Consultee	Comment / Concern	ES Response
Galloway Fisheries Trust (GFT)	GFT (which also provided input on behalf of the adjacent Kirkcudbrightshire Dee District Salmon Fishery Board [DDSFB]) noted that if all construction activity remains out with the Kirkcudbrightshire Dee catchment then GFT are happy that there is minimal impact on the Kirkcudbrightshire Dee and that no survey work is required.	Desk studies and site surveys presented in Technical **Appendices 11.A-11.I**. NDSFB Fisheries Habitat Survey and Electrofishing Survey Results presented in Technical **Appendix 11.H**. Potential design and construction impacts have informed the design, as well as mitigation, pre-construction surveys and monitoring requirements. All construction activity is expected to remain outside the Kirkcudbrightshire Dee catchment.
Forestry Commission Scotland	FCS noted that the Development Site contained minimal forestry interest and that any works would seek to comply with the Scottish Governments policy on the Control of Woodland Removal.	Desk studies and site surveys presented in Technical **Appendices 11.A-11.I**. However, no felling is of trees/woodland is required for this scheme.

Scope of Assessment

11.3.5 The consultations and collation of baseline data allowed the identification of potential receptors to be undertaken which could be subject to likely significant effects as a result of the Proposed Development. This amounted to a scope that encompassed the following:

- A National Vegetation Classification (NVC) survey within at least 100m of access tracks / access routes and at least 250m from other proposed infrastructure and hard standing according to standard guidance documents (excluding coniferous forestry outside the Development Site);
- Protected species surveys for otter, water vole, badger and bats; fisheries habitat survey; electrofishing survey; and a freshwater pearl mussel survey were undertaken where suitable habitat existed according to standard guidance documents;
- An assessment of the likely significant effects of construction, operation and decommissioning of the Proposed Development upon designated sites, protected species and sensitive habitats (such as watercourses and wetlands) and design of appropriate mitigation if significant effects are predicted to occur;
- Consideration of how the Proposed Development will affect UK BAP, SBL and LBAP key habitats and species;
- Identification of species protection/management measures for legally protected species and non-native species; and
- Identification of the need for any further ecological survey/monitoring prior to or during construction and/or operation.

11.3.6 Specialist surveys for terrestrial invertebrates, herpetofauna, European hedgehog, wildcat, red squirrel and pine marten were scoped out of the assessment on the basis of a combination of the absence of records, the sub-optimal nature of the habitats to support populations of these species and/or low likelihood of adverse impacts to occur. However, these 'scoped out' receptors are considered in relation to protection during construction and protection/enhancement of habitat to support them.

Baseline Surveys

11.3.7 Baseline surveys followed nationally recognised guidelines (e.g. Cresswell *et al*. 2012, JNCC 2010, Chartered Institute of Ecology and Environmental Managements [CIEEM] *Sources of Survey*

Methods[10]) and the competency of the surveyors was assessed against the CIEEM's *Competencies for Species Survey Guidance*[11], to ensure that all surveying and reporting was carried out by adequately experienced and trained ecological surveyors. All surveyors were full members of CIEEM and undertook survey work under appropriate survey licences if necessary. Where sub consultants were used for the completion of field surveys e.g. fisheries surveys, the personnel were experienced technical specialists who also fulfilled the CIEEM requirements for competency.

11.3.8 The field surveys focussed on the area within the Development Site boundary (plus buffer areas as defined for each receptor below). The relevant study / survey areas are described in the relevant Technical Appendices and illustrated on the associated figures.

11.3.9 An Extended Phase 1 Habitat Survey, a standardised method of recording habitat types and characteristic vegetation as set out within JNCC guidelines (JNCC, 2010), was undertaken by AECOM (AECOM, 2012) and this was 'extended' through the additional recording of specific features indicating the presence, or likely presence, of protected species or other faunal species of nature conservation significance. The existing baseline information collected by AECOM indicated the requirement for more detailed botanical surveys as described in the following section.

[10] http://www.cieem.net/sources-of-survey-methods-sosm (Accessed May 2015).

[11] http://www.cieem.net/competencies-for-species-survey-css (Accessed May 2015).

NVC Survey

11.3.10 An NVC survey, including recording of wetland habitats / GWDTEs, was completed by Amec Foster Wheeler Consultant Ecologist David Knox MCIEEM during 14 – 18 July and 15-16 October 2014 within a study area radius that included all wetland habitats at least (i) 100m from roads, tracks and trenches and (ii) 250m from the edge of the proposed borrow pit search areas and foundations within the Development Site boundary, as per SEPA requirements. The survey area is described and illustrated within **Technical Appendix 11.A and Figures 3.1-3.7 of Technical Appendix 11.A.** This surveying focused on a survey area located primarily within the central, southern and eastern parts of the Development Site.

11.3.11 Once an indicative location for the proposed borrow pit areas was determined, an NVC survey was also undertaken at these three locations located in the north-west of the Development Site on 6 May 2015 by David Knox and Amec Foster Wheeler Consultant Ecologist Kristi Leyden MCIEEM.

11.3.12 NVC surveys allowed the identification and mapping of the dominant NVC habitats in accordance with standard guidance (Rodwell 1991a, 1991b, 1992 and 1995) and included the mapping of any habitat of conservation importance and wetland habitats with potential to be GWDTEs (in accordance with SEPA guidance (SEPA, 2014) and Sniffer guidance (Sniffer, 2009) within the area of the Proposed Development. In addition to the Rodwell NVC texts, Averis *et al* (2004) provided a concise and up-to-date description of NVC communities and sub-communities of UK upland areas. Plant identification and classification was based on Stace (2010) for higher plants and Atherton *et al* (2010) for bryophytes. A hand-held GPS was used to ensure that communities were mapped accurately. No quadrats or software such as 'MATCH' were necessary to identify community types.

11.3.13 The study area was separated into polygons/stands of vegetation and the main NVC communities within each polygon identified (as illustrated on **Figure 3.1 of Technical Appendix 11.A**). Mosaic habitats (two or more communities in one polygon) are presented on **Figures 3.2-3.7** which separately indicates 50:50 mosaics from mosaics where one community is dominant.

11.3.14 For any potential GWDTEs identified within the NVC study area, further hydrological assessment of these was undertaken to assess their level of groundwater dependency. For the potential GWDTEs that were subsequently assessed as likely to be groundwater dependent (referred to as 'assessed' GWDTEs where this was considered to be the case), the likely effects of development on these features was then determined (in terms of ecological interest) through qualitative assessment. Further detailed methodology for hydrological assessment of potential GWDTEs and confirmation of assessed GWDTEs is provided within **Chapter 13** -**Hydrology, Geology and Hydrogeology**.

Otter Survey

11.3.15 A detailed otter survey was carried out on all watercourses and waterbodies within the study area in September 2013 following standard methods (e.g. Chanin 2003, SNH 2008, see Technical **Appendix 11.B**). Surveying was then repeated, but within a smaller survey area, in September 2014 and September 2015 to update the baseline (see Technical **Appendix 11.B** and Technical **Appendix 11.I**), during which searches for otter and field evidence of otter activity were carried out along sections of watercourse at least 250m from proposed turbine locations and their associated infrastructure, 250m from proposed crossing points and 100m either side of proposed access tracks in accordance with SNH guidance (SNH, 2008). Searches were completed along a corridor of at least 10m width along each bank. An examination of obvious features such as crevices and dense vegetation was undertaken along with careful searches of all habitat suitable for use as resting places (holts, couches etc).

11.3.16 The presence/absence of otters was determined using field signs of otter activity including otter spraints, footprints, tracks, slides and resting places or potential resting places. Any sightings of otter were also recorded (see **Technical Appendix 11.B** and the associated figures). Terminology used to describe resting sites used by otters is set out within Technical **Appendix 11.B**, i.e. use of 'holt' for below-ground resting sites and 'couch' for above ground resting sites.

11.3.17 All otter field signs were recorded and mapped, with standard key parameters including weather/watercourse flow conditions and habitat suitability recorded. In addition, the presence of field evidence of mink was recorded.

Water Vole Survey

11.3.18 A detailed water vole survey was carried out on all watercourses and waterbodies within the study area in September 2013 following standard methods (Strachan *et al.* 2011) (see Technical **Appendix 11.B**). Surveying was then repeated in a smaller survey area in September 2014 and September 2015 to update the baseline (see Technical **Appendix 11.B** and Technical **Appendix 11.I**). Searches were made for signs of water vole along all watercourses within the study area (the same study area as for otter), covering a corridor of up to 10m on either bank. Any signs including burrow entrances, tunnels in vegetation (runs), droppings or small groups of droppings (latrines), footprints, feeding stations (chopped up grass / sedge / rush) and grazed lawns were recorded. Any food remains at feeding stations were identified as far as possible. The numbers of latrines, burrows and feeding stations were counted in order to provide an indication of the abundance of water vole individuals. The presence or absence of otter, mink and rat was also recorded during the surveys to provide information about the presence of predator species.

11.3.19 Habitat information and habitat suitability for supporting water vole was also assessed and recorded along with details of watercourse flow conditions (see Technical **Appendix 11.B**).

Bat Surveys

11.3.20 A suite of bat surveys was undertaken during 2012, 2013 and 2014 according to the prevailing BCT guidelines, which satisfies the requirements outlined in the SNH position statement specifically focusing on bats and wind turbines (Walsh, Matthews & Raynor, 2012). The level of bat survey effort was based upon the level of survey effort required for a proposed wind farm site assessed as being LOW RISK to bat populations, as outlined in the BCT guidelines. This decision was based upon factors such as the homogeneity of the habitats within the Development Site, the presence of higher quality habitat within the wider landscape and the lack of records at the time for high risk bat species within 10km of the Development Site.

11.3.21 In 2012, following a specific request from SNH due to the presence of a known bat hibernaculum (at Craigdullyeart Mine) within 10km of the Proposed Development, static detector surveys were undertaken within the Development Site in October and November. Static surveys were undertaken simultaneously at the known hibernacula in order to investigate the importance of the Proposed Development at Enoch Hill particularly during the time of autumn migration (see Technical **Appendix 11.C** and the associated figures for details). Ten static detectors were placed across the Development Site at ground level at locations used in previous surveys undertaken by AECOM[12]. Detectors were left *in situ* for six consecutive nights in October and November. Four static detectors were deployed at the mine entrances at Craigdullyeart Mine and monitoring was undertaken for a two week period.

11.3.22 In 2013, seasonal bat activity transect surveys were undertaken along three routes within the Proposed Development area[13]. In addition, static detector surveys were undertaken seasonally using seven detector units for up to five nights at ground level at six separate locations within the Development Site. Surveys were undertaken following the BCT guidelines (Hundt, 2012) and complied with the requirements for a LOW RISK site. Bat detection equipment (SM2 Song Meter detectors) were programmed to record continually from 30 minutes before sunset to 30 minutes after sunrise. The data were stored on pre-programmed Secure Digital (SD) memory cards which were collected (along with the SM2 detectors) following each deployment. Data were converted and analysed in the office using specialist software whereby individual call files were labelled according to the species and behaviour (e.g. feeding buzz or social call). The results of the surveys completed in 2013 are presented in Technical **Appendix 11.D** and the associated figure.

[12] AECOM (2012) Enoch Hill Wind Farm Protected Species Report

[13] Similar surveys were previously undertaken along these three routes by AECOM during 2012.

11.3.23 In June 2014, daytime roost assessment surveys, coupled with static detector surveys, were undertaken at four locations adjacent to the Development Site over eight consecutive nights.

11.3.24 In addition, two meteorological masts (met masts) fitted with SM2 bat detectors were installed on the Development Site (July 2014). Each SM2 bat detector was set up with a 'high microphone' at approximately 60m and a 'low microphone' at approximately 5m in order to provide simultaneous data 'at height' and 'at ground level' respectively. The detectors were checked manually at regular intervals for troubleshooting and data collection purposes between July and December 2014. In order to compare bat activity on site and bat activity at the met masts, three static detectors (at ground level) were deployed from 16-24 September 2014. The detectors were placed close to ground level and data were collected over eight consecutive nights. The results of the surveys completed in 2014 are presented in Technical **Appendix 11.E** and the associated figures.

Badger Survey

11.3.25 A badger survey was undertaken across the Development Site in September 2013 in combination with the surveys for other protected species such as otter and water vole following standard methods (Harris *et al.* 1989, SNH 2003) (see Technical **Appendix 11.B**). The survey aimed to identify and examine areas where badgers might occur by noting any evidence of their presence. This included mammal paths/runs, identification of badger guard hairs, paw prints, evidence of foraging, dung pits, latrines and badger setts. A mammal path was assumed to be used if the character of the path (in terms of size) was appropriate and / or if any other signs were in close vicinity (e.g. a badger sett). Ground conditions were wet over the majority of the survey area, and thus considered suboptimal (but not totally unsuitable) for badger sett building, with the search for badger setts therefore mainly focused on the lower reaches and wooded areas.

Fisheries Habitat Survey

11.3.26 In response to consultation with MS (see **Table 11.2**), targeted surveys were undertaken for freshwater fish on the watercourses within the Development Site. The Nith District Salmon Fisheries Board (NDSFB) undertook electrofishing surveys on all watercourses within the catchment of the Development Site during summer 2014. The Scottish Fisheries Co-ordination Centre (SFCC) protocol for electrofishing was adhered to throughout this survey (see Technical **Appendix 11.G**). Survey sites were selected according to their location in relation to any potential run off from the Development Site during the construction phase and at likely crossing points for the proposed wind farm infrastructure. Habitat surveys were also completed at the same locations following standard guidance (SFCC, 2007).

11.3.27 During the surveys, information on substrate type, bank structure and obstructions to fish movement were recorded. General comments on individual stretches of river were recorded to assist in the rapid overview of the study area as a whole. A photographic record of the watercourses was collected during the surveys.

Freshwater Pearl Mussel

11.3.28 Surveys for freshwater pearl mussel were undertaken by Amec Foster Wheeler Ecologists in October 2014 at four[14] potential water crossing locations (plus 100m upstream and 500m

[14] At the time of survey, only four water crossings were identified within the most current design layout and this determined the locations of the surveys for freshwater pearl mussel. As the additional two water crossings are located along watercourses which were assessed for their suitability to support freshwater pearl mussel during the targeted surveys, (the first water crossing is further upstream from the original water crossing along the western tributary of Littlechang Burn and the second water crossing is located immediately adjacent to the farthest extent of the downstream survey area along the Knockburnie Burn) the conclusions presented in **Appendix 11.H** can be applied to these locations and it is not considered that additional surveys are required in these locations given the general unsuitability for freshwater pearl mussel identified within these watercourses.

downstream) on Knockburnie Burn, Littlechang Burn and its unnamed tributary and Catlock Burn using standard survey methods[15] [16] (see Technical **Appendix 11.H** and the associated figures).

11.3.29 A general survey was completed of each watercourse and its substrate types by walking along the banks and/or by wading in the water. In areas of habitat deemed suitable for freshwater pearl mussels, the watercourse was entered and a detailed survey of the substrate was completed using a bathyscope[17]. Given the limited areas of suitable habitat recorded, 50m transects using the bathyscope (as recommended) were not possible and areas surveyed were no more than ~10-15m in length;

11.3.30 During the surveys, information on substrate type, bank structure and obstructions were recorded. General comments on individual stretches of each watercourse were recorded to provide an overview of the study area as a whole. A photographic record of the watercourses was collected during the surveys.

Herpetofauna

11.3.31 No specific survey was undertaken for herpetofauna (collective term for amphibians and reptiles), however, the some limited suitability was present within isolated areas of terrestrial habitats throughout the Development Site which could support amphibians and reptiles, e.g. ponds and waterbodies, embankments, slopes, interface or edge habitats, and shade free areas near dense vegetation were recorded where present during the completion of other surveys. However the majority of the Development Site was assessed as being largely unsuitable for amphibians and, in relation to reptiles that lack of connectivity, lack of areas suitable for sheltering and grazing pressures from domestic livestock make it of low potential to support reptiles.

11.3.32 Best practice methods were followed as appropriate, for example where considering the suitability of the habitat to support reptiles (Edgar *et al* 2010).

Other Protected and / or Notable Species

11.3.33 Habitats on site were assessed in September 2013 (during the protected species surveys) for the potential to support other protected and notable species and information gathered comprised the following:

- Invertebrates: The general suitability of terrestrial habitats for invertebrates such as butterflies, bees and moths, e.g. botanical diversity, larval food plants of notable butterfly species. The general suitability of watercourses to support aquatic invertebrates was also assessed, e.g. overhanging vegetation, channel width, depths, flow, bank and substrate material;
- Fish: The general suitability of watercourses and water bodies to support a range of fish species, including channel width, depths, flow, bank and substrate material, obstacles to upstream migration of, for example, sea trout (*Salmo trutta*), Atlantic salmon (*Salmo salar*), lamprey species and eels (*Anguilla anguilla*). The potential for spawning sites was also assessed, dependent on water conditions. Visual inspection of waterbodies was undertaken to detect the level of suspended solids. Incidental notes were taken on all of these features by surveyors whilst undertaking other surveys e.g. otter and water vole surveys (more information is provided in Technical **Appendix 11.F**;

[15] Young MR, Hastie LC & Cooksley SL (2003). Monitoring the Freshwater Pearl Mussel, *Margaritifera margaritifera* .Conserving Natura 2000 Rivers Monitoring Series No. 2, English Nature, Peterborough

[16] SNH Freshwater Pearl Mussel Survey Guidelines. Freshwater pearl mussel survey protocol for use in site-specific projects. http://www.snh.gov.uk/docs/A372955.pdf. Accessed March 2015

[17] The Aquascope Underwater Viewer was used as supplied by NHBS. http://www.nhbs.com/title/185837/large-aquascope-underwater-viewer-bathyscope

- Red Squirrel: The general suitability of woodlands and shelterbelts to support red squirrel; field signs for this species include dreys (distinctive bundles of twigs in trees) and chewed pine cones, which are often discarded on prominent features at feeding stations; and
- Other UK Biodiversity Action Plan (BAP) species such as west European hedgehog (*Erinaceus europaeus*), brown hare (*Lepus europeaus*), mountain hare (*Lepus timidus*), polecat (*Mustela putorius*), pine marten (*Martes martes*) and wild cat (*Felis silvestris*) as well as other incidental species including non-natives.

11.3.34 Any sightings of notable ecological features (including legally protected species) were also made during other surveys within the study area were recorded.

Methodology for Establishment of Effects

11.3.35 The assessment of the significance of predicted effects on ecological receptors is based on the value (or 'sensitivity') of a receptor and the predicted magnitude of change that the development will cause. Effects on biodiversity may be direct (e.g. the loss of species or habitats) or indirect (e.g. effects due to noise, dust or disturbance on receptors located within or outside the Development Site). This Ecological Impact Assessment (EcIA) has, in principle, followed the assessment methodology outlined in **Chapter 2** - **EIA Process** but with regard to the specific methods and criteria as defined below, including the CIEEM Guidelines (formerly the Institute of Ecology and Environmental Management; IEEM, 2006).

Receptor Value

11.3.36 Receptor value has been assessed using an adaptation of the CIEEM Guidelines. A key consideration in assessing the effects of any development on flora and fauna is to define the areas of habitat and the species that need to be considered. This requires the identification of a potential zone of influence, which is defined as those areas and resources that may be affected by biophysical changes caused by project activities, however remote from the Development Site.

11.3.37 In identifying ecological receptors, it is important to recognise that a development can affect flora and fauna directly (e.g. land take requirements) and indirectly by affecting land beyond the development study area (e.g. through noise generation or hydrological impacts). The approach that has been applied to this assessment is to identify 'valued ecological receptors' (VERs) i.e. species and habitats that are valued in some way and could be affected by the Proposed Development and, separately, to consider legally protected species.

11.3.38 The value of species populations and habitats is assessed with reference to:

- Their importance in terms of their biodiversity conservation value (which relates to the need to conserve representative areas of different habitats and the genetic diversity of species populations);
- Any social benefits that species and habitats deliver (e.g. relating to enjoyment of flora and fauna by the public); and
- Any economic benefits or other secondary benefits they provide.

11.3.39 Both species' populations and habitats have been valued using the following evaluation scale: International; UK; Scottish; District; Local; and Less than local. The approach generally taken in this assessment is that a species population or habitat that is considered to be of District or greater importance in biodiversity conservation terms is considered to be a VER. Exceptions are made if the species population or habitat is identified as having a high social or economic value, or if the species is legally protected. Species' populations and habitats have been valued using the scale set out in **Table 11.3**, with examples provided of criteria used when defining the value.

11.3.40 It should be noted that the approach of this assessment is to consider the value of the Development Site for the species or habitat under consideration, rather than the nature conservation importance of the species or habitat itself. While the importance of the species or habitat present is taken into account in order to assess nature conservation importance, the number of individuals of that species using the Development Site (or extent of habitat), and the nature and level of this use, is also taken

into account. An assessment is then made of the value of the area for that species or habitat, based upon professional judgment.

Table 11.3 Ecological Value Together with Examples of Criteria Used to Define the Value

Value	Examples of Criteria
International	An internationally important site e.g. SAC (or a site proposed for, or considered worthy of such designation). A regularly occurring substantial population of an internationally important species (listed on Annex IV of the Habitats Directive).
UK	A nationally designated site e.g. SSSI or a site proposed for, or considered worthy of such designation. A viable area of a habitat type listed in Annex 1 of the Habitats Directive or of smaller areas of such habitat which are essential to maintain the viability of a larger whole. A regularly occurring substantial population of a nationally important species e.g. listed on Schedules 1, 5 and/or 8 of the Wildlife and Countryside Act (1981) (as amended).
Scottish	Areas of internationally or nationally important habitats which are degraded but are considered readily restored. A viable priority species population or habitat listed on the SBL. Species occurring regularly in regionally important numbers (>1% of the regional population). A regularly occurring, regionally significant population of a species listed as being nationally rare (e.g. species recorded from <15 10x10km squares of the national grid).
District (East Ayrshire)	A designation such as a Local Nature Reserve, Scottish Wildlife Trust Wildlife Site or woodland listed on the Ancient Woodland Inventory. A regularly occurring, locally significant population of a species listed as being nationally scarce (e.g. species recorded from 16-100 10x10km squares of the national grid). A priority species/habitat listed on the SBL, but which is only present in very low numbers or habitat that is isolated and/or degraded. Viable areas of priority habitat identified in the LBAP or smaller areas of such habitat which are essential to maintain the viability of a larger habitat.
Local	Areas of internationally or nationally important habitats which are degraded and have little or no potential for restoration. A good example of a common or widespread habitat in the local area, e.g. those listed as broad habitats on the LBAP. Species of international or national importance, but which are only present very infrequently or in very low numbers within the subject area.
Less than local	Areas of heavily modified or managed vegetation of low species diversity or low value as habitat to species of nature conservation interest. Common and/or widespread species.

Legal Protection of Species

11.3.41 There is also a need to identify all legally protected species that could be affected by the Proposed Development in order that measures can be taken to ensure that contravention of the relevant legislation is avoided. This may include the adoption of mitigation which is acceptable to SNH. By implication, therefore, it is inappropriate to assess the significance of effects within the context of species' legal protection – measures to avoid or reduce effects on such species are legally required. In certain situations, however, adherence to measures that are designed to ensure that the law is not contravened may not prevent a significant effect relating to a species' biodiversity conservation, social or economic value (i.e. in the context of the species being a VER) and so further mitigation is required to reduce the significance of effect.

11.3.42 Even where a protected species is not considered to be a VER, for example badgers, which are protected on animal welfare grounds rather than nature conservation value, the measures that will be taken to ensure compliance with the legislation are documented within this chapter.

Significance Evaluation Methodology

Magnitude of Change

11.3.43 As defined in **Chapter 2** - **EIA Process** an impact is defined as any change attributable to the Proposed Development that is likely to result in an environmental effect, i.e. they are the cause of the environmental effect. Effect is defined as the result of the change in relation to specific environmental resources or receptors (an effect may in turn produce further change, i.e. an effect may bring about an impact in its own right).

11.3.44 Effects can be permanent or temporary; direct or indirect; adverse or beneficial, and can be cumulative. These factors are brought together to assess the level of effect on the 'conservation status' of the particular VER, and the 'integrity' of the habitats that support them:

- Integrity is the coherence of the ecological structure and functions of a site or habitats that enables it to sustain its plant and animal communities and populations; and
- Conservation status is the ability of a habitat, a plant or animal community or population to maintain its status and / or extent / size.

11.3.45 Wherever possible, the magnitude of change is quantified using professional judgment (considering duration, whether direct/indirect, timing and frequency, reversibility, whether positive/negative and confidence in prediction) and assigned to one of four classes: High, Medium, Small or Negligible/None, with examples of each class provided in **Table 11.4**.

Table 11.4 Examples of the Magnitude of Change on Ecological Receptors

Magnitude of Change	Definition
High	Would cause discernible effects in the long-term (>15 years) or permanently and the integrity and conservation status of the habitat or population would be at risk.
Medium	Would cause discernible effects in the medium-term (5-15 years) but would not affect the long-term integrity or conservation status of the habitat or species population.
Small	Would cause discernible effects in the short-term (< 5 years) but would not affect the long-term viability of the habitat or species population.
Negligible/None	No discernible effect on the habitat or species population.

Level of Effect

11.3.46 In terms of the EIA Regulations, it is only impacts that are likely to have significant effects that require detailed assessment. As the EIA Regulations guide the assessor to focus on effects that are likely to be significant, the outcome of the assessment of a given effect on a particular receptor in its simplest form would be that it is significant or not significant. However, there may be instances where it is appropriate to further sub-divide the category of 'not significant', for example by use of the terms 'slight' and 'negligible' in terms of the level of effect. The use of the category of 'slight' may for example be used in acknowledgement that there are instances whereby there may be an effect, albeit that this is not likely to be significant - and this approach may better facilitate assessment of cumulative effects where cumulatively, several slight effects could be significant.

11.3.47 With this consideration in mind, **Table 11.5** illustrates a matrix, which is has been used for guidance in the assessment of significance. Those effects which are shaded equate to those considered significant under the EIA Regulations with the others constituting no effect or a not significant effect. Having defined a level of effect, professional judgment in combination with guidance and standards

are then applied to identify which of those levels of effect are then considered to be equivalent to significant effects in terms of the EIA Regulations. Where the level of effect is considered to be moderate or less, these are generally not deemed significant in terms of the EIA Regulations. However, depending on the receptor being considered, it is possible that some potentially moderate effects could be judged as significant in terms of the EIA Regulations, and where this is judged to be the case, the rationale for this conclusion will be provided.

11.3.48 For potentially significant effects, mitigation is identified in order to prevent, reduce or offset the significant adverse effect. Effects determined as slight or lower are considered to have no likely significant effect in terms of the EIA Regulations and do not require the identification of mitigation. Where any impact can be reduced by the application of best practice procedures to project design/construction/operation etc, this is also identified. This assists in reducing all effects, whether significant or not. For all likely significant effects, the identified mitigation is taken into consideration and the residual effect is then assessed. For any remaining significant residual effects, compensation measures then require identification.

Table 11.5 Matrix Referred to for Establishing the Level of Effect

		Value of receptor			
Magnitude of change		**International / UK**	**Scottish**	**District**	**Local/Less than Local**
	HIGH	**VERY SUBSTANTIAL**	**SUBSTANTIAL**	MODERATE	NEGLIGIBLE
	MEDIUM	**SUBSTANTIAL**	MODERATE	SLIGHT	NEGLIGIBLE
	SMALL	MODERATE	SLIGHT	NEGLIGIBLE	NEGLIGIBLE
	NEGLIGIBLE / NONE	NO EFFECT	NO EFFECT	NO EFFECT	NO EFFECT

11.3.49 It should be noted that the type of categorisation illustrated in **Table 11.5** provides a guide only, and may be moderated based upon professional judgment and experience. In particular, the divisions between categories of receptor value/sensitivity, magnitude of change, and level of effect should not be interpreted as definitive, and the lines that represent the boundaries between categories should in many cases be considered as 'blurred'. In some cases, the judgement can be guided by quantitative values, whilst in other cases qualitative descriptions are used.

11.4 Baseline Information

Current Baseline

Nature Conservation Designations

11.4.1 There are no statutory designated sites present within the Development Site or within a 2km radius.

11.4.2 Parts of two non-statutory designated sites of native woodland lie within the Development Site (but outwith the Proposed Development area, shown as Native Woodland Survey of Scotland (NWSS) sites on **Appendix 11.A, Figure 3.1**), in two small pockets to the mid north and north-east. Three further small areas of native woodland lie within 200m of the mid north boundary of the Development Site.

Ayrshire Local Biodiversity Action Plan Habitats and Species

11.4.3 The Ayrshire LBAP identifies 32 priority habitats, of which 10[18] have been selected for Habitat Action Plans (HAPs). None of the 10 habitats selected for HAPs occur within the Development Site. Three of the 32 Ayrshire local priority habitat types occur within the Development Site, these are: '*rivers and streams*'; '*purple moor grass and rush pastures*'; and '*blanket bog*'.

Habitat Features / Flora

11.4.4 The overview NVC Map is presented on **Figure 3.1** of Technical **Appendix 11.A**. Further detailed information on the habitats recorded during surveys is presented in Technical **Appendix 11.A** and the associated Figures. The Development Site is located within a large area of predominantly mire vegetation and is located approximately 5km south-west of New Cumnock in East Ayrshire. This land is used primarily for sheep grazing and there are no roads, tracks or any other man-made permanent features of note located within the survey area.

11.4.5 The habitats within the NVC survey area is dominated by mire vegetation communities, of which about 95% is blanket mire (M17 and M20) with the remainder being soligenous mire (M6 and M23). Grasslands are predominately acid grassland vegetation communities (U4, U5 and U6) with a sparse cover of neutral grassland vegetation communities (MG6 and MG9). Bracken-dominated vegetation is rare, covering a total of approximately 5ha (1%) of the NVC survey area. There are no woodland habitats within the main NVC survey area apart from the presence of a few young broad-leaved trees and shrubs (mainly willow species) on steeper ground by watercourses.

11.4.6 The land rises steadily from the northern edge of the Development Site (adjacent to the B741) in the form of a number of gently rounded ridges and summits, with several intervening small river valleys, to Enoch Hill (569m Above Mean Sea Level (AMSL)) located at the south of the Development Site. Several minor watercourses and their headwaters are located within the survey area and include: Polmath Burn, Knockburnie Burn and Spout Burn to the west; Littlechang and Catlock Burns located close to the centre; and the Trough, Polga, and Blarene Burn located to the north-east. All of these watercourses form a small part of the River Nith catchment, however, minor watercourses located on the southern and eastern slopes of Enoch Hill (e.g. Bitch Burn) form a minor part of the Water of Ken catchment.

11.4.7 The gradient of most of the slopes at the Development Site indicates marginal depth of peat over most of it, with deeper peat present in the flatter areas where it is wetter. The NVC survey results should not be taken as a definitive indication of peat depth and a dedicated peat study has been undertaken. More detailed information on peat depths recorded at the Development Site is provided in **Chapter 6 - Renewable Energy, Carbon Balance and Peat** and accompanying appendices.

11.4.8 A summary of habitats and the relating broad (non sub-community) NVC vegetation communities, and a brief description of habitats of note recorded within the Development Site is provided in **Table 11.6**. For NVC community mosaics, where one community is dominant, it is included under the dominant species code; 50:50 mosaics are dealt with separately. Not applicable (N/A) is entered into the NVC community column in **Table 11.6** for habitats which do not have a corresponding NVC vegetation community (e.g. running water).

[18] http://www.ayrshire-jsu.gov.uk/albap_reports.html

Table 11.6 Summary of Habitats and Vegetation Communities Recorded within the Proposed Enoch Hill Wind Farm Site

Habitat type	NVC Vegetation Community	Percentage Cover and Key Features / Species
Mire including blanket bog and flush	M6 *Carex echinata – Sphagnum recurvum/auriculatum* M17 *Trichophorum germanicum – Eriophorum vaginatum* M20 *Eriophorum vaginatum* M25 *Molinia caerulea – Potentilla erecta*	M6: 31.6ha (approximately 4% of the NVC study area). M17: 131.0ha (approximately 17% of the NVC study area). M20: 380.4ha (approximately 49% of the NVC study area). M25: 69.18ha (approximately 9% of the NVC study area). Mire dominated vegetation covers approximately 612ha, which is about 79% of the survey area. 95% of mire vegetation is blanket mire (M17, M20 & M25) and the remainder is soligenous mire (M6). Mosaics of mire vegetation composed of two or more mire communities, and mires forming mosaics with grassland communities form 52.3% of the total mire coverage.
Grassland including rush pasture, acid and neutral grassland.	M23 *Juncus effusus / acutiflorus – Galium palustre* rush-pasture MG6 *Lolium perenne – Cynosurus cristatus* grassland MG9 *Holcus lanatus – Deschampsia cespitosa* grassland U4 *Festuca ovina – Agrostis capillaris – Galium saxatile* grassland U5 *Nardus stricta-Galium saxatile* grassland U6 *Juncus squarrosus – Festuca* ovina grassland	M23: 88.76ha (approximately 11% of the NVC survey area) MG6: 1.85ha (negligible % of the NVC study area) MG9: 1.85ha (negligible % of the NVC study area) U4: 22.64ha (approximately 3% of the NVC survey area) U5: 44.86ha (approximately 6% of the NVC survey area) U6: 9.39ha (approximately 1% of the NVC survey area)
Running Water	N/A	Dalleagles Burn forms at the convergence of Crocradie Burn and Trough Burn, the latter rising between Chang and Benty Cowan Hills. Crocradie Burn itself forms at the confluence of Catlock Burn and Littlechang Burn, rising on High Chang and Enoch Hills. The burn passes through marshy and grazed upland grassland habitats in the south, passing into mixed woodland along the northern boundary of the Development Site. This burn is sinuous and up to ca.0.5m deep with a number of small waterfalls set into the hillsides. The channel bed is largely bedrock to the south becoming more dominated by a mixed rock substrate to the north (cobble/pebble with some boulders). The burn is broad in places (3-5m) and becomes shallower with a substrate of largely smaller rocks and pebbles to the north. Large trees overhang along the site boundary location, with tree roots buttressing the steep banks however the majority of bank top vegetation across the Development Site is dominated by rough pasture with low intensity sheep grazing. Straid Burn is a minor watercourse of very narrow width (<50cm) for much of its extent, winding through grazed pasture. Towards its northern extent, it widens out to ca.1m, through primarily wooded/scrub areas, and drops substantially through the landscape, with a steep decline through the woodland via waterfalls. Substrate comprises pebbles and cobbles along lower course with bedrock in the steeper upper courses. Redhall Burn is largely the same as Straid Burn although up to ca. 2m at its widest (to the north). Also present is an online pond (this appears to have been created for game given the adjacent hide) of ca. 1,400m^2, ca.1m depth, with little emergent vegetation present at the time of survey. The shallow banks are grassland and rush dominated. Knockburnie Burn is similar to Dalleagles Burn but approximately half the size and with a few areas containing waterfalls. The burn is slower flowing with areas of pooling water where the land becomes flatter (in between hills).

Habitat type	NVC Vegetation Community	Percentage Cover and Key Features / Species
		It passes through marshy and grazed upland grassland habitats in the south, however with a much smaller extent of woodland habitat towards the northern boundary. It appears on average ca. 30cm deep with occasional, small, rocky waterfalls. The channel bed is more peat-based than previous watercourses (primarily in marshy, flat areas where water tends to pool up to ca.5m width) however includes mixed rock substrate (cobble/pebble with some boulders) in places. The majority of bank top vegetation is dominated by rough pasture with low intensity sheep grazing. Spout Burn is a very minor burn of <0.5m width, with the channel not visible in places due to it mainly running through marshy ground. There is primarily an earth/peat substrate and where the watercourse is visible the flow is smooth. The banks are similarly earthen/peat, with bank top vegetation of marshy and grazed grassland. Blarene Burn is a moderate sized watercourse, ca.1-2m wide, ca. 30cm deep. Substrate is cobble/pebble with some siltation in places. The burn meanders through a number of grassland fields. The banks are mostly shallow and earthen, however the banks further south become steeper. All the bank top vegetation is pasture. The unnamed tributary of Knockburnie Burn (draining from Blood Moss), is similar to Spout Burn. Connel Burn (including Polga and Purreoch Burns) forms the eastern boundary of the Development Site, it flows north from within the plantation woodland outwith the south of the Development Site to the north towards New Cumnock. It varies between 2-4m wide and is ca. 50cm deep with a smooth/rippled/unbroken standing wave flow. The substrate is cobble/pebble with a number of boulders also present within the watercourse. It is clad with broadleaf woodland within the north-east of the Development Site with steep earthen banks. South of this, the banks of the watercourse are shallow, however the watercourse is located within a gorge with steep banks with exposed rock in places. The bank top vegetation here is dominated by rough pasture with low intensity sheep grazing. Polmath Burn is located along the western site boundary, adjacent to plantation woodland. It is a small watercourse, ca. 1m wide and ca. 30cm deep. The burn has a pebble and silt substrate in lower courses and in the upper course it splits into many tributaries that cut through marshy grassland and rush pasture. The origin of much of the water in the burn is from flushes on site. The burn is culverted under the B741 to the north.
Bracken	N/A	Bracken coverage is limited to ca. 5ha on the very steep, south-east facing slope at the south-east margin of the survey area (about 1% of the total survey area).
Scattered trees	N/A	Largely scattered willow trees on steeper ground by watercourses.

Groundwater Dependent Terrestrial Ecosystems (GWDTE)

11.4.9 The NVC habitat survey (Technical **Appendix 11.A**) identified the presence of a number of potential groundwater dependent terrestrial ecosystems (GWDTEs) within the Development Site.

11.4.10 Each potentially groundwater dependent area was allocated a unique number identifier and 85 separate NVC plant communities were assessed for actual groundwater dependence. A full description of this assessment and the GWDTEs is provided in **Chapter 13** - **Geology, Hydrology & Hydrogeology** and its associated Technical Appendices.

11.4.11 The majority of the habitats identified as being of potentially Moderate or High groundwater dependency during the NVC survey have subsequently been assessed as being of Low actual groundwater dependence. This is based on their hydrogeological and topographical settings and the apparent lack of a significant groundwater component feeding the habitat, with it being concluded

that a surface water supply is much more likely. Such habitats are therefore not considered any further within this assessment and have been scoped out on the basis of the information provided in **Chapter 13** and the associated Technical Appendices.

11.4.12 Three potential moderate to high GWDTE vegetation communities, including mosaics of these communities, were identified as being present within the Development Site during the NVC survey. Three areas have now been assessed to be of Moderate or High actual groundwater dependence. These are habitats 41 (NVC community M23a), 207 (NVC community M25) and 208 (NVC community M23a) as shown on **Figure 3.1, Appendix 11.A** and are all associated with either faults or mineral vein outcrops. Of these, two (GWDTEs 41 and 208) are located within 250m of a turbine location or borrow pit search area, and one (GWDTE 207) has been identified within 100m of an access track.

11.4.13 These habitats are assessed further with respect to the Proposed Development in **Chapter 13**. The relevant mitigation measures that would be employed during the construction, operation and decommissioning of the Proposed Development to minimise potential impacts are also considered in Chapter 13.

Protected Species / Fauna

11.4.14 The detailed surveys for protected species included assessment and recording of any evidence of the following protected species: otter, water vole, badger, bat and incidental recordings of red squirrel, pine marten, amphibians and reptiles. Of these species, no evidence of red squirrel (including individuals, dreys or other signs such as feeding stations) or pine marten (including individuals, dens or scats) was recorded. Due to a lack of woodland cover and other suitable habitat, it was considered that the Development Site is extremely unlikely to support populations of these species and they were therefore not considered any further and have been scoped out of the assessment.

11.4.15 In addition, no suitable habitat for great crested newts was recorded within the Development Site. A single pond was found in the northern section of the Development Site, along the Redhall Burn to the south of Straid, i.e. “online”, which was assessed as being largely unsuitable for great crested newts. Based upon this, great crested newts were therefore not considered any further and have been scoped out of the assessment.

Otter

11.4.16 Strachan (2007) confirmed that the otter population in Ayrshire showed highly significant increase and had reached or was close to carrying capacity at that time. During the otter survey in 2013, otter activity concentrated within the northern areas of the Development Site, generally along the lower, downstream sections of the larger watercourses. A single potential resting site was identified within woodland west of Dalleagles Burn and sprainting activity was found on most watercourses within the Development Site; however sprainting sites were at higher density along the Dalleagles Burn and Knockburnie Burn i.e. the larger watercourses. The focus of otter activity recorded during the survey in 2014 was along the Connel Burn which forms the eastern boundary of the Development Site where five potential resting sites (couches/holts) were recorded along with 19 sprainting locations and one potential otter slide (i.e. where the otter regularly enters the watercourse). Activity was also recorded along the Polga Burn, Knockburnie Burn, Bitch Burn, Littlechang Burn, Catlock Burn, Polmath Burn and Crocradie Burn. No confirmed otter holts or couches were recorded. The focus of otter activity recorded during the survey in 2015 was along the Polmath Burn located along the western boundary of the Development Site. A single potential resting site was recorded along Polmath Burn with 10 spraint locations and two potential locations of otter feeding remains. Activity was also recorded along Knockburnie Burn, Catlock Burn, Crocradie Burn and Polga Burn. No confirmed otter holts or couches were recorded in these areas.

Water Vole

11.4.17 Publically available information on the internet indicated that water vole are present within East Ayrshire, and a recent record of water vole[19] was noted within 11km of the Proposed Development at Belston Loch.

11.4.18 Two water vole burrows were recorded along Dalleagles Burn just outside the northern boundary of the Development Site during the surveys completed in 2013 within a smooth flowing section of the river; these were surrounded by distinct "lawn" areas. No other evidence of water vole was recorded throughout the Development Site, however suitability for their presence was recorded along some of the banks on the flatter watercourses with a slower flow. Similar to 2013, no signs of water vole were recorded during the surveys completed in 2014 and 2015. An incidental sighting of a stoat (*Mustela erminea*) was made along the Knockburnie Burn in 2014.

Bats

11.4.19 Technical **Appendix 11.C** presents the findings of the static detector surveys undertaken between 10-16 October (six nights) and 14-20 November 2012 (six nights) at ten locations across the Development Site. It also presents the results of static detector surveys at four of the entrances of Craigdullyeart Mine. These surveys were undertaken over a two week period between 23 October and 09 November 2013.

11.4.20 Technical **Appendix 11.D** presents the findings of the bat activity transect surveys which were undertaken three times along three separate routes: once in spring (30 May), summer (08 July) and autumn (09 September) 2013. Static detector survey results (at ground level) from seasonal surveys at seven locations are also presented within this Technical Appendix.

11.4.21 Technical **Appendix 11.E** present the findings of the daytime roost assessment surveys undertaken in 2014 at four areas adjacent to the Development Site. In addition, results of the static detector surveys at height (using the met masts) between July and December 2014 and at ground level (at control sites outwith the Development Site) during September 2014 are presented.

11.4.22 No bat roosts were identified during the surveys in 2012 or 2013 and no suitable roosting habitat was identified on the Development Site. Limited roosting suitability exists immediately to the west, east and south of the Development Site (dominated by open upland habitats and conifer plantation forestry with inherent low suitability for roosting. During surveys in 2014, individual trees within the area of mature broad-leaved woodland adjacent to the B741 at Dalleagles were found to contain features which offer shelter and protection for roosting bats.

11.4.23 The results of bat roost assessment surveys from these woodland areas, all of which are located over 1.5km north of the proposed turbine envelope, identified 22 trees with roost potential, one of which supports a bat roost (category 1a) on the basis of the presence of a bat dropping and possible signs of wear. In addition, 19 trees with high potential to support roosts (category 2a) and two with low potential (category 2b) were also recorded.

11.4.24 Building surveys (also completed in 2014) revealed a roost at Marshallmark (Afton Boarding Kennels), assumed to be from pipistrelle species (i.e. common pipistrelle *Pipistrellus pipistrellus* or soprano pipistrelle *P. pygmaeus*) on the basis of the small size, the texture and the location of droppings observed, and there are anecdotal reports from a tenant[20] of bats roosting in a house at Dalleagles Terrace.

11.4.25 Bats from the genera *Pipistrellus*, *Myotis, Plecotus* and *Nyctalus* were identified throughout the study area through the series of bat surveys completed. The overall activity levels recorded during the bat

[19] http://www.ayrshireriverstrust.org/blog/2015/04/30/water-vole-spotted-at-belston/

[20] Conversation between Claire Hopkins, Amec Foster Wheeler and the tenant of Dalleagles Terrace during bat surveys in July 2013.

activity transect surveys were generally considered to be low[21]. Similarly, the overall activity levels recorded during the static detector surveys at ground level during 2013 within the Development Site were generally considered to be low for bats from the genera *Pipistrellus*, *Myotis* and *Plecotus*. However, twice as much activity was recorded for Leisler's bat/*Nyctalus* sp. when compared with pipistrelle species. This ratio between the two genera was considered to be relatively high in Amec Foster Wheeler's experience of carrying out bat surveys in Ayrshire and the south-west of Scotland.

11.4.26 In general, very low levels of bat activity were recorded at the met masts during 2014 with bat activity within the control sites (near to ground level) being higher than observed at on-site met masts.

11.4.27 Whilst the bat activity levels at the met masts, and particularly at height, are relatively low, resulting in small sample sizes on which to base observations of bat activity, analysis of observed 2014 bat activity data in relation to wind speed, indicate that most bat activity takes place at wind speeds of less than 6m/s.

11.4.28 The level of bat activity recorded throughout the bat surveys is considered to be typical of this type of upland habitat (based on Amec Foster Wheeler's experience on similar moorland locations within the south and west of Scotland). The survey results suggest that low numbers of low risk bat species and a low number of high risk bat species occur at the Development Site.

Badger

11.4.29 No badger field signs were identified during surveys and the Development Site was largely considered unsuitable for sett creation, comprising primarily of large swathes of modified bog, marshy grassland, acid grassland and flushes. There are a few drier areas where sett creation could be possible e.g. the lower courses of burns associated with woodland, scrub and field boundaries along steep inclines (and these are described in Technical **Appendix 11.B)**.

Herpetofauna

11.4.30 No amphibians were observed during the surveys. A single online pond was assessed as having poor suitability for great crested newts. In general, the Development Site is largely unsuitable for amphibians, with little shelter/hibernation opportunities within open pasture land, although species such as common frog (*Rana temporaria*) may be present within more heterogeneous habitats to the north. No reptiles or signs of their presence were identified during protected species survey. Overall, a lack of connectivity to suitable habitats in the surrounding area, lack of areas suitable for sheltering and grazing pressure across much of the Development Site is likely to limit the presence of reptiles in the general area, making it of low potential to support these species.

Fish Habitat Survey

11.4.31 Technical **Appendices 11.F and 11.G** provides full details of the survey methods, locations and photographs and these are summarised in **Table 11.7**. At the time when these surveys were being conducted, drought conditions prevailed within Scotland and in particular Ayrshire which explains why so many of the minor watercourses were dry and thus not capable of sustaining fish.

11.4.32 While the majority of the small tributaries and upper watercourses were found to not contain juvenile salmonids, these were found to be present in the lower sections of most of the main watercourses surveyed. However, at the locations of the proposed water crossing on Littlechang Burn, Catlock Burn and the unnamed tributary of the Littlechang Burn (one proposed water crossing on each of these) do not contain suitable habitat for fish to inhabit.

[21] Based on experience gained by Amec Foster Wheeler through working on numerous other similar developments within the south and west of Scotland.

Table 11.7 Electrofishing Survey Results

Watercourse	Results of Electrofishing Survey
Polmath Burn	Did not contain fish at the site surveyed.
Knockburnie Burn	Contains juvenile trout in its lower reaches. No fish were found to be present in the upper reaches of the Knockburnie Burn.
Crocradie Burn	Contains juvenile trout in excellent densities.
Trough Burn	Contains juvenile trout (in lower densities than the Crocradie Burn).
Dalleagles Burn	Contains good to excellent densities of juvenile trout.
Polga Burn	No fish were found to be present although sufficient habitat was present and there were no obvious restrictions to movement between the Connel Burn and the Polga Burn.
Connel Burn	A tributary of the Nith which contains juvenile salmon and trout.
Barlene Burn	This was found to contain no fish.

11.4.33 Habitat surveys were carried out on five sites which had initially been identified as potentially being subject to disturbance from the construction of proposed access tracks. At the time of survey, water levels were very low within four of these areas (site 3 on the Knockburnie Burn, site 9 on the Littlechang Burn, site 10 on the unnamed tributary of the Littlechang and site 11 on the Catlock Burn). Habitat surveys showed that these burns, would be unlikely to hold juvenile salmonids due to the lack of suitable spawning material or in-stream cover from substrate.

11.4.34 The habitat survey carried out at site 4 on the Knockburnie Burn showed that the burn at this location contained limited spawning substrate although habitat for juveniles was available. Electrofishing surveys confirmed no juvenile salmonids were present at this location.

Freshwater Pearl Mussel

11.4.35 Seven historic records (dated between 1962 and 1989) for freshwater pearl mussels were included within the NBN Gateway database for the 10km grid squares surrounding the Development Site.

11.4.36 Consultation with NDSFB in combination with the results of their electrofishing surveys indicated the unsuitability for freshwater pearl mussel in Littlechang Burn, the unnamed tributary of the Littlechang Burn and the Catlock Burn given the absence of suitable fish habitat. Migratory fish species such as trout were recorded in the lower reaches of the Knockburnie Burn (but not in the upper reaches) and it offered limited suitable spawning habitat, although habitat for juvenile fish was present.

11.4.37 No freshwater pearl mussels were recorded during the surveys in 2014.

Other Notable and / or Protected Species

11.4.38 No incidental sightings of other protected and / or notable species were recorded during the series of surveys undertaken at the Development Site.

Value of Receptors

11.4.39 This section evaluates the nature conservation interest of the Development Site for its habitats and for the species it supports in terms of its relative value in a geographical context. VERs are defined as those which have a value of at least District level. All other ecological receptors are henceforth not considered further in this chapter, apart from where legal considerations need to be taken into account, for example, where badgers are considered of Local value, but due to legal considerations need to be further assessed (such receptors are identified with an asterisk [*] in **Table 11.8** below).

11.4.40 A number of receptors identified in this Baseline Information section of the chapter are scoped out of/scoped in to the assessment prior to the evaluation stage as follows:

- The two areas of native woodland to the north of the Development Site and the three areas of native woodland 200m outwith the boundary of the Development Site are scoped out given that no woodland would be felled to accommodate the Proposed Development;
- Since no woodland would be felled to accommodate the Proposed Development, the Carsphairn Forest red squirrel priority woodland is not included further in the scope and both red squirrel and pine marten are scoped out;
- No suitable amphibian habitat (i.e. no ponds) was recorded in the study area and the 500m buffer area, so the presence of protected amphibian species has been scoped out;
- While suitable habitat was recorded within the Development Site for freshwater fish, the only species recorded aside from salmon and trout during the electrofishing surveys were stone loach (*Noemacheilus barbatulus*), minnow (*Phoxinus phoxinus*) and lamprey (*Lampetra fluviatilis*). None of these non-salmonid species were present within the Development Site. The results of the habitat surveys at each of the five[22] proposed water crossings showed that these burns, even under higher water conditions, would be unlikely to hold juvenile salmonids due to the lack of/limited suitable spawning material or in-stream cover from substrate although habitat for juveniles and limited spawning substrate was available at Knockburnie Burn. Freshwater fish are therefore scoped out of the assessment;
- Freshwater pearl mussels are also scoped out due their presence not being recorded during surveying, the inaccessibility of the watercourses within the Development Site to migratory salmonids as well as a general paucity of suitable habitat for the species; and
- Although targeted surveys were not undertaken for herpetofauna, isolated areas of suitable habitat is present within the Development Site and they are therefore considered in the scope of the assessment and are included in **Table 11.8** below.

Table 11.8 Value of Ecological Receptors

Receptor	Rationale	Value
Soligenous mire **M6 *Carex echinata – Sphagnum recurvum/auriculatum***	SBL habitat; LBAP habitat Botanically unremarkable and heavily grazed.	Local
Blanket mire **M17 *Trichophum germanicum – Eriphorum vaginatum***	Annex 1 habitat; SBL habitat; LBAP habitat Forms 23% of blanket mire (~17% of the survey area) and is locally prevalent habitat in areas of high ground where it forms a mosaic with M20. There are two isolated areas of better quality and more species-rich M17 present. However, these are currently under pressure from agricultural management including grazing and drainage.	District
Blanket mire **M20 *Eriophorum vaginatum***	Annex 1 habitat; SBL habitat; LBAP habitat Forms 65% of blanket mire (~49% of the survey area). Dense network of drainage ditches and intense grazing have degraded/modified this habitat. The dominant species is hare's tail cotton grass and *Sphagnum* species are common in some areas, although it is believed that this plant community has been heavily influenced by past agricultural management.	District

[22] At the time of survey, five water crossings were identified within the most current design layout and this determined the locations of the surveys for these surveys. As the additional water crossing is located downstream along the Knockburnie Burn, (this watercourse was surveyed in detail during the targeted fish surveys with five survey locations along the watercourse) the conclusions presented in **Appendix 11.G** for the Knockburnie Burn can be inferred to this water crossing location. It is not considered that additional surveys are required at this water crossing given that no fish were found to be present in the upper reaches of this watercourse at the time of survey.

Receptor	Rationale	Value
Blanket mire **M25 *Molinia caerulea – Potentilla erecta***	Annex 1 habitat; SBL habitat; LBAP habitat Forms 12% of blanket mire (~9% of the survey area). Small areas of botanically unremarkable wet modified bog are present in the survey area. These have been heavily influenced by past agricultural management	District
Rush-pasture **M23 *Juncus/effusus/acutiflorus - Galium Palustre***	SBL habitat; LBAP habitat Forms 53% of the grasslands habitat. However, most of this habitat type is rank and species poor apart from occasional areas where it is more species rich but with common species.	Local
Mesotrophic grassland **MG6 *Lolium perenne – Cynosurus cristatus***	Forms 1% of the grasslands habitat. Found as a mosaic with MG9 in the north-west of the survey area. Some locally rare species present.	Less than Local
Mesotrophic grassland **MG9 *Deschampsia cespitosa***	Forms 1% of the grasslands habitat. Found as a mosaic with MG6 in the north-west of the survey area. Some locally rare species present.	Less than Local
Acid grassland **U4 *Festuca ovina – Agrostis capillaris – Galium saxatile***	LBAP habitat Forms 13% of the grasslands habitat. Small areas of U4 are present as discrete stands with the majority of the remainder being found as a mosaic with U5, U6 and M23. Typical species composition but with some locally rare species present.	Local
Acid grassland **U5 *Nardus stricta – Galium saxatile***	SBL habitat, LBAP habitat Botanically unremarkable (dominated by mat grass) which forms 26% of the grassland habitats but only 1% of this is in discrete stands.	Local
Acid grassland **U6 *Juncus squarrosus – Festuca ovina***	SBL habitat, LBAP habitat Forms 6% of the grassland of the survey area, the majority of which exists as discrete stands. Species composition is typical of this habitat type with notable, locally rare species of *Sphagnum capillifolium* present. Likely to be former blanket mire or wet heath (i.e. peatland vegetation) which has been lost due to agricultural management including livestock grazing, drainage and/or burning.	Local
Bracken **U20 *Pteridium aquilinum - Galium saxatile***	A stand (~5ha) of botanically unremarkable bracken habitat (which also contains U5 and U6 grassland) was recorded on the very steep, south-east facing slope at the south-east margin of the survey area.	Less than local
Running Water	Valuable resource within the Development Site and in wider context.	District
Otter	Otters are legally protected to the highest level by the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended) i.e. they are European protected species (EPS) which makes it an offence to deliberately or recklessly kill, injure or disturb (an) otter(s) and it is an offence of strict liability to damage or destroy an otter resting place. This species is present within the Development Site although resources are generally limited to foraging and commuting which are important at the local scale. Otter populations are thought to be stable and at carrying capacity in Ayrshire (Strachan, 2007) and are a UK BAP priority species on the SBL and are an LBAP priority species. Red List: Near-Threatened.	District*
Water vole	Water vole is afforded partial protection in Scotland under the Wildlife and Countryside Act 1981 (as amended). This makes it an offence to disturb or damage water vole habitat rather than an offence to recklessly kill, injure or take individual water voles. Water vole is also listed in the SBL as 'conservation action needed'. It is also listed on the LBAP. Red List: Least Concern.	Less than local*

Receptor	Rationale	Value
	Although some areas of the Development Site were found to be suitable for water vole habitation with a potential for future colonisation, no evidence of water vole was found within the Development Site, although a water vole burrow was recorded in 2013 just beyond the Site boundary along the Dalleagles Burn. The Development Site is therefore classed as being of Less than local value to water vole.	
Bats	All species of bats and their roosts are legally protected at European level through the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended). The SBL lists Daubenton's bat, whiskered bat, Natterer's bat, noctule, Nathusius' pipistrelle, common pipistrelle, soprano pipistrelle and brown long-eared bat in respect of their importance for biodiversity conservation and international obligations. The common pipistrelle is also listed on the Ayrshire LBAP as a priority species. Population estimates/trends for species considered to be present within the Development Site (based on Battersby et al, 2005 and BCT 2012 population trends[23]) are: ▶ Common pipistrelle: Native, common across the UK. UK 2,430,000 (positive trend); ▶ Soprano pipistrelle: Native, common across the UK. UK 1,300,000 (negative trend); ▶ Daubenton's bat: Native, fairly common throughout much of the UK. UK 560,000; Scotland 40,000 (positive trend); ▶ Natterer's bat: Native, fairly common in much of the UK. UK 148,000; Scotland 175,000 (positive trend); ▶ Whiskered bat: Native, locally distributed. UK 64,000; Scotland 1,500 (no significant trend data); ▶ Noctule: Native, widespread in England and Wales but uncommon in Scotland. UK 50,000; Scotland 250 (no significant trend data); ▶ Leisler's: Native, scarce across England and Wales but uncommon in Scotland. UK 10,000, 250 in Scotland (no significant trend data); and ▶ Brown long-eared bat: Widespread throughout the UK, with a stable population. Estimated population In the UK is 245,000 with ~27,500 in Scotland. Bats from four genera are present within the Development Site: *Pipistrellus*, *Myotis, Plecotus* and *Nyctalus.* *Myotis* species calls and *Nyctalus* species calls were recorded during the bat surveys but these were not identified to species level (e.g. *Myotis* - Natterer's, whiskered or Daubenton's & *Nyctalus* – Noctule or Leisler's). Suitable roosting habitat was limited within the Development Site. One tree roost and one building roost (both pipistrelle) were identified during daytime surveys directly adjacent to the Development Site. Anecdotal evidence exists of another bat roost near Dalleagles and there are numerous mature broad-leaved trees within this area with the potential to support roosting bats. 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. It is also likely that the Development Site acts as an occasional and supplementary foraging resource for bats roosting and foraging in the adjacent, lower lying and more productive habitats. Therefore the Development Site is assessed as being of Local* value to all bat species. The Development Site offers limited suitable foraging habitat for pipistrelle bats but some is present along the coniferous woodland edge and within the marshy grassland where insect prey is more abundant. However, the linear features within the Development Site e.g. the watercourses and sheltered valleys connect the Development Site to more productive foraging and roosting areas within the wider area, therefore the Development Site is assessed as Local* value for pipistrelle bats.	Pipistrelle: Local* *Myotis*: Local* *Nyctalus*: Local* *Plecotus:* Local*
	The Development Site offers limited suitable foraging habitat for *Myotis* bats, but these habitat features extend outwith the Development Site and into areas containing more productive foraging areas and more suitable roosting habitat and therefore the Development Site is valued as Local* value for *Myotis* bats.	

[23] www.bats.org.uk/publications...php/.../NBMP_Summary_2012_web.pdf

Receptor	Rationale	Value
	Fast, high-flying species such as noctule and Leisler's bat do not show as strong preferences for foraging in sheltered/cluttered environments and the factors influencing the activity of this species are thought to be largely related to food abundance. Although heathland is an important habitat for these species in some parts of their range, in south-west Scotland they tend to be associated with woodland, wetland and parkland habitats. Conifer plantation woodland such as that found in the Carsphairn Forest surrounding the Development Site, is less suitable for the insect prey which these species feed on (including moths and beetles). Therefore, the Development Site is valued as Local* value for *Nyctalus* bats.	
Badger	Legally protected species under the Protection of Badgers Act 1992 (as amended by the Nature Conservation (Scotland) Act 2004). Red List: Least Concern. The Development Site provides limited foraging and sett-building habitat. Badgers are not uncommon in the area and are not protected for nature conservation reasons.	Less than local*
Salmonids	Legally protected species under The Salmon and Freshwater Fisheries (Consolidation) Scotland Act 2003. The Development Site provides suitable habitat for the different life stages of the Atlantic salmon and brown trout with most suitability in the lower stretches of the watercourses and upper stretches were found to not contain any juveniles during the electrofishing surveys. Salmonids are a UK BAP priority species and SBL species.	Local*
Freshwater Pearl Mussel	Freshwater pearl mussel receives full legal protection under Schedule 5 of the Wildlife and Countryside Act (WCA) 1981 (as amended). In addition, freshwater pearl mussel are listed on the Scottish Biodiversity List (SBL)[24] as a species for which conservation action is needed and to which the avoidance of negative impacts are critical. No freshwater pearl mussels were recorded during the completion of the surveys in 2014 and habitat suitability was limited to isolated stretches within lower lying areas of the watercourses.	Less than local*
Herpetofauna	Smooth and palmate newt, common frog, common toad, common lizard, slow-worm and adder are afforded limited protection under the Wildlife and Countryside Act 1981 (as amended). Common toad is listed in the SBL. Common lizard and adder are widespread in Ayrshire and are known to extend into the Southern Uplands. Slow worm and grass snake are known to be present in the region but are not considered to be present in the proposed development area. Suitable habitat including walls and tussock-forming purple moor grass is present throughout the Development Site, as such it is evaluated at Local value for these species.	Local*

11.4.41 Based on the evaluation described above, the VERs identified within the context of this assessment are:

- M17 *Trichophum germanicum – Eriphorum vaginatum* blanket mire;
- M20 *Eriophorum vaginatum* blanket mire;
- M25 *Molinia caerulea – Potentilla erecta* blanket mire;

[24] The UK BAP was replaced by the 'UK Post-2010 Biodiversity Framework' (July 2012) which covers the period 2011-2020. This framework is implemented individually by each of the four countries in the UK. Following the publication of the new framework the UK BAP partnership no longer operates but many of the tools and resources originally developed under the UK BAP still remain in use. Within Scotland, the UK Post-2010 Biodiversity Framework is co-ordinated through the Biodiversity Action Reporting System (BARS) which is an online tool which contains a list of Scottish priority habitats and species (also known as The Scottish Biodiversity List [SBL]).

- Running water; and
- Otter.

11.4.42 With respect to species, only otter is considered to be a VER within the context of this EcIA assessment. However, the presence or potential presence of other species that are afforded legal protection has been identified in **Table 11.8** and these have also been included in this assessment:

- Water vole;
- Common pipistrelle;
- Soprano pipistrelle;
- *Myotis* bat species;
- *Nyctalus* bat species;
- Plecotus bats;
- Badger;
- Herpetofauna;
- Salmonids; and
- Freshwater Pearl Mussel.

Predicted Future Baseline

11.4.43 The Development Site is currently used for upland grazing by sheep and it is unlikely that this land use and the associated land management will be altered in the future if the Proposed Development did not proceed. Woodland coverage is limited to scattered broad-leaved trees and scrub on steeper banks at some of the watercourses therefore there are no commercial forestry interests associated with the Development Site or future forestry harvesting requirements.

11.4.44 Areas of marshy grassland may transition into semi-improved grassland over time and some drainage blocks may alter hydrological regimes, but in general the habitats will remain similar. As such the future baseline is unlikely to change significantly from the present baseline conditions reported.

11.4.45 Species that are present in the wider area, but not recorded currently on the Development Site may move into the area in future, e.g. salmonids and water vole, should the habitat become more suitable for these species or as they expand their ranges.

Information Gaps

11.4.46 It is not considered that there are any information gaps that would affect the validity of the impact assessment presented in this chapter.

11.5 Design Evolution

11.5.1 The layout of the Proposed Development has taken account of the findings of (amongst others) ecological assessments as presented in **Chapter 3** - **Site Selection and Design Evolution**. Early identification of ecological constraints has resulted in the following embedded mitigation being incorporated into the design of the Proposed Development in order to remove or reduce the potential for significant ecological effects:

- A buffer zone of 50m from watercourses within the River Dee (Solway) Catchment (Bitch Burn and Strathwiggan Burn and their unnamed tributaries) was applied at design stage (excluding watercourse crossings);
- A buffer zone of 100m from the tributaries within the River Nith catchment (i.e. all watercourses on site with the exception of the Bitch Burn and Strathwiggan Burn, which includes Polmath

Burn, Knockburnie Burn, Spout Burn, Littlechang Burn and its unnamed tributary, Catlock Burn, Crocradie Burn, Trough Burn, Polga Burn, Connel Burn, Straid Burn, Redhall Burn and Blarene Burn) was applied at design stage wherever possible (excluding watercourse crossings);

- A stand-off of at least 50m has been applied to watercourses where otter and/or water vole activity was recorded;
- Infrastructure has been sited to minimise the number of watercourse crossings required, all being located on upper sections of headwaters;
- The cable trench route has been designed to follow access track routes, minimising the overall development footprint;
- Three potential borrow pit search areas, the temporary construction compound and permanent onsite control building and substation locations have been carefully sited, taking into account a suite of environmental considerations;
- A micro-siting allowance of 50m has been incorporated for turbines and crane pads and a 25m allowance for access tracks (**Chapter 4**) to allow minor amendments to site infrastructure due to environmental (and technical) constraints; and
- Turbines have been located so that the turbine blade tips (plus their 50m micro-siting allowance) will be in excess of 50m from features which may be used by bats, including linear habitat such as woodland edges.

11.6 Predicted Effects: Construction

11.6.1 The following assessment of potential effects addresses the construction of the Proposed Development (detailed in **Chapter 4**), comprising up to 19 turbines and associated crane pads, foundations, underground electricity cables, control building and substation compounds, access tracks including six culverted minor watercourse crossings, one temporary construction compound, two permanent wind monitoring masts, three borrow pit search areas and associated ancillary works and infrastructure.

Habitats and Plant Communities

11.6.2 The Proposed Development will result in both temporary and permanent habitat loss due to land take associated with the construction of access tracks, wind turbine foundations, crane pads, construction compound, borrow pits and other associated infrastructure.

11.6.3 It is also possible that indirect effects on surrounding plant communities may occur, particularly from any changes in the hydrological regime.

Habitat Loss and/or Disturbance due to Construction Activity

11.6.4 The anticipated permanent habitat loss during operation of the Proposed Development is expected to be ~ 14.23ha, summarised as follows:

- Turbine bases approximately 0.93ha;
- Turbine crane pads - approximately 2.38ha;
- New access tracks (including passing places) - approximately 8.85ha;
- Substation, Control building and Transformers -approximately 1.98ha; and
- Two permanent met masts approximately 0.09ha.

11.6.5 These permanent habitat losses are broken down by plant communities in **Tables 11.9** and **11.10**.

Table 11.9 NVC Communities and Areas that will be Permanently Lost to Construction Activities (ha) – Mire Habitat

Infrastructure Component	M17	M17 / M20	M17 / M23b	M17a	M20	M20 / M17	M20 / M17 / M23b	M20 /M23b	M20 / minor M23b & U6	M6 / M23	M6	M6c	TOTALS
Turbine bases x 19	0.05	0.001			0.33	0.18	0.006	0.01	0.1				0.677
Crane pads x 19	0.14	0.07		0.01	0.75	0.41		0.09	0.25				1.72
New access track (maximum 6m wide)	0.65	0.51	0.03	0.07	2.54	1.81	0.25	0.1	0.42	0.1	0.04	0.04	6.56
Passing places x 25	0.05	0.05			0.05	0.05	0.05		0.05				0.30
Sub-Station, Control Building & Transformers					1.95								1.95
Two permanent met masts					0.045								0.045
Totals	**0.89**	**0.631**	**0.03**	**0.08**	**5.665**	**2.45**	**0.306**	**0.2**	**0.82**	**0.1**	**0.04**	**0.04**	**11.252**

Table 11.10 NVC Communities and Areas that will be Permanently Lost to Construction Activities (ha) – Grassland Habitats including Rush Pasture

Infrastructure Component	M23 / M25	M23 / M6	M23a/ U4	M23a	M23a/ minor M6 and M20	M23b	M25	M25 / M17	MG6 / MG9	U6	U4 / U6	U4 / U5	U4b / M25	U5 / M25	TOTALS
Turbine bases x 19			0.04			0.05	0.004	0.001		0.09	0.07				0.255
Crane pads x 19			0.11			0.01	0.01	0.12		0.12	0.29				0.66
New (cut) access track (maximum 6m wide)	0.15	0.13	0.12	0.17	0.08	0.03	0.32	0.13	0.07	0.49	0.03	0.03	0.07	0.02	1.84
Passing places x 25		0.05					0.05			0.05					0.15
Sub-Station, Control Building & Transformers				0.03											0.03
Two permanent met masts										0.045					0.045
Totals	**0.15**	**0.18**	**0.27**	**0.20**	**0.08**	**0.09**	**0.384**	**0.251**	**0.07**	**0.795**	**0.39**	**0.03**	**0.07**	**0.02**	**2.98**

11.6.6 In addition to the losses set out in these tables, it is expected that temporary disturbance or loss will occur due to the temporary construction compounds, up to three borrow pits and within adjacent plant communities due to construction activities, particularly for new access tracks where a temporary working corridor of up to 25m may be required before reinstatement to leave access tracks at a maximum of 6m wide (excluding corners and passing places). Temporary disturbance/losses of up to 50m are expected around the infrastructure including turbine foundations and bases, crane pads and the control building compound.

11.6.7 Temporary disturbance or loss (i.e. habitats that will be reinstated following construction) are expected to be in the region of 31.89ha, made up as follows:

- Three borrow pits (total 5ha excavated from within defined search areas);
- Temporary construction compound (0.21ha);
- Turbine bases (0.90ha). This is based upon an additional average 4.5m buffer for construction activities (probably extends to 10m around half the turbine as other half is adjacent to a road or crane pad);
- Crane pads approximately (0.76ha). This is based upon an additional 5m wide construction buffer around half of the crane pad, as the other half is adjacent to a road or turbine;
- New access tracks - approximately 24.72ha, based upon a 25m wide construction corridor; and
- Substation, Control building and Transformers (0.30ha). This is based upon a 10m construction effects buffer excluding those parts of the substation which lie adjacent to a road or the temporary construction compound.

11.6.8 The following paragraphs consider the potential effects on the NVC communities and on running water, which are classed as VERs (being valued at the District level).

11.6.9 Permanent losses of M17 *Trichophum germanicum – Eriphorum vaginatum* blanket mire (including mosaics where M17 is considered to be the dominant plant community) amounts to 1.63ha, while it is anticipated that an additional area of approximately 3.78ha is expected to be temporarily disturbed during construction, i.e. a total of 5.41ha. The loss will be spread across areas of turbine bases and crane pads but will predominantly result from the construction of the access tracks of the Proposed Development. In the absence of mitigation, the overall magnitude of change on M17 *Trichophum germanicum – Eriphorum vaginatum* blanket mire is likely to be medium adverse which equates to an adverse 'slight' effect on a plant community valued at the District level and is '**not significant**' in EIA terms.

11.6.10 Permanent loss of M20 *Eriophorum vaginatum* blanket mire (including mosaics where M20 is considered to be the dominant plant community) amounts to 9.44ha, while it is anticipated that an additional area of approximately 19.80ha is expected to be temporarily disturbed during construction, i.e. a total of 29.54ha. The loss will be spread across areas of turbine bases, crane pads, borrow pit C (M20 is the dominant habitat within the search area) and access tracks, the majority of which will be temporary habitat loss during the construction of the access tracks. In the absence of mitigation, the overall magnitude of change on M20 *Eriophorum vaginatum* blanket mire is likely to be medium adverse, which equates to an adverse 'slight' effect on a plant community valued at the District level and is '**not significant**' in EIA terms.

11.6.11 Permanent loss of M25 *Molinia caerulea – Potentilla erecta* blanket mire (including mosaics where M20 is considered to be the dominant plant community) amounts to 0.64ha, while it is anticipated that an additional area of approximately 1.36ha is expected to be temporarily disturbed during construction, i.e. a total of 2.00ha. The loss will be spread across areas of turbine bases, crane pads and access tracks, the majority of which will be temporary habitat loss during the construction of the access tracks. In the absence of mitigation, the overall magnitude of change is likely to be small, which equates to an adverse 'negligible' effect on a plant community valued at the District level and is '**not significant**' in EIA terms.

11.6.12 All remaining plant communities where habitat loss is predicted are not VERs, having a value of Local or Less than Local. With the likely magnitude of change for each of these communities being small, this would equate to an adverse 'negligible' effect, which is '**not significant**' in EIA terms.

11.6.13 Running water – Six new culverted watercourse crossings will be installed at minor watercourses across the Development Site which will result in the loss of small sections of open water and have the potential to alter local flow regimes. These will be located on Knockburnie Burn, Littlechang Burn (two crossings), unnamed tributary of the Littlechang Burn and Catlock Burn. In the absence of mitigation there is the potential for the construction phase to result in siltation or pollution events within these watercourses, either during crossing construction/upgrades or during the construction of access tracks and other infrastructure across the wider Development Site. However, the inclusion of buffer zones of 50m for the River Dee catchment and 100m for River Nith catchment (except at crossing points) will minimise the risk of adverse effects (as detailed in **Section 11.5**). Longer term localised effects due to altered drainage patterns across the Development Site caused by the construction of turbines, access tracks and other infrastructure are also possible. As such, in the absence of mitigation, the overall effect on running water habitats within the Development Site is likely to be medium which equates to a 'slight' adverse effect on a habitat valued at the District level and is '**not significant**' in EIA terms.

Ground Water Dependent Terrestrial Ecosystems

11.6.14 A detailed assessment for each of the three GWDTEs is provided in **Chapter 13.** There are three separate locations assessed as having moderate or high groundwater dependency included in this assessment (referred to in **Chapter 13** as '41, 207 and 208', see **Figure 13.1** within M23 and M25 habitat communities. These are classed in this chapter as being of Less than Local value (M23) and District value (M25).

11.6.15 Given that the majority of wind farm infrastructure would be located up-gradient of the moderately groundwater dependent locations (as assessed in **Chapter 13**) and no direct habitat loss is predicted within any of the three areas, the magnitude of change is considered to be small resulting in 'negligible' effects which are '**not significant**' in EIA terms.

11.6.16 Accordingly, in the absence of mitigation, no significant effects are anticipated in relation to habitats supported by groundwater.

Fauna

11.6.17 As detailed in **Section 11.3**, the species for which potential effects are assessed are those that are considered to be VERs. Legally protected species (whether VERs or not) are considered separately with respect to the potential to contravene legislation.

Valued Ecological Receptors (Otter)

11.6.18 *Otter*: Otter activity was found along most watercourses within the Development Site, with the majority of activity being confined to their lower lying stretches, most of which are outside of the areas being considered for potential development.

11.6.19 No confirmed otter resting places were identified during the surveys but potential resting places were identified along Knockburnie Burn, Connel Burn, Catlock Burn, Polmath Burn and Littlechang Burn during surveys completed in 2013, 2014 and 2015. As no confirmed otter resting sites were found within the area of the Proposed Development, no effects in relation to known resting sites are anticipated. However, there is a risk that otter could establish resting sites such as couches in advance of construction as suitable habitat is present, and in the absence of mitigation, construction activities may cause disturbance or destruction of any new resting sites. This would constitute a 'small' magnitude of change.

11.6.20 The Proposed Development would result in six culverted crossings of the Knockburnie Burn, Littlechang Burn and its unnamed minor tributary and the Catlock Burn. While this species is present within the Proposed Development area, resources are generally limited to foraging and commuting which provide an important resource at the District scale only. In addition, in view of the fact that otter territories cover many kilometres of watercourses/water bodies and other

watercourses within the catchment would be unaffected, the temporary loss or barrier effects during the construction of watercourse crossings is considered to be 'negligible'. There is a risk, however, that construction activities may result in temporary severance of otter habitats which would constitute a 'small' magnitude of change.

11.6.21 There is also potential for the construction phase to affect otters' food resource through siltation or pollution-related adverse effects on fish/aquatic invertebrates, or by changes to flow regimes within the Development Site, in particular the construction of watercourse crossings. However, as a minimum of a 50m buffer zone around watercourses (except for watercourse crossings) has been incorporated into the scheme, and due to the fact that the Development Site is likely to represent only a very small proportion of an otter's foraging territory, the magnitude of change is considered to be 'small'.

11.6.22 Therefore, in the absence of mitigation, the construction phase has the potential to result in a 'small' magnitude of change in respect of otters. As the Development Site is valued at the District level for otters, this is equivalent to an adverse 'slight' or 'negligible' effect on this species which is '**not significant**' in EIA terms.

Legally Protected Species (not Valued Ecological Receptors)

11.6.23 *Water Vole:* Although water vole were not recorded within the Development Site, some of the watercourses provide suitable habitat for the species. If water vole should colonise these areas, the creation and upgrading of watercourse crossings would have potential to disturb or destroy their habitat, which would be an offence under UK legislation.

11.6.24 *Bats*: No bat roosts have been identified within the Development Site and the habitat is considered generally unsuitable for providing roosting habitat. Since no trees or buildings would be removed, there is no potential for clearance works during construction to disturb or destroy bat roosting habitat. Although bat roosts have been identified in buildings at Marshallmark (Afton Boarding Kennels) and within a tree along Dalleagles Burn, both are located more than 1.5km from the nearest wind farm infrastructure. These features are unlikely to be subject to direct or indirect disturbance as a result of construction activities, including lighting. Therefore, construction effects on resident bat populations in respect of roosts are assessed as being of 'negligible' magnitude of change, resulting in **no effect**.

11.6.25 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 and within the area of sheltered woodland along Dalleagles Burn to the north of the Development Site. The use of lighting on or near these features would therefore be anticipated to result in a 'small' magnitude of change at worst on these Local to Less than local valued populations of bats. This would result in a 'negligible' adverse effect which is '**not significant**' in EIA terms.

11.6.26 *Badger*: Habitat across the Development Site is generally unsuitable for badger and no evidence of this species was recorded during surveying. However, as there are previous records of badger activity in the area (including setts), there is potential for this species to colonise areas close to proposed infrastructure prior to the construction phase i.e. within the adjacent woodland. It is also possible for badgers to commute through the Development Site during the construction process on route to more productive foraging areas. Should this occur, there is the potential to injure a badger or cause disturbance to/destruction of a badger sett which would be an offence under UK legislation (refer to **Table 11.8**). It is anticipated that there would be a 'negligible' magnitude of change on this Less than local valued species, resulting in a 'negligible' adverse effect which is '**not significant**' in EIA terms.

11.6.27 *Salmonids:* All wind farm infrastructure will be located a minimum of 50m from watercourses within the River Dee catchment and 100m from watercourses within the River Nith catchment (apart from watercourse crossings) and salmonids are absent from the sections of watercourse where six crossings will be placed. It is however possible that pollution and sedimentation could occur during in-channel works related to the construction of the water crossings in particular. This could affect water quality, downstream salmonid habitat and populations, which could lead to an offence under

UK legislation (refer to **Table 11.8**). In the absence of mitigation the construction phase has the potential to have a 'small' magnitude of change in respect of salmonids. As the Development Site is valued at the Local level for salmonids, this is equivalent to an adverse 'negligible' effect on this species which is '**not significant**' in EIA terms.

11.6.28 *Freshwater Pearl Mussel*: Freshwater pearl mussels were not recorded within the Development Site, although some of the watercourses could provide future suitable habitat for the species. With salmonids not inhabiting the upper reaches of the affected watercourses (**Section 11.7.19** and Technical **Appendix 11.G**) and these watercourses being prone to drying out, it is unlikely that freshwater pearl mussels will inhabit these watercourses in the future. While all wind farm infrastructure will be placed a minimum of 50m from any watercourse (apart from watercourse crossings) it is possible that pollution and sedimentation could occur as noted in the preceding paragraph. This could affect any freshwater pearl mussel habitat or populations that may potentially be present outwith the Development Site further downstream (no information on current distribution, or presence, is available although there are historical records of this species within 10km of the Development Site). This could be an offence under UK legislation (refer to **Table 11.8**). However, as freshwater pearl mussel are not currently present, there will be no magnitude of change and no effect on this species.

11.6.29 *Herpetofauna*: Habitat across the Development Site offers limited suitability for amphibian and reptiles. Unmitigated construction activities could result in the killing/injury of common lizards and/or other amphibian and reptiles (within isolated areas which could provide suitable habitat only) and would be an offence under certain legislation (refer to **Table 11.8**). It is anticipated that there would be a 'negligible' magnitude of change on this Local valued species, resulting in a 'negligible' adverse effect which is '**not significant**' in EIA terms.

11.7 Predicted Effects: Operation

Habitats and Plant Communities

11.7.1 It is anticipated that the operational phase of the Proposed Development would not result in further habitat loss or degradation beyond that identified above in respect of construction, although it is possible that some plant communities affected during construction may not fully recover during operation due to changes in hydrology resulting from longer-term changes in surface water flows. Similarly, there should be no further pollution or sedimentation to running water, unless major maintenance works was required on watercourse crossings or there was an accidental spillage of oil, concrete or other materials during maintenance of wind farm infrastructure. Any such impacts are considered to be of 'small' magnitude of change, resulting in adverse 'negligible' effects which are '**not significant**' in EIA terms.

Fauna

Valued Ecological Receptors (Otter)

11.7.2 *Otter*: Operational effects on otter would be limited to occasional disturbance during routine maintenance and monitoring visits to the Proposed Development. Such disturbance is not anticipated to be significantly greater than current disturbance levels due to farming on the Development Site and is considered to be of 'negligible' magnitude of change, resulting in a 'no effect' on this species in EIA terms.

Legally Protected Species (not Valued Ecological Receptors)

11.7.3 *Bats:* Direct mortality is the main potential operational effect on bat populations. Based on American and European studies[25] investigating dead and dying bats found beneath and in proximity to wind turbines, the main causes of death in bats at operational wind farms appear to be:

[25] Including in the UK – Fiona Matthews (2014). Conference proceedings, National Bat Conference, University of Warwick.

- Collisions with fast-moving turbine blades resulting in trauma injuries (bats are not known to be killed by direct collisions with stationary blades); and
- Barotrauma (i.e. internal haemorrhaging in the lungs resulting from rapid changes in air pressure behind moving turbine blades).

11.7.4 It is not clear why bats may be attracted to wind turbines although some actively visit turbines to feed on insects that accumulate around the turbine towers and blades. The pattern of mortality is not fixed and seasonal variations in mortality with a peak in August and September have been recorded (Rydell *et al*., 2010a; 2010b) which may be the result of bats moving between lower and higher areas following insect prey: accumulated evidence suggests that turbines may affect migratory movements of insect populations, which may in turn cause clouds of insects to gather around the tops of turbines.

11.7.5 The degree of population-level and individual risk from collision with wind turbines/barotraumas for those bat species identified as using or potentially using the proposed development area are shown in **Tables 11.11 and 11.12** (taken from Natural England, 2014).

Table 11.11 Perceived Levels of Risk to Bat Populations due to Impacts from Wind Turbines

Low	Medium	High
Brown long-eared bat	(No medium risk species present in Scotland)	Nathusius' pipistrelle
***Myotis* species (including Daubenton's, Natterer's and whiskered bats)**		**Noctule**
Soprano pipistrelle		**Leisler's**
Common pipistrelle		

*Bold text indicates those taxa from which individuals have been identified as being present/potentially present within 5km of the Development Site

Table 11.12 Perceived Levels of Risk to Individual Bats due to Impacts from Wind Turbines

Low	Medium	High
Brown long-eared bat	Soprano pipistrelle	Nathusius' pipistrelle
Myotis species (including Daubenton's, Natterer's and whiskered bats)	Common pipistrelle	**Noctule**
		Leisler's

*Bold text indicates those taxa from which individuals have been identified as being present/potentially present within 5km of the Development Site

11.7.6 The highest mortality rates have been found within bat species which are adapted to catch insect prey in the open air (i.e. several metres away from trees and other obstacles). Such species are morphologically and physiologically adapted to straight and fast flight and are the species most often observed flying at the proposed turbine hub height, i.e. noctule, Leisler's and Nathusius' pipistrelle. While the Development Site is outside the known range of Nathusius' pipistrelle in Scotland, *Nyctalus* species including Leisler's bats were recorded.

11.7.7 While many studies have been completed in North America and Europe, there is little published evidence which promotes understanding of the effects of wind turbines on bats within the UK. In this respect, many of the papers already published can only provide hypotheses as to what the potential effects may be for the bat species resident within the UK using similar habitat and

landscape features in continental Europe as reference text. Based on European studies (e.g. Rydell et al., 2012) and preliminary results from the UK (Matthews *et al*, University of Exeter) the differences in which species are killed reflect local / regional differences in the occurrence of high risk species.

11.7.8 Bat species at high risk from wind farm developments were recorded within and adjacent to the Development Site during the series of bat surveys undertaken between 2012-2014. From data collected at static detectors at ground level in 2013, it was concluded that the Development Site is likely to be used as a commuting route for Nyctalus species (the majority of the calls from this group were recorded as being Leisler's bats and during the summer recording period in July) and the main bulk of the activity recorded was within the western section of the Development Site. While the bulk of the calls recorded during 2013 were attributed to Nyctalus bats it was concluded that it was likely to be from a small number of individual Leisler's bats who were exploiting the habitats within the Development Site on route to more productive feeding areas.

11.7.9 High risk species were also recorded during the surveys at height in 2014, but in small numbers (a total of 3.1% of total activity from both met masts over the entire survey period). In view of the very low number of high risk species recorded, it is considered that the operation of the Proposed Development will have no greater than a 'small' adverse magnitude of change on high risk species or populations, resulting in a 'negligible' adverse effect that is '**not significant**' in EIA terms.

11.7.10 There are no bat species which are of medium risk at the population level in Scotland. Soprano pipistrelle, common pipistrelle and Myotis species are of low risk at the population level, although soprano and common pipistrelle are of medium risk at the individual level based on their typical flight behaviour.

11.7.11 A 'low' level of bat activity was recorded during the surveys undertaken in comparison with other wind farm sites in similar locations, and common and soprano pipistrelle bats were by far the most frequently recorded species. Although turbines have been located so that blade tips are in excess of 50m from features typically used by bats (e.g. woodland edges), there is a risk of individual bats colliding with moving turbine blades. However, the potential magnitude of change in terms of risk to populations of soprano and common pipistrelle bats is considered to be no greater than 'small', resulting in a 'negligible' adverse effect that is '**not significant**' in EIA terms.

11.7.12 Very low numbers of Myotis species were recorded at the Development Site and given their low risk status at both the individual and population level, magnitude of change is likely to be 'small' resulting in a 'negligible' adverse effect which is '**not significant**' in EIA terms.

11.7.13 Alteration to bats' behaviour as a result of the presence of wind turbines has been hypothesised as a potential effect during operation. For example, the installation of lighting attractive to bats or their insect prey may result in changes in bat activity levels or fatalities (Bat Conservation Trust and Institute of Lighting Engineers, 2009). There is a requirement for lighting on the proposed turbines for aviation purposes; however any permanent lighting would be infrared. In addition, any directional security lighting used on for example the construction compound would conform to the institute of lighting professionals guidance for Zone E1 (Guidance Notes for the Reduction of Obtrusive Light GN01:2011) and would use a shielded downwards pointing installation. Lighting therefore would not result in the illumination of roosts, river corridors, woodland edges or other key foraging features and as such, there will be no effect on bats as a result of lighting.

11.7.14 Operational effects on other protected species (not valued ecological receptors) i.e., water vole, badger, salmonids, freshwater pearl mussel and herpetofauna, would be limited to possible occasional disturbance during routine maintenance and monitoring visits to the Development Site. Such disturbance is not anticipated to be significantly greater than current disturbance levels due to farming practices on the Development Site. As neither water vole, badger, salmonids, freshwater pearl mussel nor herpetofauna are considered as VERs in respect of the Development Site, such limited effects are classed as '**not significant**' in EIA terms.

11.8 Predicted Effects: Decommissioning

11.8.1 During the decommissioning of the Proposed Development, potential impacts on nature conservation interests would be expected to be similar in nature (although not necessarily in extent or intensity) to those during the construction phase and similar mitigation measures are likely to be employed. The predicted effects of decommissioning (based on the application of the precautionary principle and assuming that there has been no alteration in the environmental conditions) are the same as for construction, none would be classed as significant for EIA purposes. Any new legislation or guidelines published prior to decommissioning would be adhered to and incorporated into mitigation design prior to decommissioning taking place[26] and collated in the form of a Restoration and Decommissioning Plan (RDP). Elements for inclusion in the RDP will include:

- Habitat restoration;
- Protection of watercourses; and
- Consideration of protected species; taking into account the potential for (re)colonisation by species which were found to be absent during baseline surveys (e.g. water vole and badger).

11.9 Predicted Effects: Cumulative

11.9.1 With embedded mitigation (**Section 11.5**), any impacts on habitats due to the Proposed Development are not anticipated to extend beyond the Development Site, however, the potential for cumulative effects needs to be considered in respect of aquatic ecology features given the pathway via watercourses to off-site receptors and highly mobile species such as otter and bats.

11.9.2 In terms of cumulative effects on terrestrial ecology, only proposed developments (either within the planning consent process, consented but not yet constructed or operational) that would impact upon the designated sites, habitats and fauna identified as receptors in this chapter require consideration. This cumulative assessment assesses a zone of influence comprising the spatial area within a 10km radius of the Proposed Development.

11.9.3 Three proposed wind farms, (for which information is readily available publically for cross reference) which are at application stage, are located within 5km of the Development Site:

- South Kyle, 50 turbines, ~2.7 km away;
- Pencloe, 21 turbines, ~3.5 km away; and
- Benbrack, 18 turbines, ~5.81km away.

11.9.4 In addition, the existing Windy Standard Wind Farm which consists of 36 turbines and the consented extension to Windy Standard (30 turbines) are located ~5 km away.

11.9.5 In relation to protected species (apart from bats, with further consideration of this group below) and water quality, it is considered that mitigation incorporated into the South Kyle and Pencloe proposals together with the embedded mitigation within the Proposed Development should prevent any cumulative effects occurring.

11.9.6 This is also considered the case for bat species recorded which do not regularly range over long distances, e.g. over 5km, i.e. *Myotis* and pipistrelle bats (Dietz *et al* 2009) but not necessarily so for larger, further ranging bat species such as *Nyctalus* species where potential collision risk may be an issue. *Nyctalus* species (i.e. noctule and Leisler's) are recognised as a long-ranging species group, where individuals have been recorded to travel up to 26km from a roost to forage and travel at speeds of over 50kph at altitudes between 10m and hundreds of metres, over open ground, including upland sites with no discernible navigation features (Dietz *et al* 2009).

[26] E.g. any updated versions of 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.

11.9.7 When considering potential for bat collision with turbines, it is most relevant to note that there are an additional 11 wind farms currently within the planning system (four consented and seven at application stage) within 10km of the Proposed Development. However, given that the majority of these are currently at application/scoping stage, publically available information in the form of an ES, with specific reference to baseline bat data, was not yet available for direct comparison. Furthermore, where wind farms were consented and/or built prior to the publication of the BCT Best Practise Guidelines (Hundt L, 2012), baseline bat data for wind farms tends to be limited and can often not be used for direct comparison.

11.9.8 It is reported in the South Kyle Wind Farm ES that a suite of monthly transects (completed a minimum of three times during the period May to September 2012) and static ground level (SM2) surveys was undertaken (units placed at sampling locations for five consecutive nights each month between May to September 2012). During all of the transect surveys undertaken only one Leisler's pass was recorded (May 2012) while during the ground level static surveys there were four passes detected from Leisler's bat at three different locations in June, August and September 2012. As is the case with the Proposed Development, there was no evidence that Leisler's were roosting on or nearby South Kyle and the call sequences indicated commuting rather than foraging.

11.9.9 From the bat surveys undertaken at Benbrack (monthly bat activity transect surveys and static detector surveys between May and October 2011, plus repeat surveys undertaken between May and October 2013 – which included surveys at height) bats from the genera Pipistrellus, Myotis and Nyctalus were identified throughout the study area through the series of bat surveys completed, however the overall activity levels were generally considered to be low. From the total bat passes collected at ground level (864), only 14 were attributed to high risk bat species. Static detector surveys at height recorded one bat pass from high risk species.

11.9.10 At the Proposed Development, static bat detector surveys at rotor-swept height using the temporary met masts recorded very little activity throughout the recording period which was dominated by bats from the genus *Pipistrellus*. From a combined total of 255 bat passes, only 15 passes could be attributed to bats from the high risk genus *Nyctalus*: eight Leisler's bat passes were recorded (six at MM1 and two at MM2) and seven passes (labelled as *Nyctalus*) which could not be identified to species level.

11.9.11 Therefore, at South Kyle, Benbrack and at the Proposed Development very few *Nyctalus* passes were recorded either at ground-level or at rotor-swept height respectively, indicating that *Nyctalus* species would only be at an increased risk of collision with turbines at South Kyle and / or the Proposed Development, if the presence of turbines at either or both sites significantly altered their distribution or flight characteristics, causing them to fly more regularly at rotor-swept height. However, this is considered to be very unlikely.

11.9.12 It is reported in the Pencloe ES that a series of bat surveys were undertaken during 2007 following the prevailing survey guidelines (BCT, 2007). Bat roost potential surveys were undertaken at potential roosting features within 200m of the development footprint during which two roosts were identified; one of which contained a roosting noctule bat. Activity surveys (one dusk and one dawn) were undertaken on 29 August and 5 September 2007 at features identified as containing medium or high bat roosting potential during the bat roosting potential surveys. A single soprano pipistrelle was recorded emerging from one of the trees during these surveys.

11.9.13 As these surveys were undertaken prior to the publication of the Hundt, 2012 guidelines, no baseline exists which would allow a direct comparison between the bat species composition within the development footprint at Pencloe with the data collected to date at Enoch Hill due to the differing survey techniques and the lower level of survey effort employed.

11.9.14 No significant cumulative effects on bats are considered likely.

11.10 Mitigation and Enhancement Measures

11.10.1 In view of the likely effects taking into account the design evolution (see **Section 11.5**), all potential effects on VERs are considered to be '**not significant**'. Therefore there is no strict requirement for

any additional mitigation (i.e. additional to that embedded at the design phase) with respect to valued ecological receptors. However, mitigation is also required where there is a potential for protected species legislation to be contravened. Furthermore, although no significant effects are predicted on VERs, in the interests of best practice, a range of additional mitigation measures which may further minimise effects are considered below.

Construction Phase

11.10.2 The following general mitigation and best practice will be incorporated into the construction phase in order to minimise any adverse ecological effects as far as possible.

11.10.3 All construction activity will be limited to clearly-defined working areas, vegetation clearance will be kept to a minimum and areas of hard standing will also be minimised to reduce the need for additional drainage provision. On-site cabling will follow access tracks wherever practicable to reduce land-take during construction. Where applicable, vegetation will be lifted as turves (e.g. heath and mire vegetation where the structure is suitable) to provide optimal opportunity for habitat restoration in accordance with guidance on wind farm construction (Scottish Renewables *et al*., 2013). Habitats which would be subject to temporary loss will be re-vegetated and reinstated as soon as possible after construction.

11.10.4 Storage of materials will be confined to areas of hard standing and appropriately located away from sensitive features such as those areas of known value to protected species and watercourses.

11.10.5 Watercourses will be protected during construction through the adoption of a range of mitigation measures outlined in **Chapter 13** which include: provision of drains, silt traps and barriers to prevent silt-laden run-off from entering watercourses; in addition to the implementation of a minimum 50m stand-off distance from watercourses which was incorporated at the design stage (with the exception of the five watercourse crossings).

11.10.6 A Construction Environmental Management Plan (CEMP) will be prepared which will set out a variety of control measures for managing the potential environmental effects of construction works including control and management of surface water runoff, waste and pollution control. In particular the CEMP will draw on good practice guidance which includes the following:

- Good practice during wind farm construction (Scottish Renewables *et al.,* 2013);
- SEPA Pollution Prevention Guidelines (PPG), specifically PPG 1 (general guide to the prevention of pollution), PPG 5 (works and maintenance in or near water), PPG6 (working at construction and demolition sites), PPG7 (safe operation of refuelling facilities), PPG 21 (pollution incident response planning) and PPG22 (incident response – dealing with spills);
- SEPA Good Practice Engineering Guidance will be adopted, specifically WAT-SG-23 (bank protection), WAT-SG-25 (river crossings), WAT-SG-26 (sediment management) and WAT-SG-29 (construction methods)[27];
- Watercourse crossings will be designed according to CIRIA best practice[28]. The exact designs for upgraded/new culvert structures (including six water crossings) will be the subject of consultation with SEPA, Marine Scotland, NDSFB and ART prior to construction, and will be designed to allow the through passage of fish and otters, while maintaining existing flow conditions and river bed conditions within each watercourse;
- An Environmental/Ecological Clerk of Works (ECoW) will be appointed to ensure compliance with the CEMP, to provide advice in the event of any unforeseen protected species issues that arise during construction, and to oversee the implementation of mitigation measures;

[27] http://www.sepa.org.uk/water/water_regulation/guidance/engineering.aspx

[28] CIRIA Culvert Design and Operation Guide [C689] and Scottish Executive River Crossings and Migratory Fish: Design Guidance (http://www.scotland.gov.uk/consultations/transport/rcmf-03.asp: (accessed October 2013).

- Where night works are unavoidable, the need for artificial lighting will be kept to a minimum and directed away from sensitive habitats and species. The ECoW may make recommendations to revise the times of working hours at specific locations or times of year as appropriate to avoid disturbance of sensitive receptors;
- Micrositing of infrastructure (+/- 50m for turbines and met masts; +/- 25m for access tracks) will be undertaken during construction works, under the direction of the ECoW, so that any disturbance or damage to sensitive habitats can be avoided as far as possible; and
- Borrow pits will be restored in line with the above good practice guidance during wind farm construction (Scottish Renewables *et al*., 2013).

Habitats and Plant Communities

11.10.7 **Table 11.9 and 11.10** summarises areas of various plant communities that would be directly lost under the development footprint. As all effects were classed as '**not significant**' no additional mitigation measures are required. In addition, potential effects on plant communities assessed as GWDTEs (**Chapter 13**) were classed as '**not significant**' and therefore again, no additional mitigation with respect to these receptors is required. However, the general construction phase mitigation measures outlined above will further reduce any medium, small or negligible effects on these habitats. In addition, the implementation of a Drainage Management Plan and a Pollution Prevention Plan including pollution prevention measures track drainage design, and an emergency response plan will further minimise any potential for plant communities to be indirectly affected by changes to surface water flows resulting from the Proposed Development or pollution (**Chapter 13**).

Fauna - Valued Ecological Receptors (Otter)

11.10.8 *Otter*: Otters are active both within and adjacent to the Development Site and detailed pre-construction otter surveys will be undertaken within a radius of 250m around each proposed turbine location and associated infrastructure, 250m upstream and downstream of each water crossing, and 100m either side of access tracks in accordance with SNH guidance. This will inform consultation with SNH, mitigation plans and/or licence applications where appropriate. These surveys will be undertaken no more than six months prior to the start of construction.

11.10.9 In the context of its EPS status, works that can be expected to cause disturbance to otters or which may result in damage or destruction to their places of shelter should only proceed after an appropriate licence has been issued by SNH. In their guidance, SNH advises that disturbance during development works can be minimised by declaring an area within at least 30m of an otter shelter/resting place out of bounds to all site users at all times (increasing to 100m for breeding or natal holts), although SNH should be consulted to determine whether any proposed measures incorporated into the Proposed Development are sufficient to avoid the need for a licence. If resting sites become established during construction, all contract and site operatives will be briefed on the location of such sites to avoid any accidental damage or disturbance. Exclusion zones around such sites or programming of works to avoid sensitive areas will be considered where appropriate, under the direction of the ECoW.

11.10.10 Site compounds and welfare facilities will be located at least 100m away from any watercourses and lighting will be directed away from watercourses to enable otter to move within their territories undisturbed.

11.10.11 A suitable means of escape from any exposed trenches and other excavations will be provided (such as a long wooden or metal plank). Deeper excavations (e.g. borrow pits) will be fenced off appropriately (as instructed by the ECoW), to prevent wildlife access. Any pipes being stored on-site will be open at both ends to allow animals to enter and exit. Where pipes are not open at both ends, they will be capped to prevent otters from entering/becoming trapped.

Fauna - Legally Protected Species (not Valued Ecological Receptors)

11.10.12 *Water Vole*: Although no evidence of water vole was identified at the Development Site, habitat with potential to support this species is present. Therefore, a pre-construction water vole survey will be carried out within a minimum of 50m of the location of each watercourse crossing. In the event that the presence of water voles is confirmed, a mitigation scheme will be agreed with EAC in consultation with SNH and will be implemented prior to construction. If required, this is likely to include water vole exclusion and habitat enhancement measures in accordance with current guidance (Strachan, Moorhouse & Gelling 2011).

11.10.13 Badger: Best practice guidelines will be adopted e.g. excavations will be fenced off to prevent wildlife access.

11.10.14 *Salmonids, Freshwater Pearl mussel and other aquatic species*: Pollution prevention mitigation (as described in Chapter 13), will further minimise the potential for any effects on these species and if required, specific timings will be incorporated into the project delivery stage. In addition, no water crossings will be constructed during key sensitive spawning periods for salmonids (i.e. between January and May) to ensure no interference or damage to eggs or alevins that may potentially be present in the gravels, either at the water crossings or downstream.

11.10.15 *Herpetofauna*: Best practice for amphibians and reptiles will be implemented through compliance *with a protected spec*ies method statement which will include the following measures (for legal protection purposes):

- The ECoW or a suitably qualified ecologist will check any such existing or created piles and stone walls for resting/hibernating amphibians and reptiles prior to site clearance/dismantling and the storage of equipment. Any animals found will be relocated away from such areas to more suitable receptor areas (as determined by the ECoW) where possible to avoid disturbance;
- Areas of suitable reptile habitat (particularly tufted grasses) will be mown short when reptiles are least likely to be present, and under the supervision of a suitably qualified ecologist, prior to cutting/removal for construction; and
- For the duration of any earthworks, any trenches or excavations which are left open overnight will be inspected for the presence of amphibians and reptiles prior to infilling, if dug during their active period (i.e. March – October). Any amphibians and reptiles found during works would be carefully removed and placed at a suitable receptor site away from the construction works.

11.10.16 It must be noted that potential does exist for changes to baseline conditions and for species which have been scoped out of this assessment (or have been recorded in a limited capacity only) to colonise e.g. badger. If evidence of previously unrecorded protected species is suspected or found during the active construction phase, work within the vicinity of the location (plus an appropriate buffer depending on the type of work being undertaken and the likely disturbance zone resulting from these activities) will immediately be halted, the ECoW informed, and the most appropriate course of action to ensure the welfare of the species concerned and the avoidance of any offences under protected species legislation will be agreed. For example, ecological surveys will be undertaken as required (as determined by the ECoW) prior to construction activities recommencing. If protected species or their signs are subsequently confirmed (e.g. badger setts), consultation will be undertaken with SNH to agree a mitigation strategy and to ensure that an offence is not committed.

Operation Phase

11.10.17 The majority of the mitigation applied during ongoing and operational activities relates to the application of best practice in terms of managing and controlling activities to minimise the risk of pollution upon receptors and hydrological features. A detailed explanation of the general site pollution control, emergency procedures and contingency planning is set out within **Chapter 13**.

11.10.18 All operational and maintenance work requirements will be undertaken within working areas clearly defined in advance of works and the storage of materials would be restricted to areas of hard standing e.g. permanent tracks, crane pads or substation and control building, and associated

infrastructure. Any maintenance works would take place during daylight hours to minimise the potential for disturbance to nocturnal protected species that may be present on the Development Site (e.g. otter and bat).

11.10.19 The need for mitigation in terms of protected species presence during ongoing and operational work will be determined through pre-construction surveys and through the advice provided by an ECoW. If EPS or other development licences are subsequently required, these will be discussed with SNH and applied for as necessary.

Decommissioning Phase

11.10.20 During the decommissioning of the Proposed Development, potential effects on nature conservation are expected to be similar to those encountered during the construction phase and therefore similar ecological mitigation measures will be required. Any new legislation or guidelines published prior to decommissioning will be adhered to and incorporated into mitigation design (and the RDP) prior to decommissioning taking place.

Summary of Incorporated Mitigation Measures

Table 11.13 Incorporated Mitigation Measures

Potential Receptor and Effect	Mitigation Measure	Responsibility for Implementation	Compliance Mechanism
Construction			
Temporary habitat loss / degradation	Reinstatement of areas subject to temporary disturbance. Preparation and adherence to CEMP.	Construction Manager and ECoW	By planning condition; compliance monitored by EAC/SNH/SEPA.
Running Water (habitat loss / degradation/pollution)	Adherence to pollution prevention guidelines etc. as fully detailed in **Chapter 13**	Construction Manager and ECoW	By planning condition; monitored by EAC/SNH/SEPA.
Protected and/or Notable Species (disturbance, killing, injury, habitat loss / degradation / fragmentation)	All working areas would be clearly defined. Pre-construction surveys for protected species with relevant Method Statements and Licences produced as necessary. An ECoW would provide advice in the event of any expected or unforeseen protected species issues that arise during the construction and to oversee the implementation of mitigation requirements. Water quality protection measures (e.g. adherence to SEPA PPGs). Water crossing construction to follow SEPA and Scottish Government culvert design requirements and avoid sensitive time period for salmonids (spawning, egg deposition & fry emergence). Removal of vegetation/spoil/brash piles to be supervised by ECoW.	Construction Manager and ECoW	By planning condition; compliance monitored by EAC/SNH.
Operation			
Protected and/or Notable Habitats (habitat loss / degradation) **Protected and/or Notable Species (disturbance, killing, injury, habitat loss / degradation / fragmentation)**	Water quality protection measures (e.g. adherence to SEPA PPGs). All maintenance working areas would be clearly defined.	Construction Manager and ECoW	By planning condition; compliance monitored by EAC/SNH/SEPA.

Potential Receptor and Effect	Mitigation Measure	Responsibility for Implementation	Compliance Mechanism
Decommissioning			
Protected and/or Notable Habitats (habitat loss / degradation) **Protected and/or Notable Species (disturbance, killing, injury, habitat loss / degradation / fragmentation)**	Preparation of a Restoration and Decommissioning Plan.	Developer	By planning condition; compliance monitored by EAC.

11.11 Residual Effects

Construction

Habitats and Plant Communities

11.11.1 As no significant pre-mitigation effects were identified for habitats and plant communities, including GWDTEs, residual effects remain '**not significant**'.

11.11.2 The potential overall pre-mitigation magnitude of change on running water was anticipated to be 'medium' and '**not significant**' in EIA terms. With the incorporation of the identified mitigation and best practice into the Proposed Development, the overall magnitude of change is anticipated to reduce to 'small' and remains '**not significant**' in EIA terms.

Fauna

11.11.3 No significant pre-mitigation effects were identified for protected species, therefore, with mitigation incorporated, residual effects are considered to be 'small' (bats and salmonids) or 'negligible' and '**not significant**'. Best practice mitigation has been identified for application during construction in order to ensure that the Proposed Development takes place in accordance with European and national legislative requirements. Such measures include pre-construction surveys, sensitive timing/phasing of works, SNH licence applications where appropriate, compliance with the CEMP, works to be overseen by an ECoW and adoption of best practice.

11.11.4 The potential overall pre-mitigation magnitude of change on otter ranged from 'medium' to 'small'. With the mitigation incorporated into the Proposed Development, the overall magnitude of change is anticipated to reduce to 'negligible' and remain '**not significant**' in EIA terms.

Operation

11.11.5 No significant adverse effects have been identified on any habitats and plant communities or faunal species during operation. Therefore, with mitigation incorporated residual effects are considered to remain 'negligible' and '**not significant**'.

Decommissioning

11.11.6 With the application of the mitigation identified for decommissioning, the worst case scenario residual effects resulting during decommissioning are identified as being similar to the residual effects resulting from construction. As such, with mitigation incorporated the residual effects are considered likely to remain 'negligible' and '**not significant**'.

Summary of Assessment of Residual Ecological Effects

11.11.7 A summary of the potential residual effects is provided in **Table 11.14**. Receptors such as badger which are considered of Local value, but due to legal considerations need to be further assessed (such receptors are identified with an asterisk [*] in **Table 11.14** below).

11.11.8 With the provision of all of the mitigation measures identified in **Section 11.4** and **Section 11.9** (embedded within the scheme design or identified as being a requirement for the construction,

operation and decommissioning processes) no significant ecological effects on VERs have been identified.

Table 11.14 Summary of Residual Effects

Potential Effect	Valued Ecological Receptor / Legally Protected Species	Magnitude of Change	Receptor Value	Significance	Summary Rationale
Construction/ Decommissioning					
Valued Ecological Receptor habitat loss/degradation	Blanket mire M17 *Trichophum germanicum – Eriphorum vaginatum*	Small	District	NS	Design mitigation, specific construction mitigation and application of best practice will result in no significant effect.
	Blanket mire M20 *Eriophorum vaginatum*	Small	District	NS	
	Blanket mire M25 *Molinia caerulea – Potentilla erecta*	Small	District	NS	
	Running water	Small	District	NS	
GWDTE (degradation / loss)	Three areas of GWDTE: M23 and M25	Negligible	Less than Local and District	NS	
Disturbance to legally protected species	Otter*	Negligible	District*	NS	
	Water vole*	Negligible	Less than local*	NS	
	Bats*	Small	Local*	NS	
	Badger*	Negligible	Less than local*	NS	
	Salmonids*	Small	Local*	NS	
	Freshwater Pearl Mussel	None	Less than Local*	NS	
	Herpetofauna*	Negligible	Local*	NS	
Operation					
Valued Ecological Receptor habitat degradation (e.g. due to hydrological changes)	Blanket mire M17 *Trichophum germanicum – Eriphorum vaginatum*	Negligible	District	NS	Design mitigation, operational mitigation and application of best practice will result in no significant effect.
	Blanket mire M20 *Eriophorum vaginatum*	Negligible	District	NS	
	Blanket mire M25 *Molinia caerulea –*	Negligible	District	NS	

Potential Effect	Valued Ecological Receptor / Legally Protected Species	Magnitude of Change	Receptor Value	Significance	Summary Rationale
	Potentilla erecta				
	Running water	Negligible	District	NS	
GWDTE degradation(e.g. due to hydrological changes)	Three areas of GWDTE: M23 and M25	Negligible	Less than Local and District	NS	
Mortality due to collision with turbine blades/ barotrauma	Soprano and common pipistrelle bats*	Small	Local*	NS	
	Myotis species bats*	Small	Local*	NS	
	Nyctalus species*	Small	Local*	NS	
Disturbance to protected species	Otter*	Negligible	Local*	NS	
	Water vole*	Negligible	Less than Local*	NS	
	Bats*	Negligible	Local*	NS	
	Badger*	Negligible	Less than local*	NS	
	Salmonids	Negligible	Local*	NS	
	Freshwater Pearl Mussel	Negligible	Less than Local*	NS	
	Herpetofauna*	Negligible	Local*	NS	
Cumulative					
Mortality due to collision with turbine blades/ barotrauma	Soprano and common pipistrelle bats*	Negligible	Local*	NS	Design mitigation, specific construction / operational mitigation and application of best practice will result in no significant effect.
	Myotis species bats*	Negligible	Local*	NS	
	Nyctalus species*	Negligible	Local*	NS	
		Large Medium Small Negligible	International National Scottish District Local Less than Local	S = Significant NS = Not Significant	

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12. Ornithology

12.1 Non-Technical Summary

12.1.1 A programme of bird surveys was undertaken at the Development Site in accordance with Scottish Natural Heritage guidance during the 2012 and 2013 breeding seasons and the 2011/12, 2012/13 and 2013/14 non-breeding seasons ('winter'). These surveys were comprised of vantage point (VP) surveys from three locations with an average of 36.25 hours of observation per VP during the 2012 breeding season; and 42 hours per VP from five locations during the 2013 breeding season. VP surveys were undertaken from five locations during the 2011-12 winter season with an average of 41.7 hours of observation per VP; and 42 hours per VP from five locations in both the 2012-13 and 2013-14 winter seasons. In addition, the following distribution and abundance surveys were also carried out during each relevant season: breeding waders, breeding raptors and walked transects during winter. Black grouse lek surveys were undertaken in spring 2012 and 2013 and barn owl surveys were undertaken in the 2012 breeding season. Data for 'target species', i.e. those assessed as being of notable nature conservation value, were supplemented with information provided by the RSPB and local Raptor Study Group.

12.1.2 The Development Site primarily consists of grass-dominated moorland which is grazed by sheep and is bordered by similar habitats to the east, plantation forestry to the south and west and agricultural land to the north. Recorded target species activity was low throughout the survey periods, with key findings being the presence of a small black grouse population, active barn owl and merlin nests (in 2012 and 2013 respectively), low densities of breeding waders and a small population of overwintering golden plover. Target species flight activity levels remained low throughout the survey periods.

12.1.3 Black grouse have been recorded lekking at locations across the north west section of the Development Site (with the core lekking area more than 1km to the north of proposed turbine locations), each time comprising one to three individuals and thus indicating the presence of a small population that is not restricted to fixed/traditional lek locations. A single tree nest of merlin was identified in 2013 approximately 500m from the nearest proposed wind turbine. Three curlew territories were recorded in 2013, all located more than 600m from the proposed wind turbines. Small flocks of golden plover were recorded across the higher elevations of the Development Site during the autumn and spring passage as well as the core winter periods.

12.1.4 No residual significant effects on birds are predicted as a result of the Proposed Development, or cumulatively or in combination with other developments.

12.2 Introduction and Overview

12.2.1 This chapter details the methodology and results of the ornithological surveys undertaken by AECOM and Amec Foster Wheeler Environment & Infrastructure (Amec Foster Wheeler) to inform the EIA for the Proposed Development. The chapter describes and evaluates the current ornithological interest of the Development Site and its surrounds, and provides an assessment of the potential effects of the Proposed Development on birds. Mitigation/compensation/enhancement measures are identified where necessary and an assessment of the potential residual effects on ornithological receptors taking these measures into account is presented.

12.3 Methodology and Approach

Policy and Legislative Context

12.3.1 The ornithological assessment has taken account of the requirements and guidance given in:

- Council 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);
- The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2000 (as amended);
- The Wildlife and Countryside Act 1981 (as amended) (W&CA);
- The Nature Conservation (Scotland) Act 2004;
- The Town and Country Planning (Scotland) Act 1997 (as amended);
- Scottish Planning Policy (SPP) (2014);
- Planning Advice Note (PAN) 60 (2000, revised 2008): Planning for Natural Heritage;
- Approved Ayrshire Joint Structure Plan (2007);
- Adopted East Ayrshire Local Plan (2010); and
- East Ayrshire LDP Proposed Plan (2015).

Guidance Documents

12.3.2 The ornithological assessment has also drawn upon available guidance on bird survey methods and assessment methods, with notable examples below. While the key guidance used as the basis of this assessment are noted below, where there have been deviations, the approach taken is clearly defined in the relevant sections of this chapter (e.g. the approach taken to assessing nature conservation value and significance levels):

- Survey Methods for Use in Assessment of the Impacts of Proposed Onshore Wind Farms on Bird Communities (Scottish Natural Heritage (SNH) 2010, revised 2013). Due to the timing of the surveys (undertaken between September 2011 and March 2014) these took account of the prevailing guidance at the time (i.e. SNH, 2010 & 2013). This chapter does however take account of the guidance given in SNH 2013 (updated in 2014) in relation to reporting and presentation of data;
- Assessing Significance of Impacts from Onshore Wind Farms on Birds outwith Designated Areas (SNH, 2006);
- Developing Field and Analytical Methods to Assess Avian Collision Risk at Wind Farms (Band *et al*., 2007); and
- Guidelines for Ecological Impact Assessment in the United Kingdom (Institute of Ecology and Environmental Management, 2006).

Baseline Establishment

Desk Study

12.3.3 The presence of Special Protection Areas (SPAs), Ramsar Sites and Sites of Special Scientific Interest (SSSIs) for which birds were a principal reason for notification or designation within 20km of the Development Site boundary was determined by accessing the SNH SiteLink and Joint Nature Conservation Committee (JNCC) websites and through use of the on-line GIS tool MAGIC (http://magic.defra.gov.uk/). **Figure 12.1** illustrates the locations of statutory sites within 20km of the Development Site. A distance of 20km has been selected based on the upper limit of the commuting distance of geese attributed to SPAs (Pendlebury *et al*., 2011).

12.3.4 Sites of Importance for Nature Conservation (SINC) within 2km of the Development Site were identified as part of the wider ecological assessment (**Chapter 11: Ecology**) and those with ornithological interest have been considered within this chapter. A distance of 2km has been

selected based on the lower level of importance of SINCs as compared to SPAs/SSSIs, as accepted by SNH for other wind farm projects, including Benbrack Wind Farm in Dumfries and Galloway for example.

12.3.5 A literature search and review was carried out in order to obtain contextual data and to gain further information on aspects of the ecology and behaviour of key species that could potentially be affected by the Proposed Development. The primary source of published contextual data was *The Birds of Scotland* (Forrester *et al*., 2007).

12.3.6 RSPB (Clare Bunyard) and the South Strathclyde Raptor Study Group (SSRSG) (Gordon Riddle) were contacted to request the provision of data relating to black grouse from within 1.5km of the core survey area (see 12.3.11 below) and protected raptors and other species of designated conservation concern (including migratory wildfowl) from within 2km (6km for golden eagle) of the core survey area.

12.3.7 Associated ornithological documentation supporting the planning application for Ashmark Hill Wind Farm (located to the east on land immediately adjacent to the Development Site, refused in September 2014 and subsequently dismissed on appeal in May 2015) was also reviewed to provide contextual information.

Baseline Determination

12.3.8 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. The guidance document on survey methods for use in assessment of the impacts of proposed onshore wind farms on bird communities produced by SNH (SNH, 2010; revised in 2013) was taken into account when defining the survey programme.

12.3.9 The SNH guidance suggests that assessment should concentrate on ‘target species’, which are those species valued on the basis of satisfying certain criteria (by virtue, for example, of being listed on Schedule 1 of the W&CA or Annex 1 of the Birds Directive). A phased approach was taken in assessing the ornithological interest of the Development Site, beginning with an initial Development Site appraisal and desk-study followed by detailed survey work.

12.3.10 The data collected by AECOM at the Development Site in 2011/12 and 2012 and existing knowledge of Amec Foster Wheeler technical staff with respect to the ornithological interest of the local area (gained from working on, for example, Benbrack, Glenmount, Lorg and Garleffan Wind Farms in south west Scotland) indicated that the Proposed Development area was likely to support a typical range of species associated with grass dominated moorland, including the presence of target species such as black grouse, protected raptors and transiting wildfowl. The following target species were identified as being potentially present during the desk based study and a review of species range maps for the Development Site (Forrester *et al*., 2007):

- Protected raptors and owls (including hen harrier *Circus cyaneus,* merlin *Falco columbarius*, peregrine *Falco peregrinus,* goshawk *Accipiter gentilis*, barn owl *Tyto alba* and short-eared owl *Asio flammeus*);
- Waterfowl and waders (particularly grey geese *Anser spp*. Which might migrate over or use the area, whooper swan *Cygnus cygnus* and European golden plover *Pluvialis apricaria*); and
- Black grouse *Tetrao tetrix*.

12.3.11 Based on the desk study, early consultations with SNH, Amec Foster Wheeler and AECOM’s professional experience and taking account of the latest SNH survey guidance, it was concluded that winter and breeding bird surveys would be required and that these should include vantage point watches and targeted black grouse, wader and raptor surveys (details of which are provided in **Appendices 12.A-E**).

Study Area and Survey Scope

12.3.12 The 'Development Site' refers to land encompassed within the red-line application boundary. The study area consisted of a 'core survey area'[1] (initial potential turbine envelope) plus all of the land to which access was available for surveys (The Development Site), with **Figures 12.2a-c,** illustrating the extent of these survey areas. It should be noted that the site boundaries shown on the baseline report figures reflect the site boundary which applied to the Development Site at the time the surveys were undertaken, rather than the application site boundary as shown on **Figure 1.2**. Furthermore, **Figure 12.2a** shows land to the south east of the Development Site which was included in the 2011-12 winter transect survey but was subsequently not surveyed as the landowner withdrew from discussions with E.ON about the potential development of turbines on this land.

12.3.13 **Figure 12.3a** illustrates the five VPs used by AECOM in the 2011-12 winter season and also the three VPs used in the 2012 breeding season (explanations for these VP locations can be found in **Appendices 12.A** and **12.B**). **Figure 12.3b** illustrates that each of the five VPs used in 2012/13, 2013 and 2013/14 are located approximately 2km from each other, at the very edge of the view-sheds of the other VPs. The potential influence of surveyor presence on bird behaviour during simultaneous VP surveys was minimised by locating the VPs as far as possible away from each other whilst also maximising coverage of the proposed turbine area. Care was taken by the surveyors to be inconspicuous during surveys, with the surveyor hidden by trig point(s) at VP1, VP2 and VP3, a stone wall at VP4 and by a raised area immediately behind VP5. Surveyors wore dull clothing and concealed themselves within a camouflaged bivouac bag at each VP. Three of the VPs are located outside of the proposed turbine array, with VP2 and VP3 being the exceptions.

12.3.14 A variety of survey methods were employed based on the range of habitats present and the range of target species. SNH confirmed in their scoping response (**Table 12.1**) that they were satisfied with the survey methods employed. A summary of the surveys completed is provided below, with full details in the following Appendices:

- **Appendix 12.A**: Baseline Ornithology Report – Winter Season 2011/12 (AECOM);
- **Appendix 12.B**: Baseline Ornithology Report – Breeding Season 2012 (AECOM);
- **Appendix 12.C**: Baseline Ornithology Report – Winter Season 2012/13 (Amec Foster Wheeler);
- **Appendix 12.D**: Baseline Ornithology Report – Breeding Season 2013 (Amec Foster Wheeler); and
- **Appendix 12.E**: Baseline Ornithology Report – Winter Season 2013/14 (Amec Foster Wheeler).

12.3.15 The following survey methodologies were employed:

- VP surveys: covering the core survey area, from 5 VPs, totalling 42 hours per VP between September 2011 and March 2012 (with the exception of Blarene [37.5 hours] and High Chang East [45 hours]); from 3 VPs, with an average of 36.25 hours per VP between April and August 2012; from 5 VPs, totalling 36 hours per VP between October 2012 and March 2013; from 5 VPs, totalling 42 hours per VP between April and August 2013; and from 5 VPs, totalling 42 hours per VP between September 2013 and March 2014. During surveys, observed flights of target species were assigned to one of a series of height bands to allow the subsequent assessment of the amount of flight activity in the airspace that would be occupied by turbine blades, as well as that below and above the blades. The following height bands were generally used for the VP surveys undertaken at Enoch Hill: 0-30m, 30-40m, 40-130m and >130m (or 40-150m and >150m for some seasons).

[1] The northern extent of the 'core survey area' follows the east – west grid line which defines the southern extent of a turbine 'avoidance area' applied to minimise effects on residential properties located to the north of the Development Site, see Table 3.1 for more details.

- Moorland breeding bird surveys: a walkover survey recording and mapping all breeding species, covering the core survey area plus a 500m buffer (where access available) between April and June 2012;
- Breeding wader surveys: following the Brown and Shepherd (1993) method, covering the core survey area plus a 600m buffer within the Development Site between April and July 2013;
- Breeding raptor surveys: following the methods in Hardey *et al*., 2006, between April and July 2013, covering the core survey area and 2km buffer (where access was available);
- Black grouse lek surveys: in line with the methodology recommended in SNH guidance (2005, updated 2010), entailing a two visit survey of the core survey area and 1.5km buffer (where access was available), in May 2012; and following the method in Gilbert *et al*., (1998), a two-visit survey of the core survey area and Development Site in April and May 2013;
- Barn owl surveys of suitable nesting habitat within 1km of the Proposed Development were undertaken between May and July 2012; and
- Monthly winter walked transect survey: between September 2011 to March 2012 of land within 600m of the core survey area (where this falls within the Development Site); between September 2012 and March 2013, of land within 1km of the core survey area (where this falls within the Development Site); and between September 2013 and March 2014 of the Development Site.

Consultation

12.3.16 Scoping feedback relevant to this ornithological assessment is summarised in **Table 12.1**, with details of how each comment has been addressed also provided.

Table 12.1 Summary of Ornithology Related Scoping Responses

Organisation	Comments	Action Taken
East Ayrshire Council	Noted Ornithology assessment should consider "*hen harrier, golden eagle, short eared owl, barn owl, merlin, peregrine falcon, golden plover and black and red throated diver*".	Effects on all these species have been considered. A number could be ruled out from full assessment based on lack of recorded activity, including hen harrier, golden eagle, short-eared owl and divers.
RSPB Scotland	Noted that the initial results recorded in the scoping report show that the Development Site provides habitat for a range of upland bird species including some Annex 1 species. They also noted that surveys are already largely completed and appear to be appropriate to assess interest at the Development Site. However, no methods are provided and details such as vantage point location, timing and duration of surveys are not provided. These must all comply with the latest SNH guidance. Concerns over cumulative impact from the scheme plus opencast mining, other windfarms and plantation forestry in area. Requested additional black grouse surveys take place in 2013 using standard methods.	Surveys complied with current SNH guidance. Cumulative impacts are assessed in **Section 12.10**. Black grouse surveys were undertaken between April and May 2013 in line with survey guidance for this species.
SNH	SNH were initially contacted in November 2011 by AECOM, who sought advice on the level of survey effort as well as the type of surveys undertaken during the 2011/12 winter season. The dialogue continued through to October 2012 and is documented in Appendices 12.A and 12.B. SNH raised the following four main areas for clarification: 1. A representative sample of dates and weather conditions should be obtained. 2. Viewsheds 1, 4 and 7 appear to be more than 180 degrees.	AECOM provided a summary of the methods and results of the surveys as requested. A summary of the clarifications were as follows: 1. Approximately two thirds of the VP surveys were targeted at dusk and dawn with the remainder during the day. Extreme weather conditions were avoided. 2. The viewsheds of VPs 1, 4 and 7 were expanded to account for the site topography which made it very difficult to obtain extensive coverage and also to encompass several habitat features that were identified as having potential for supporting target species activity.

Organisation	Comments	Action Taken
	3. Some of the VPs appear to be close to the proposed turbine layout and would recommend a 500m separation buffer. 4. Further viewshed mapping is required to confirm appropriate coverage of the turbine layout. SNH confirmed in October 2012 that they were happy with the reasoning and had no further comments. In their scoping response SNH re-iterated that survey methods had followed their guidance and had no further comments.	In actuality, target species activity was very low and therefore the expanded viewsheds did not detract from target species flight monitoring. 3. Surveyors took steps to remain concealed when in position at VPs, using temporary shelters. None of the VPs were located within the viewshed of another VP. 4. Viewsheds were provided to SNH.

Methodology for Establishment of Effects

Prediction of Effects

12.3.17 The key issues relating to bird and wind farms are as follows:

- The effects of direct habitat loss due to land take by wind turbine bases, tracks and ancillary structures;
- The effects of indirect habitat loss, entailing the displacement of birds from the proximity of turbines. Such disturbance may occur as a consequence of construction work, or due to the presence of the wind farm close to nest or feeding sites or on habitual flight routes; and
- The effects of collision with rotating turbine blades, overhead wires and guy lines (i.e. killing or injury of birds), which is of particular relevance for sites located in areas known to support raptors or large concentrations of waterfowl.

12.3.18 There are multiple variables that affect the responses of individual living organisms, populations, communities and ecosystems to changes in their environment. These are not fully understood, and it is therefore rarely possible to make predictions about the ecological effects of any form of development with absolute confidence.

12.3.19 Prediction relies on the information gathered during the baseline surveys and studies of the Development Site, together with the body of contextual information and knowledge available from written sources. Input is also required from those individuals and organisations with expertise in, or local knowledge of, relevant aspects of ecology.

12.3.20 Early investigations into the potential for terrestrial wind farms in the UK to cause significant displacement or mortality of birds concluded that this was only likely in exceptional circumstances (Percival 2000; and Gill *et al*., 1996). Although various post-construction ornithological monitoring studies are being undertaken in the UK, the results of few of these have been made available as formal peer-reviewed scientific papers. An increasing number are, however, becoming available in the 'grey literature' (i.e., they are not formally peer-reviewed) and are available on the internet. In predicting the effects of an individual wind farm, the consultant is therefore obliged to draw on these as well as additional information from studies elsewhere in Europe (again, increasingly available as grey literature).

Evaluation of Effects

12.3.21 Four criteria have been used in evaluating the ornithological effects of the Proposed Development:

- The type of effect, whether it is positive, negative, neutral or uncertain;
- The probability of the effect occurring based on the scale of certain, likely or unlikely;
- The nature conservation importance of the resource under consideration, based on guidelines initially developed by SNH and British Wind Energy Association (BWEA [now Renewable UK]) (Percival *et al*., 1999) and expanded on in SNH (2006) and Percival (2007) which are set out in **Table 12.2**; and

- The magnitude of change in relation to the resource, definitions of which are set out in **Table 12.3** (based on Percival *et al*., (1999) and Percival (2007)). The magnitude of any impact is determined by the interaction between the scale of the effect in time, area and intensity and the sensitivity of the affected species.

12.3.22 A matrix showing how nature conservation importance and magnitude of change are used to derive an assessment of the significance of effects is presented in **Table 12.4**. The guidelines (Percival *et al*., 1999; Percival 2007) aim to make the evaluation of nature conservation importance relatively straightforward. Under these, both the value of the birds using a site with regard to the percentage of the population under consideration, and their conservation status (for example Schedule 1 W&CA/Annex 1 Birds Directive species) are used along with other factors to assess the nature conservation importance of a site. These terms effectively only set out to evaluate the importance of a species. However, the importance of the site for that species, as judged on the basis of the habitats present and the level of use by the species under consideration, is not evaluated.

12.3.23 The approach of this assessment is therefore to also consider the value of the site (and the airspace above it) 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 Bullfinch is a Scottish Biodiversity List species (and hence of Medium importance as a species following the criteria in **Table 12.3**), the value of a site which was only used by a single Bullfinch will be extremely limited. Therefore, in this example, nature conservation importance of the site would be assessed as being 'Negligible'.

12.3.24 Therefore, while the importance of the species is taken into account, in order to assess the nature conservation importance of the survey area, 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 survey area to that species.

Table 12.2 Definition of Terms relating to Conservation Importance (Sensitivity)

Importance	Definition
Very High	A species which is part of the cited interest of an SPA or an SSSI. Species present in internationally important numbers.
High	Other non-cited species which contribute to the integrity of an SPA or SSSI. Ecologically sensitive species such as rare birds (<300 breeding pairs in the UK) and the less common birds of prey (e.g. golden eagle, honey buzzard, osprey, marsh harrier and hen harrier). A species present in nationally important numbers (>1% UK Population). A species listed on Annex 1 of the EU Birds Directive ('Annex 1 species') and/or Schedule 1 of the Wildlife and Countryside Act 1981 ('Schedule 1 species') Regularly occurring relevant migratory species which are either rare or vulnerable, or warrant special consideration on account of the proximity of migration routes, or breeding, moulting, wintering or staging areas in relation to the Proposed Development.
Medium	Species present in regionally important numbers (>1% of regional population). Species occurring within SPAs and SSSIs, but not crucial to the integrity of the site. Species on the Scottish Biodiversity List.
Low	Species covered above which are present infrequently or in very low numbers. Any other species of conservation interest not covered above, e.g. species listed on the red or amber lists of Birds of Conservation Concern (Eaton *et al*., 2009).
Negligible	Species that remain common and widespread.

Table 12.3 Definition of Terms relating to Impact Magnitude

Magnitude	Definition
High	Total loss or major alteration to key elements/features of the baseline conditions such that post development character/composition of baseline condition will be fundamentally changed.
Medium	Loss or alteration to one or more key elements/features of the baseline conditions such that post development character/composition of the baseline condition will be materially changed.
Low	Minor shift away from baseline conditions. Changes arising from the alteration will be detectable but not material; the underlying character /composition of the baseline condition will be similar to the pre-development situation.
Negligible	Very little change from baseline conditions. Change is barely distinguishable, approximating to a "no change" situation.

12.3.25 It is important to note that these criteria are only a guide, and are applied very broadly i.e. they do not take into account variation between individuals or variation in topography, habitat type, or wind farm layout or size.

Significance Evaluation Methodology

12.3.26 In terms of the EIA Regulations, it is impacts that are likely to have significant environmental effects that require detailed assessment. As the EIA Regulations guide the assessor to focus on effects that are likely to be significant, the outcome of the assessment of a given effect on a particular receptor in its simplest form would be that it is significant or not significant. However, there may be instances where it is appropriate to further sub-divide the category of 'Not Significant', for example by use of the terms 'Slight' and 'Negligible' in terms of the level of effect. The use of the category of 'slight' may for example be used in acknowledgement that there are instances whereby there may be an effect, albeit that this is not likely to be significant - and this approach may better facilitate assessment of cumulative effects where cumulatively several slight effects could be significant. With this consideration in mind, **Table 12.4** illustrates a matrix, which has been used for guidance in the assessment of significance.

12.3.27 Having defined a level of effect, professional judgement, in combination with guidance and standards (e.g. SNH, 2006), are then applied to identify which of those levels of effect are then considered to be equivalent to significant effects when discussed in terms of the EIA Regulations. Those levels of effect which are shaded in **Table 12.4** equate to those considered significant under the EIA Regulations with the others constituting no effect or an insignificant effect.

Table 12.4 Establishing the Level of Effect

Magnitude	Sensitivity				
	Very High	**High**	**Medium**	**Low**	**Negligible**
High	Substantial	Substantial	Substantial	Moderate	Slight
Medium	Substantial	Substantial	Moderate	Slight	Negligible
Low	Moderate	Moderate	Slight	Negligible	Negligible
Negligible	Slight	Slight	Negligible	Negligible	Negligible

Shaded Cell = Significant in terms of EIA Regulations.

Unshaded cell = Not significant in terms of EIA Regulations.

12.3.28 It should be noted that the type of categorisation illustrated in **Tables 12.2** to **12.4** provide a guide only, and may be moderated based upon professional judgement and experience. In particular, the divisions between categories of receptor sensitivity, magnitude of change, and level of effect

should not be interpreted as definitive, and the lines that represent the boundaries between categories should in many cases be considered as 'blurred'. Where the level of effect is considered to be moderate or less, these are generally not deemed significant in terms of the EIA Regulations. However, depending on the receptor being considered, it is possible that some potentially moderate effects could be judged as significant in terms of the EIA Regulations, and where this is judged to be the case, the rationale for this conclusion has been provided in this chapter.

12.4 Baseline Information

Current Baseline

Designated Sites

12.4.1 The Development Site is not subject to any statutory nature conservation designation (e.g. SPA, Special Area for Conservation [SAC], SSSI), nor any non-statutory designation (e.g. SINC). No reserves managed by the Scottish Wildlife Trust, RSPB or similar organisations are present within the Development Site.

12.4.2 There is one site of International / European importance for its bird populations within 20km of the Site: Muirkirk and North Lowther Uplands SPA. This is located approximately 10km to the north-east of the nearest proposed turbine (T18) and is designated for:

- Short-eared owl, hen harrier, merlin, peregrine and golden plover during the breeding season; and additionally; and
- Hen harrier during the winter season.

12.4.3 Three SSSIs which list ornithological interest as a feature are located within 20km of the Development Site boundary, comprising the Merrick Kells, Bogton Loch and the North Lowther Uplands.

12.4.4 **Table 12.5** summarises the location of ornithological statutory sites relative to the Development Site and notification features of ornithological interest, with locations illustrated in **Figure 12.1**.

Table 12.5 Summary of SSSIs within 20km of the Site Boundary

Designated Sites (SSSIs)	Distance / Direction from the Development Site	Notification Feature	Potential connectivity with the Site *
Muirkirk and North Lowther Uplands SPA	7km/NE	Short-eared Owl (26 breeding pairs) Hen Harrier (29 breeding pairs and 12 overwintering individuals) Merlin (six breeding pairs) Peregrine (nine breeding pairs) Golden Plover (154 breeding pairs)	Short-eared Owl (most foraging flights are recorded within 2km of nest sites, suggesting that the core range is 2km, but foraging up to 4-5km away from the nest site has been recorded). Hen Harrier (regularly forages between 2-4km but up to 10km during the breeding season and forages within 6-16km of communal winter roosts). Merlin (regularly forages between 4-5km from the nest during the breeding season, with a maximum recorded distance of 8km). Peregrine (70% of foraging flights are recorded within 2km of nest sites, suggesting that the core range is 2km). Golden Plover (forages a maximum of 10.7km away from breeding sites).

Designated Sites (SSSIs)	Distance / Direction from the Development Site	Notification Feature	Potential connectivity with the Site *
Merrick Kells SSSI	16km/SW	Notified for its breeding bird assemblage of national importance; no further details are provided in the description.	Species not cited.
Bogton Loch SSSI	8.5km/W	Notified for its nationally important breeding bird assemblage, including: song thrush, grasshopper warbler, spotted flycatcher, willow tit, reed bunting and black-headed gull. It is also of importance for wintering wildfowl including whooper swan (although this is not a notified feature).	Species not cited.
North Lowther Uplands SSSI	7km/NE	Nationally important breeding bird assemblage. Includes all species cited within the Muirkirk and North Lowther Uplands SPA; and also Dunlin.	See above for species also cited within the SPA. Dunlin (regularly forages up to 2km from a nest site with 3km foraging flights the furthest distance recorded).

* Foraging distances taken from Pendlebury *et al*., 2011.

12.4.5 There are no non-statutory sites identified for its ornithological interest within 2km of the Development Site.

Desk Based Review of Bird Records

12.4.6 Information was provided by Clare Bunyard (RSPB) in relation to black grouse records and other sensitive species and is presented in **Confidential Appendix 12.F** and **Figure 12.C**. This comprised of several records of single displaying male black grouse at several locations to the north, west and east of the proposed turbine locations between 2006 and 2011. This dataset highlights that black grouse utilise a large number of patches of short vegetation spread throughout the wider area for lekking, with the same individuals likely to be moving between locations on separate mornings or even the same morning. Records of barn owl and nightjar presence to the north and west of the Proposed Development were also indicated by the data search. These records were from 2006, with the single nightjar record from outwith the Development Site. Onsite habitats are largely unsuitable for this species.

12.4.7 The information provided by the SSRSG is also presented in **Confidential Appendix 12.F**. They confirmed that there are known nest sites of a single Annex 1 Birds Directive or Schedule 1 W&CA listed raptor / owl species from within the search areas relevant for each species: four barn owl breeding sites within 1.5km of the accessible survey area. A further three nest sites of barn owl were identified as being present close to the search areas, as well as two nest sites of peregrine.

12.4.8 The nearby Ashmark Hill Wind Farm ornithology ES chapter provided details of a single black grouse lekking on the Development Site on two successive days in mid-April 2011 and also a record of black grouse droppings on Enoch Hill and High Chang Hill. Surveys were undertaken at the Ashmark Hill site during the 2010/11 winter season and the 2011 breeding season.

Field Survey Results Summary

12.4.9 A summary of the main findings from the survey programme is as follows:

- A black grouse lek was identified supporting peak counts of three lekking males and two female birds (in March 2014). Three satellite leks (smaller leks close to the main sites or a lek stand [an area where a single male will display]) were also recorded within the Development Site (around 1km from the main lek);
- The densities of breeding wader species were low, with three curlew territories identified within 600m of the core survey area in 2013;

- Two Annex 1 Birds Directive and/or Schedule 1 W&CA listed raptor/owl species were identified as nesting within / adjacent to the raptor survey area - merlin in 2013 and barn owl in 2012;
- Low levels of target species flight activity was recorded throughout the breeding season, with moderate levels of flight activity in winter (specifically golden plover); and
- Small flocks of golden plover and small numbers of black grouse utilising onsite habitats throughout the winter season(s).

12.4.10 Further details are provided in the section below and full details of the results are provided in the baseline reports presented in **Appendices 12.A-E**. All target species flight-lines, from each of the five survey seasons, are illustrated in **Figures 12.4** and **12.5**, with breeding wader territory locations in **Figure 12.6**. Confidential information such as black grouse lek locations, Schedule 1 species nest sites and other sensitive species information is presented in **Confidential Figures 12.A-C**.

Target Species: Summary of Activity

Whooper Swan

12.4.11 Whooper swan was recorded on a single occasion during the entire survey period (2011-14), comprising one flight of a total of three individuals during VP surveys. In the 2012-13 winter season, three individuals were recorded during a VP watch on 01/11/2012 flying over the proposed turbine locations[2], though above the maximum blade tip height of 130m. There was also a single unconfirmed record of five individuals during a winter walkover survey in the 2011/12 season.

Pink-footed Goose

12.4.12 One pink-footed goose flight was recorded during VP watches across the entire survey period (2011-14), totalling ten individuals in winter 2013-14 (08/01/2014). This flight was away from the proposed turbine locations (plus 200m buffer). A single incidental record of 48 birds was noted in winter 2013/14 (11/10/2013) and a further incidental record was noted to the west of the Development Site, comprising 200 individuals in the 2013 breeding season (19/04/2013).

Greylag Goose

12.4.13 Greylag goose was recorded on two occasions during the entire VP survey period (2011-14), with one flight of two birds above the maximum blade tip height of 130m during the 2013 breeding season on 07/04/2013 and a single flight at 30-130m height but >500m from proposed turbine locations. There were no other records of this species.

Barnacle Goose

12.4.14 A total of two barnacle goose flights were recorded during the entire VP survey period (2011-14), totalling 130 individuals (during the 2013 breeding season on 13/04/2013), both flights being within the 30-130m flight height band over the proposed turbine locations[2]. There were no other records of this species.

Black Grouse

12.4.15 A single main lek site was identified in 2012 with several mobile 'satellite' lek sites also identified in 2013 (04/04/2013 and 07/04/2013). During the 2012 breeding season, a peak count of two males were observed lekking at the main lek site, with another record of one (or possibly two) males during a black grouse survey. During the 2013 breeding season, a peak count of three males was observed within the survey area (on 04/04/2013), with two males seen in several locations across

[2] Plus a 200m buffer around turbines to account for any inaccuracy in mapping flight line locations.

the Development Site, from Enoch Hill and Benty Cowan to Peat Hill and Rigg Hill. A peak count of one displaying male was recorded at each of the 'satellite' lek sites.

12.4.16 Supplementary information on black grouse provided by the RSPB is presented in **Confidential Appendix 12.F**. Records of black grouse were noted from the period 2006-2010. Records ranged from the simple presence of black grouse in two kilometre grid squares to the south west and the east of the Development Site, to confirmed sightings of both female and male individuals as well as lekking birds on the Development Site and also offsite to the south west and east.

12.4.17 Four black grouse flights of nine birds were noted during the 2012/13 winter season VP surveys (peak count of four females and two males; with flights recorded on 10/10/2012, 12/10/2012, 14/11/2012 and 01/03/2013). A single flight of four individuals (two males and two females) was recorded during VP surveys in 2013/14 (01/03/2014). All flights were low level (up to a maximum of 30m) and of short duration (maximum of 75 seconds).

12.4.18 During the 2011/12 winter transect surveys, two individual black grouse were noted, a bird in flight over Blood Moss in February and a male at Connelburn Rigg in March. The 2012/13 winter transect surveys recorded a single male and two females loafing on Chang Hill. During the 2013/14 winter transect surveys, black grouse were recorded on three occasions, with a peak count of three males and a single female loafing around the main lek (on 24/09/2013, 28/01/2014 and 03/03/2014). There were eight incidental records of black grouse in winter 2013/14, with the majority of records from the main lek area (one record was in September with the remainder spread from December through to March). A peak count of three lekking males was recorded on 11/03/2014 and a peak count of two females on 12/03/2014.

12.4.19 It was notable from the surveys undertaken at the Development Site that the main concentration of black grouse were from Peat Hill and Blood Moss in the northwest of the Development Site. This main concentration was centred on the largest lek in the survey area. Occasional records of one to two birds were recorded from elsewhere within the Development Site, both of flushed birds and of lekking males. As there is no high quality nesting habitat onsite it is likely that birds will nest within areas of forestry to the south and west. Habitats suitable for chick-rearing are in good supply across the Development Site, particularly the boggy areas around Blood Moss. Overwintering birds are more likely to use the forest edge habitats to the south and west and broadleaf stands to the west and north.

Hen Harrier

12.4.20 Five hen harrier flights below 30m height were recorded during the 2013/14 winter season, comprising both male and female individuals (two flights on 24/09/2013; and one flight on 02/10/2013, 11/10/2013 and 09/01/2014). No further vantage point records were obtained (i.e. from winter 2011/12, breeding 2012, winter 2012/13 and breeding 2013 surveys). During winter transect surveys, a single male was recorded in late September 2011 (2011/12 winter season) and a female was recorded on two occasions during winter 2013/14 (on 16/02/2014 and 03/03/2014). There was no evidence of a nest or roost site on or close to the Development Site, which was further reinforced by the survey data provided by the SSRSG as they did not identify any hen harrier nests or roosts from within 2km of the Proposed Development.

Goshawk

12.4.21 A total of three goshawk flights were recorded during winter 2011/12 VP surveys. While much of the activity was at rotor height, all flights were outside the proposed turbine area. A single goshawk was recorded during the 2013 breeding season, out with the Development Site (on 26/07/2013). There were no other records of this species. The survey data provided by the SSRSG did not identify any goshawk nests from within 1km of the Proposed Development.

Merlin

12.4.22 A total of 14 merlin flights were recorded during the VP surveys (2011-14) with both male and female individuals observed. Two merlin flights were noted in winter 2011/12, one flight in the 2012

breeding season, one flight in winter 2012/13, six flights during the 2013 breeding season (four in April, one in May and one in June) and four flights during winter 2013/14 (five in September and two in October). Flights were generally low level and of short duration (maximum of 75 seconds).

12.4.23 Although there were no nest records from within 2km of the Proposed Development provided by the SSRSG, a single merlin nest was identified within 2km of the Proposed Development in 2013.

Peregrine

12.4.24 Two peregrine flights were observed during the survey period (one flight during the 2012/13 winter season on 16/01/2013; and a second flight during the 2013 breeding season on 13/04/2013), with both being low level (less than 30m) and for short duration (maximum of 60 seconds). There was also a single incidental record from the 2012 breeding season. No records were obtained relating to peregrine breeding attempts from within 2km of the Proposed Development.

12.4.25 Supplementary information provided by the SSRSG in **Confidential Appendix 12.F** documents two peregrine nest sites within a 5km buffer of the Development Site boundary, although no nest sites are located within a 2km buffer.

Golden Plover

12.4.26 Golden plover were recorded throughout the winter period in 2011/12, 2012/13 and 2013/14 during both VP and winter walkover surveys. Golden plover were also recorded during VPs in the 2012 and 2013 breeding seasons and during the breeding bird walkover surveys in 2013. A total of 72 golden plover flights (cumulative total of 1,650 individuals[3] and a combined flight time of 560,556 seconds[4]) were recorded across the entire survey period (five seasons from 2011-2014).

12.4.27 Of the three non-breeding seasons during which VP surveys were undertaken at Enoch Hill, golden plover activity appeared to be at its greatest during winter 2013/14 in terms of peak flock size and the cumulative amount of flight time. The mean flock size was of 26 individuals and the three largest flocks, comprising 110, 200 and 220 birds (the latter being the peak count) were recorded in late February and March. The mean flock size outwith this period during winter 2013/14 was eight individuals.

12.4.28 Records of golden plover during the two breeding seasons were limited to the month of April and as such these records were likely of passage rather than breeding birds. There was no indication that this species bred on or close to the Development Site in either the 2012 or 2013 breeding season.

12.4.29 The majority of records were of roosting and loafing birds on the higher summits throughout the Development Site, particularly at High Chang and Benty Cowan Hill. It is likely that these flocks foraged within the enclosed pastures on the lower ground within the Nith Valley hence their regular presence at the Development Site throughout the winter.

12.4.30 Given the regular occurrence of golden plover during the winter period, with flight activity recorded over the proposed turbine area at blade height, Collision Risk Analysis (CRA) has been undertaken. Further details of golden plover flight activity and CRA are presented in **Section 12.8** and **Appendix 12.G** (which presents CRA calculations).

[3] While the cumulative total number of golden plover recorded was 1,650, with a peak count of 220 individuals it is unlikely that 1,650 different individuals utilise the site (i.e. it is likely that some individuals were at least double counted over the course of the survey period).

[4] For example, if a flock of 50 birds were recorded flying within the CRV for 20 seconds, the cumulative flight time would be 1,000 seconds (i.e. 50 individuals x 20 seconds).

Dotterel

12.4.31 There was a single incidental record of dotterel during the 2013/14 winter season surveys and two incidental records of dotterel during the 2013 breeding season in August.

Dunlin

12.4.32 There was a single incidental record of dunlin during the 2013/14 winter season surveys.

Barn Owl

12.4.33 No barn owls were recorded during generic breeding or winter season surveys. This species was only recorded during species-specific barn owl surveys in 2012. A successful nest site was recorded over 2.5km from the nearest proposed turbine location (T14).

12.4.34 Supplementary information provided by the SSRSG in **Confidential Appendix 12.F** documents seven nest sites within a 5km buffer of the Development Site boundary and four within the 1.5km standard search area.

Other Species of Conservation Concern: Waders

Curlew

12.4.35 Three curlew territories were recorded in 2013 but there were no confirmed territories within 600m of the Proposed Development. During surveys in 2012, occasional records of curlew occurred in April but there were no breeding attempts noted. There were no records of curlew during any of the three winter seasons.

Snipe

12.4.36 There were several incidental records of this species during each breeding season, for example on dawn and dusk walks to and from VPs. This species was regularly recorded in small numbers during the winter season surveys carried out in 2011/12, 2012/13 and 2013/14.

Oystercatcher

12.4.37 This species was occasionally recorded within the Development Site during winter and breeding seasons, however there was no evidence of breeding from within 600m of the core survey area in 2012 or 2013.

Woodcock

12.4.38 There was a single record of woodcock in both the 2011/12 and 2013/14 winter season surveys.

Other Species

12.4.39 A number of red and amber listed species (Birds of Conservation Concern, Eaton *et al.,* 2009) were recorded on the Development Site. Red listed species breeding within 500m of the core survey area included skylark, song thrush and lesser redpoll. Amber list species breeding within 500m of the core area included meadow pipit, dunnock and willow warbler.

12.4.40 During the five winter seasons, flights of kestrel, buzzard and raven were regularly observed. The range of passerine species was similar to that observed during the breeding season, although numbers tended to be lower, particularly during the core winter months.

Predicted Future Baseline

12.4.41 There are no known plans to alter the current land management practices at the Development Site, which could in turn affect the bird community characterised by the baseline surveys. In the absence of the Proposed Development, it is therefore assumed that the bird community on the

Development Site will be relatively stable (though subject to fluctuations in species composition and population sizes as is typical of ecological communities).

Information Gaps

12.4.42 Adverse weather conditions during early spring 2013, as documented by Slingo (2013)[5], led to the adaptation of the survey scheme, delaying the start of the distribution and abundance surveys. It is outlined in Gilbert *et al*., (1998) that black grouse surveys should be undertaken between mid-March and mid-May, but with snow on the ground in March, the first survey visit was delayed until early April 2013, with the second visit undertaken in early May. Hardey *et al*., (2006) recommend that the first survey visit to detect the majority of Schedule 1 W&CA raptors be undertaken in March, but similarly to the delayed start of the black grouse surveys, raptor surveys began in mid-April as a response to the adverse weather. This was also the approach taken with regard to the moorland breeding bird surveys, which began in late April.

12.4.43 Given the volume of survey work undertaken over several seasons, this is not considered to have resulted in a significant information gap. No other survey limitations have been identified and it is considered that the survey programme is appropriate and robust, adhering to SNH guidelines in respect of bird surveys at proposed onshore wind farms.

12.5 Design Evolution

12.5.1 The design of the Proposed Development has evolved over time in response to a variety of factors including the findings of the initial feasibility study and baseline work subsequently carried out as part of the EIA. From an ornithological perspective, the presence of black grouse has in some part influenced the evolution of the design of the Proposed Development or will be inherent in its construction and/or operation.

12.5.2 While surveys and desk study have identified several locations utilised by small numbers of lekking black grouse, turbine positions are over 500m from these. The initial borrow pit search identified three potential locations, with the northernmost and largest of these search areas initially straddling the proposed access track to the south of the B741. However, the main lek location within the Development Site (maximum count of 3 males) lies to the east of the access track and within the area initially identified as a potential borrow pit search area. As a result of the presence of this lek site, the borrow pit search area was reduced in size and restricted to the area to the west of the proposed access track only. As a result, this borrow pit search area is now located ~300m from the main lek site as shown on **Figure 4.1**.

12.6 Scope of Assessment

Potential Receptors

12.6.1 This section evaluates the ornithological importance of the core survey area, in regional, national and international contexts as appropriate. When considering bird populations, importance is often taken as meaning that a site supports at least 1% of a population under consideration at regional, national or international level[6]. With the exception of a few species however, estimates of regional population size are often unavailable, or only occur for one season of the year. In most cases, therefore, professional judgement based on experience, consultation and extrapolation from national population estimates and breeding ranges, is used to determine whether species present are likely to occur in regionally important numbers.

[5] http://www.metoffice.gov.uk/media/pdf/i/2/March2013.pdf

[6] There is no fundamental biological reason to take 1% of a population as the threshold level for establishing the importance of a site. However, this percentage is widely considered to be of value in giving an appropriate level of protection to populations, and has gained acceptance on this basis throughout the world. The criterion was, for example, adopted by parties involved in the Ramsar Convention. Thereafter, the 1% level of national species totals has been taken as the basis of assessment in various countries, including Britain (Stroud, Mudge & Pienkowski, 1990). There seems no reason why, where regional populations exist, to extend this 1% threshold for the purpose of determining regional importance.

12.6.2 It should be noted that the definition of what constitutes a 'region' also varies for those species where numbers are known. For the purposes of this assessment, Ayrshire is considered to be an appropriate area for the region as contemporary information for regional populations of important bird species are more readily available at this level in Ayrshire Bird Reports and Atlases. The relevant SNH Natural Heritage Zone (NHZ) is No. 19 – Western Southern Uplands and Inner Solway, however, population estimates for most species are not available for this NHZ. In terms of National population, unless otherwise stated, populations given are for the UK.

12.6.3 As noted in **Section 12.3.22** it is only where the Development Site is considered to be of Medium, High or Very High importance for a given species that detailed assessment is required as, depending on the magnitude of a given impact, it is only for these categories that a significant effect would be expected to occur and therefore it is proportionate to discount the other sites from detailed assessment. Where the Development Site is considered to be of Negligible or low importance for a species, no further consideration is required.

Whooper Swan

12.6.4 Whooper swan is amber-listed on the Birds of Conservation Concern (BoCC) due to its small UK breeding population (<300 breeding pairs) and localisation in winter (at least 50% of the UK non-breeding population found in 10 or fewer sites) (Eaton *et al*., 2009). The species is a scarce winter visitor and very rare breeder in Scotland and it is also listed on Annex 1 and Schedule 1 of the Bird Directive and W&CA respectively. The Scottish population was estimated at 4,142 birds, or 15.7% of the Icelandic population (Forrester *et al*., 2007). The population in South-West Scotland is estimated at 275 individuals (WWT, 2012c).

12.6.5 Whooper swan was recorded on a single occasion during the entire survey period (2011-14), comprising one flight of a total of three individuals during VP surveys. There was also a single unconfirmed[7] record of five individuals during a winter walkover survey in the 2011-12 season.

12.6.6 The level of recorded activity indicates that the Development Site and airspace above it are of Negligible importance for this species.

Pink-footed Goose

12.6.7 Pink-footed goose is listed on the BoCC amber list based on its localisation within the UK during winter, with at least 20% of the European non-breeding population occurring within the UK (Eaton *et al*., 2009). The UK wintering population was estimated at 360,000 individuals in 2009/10 (Musgrove *et al*., 2013). The Scottish population was estimated at 200,000 during autumn migration and 100-150,000 during the winter and spring (Forrester *et al*., 2007). The wintering population (as indicated by November peak counts) in Southwest Scotland/Northwest England was estimated at: 4,823 in 2011; 5,628 in 2010; and 10,924 in 2009 (WWT, 2012b, 2011b & 2010b).

12.6.8 One pink-footed goose flight, totalling ten individuals, was recorded during the survey period (three full winter seasons), with no observations of this species on the ground. There was also an incidental record of 200 birds in flight in 2013. The minimal level of flight activity recorded indicates that the Proposed Development does not fall on a regularly used flight-path, while the Development Site itself and adjacent areas were not used by foraging or roosting geese. As such, the Development Site and airspace above it are considered to be of Negligible importance for this species.

Greylag Goose

12.6.9 Greylag goose is BoCC amber-listed based on its localisation within the UK during winter and non-breeding international importance (Eaton *et al*., 2009). The total UK wintering population was estimated at 230,000 individuals in 2009/10 (Musgrove *et al*., 2013). The Scottish population was estimated at 100,000 during the winter (Forrester *et al*., 2007). The wintering population (as indicated by November peak counts) in Southwest Scotland/Northwest England was estimated at: 1,240 in 2011; 6,536 in 2010; and 3,230 in 2009 (WWT, 2012a, 2011a & 2010a).

[7] This record of unconfirmed whooper swans was from a walkover survey in winter 2011/12 undertaken by AECOM.

12.6.10 A total of two greylag goose flights, were recorded during the survey period (three full winter seasons), with no observations of this species on the ground. The minimal level of flight activity recorded indicates that the Proposed Development does not fall on a regularly used flight-path, while the Development Site itself and adjacent areas were not used by foraging or roosting geese. As such, the Development Site and airspace above it are considered to be of Negligible importance for this species.

Barnacle Goose

12.6.11 Barnacle goose is an Annex 1 listed species and is also BoCC Amber listed due to its localised non-breeding range in the UK (Eaton *et al*., 2009). The current UK wintering population is estimated to be 94,000 birds in 2009/10 (Musgrove *et al*., 2013). The wintering population on the Solway was estimated to be 31,000 birds in 2012/13 (WWT, 2013) with the Scottish population estimated at 70,000 overwintering birds (Forrester *et al*., 2007).

12.6.12 A total of two barnacle goose flights, totalling 130 individuals, were recorded during the survey period (2011-14). There were no other records of this species at the Development Site. As such, the Development Site and airspace above it are considered to be of Negligible importance for this species.

Black Grouse

12.6.13 Black grouse is a Scottish Biodiversity List (SBL) priority species and is red listed due to historical and recent, rapid population declines. The most recent national survey in 2005 found an estimated 3,344 lekking males in Scotland of which 800 were in south-west Scotland (Dumfries and Galloway, Ayrshire, Argyll, most of Clyde and Upper Forth [Forrester *et al*., 2007]). Black grouse is described as a scarce resident and breeding species in the Dumfries and Galloway Bird Report (Irving 2012). During a black grouse lek survey of three upland areas in East Ayrshire carried out in spring 2007 (Zisman *et al*., 2009), most leks and males were observed in the Muirkirk Uplands survey block, with the remainder in the Glen Afton area (this is despite a range of previous records around Dalmellington, Chalmerston and Dunston Hill). In 2010, 35 leks were identified in the Galloway Forest Park, with 94 birds present (Irving, 2012).

12.6.14 A peak of three male and four female black grouse were recorded within the Development Site, with birds recorded across all survey seasons. The peak count at the main lek site, was in 2013 and was of three males and two females. Data provided by the RSPB from the period 2006 to 2010 identified several lek sites within and close to the Proposed Development being used by single displaying males, with most leks apparently transient in nature with the exception of a lek used by a single bird in 2008, 2009 and 2010. Each of these recorded lek sites were located more than 500m from the nearest proposed turbine location.

12.6.15 The level of black grouse activity recorded over the survey period indicates that the Development Site and adjacent land is of Low importance for this species.

Hen Harrier

12.6.16 Hen harrier is cited within the Muirkirk and North Lowther Uplands SPA designation and is present as a breeding (29 pairs) and wintering (12 individuals) species. Hen harrier is red-listed due to an historical decline in the UK and unfavourable population status in Europe, it is also listed on Annex 1 of the Birds Directive and is a W&CA Schedule 1 listed species. Persecution of this species across Scotland is well documented and remains severe in certain areas including Dumfries and Galloway (Forrester *et al*., 2007). The 2010 National hen harrier survey estimated that there were 505 pairs in Scotland (Etheridge *et al*., 2013). The Western Southern Uplands and Inner Solway Natural Heritage Zone support 15-20 pairs (SNH, 2012). A total of 38 home ranges in Ayrshire were checked in 2013 by the SSRSG (Challis *et al*., 2014) of which seven were occupied by pairs and two by single birds. It is described as an uncommon breeding and passage species in Ayrshire (Simpson, 2012).

12.6.17 A total of five hen harrier flights were recorded during the VP survey programme. Surveys indicated that a male and female bird wintered in the local area in 2013/14 and made occasional forays into the Development Site, although this was not recorded in any of the previous winter seasons, bar a single record in autumn 2011. No evidence of nesting or roosting was recorded,

which was further reinforced by the survey data provided by the SSRSG as they did not identify any hen harrier nests from within 2km of the Proposed Development.

12.6.18 This level of activity indicates that the Development Site and airspace above it are of Negligible importance for this species.

Goshawk

12.6.19 Goshawk is not of particular conservation concern within the UK but is considered a rare breeding bird. The species is listed on Schedule 1 of the W&CA, and is prone to persecution (Kenward, 2006). It is a scarce and secretive species with a preference for coniferous forests with many clearings. The Rare Breeding Birds Panel (RBBP) estimated a five year mean of 445 breeding pairs (Holling and RBBP, 2013). The Scottish Raptor Monitoring Scheme (SRMS) Report for 2013 checked 174 home ranges with 124 occupied by pairs and a further 15 occupied by single birds (Challis *et al*., 2014). It is believed that up to 200 home ranges may be used by goshawks in Scotland (Etheridge *et al*., 2013). One home range was checked in 2013 in Ayrshire by Challis *et al*., (2014) which was occupied by a single pair and fledged one young. It is described as an uncommon breeding species in Ayrshire (Simpson, 2012).

12.6.20 A total of three goshawk flights were recorded during winter 2011/12 VP surveys and there was also a single record of goshawk from the 2013 breeding season. While it is acknowledged that goshawk is a secretive species which may be under-recorded during VP watches, no desk study records of this species were identified within 1km of the Development Site. As such, it is concluded that the Development Site and airspace above it are of Negligible importance for this species.

Merlin

12.6.21 Merlin is listed in the Muirkirk and North Lowther Uplands SPA citation, with a cited population of six breeding pairs. Merlin is listed on Annex 1 of the Birds Directive and Schedule 1 of the W&CA. It is also an SBL priority species and is also amber-listed due to its unfavourable conservation status in Europe (Eaton *et al*., 2009). During late summer and autumn, merlin, in common with their prey, tend to leave the uplands and move to lower elevations, which include both coastal and farmland localities. The most recent national breeding survey (2008) suggested the population has remained relatively stable since 1993/94, with an estimated population of 1,160 pairs in the UK. Scotland holds the highest proportion with 733 pairs (63% of the UK total), a non-significant decline of 7% on the 1993-94 estimate (Etheridge *et al*., 2013). In 2012, a total of 369 home ranges were checked in Scotland, 211 of which were occupied by pairs, fledging a minimum of 287 young (Etheridge *et al*., 2013). Ten home ranges were checked in Ayrshire in 2013, eight of which were occupied by pairs (Challis *et al*., 2014). Simpson (2012) detailed merlin as a breeding bird with less than 25 pairs per annum and regular winter visitor in Ayrshire.

12.6.22 A total of 14 merlin flights were recorded throughout the VP survey period, with both male and female individuals observed, and a single merlin nest was identified within 2km of the Proposed Development in 2013. This level of activity indicates that the Development Site and airspace above it are of Low importance for this species.

Peregrine

12.6.23 Peregrine is listed on Annex 1 of the Birds Directive and Schedule 1 of the W&CA. It is also a BoCC amber list species based on its unfavourable conservation status in Europe (Eaton *et al*., 2009) and a SBL species. The UK population is estimated to be 1,530 pairs (Holling *et al*., 2013). A total of 49 home ranges were checked in Ayrshire in 2013, with 24 occupied by pairs and nine by single birds (Challis *et al*., 2014). Peregrines need open areas with a plentiful supply of birds to hunt and secure sites for breeding, with most eyries (nests) and roosts generally located on cliffs, crags or tall man-made structures. The species is described as a common resident in Ayrshire (Simpson, 2012). The Scotland wide population is estimated at 600 pairs (Forrester *et al*., 2007). The Western Southern Uplands and Inner Solway Natural Heritage Zone supports 95 pairs (SNH, 2012).

12.6.24 Only three records of peregrine were obtained during the survey period and there was no evidence of breeding within 2km of the Proposed Development. This indicates that the Development Site and airspace above it are of Negligible importance for this species.

Golden Plover

12.6.25 Golden plover is listed in the Muirkirk and North Lowther Uplands SPA citation, with a total of 154 breeding pairs at the site. Golden plover is a Birds Directive Annex 1 listed species and is also listed on the BoCC amber list as at least 20% of the European non-breeding population is found in within the UK (Eaton *et al*., 2009). Golden plover is also listed on the SBL. The British breeding population was estimated at 38,000-59,000 pairs (Musgrove *et al*., 2013). Forrester *et al*., (2007) cites that the Scottish breeding population is 15,000 pairs, with 25-35,000 overwintering individuals, 10-30,000 during the spring passage and 20-60,000 during the autumn passage period.

12.6.26 A total of 72 golden plover flights, with a peak count of 220 individuals, were recorded across the entire survey period (five seasons from 2011-2014). There was no evidence of breeding on, or in the vicinity of, the Development Site. While golden plover were regularly recorded, they were not present on every survey visit, suggesting that other suitable habitat is available in the surrounding area. Nonetheless, it is considered that this level of activity indicates that the Development Site is of Medium importance for this species during winter.

Dotterel

12.6.27 Dotterel is listed as both an Annex 1 and Schedule 1 species and is classified as being of amber conservation status due to its localised breeding status in Britain (Eaton *et al*., 2009). Dotterel is also listed on the Scottish Biodiversity List. The UK breeding population in 1999 was estimated to be 630 males (Musgrove *et al*., 2013) with around 20-120 individuals reported during the passage period outside the core breeding areas. In Ayrshire, Dotterel is an uncommon passage migrant or occasional breeder (Simpson, 2012).

12.6.28 There was a single incidental record of dotterel during the 2013/14 winter season surveys and two incidental records of dotterel during the 2013 breeding season surveys in August. Given the low number of records, the Development Site and airspace above it are therefore considered to be of Negligible importance for this species.

Dunlin

12.6.29 Dunlin is an Annex 1 species and is also listed on the Scottish Biodiversity List. Dunlin is a BoCC red listed species, based on; its unfavourable conservation status in Europe; it has suffered a >50% population decline both short and long term (the last 25 and 50 years respectively); its localised breeding and non-breeding distribution in the UK; and because the non-breeding population in the UK is of international importance (Eaton *et al*., 2009). The overwintering population in the UK was estimated at 360,000 individuals in 2004/05 to 2008/09 (Musgrove *et al*., 2013). The Scottish population was recorded as 37-58,000 overwintering individuals and 8-10,000 breeding pairs of the *schinzii* race. In Ayrshire, dunlin is a common wintering and passage species and is occasionally recorded breeding (Simpson, 2012).

12.6.30 There was a single record of dunlin obtained during the survey period. As this was the only record, the Development Site and airspace above it are of Negligible importance for this species.

Barn Owl

12.6.31 Barn owl is a Schedule 1 listed species, and is also a BoCC amber list species, based on its categorisation as a species of European Conservation Concern (Eaton *et al*., 2009). The species is also listed on the Scottish Biodiversity List. The current UK population is estimated at 4,000 pairs (Musgrove *et al*., 2013). Of 49 territories checked in Ayrshire in 2013, 20 were occupied by pairs and seven by single birds (Challis *et al*., 2014).

12.6.32 No barn owls were recorded during generic breeding or winter season surveys. This species was only recorded during species-specific barn owl surveys in 2012. A successful nest site was recorded over 2.5km from the nearest proposed turbine location. Therefore the Development Site and airspace above it are considered to be of Negligible importance for this species.

Other Species of Conservation Concern

Curlew

12.6.33 Curlew is a BoCC amber list species based on: its unfavourable conservation status in Europe; its breeding population decline; and at least 20% of the European breeding population and 20% of the overwintering European population can be found in the UK (Eaton *et al*., 2009). Curlew is listed on the Scottish Biodiversity List. The curlew population in the UK was estimated at 68,000 breeding pairs and 150,000 wintering individuals (Musgrove *et al*., 2013). The Scottish breeding population is estimated at *c*.58,800 pairs (approximately 16-27% of the European breeding population) (Forrester *et al*., 2007). In Ayrshire it is a common resident (Simpson, 2012).

12.6.34 No curlew breeding territories were recorded within 600m of the Proposed Development in 2012 or 2013. There were no records of curlew during any of the three winter seasons. This level of activity indicates that the Development Site is of Negligible importance for this species.

Snipe

12.6.35 Snipe is a BoCC amber list species based on its unfavourable conservation status in Europe (Eaton *et al*., 2009). The snipe population in the UK was estimated at 80,000 breeding pairs and 1,100,000 wintering individuals (Musgrove *et al*., 2013). This species is a widespread breeder in Scotland (34,000-40,000 pairs, Forrester *et al*., 2007) and tends to move to lower elevations in winter with some migration south. The Scottish winter population is estimated at 10,000 to 30,000 birds (Forrester *et al*., 2007). In Dumfries and Galloway, it is a common breeding and passage species although is uncommon in winter (Irving, 2012).

12.6.36 No snipe were recorded breeding within 600m of the Proposed Development in 2012 or 2013. There were regular records of this species during the winter season surveys, although in small numbers. This level of activity indicates that the Development Site is of Low importance for this species.

Oystercatcher

12.6.37 Oystercatcher is included on the BoCC amber list as at least 50% of the UK non-breeding population is found in ten or fewer sites, and at least 20% of the European non-breeding and breeding population is found within the UK (Eaton *et al*., 2009). The oystercatcher population in the UK was estimated at 110,000 breeding pairs and 340,000 wintering individuals (Musgrove *et al*., 2013). This species is a widespread breeder in Scotland (84,500-116,500 pairs, Forrester *et al*., 2007) which tends to move to the coast in winter. The Scottish winter population is estimated at 80,000 to 120,000 birds (Forrester *et al*., 2007). In Ayrshire, oystercatcher is a common resident (Simpson, 2012).

12.6.38 Oystercatcher was occasionally recorded within the Development Site during winter and breeding seasons, however there was no evidence of breeding from within 600m of the core survey area in 2012 or 2013. Given the limited number of records of oystercatcher, the Development Site and airspace above it are therefore considered to be of Negligible importance for this species.

Woodcock

12.6.39 Woodcock is listed on the Scottish Biodiversity List and is a BoCC amber list species based on its unfavourable conservation status in Europe (Eaton *et al*., 2009). The woodcock population in the UK was estimated at 81,000 breeding pairs and 1,400,000 wintering individuals (Musgrove *et al*., 2013). This species is a widespread resident in Scotland (24,000-56,500 males, Forrester *et al*., 2007) with numbers bolstered in winter by migrants from the continent. The Scottish winter population is estimated at 78,000 to 167,000 birds (Forrester *et al*., 2007). In Ayrshire it is a common resident (Simpson, 2012).

12.6.40 There was a single record of woodcock in both the 2011/12 and 2013/14 winter season surveys. Given the limited number of records of woodcock, the Development Site and airspace above it are therefore of Negligible importance for this species.

Other Species

12.6.41 The remainder of the breeding and wintering bird community is represented by species such as buzzard, kestrel, skylark and meadow pipit that were found in numbers typical of the habitats present. These species remain common and widespread despite recent declines in some of them

(conferring SBL, Red or Amber listing) and the Development Site is assessed to be of no more than Low importance for these species.

Likely Significant Effects

12.6.42 The ornithology assessment would usually be focussed on those species for which the Development Site is identified as being of Medium importance or above as, with reference to **Table 12.4**, it is only these for which a significant effect may occur should the magnitude of impact be sufficiently high (Medium or High). The Development Site has been assessed as being of Medium importance for golden plover during winter but of no more than low importance for all other species.

12.6.43 However, given the regular presence of merlin and black grouse, these species have also been taken forward for more detailed assessment.

12.7 Predicted Effects: Construction

Land-Take

12.7.1 The initial stages of wind farm construction may see rock quarried from up to three proposed borrow pits within three search areas located in the vicinity of Peat Hill, Rigg Hill and Knockburnie Burn. Whether or not borrow pits are opened up in these areas will depend on whether the rock present is proven suitable for construction purposes, which will be determined by further detailed survey work undertaken if planning consent is granted.

12.7.2 The Rigg Hill and Knockburnie Burn borrow pit search areas are relatively small. The initial search area around Peat Hill was 21ha but, after the design evolution phase, the 'Peat Hill' borrow pit search area was reduced and now encompasses a worst case scenario of ~13.6ha. The expected actual extent of the borrow pit is only c.3ha (see **Chapter 4, Table 4.7**).

12.7.3 The main black grouse lek location (maximum count of three males) is located to the west of the Site access track and ~300m east of the edge of the proposed Peat Hill borrow pit search area. The area around this lek site also appeared to be utilised by foraging and loafing black grouse. The revision of the borrow pit search area at Peat Hill as described in **Section 12.5** (and as shown on **Figure 12.2b**) has resulted in this core black grouse area being avoided by the Proposed Development and, as such, it is concluded that impact magnitude would be Low at worst. As such, the predicted effect on black grouse in respect of permanent land-take is considered to be **Not Significant**.

12.7.4 The total land take for all of the Proposed Development infrastructure is 14.23ha (this excludes the borrow pits which it is assumed would be restored), which represents 0.97% of the total Development Site area. Including the temporary construction compound (c.1ha) and borrow pits (c.5ha), the total is 20.23ha, which constitutes 1.3% of the Development Site area. As such, it is considered that impact magnitude is Negligible and predicted effect birds in respect of permanent land-take is considered to be **Not Significant.**

Disturbance

12.7.5 The construction of the Proposed Development is estimated to last approximately 12 months, however on a precautionary basis it has been assumed that two breeding and two winter seasons will be affected.

12.7.6 Construction activities may temporarily displace some birds using the Development Site and surrounding areas, the level of impact depending on:

- The timing of potentially disturbing activities;
- The degree of displacement (spatially and temporally);
- The size, suitability and proximity of habitats available for displaced birds to occupy; and
- The capacity of alternative habitats to accommodate displaced birds.

12.7.7 Disturbance effects on birds due to construction activities of this type have received little attention in the literature. This is largely as a result of two factors:

- Disturbance during construction is generally short-term and can be readily mitigated by avoiding sensitive areas and by timing construction outside certain periods when sensitive species are present; and
- It is generally accepted that potentially the more significant effects on birds as a result of wind farms are related to operational disturbance and collision mortality and, therefore, most studies of wind farm/bird interactions focus on these issues.

12.7.8 A recent study by Pearce-Higgins *et al*., (2012) found that for certain upland breeding bird species, the effect of disturbance displacement from wind farms can be greater during the construction period than subsequent operation. They found that red grouse, snipe and curlew all declined on wind farms during construction, whereas densities of skylark and stonechat increased.

12.7.9 There is evidence to suggest that effects on many common species will be relatively low because they are able to habituate to disturbance close to otherwise favourable habitats. Examples include waders such as oystercatcher, ringed plover and common sandpiper that occupy habitats associated with working opencast sites, and curlew which breed close to active opencast voids. At Kiln Pit Hill Wind Farm, eight curlew territories were recorded within 500m of turbines during the construction period as compared with pre-construction numbers of between two and four territories (AMEC, 2012). At Hare Hill Wind Farm (Ayrshire), species such as skylark and meadow pipit continued to breed on site during construction (Shepherd, 2002 and 2003) and this was also observed to be the case at Minsca Wind Farm in Dumfries and Galloway for species including curlew, snipe, skylark and meadow pipit (Entec, 2007).

Black Grouse

12.7.10 The main lek site to the north-west of the Development Site (peak of three males recorded) is located approximately 1.2km from the nearest proposed turbine location. It is however ~300m of the nearest proposed site track and borrow pit search area and *c.*500m from the nearest site cabin. The lek site was active in the springs of 2012, 2013 and 2014; with two to three males observed regularly. Single males were also recorded lekking across the Development Site over the survey years although these leks tended to change location on a daily basis. Only a single lek stand was identified within 500m of a proposed turbine location (400m distant).

12.7.11 Desk study / consultation records also identified several lek locations on, or within, close proximity to the Development Site. All of these reported leks were more than 500m from proposed turbine locations.

12.7.12 A review by Ruddock and Whitfield (2007) indicated that human presence would not result in passive disturbance to lekking black grouse at over 500-750m, or active disturbance at over 300-500m. Ruddock and Whitfield (2007) cite a flushing distance of >150m in open habitats with minimal baseline disturbance. Within the spring/summer incubating birds flush at 2m on average and 39m for birds with chicks (Ruddock and Whitfield, 2007).

12.7.13 A study of the black grouse population at the 14-turbine Drumderg Wind Farm in Perthshire recorded four lekking males within the development area in 2007 prior to construction, two in 2008 during construction, seven in 2009 and 16 in 2010 during operation (Stolte, 2010 & 2011). Lek sites shifted further away from the wind farm during construction, but moved back towards it during the operational period. The increase in the population suggests that males were being recruited to the local population within the development area. In addition, in 2010, a lek of 6-8 males regularly displayed within 200m of a turbine. While it is acknowledged that the Perthshire population differs from that in Ayrshire, particularly in respect of having a more robust regional population which can act as a source for recolonisation of areas from which birds have been displaced, it nevertheless provides a relevant UK example of how this species can coexist with operational turbines.

12.7.14 A study of the black grouse population at the 11-turbine Tauernwindpark in the Austrian Alps found that the population within the 350ha wind farm site gradually declined from a peak of 41 displaying males during the construction period in 2002, to nine males in 2007 (Zeiler and Grunschachner-Berger, 2009). The population had increased in the two years of monitoring prior to construction

from 23 males in 1999. A poll among neighbouring hunting grounds in 2006 indicated that the black grouse population within a 10km radius had undergone stable development since 2002. The number of males attending leks within the study area, but located more than 300m from turbines remained unchanged from 2002 to 2007. The central lek was located approximately 100m from the nearest turbine, and males continued displaying at this lek during the construction period. From 2002 to 2007, the number of males at this lek decreased to zero. A potential explanation of these observations are that established males continued to attend their traditional lek site, but the recruitment of young males ceased, such that the lek was displaced only once the older generation had died off. The precise causes of the decline at Tauernwindpark were not proven, and increased visits to the area from tourists following construction may have been a contributory factor.

12.7.15 Given the distance between lek sites and the proposed turbines, impact magnitude in terms of turbine construction disturbance is therefore considered to be Negligible. Coupled with the assessed nature conservation importance of the Development Site for this species of Low, the level of effect is considered to be Negligible (i.e. the effect is **Not Significant**).

12.7.16 Some of the lek locations are close to the access tracks (i.e. within 250m) and therefore impact magnitude in terms of disturbance during construction is considered to be Medium. However, given the assessed nature conservation importance of the Development Site for this species being Low, any such effect would be Slight (i.e. the effects is **Not Significant)**.

12.7.17 The main lek location was initially immediately adjacent to one of the proposed borrow pit search areas. However, this area of Peat Hill, which was also used by foraging/loafing black grouse, will now be avoided following re-design of the borrow pit search area. Therefore although the impact magnitude in terms of construction (through disturbance) is considered to be Medium, the receptor is of Low sensitivity and thus any such effect would be Slight (i.e. the effect is **Not Significant)**.

Golden Plover

12.7.18 Little is known about the effect of construction on species overwintering in upland environments such as golden plover. Pearce-Higgins *et al*. (2012) suggested that 'wind farm construction can have greater impacts upon birds than wind farm operation.' The golden plover present at the Proposed Development comprise roosting rather than feeding flocks and as such there are large swathes of suitable roosting habitat both within the Development Site (but outwith the Proposed Development e.g. at Benty Cowan Hill which was regularly used) and nearby that could hold roosting golden plover. As such, impact magnitude would be expected to be Negligible.

12.7.19 Even under a worst-case scenario of the entire displacement of the peak count of individuals recorded (220 in winter 2013/14), this would represent 0.9% the lower estimate of the 25-35,000 overwintering individuals in Scotland. Under the unlikely event of the displacement of all golden plover from the Development Site and adjacent areas, other similar sites are available in the wider area and impact magnitude is considered to be Low at worst. In the context of an assessed nature conservation importance of the Development Site for this species of Medium, and a Low magnitude impact at worst, the level of effect is considered to be Slight (i.e. the effect is **Not Significant**).

Merlin

12.7.20 The upper limit of flushing distance of merlin to observers identified through expert survey was 300-500m, which corresponds to the 200-400m disturbance free zone proposed by Currie and Elliott (1997) and the few recommended protective buffers (*c*.400m) in the USA (Ruddock and Whitfield 2007).

12.7.21 A single Merlin nest has been identified within 500m of the Proposed Development, located approximately 500m away from the proposed turbines/infrastructure at the closest point. At this distance, it is considered unlikely that the breeding pair would be displaced as a result of construction works and hence the impact magnitude is considered to be Negligible. Coupled with the assessed nature conservation importance of the Development Site for this species of Low, the level of effect is considered to be Negligible (i.e. the effect is **Not Significant**).

12.8 Predicted Effects: Operation

12.8.1 The three main potential effects resulting from the operation of wind farms are land take (the direct loss of habitat to the wind turbines and associated infrastructure), displacement (the indirect loss of habitat resulting from noise and visual disturbance from turbines) and collisions (fatal collisions of birds with turbines). These are assessed below.

Land-Take

12.8.2 The footprint of the wind farm infrastructure as a component of the Development Site is relatively small at approximately 14.23ha (this excludes borrow pits and the temporary construction compound as it is assumed these would be restored) and therefore the direct loss of potential nesting and foraging habitat for birds in the context of a 1,466ha Development Site will be small (0.97%), particularly in the context of the abundant moorland habitat in the wider area. It is therefore predicted that the magnitude of this impact will be Negligible and significant effects are therefore unlikely.

Displacement

12.8.3 Published information (e.g., Vauk 1990; Phillips 1994; Percival, 2000 and 2005; and Devereux *et al*., 2008) and reviews of impacts (e.g. Crockford, 1992; Benner *et al*., 1993; Winkelmann, 1994; Langston and Pullan, 2003; and Hötker *et al*., 2006) suggest that most birds are affected only slightly by the presence of operational wind farms.

12.8.4 Studies have shown that breeding birds are generally not affected at distances greater than 300m from a turbine (Gill *et al*., 1996; and Percival, 1998 and 2005), though reduced breeding densities within 500m of turbines have been observed for some species (Pearce-Higgins *et al*., 2009). A synthesis of European work (Hötker *et al*., 2006) discovered no statistically significant negative effect on the population of any bird species (including wader and passerine species similar to those found at the Development Site such as skylark and meadow pipit) during the breeding season.

Black Grouse

12.8.5 As detailed in the construction phase disturbance effects section, a study undertaken at Drumderg Wind Farm found no evidence of any adverse effect on the black grouse population, with lekking recorded within 200m of a turbine. A study at the Tauernwindpark however recorded an impact on the population within 300m of turbines. However, a precautionary 500m potential displacement buffer around turbines is often advocated at wind farms in Scotland and a single black grouse lek, to the northwest of T16, was recorded within this distance (*c*.400m) during surveys for the Proposed Development.

12.8.6 On the basis a precautionary disturbance of 500m, it is assumed that this single lek area to the northwest of T16 will be disturbed and therefore black grouse would be displaced from it. However, there are several areas within the Development Site where black grouse were recorded lekking, including the main lekking area in the vicinity of Peat Hill. As a result, even in the event that black grouse are displaced from the area to the northwest of T16, impact magnitude in respect of the population within the Development Site is considered to be Low at worst.

12.8.7 In the context of an assessed nature conservation importance of the Development Site for this species of Low, and a Low magnitude impact at worst, the level of effect is considered to be Negligible (i.e. the effect is **Not Significant**).

Golden Plover

12.8.8 Golden plover are largely absent during the breeding season at the Proposed Development, with only a few passage birds, spending time in the area in early April. No breeding attempts of golden plover were recorded in either the 2012 or 2013 breeding seasons. During the winter months, small overwintering flocks have been recorded throughout the Development Site (peak counts of 90 in 2011/12, 80 in 2012/13 and 55 in 2013/14) and it is likely these are linked to feeding birds on the lower ground to the north. Suitable roosting habitat will still be available to these flocks on Benty Cowan Hill and Connelburn Rig to the north of the Proposed Development.

12.8.9 Limited studies have been published on the effects of operational wind farms on golden plover, particularly during the winter months. Pearce-Higgins *et al*., (2008) cited that previous studies have highlighted turbine avoidance by wintering golden plover over distances of 50–850 m (median 135m; reviewed by Hötker *et al*., 2006). The study by Hötker *et al*., (2006), which monitored 22 wind farm sites, considered the displacement distance of 850m as an anomaly. Therefore the median displacement distance would have been 175m if this anomaly was removed from the analysis. The same study also showed that golden plover habituate to turbines over time in 75% of the study sites (Hötker *et al*., 2006). Current literature regarding overwintering golden plover implies that displacement does not occur readily over 250m from operational wind farms. It is likely that greater displacement distances recorded at other wind farm sites are likely to be influenced by the availability of suitable habitat in the local area.

12.8.10 Even under a worst-case scenario of the entire displacement of the peak count of individuals recorded (220 in winter 2013/14), this would represent 0.9% the lower estimate of the 25-35,000 overwintering individuals in Scotland. Under the unlikely event of the displacement of all golden plover from the Development Site and adjacent areas during operation, other similar sites are available in the wider area and impact magnitude is considered to be Low at worst. In the context of an assessed nature conservation importance of the Development Site for this species of Medium, and a Low magnitude impact at worst, the level of effect is considered to be Slight (i.e. the effect is **Not Significant**).

Merlin

12.8.11 Research into the displacement of merlins from the proximity of wind farms is lacking, however research in respect of other falcons indicates that displacement is minimal (Ruddock and Whitfield, 2007). The upper limit of flushing distance of merlins to observers identified through expert survey was 300-500m, which corresponds to the 200-400m disturbance free zone proposed by Currie & Elliott (1997) and the few recommended protective buffers (c.400m) in the USA (Ruddock and Whitfield 2007). Madders and Whitfield (2006) comprises a review of research into displacement of (mainly foraging) raptors which concludes that in the majority of studies displacement appears to be Negligible. Although not specifically relating to merlin, several studies have found no evidence of hen harrier displacement from wind farms, however one study did record avoidance in the year following operation. Preliminary results from Scotland and Northern Ireland indicate that foraging may be little affected, but local displacement of nesting may occur within 200-300m of turbines. Other studies have indicated that buzzard (Low-Medium sensitivity to displacement), peregrine (Low), kestrel (Low), red kite (Low) and marsh harrier (Low) all suffer minimal displacement from wind farms. This is likely to be applicable to other raptors such as merlin.

12.8.12 The closest nest site in recent years to the Proposed Development is located approximately 500m from the nearest proposed turbine location. Therefore displacement is unlikely and the impact magnitude is Negligible. Coupled with an assessed nature conservation importance of the Development Site for this species of Low, the level of effect is considered to be Negligible (i.e. the effect is **Not Significant**).

Collisions with Turbines

12.8.13 The level of collisions with the proposed turbines will depend on the extent to which birds are displaced and the ability of birds to detect and manoeuvre around rotating turbine blades. Birds that collide with a turbine are likely to be killed outright or fatally injured.

12.8.14 The indications from studies published to date (reviewed in Crockford, 1992; Benner *et al*., 1993; Winkelman, 1994; and Hötker *et al*., 2006) are that collisions are rare events and occur mainly at sites where there are large concentrations of birds and turbines, or where the behaviour of the birds concerned leads to high-risk situations. Examples include migration flyways, areas where the food resource within the wind farm is exceptional, and as a result of 'wind wall' turbine layouts. Published information suggests that some species are exceptions to the rule and may be susceptible to collision with turbines, such as red kites in Germany (Dürr, 2011) and white-tailed eagles which have been recorded colliding with turbines in Norway (Bevanger *et al*., 2009).

12.8.15 Passerines nesting within the Development Site will be expected to be regularly flying between the proposed turbines and could therefore be expected to be most at risk of collision. However, it is

generally considered that these birds are not significantly impacted by wind farms (SNH, 2013), and most of the species concerned are of Low or Negligible nature conservation importance and any collisions are unlikely to affect regional populations. 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.

12.8.16 **Table 12.6** documents collisions reported to date and also UK population sizes of each of the more regularly occurring target species recorded.

Table 12.6 Flight activity, associated collision data and population sizes.

Species	Reported no. of collisions in Europe	European Population Size
Black Grouse	6	515,000 – 1,100,000
Merlin	37	436,000 – 645,000
Golden Plover	4	11,000 – 19,000

Reported number of collisions taken from Durr (2015); population sizes taken from BTO bird facts http://www.bto.org/about-birds/birdfacts.

12.8.17 Vantage point surveys undertaken across two breeding and three non-breeding seasons confirmed that the majority of target species flight activity within the Development Site is low. Collision risk Analysis (CRA) has therefore been limited to golden plover given the presence of relatively small groups of birds during the winter period that were recorded in flight within the area proposed for turbines (see **Appendix 12.G** for details of CRA).

12.8.18 The season with the highest level of golden plover flight activity in terms of peak flock size and the cumulative flight time was winter 2013/14. CRA for golden plover has been carried out, modelling cumulative data collected at VP2, VP3 and VP5 during winter 2013/14 (on the basis that modelling for the year with the highest level of flight activity assumes worst case for any given year). The CRA focused on data from these three VPs their collective view-sheds covered the main activity area for golden plover (at Enoch Hill, High Chang Hill, Barbey's Hill and Benty Cowan Hill)[8].

12.8.19 Based on the current avoidance rate of 98% recommended by SNH (2010), the CRA based on the 2013/14 data as described predicts a theoretical annual collision mortality of 4.4 individuals (80 birds over the 25 year operational life of the Project). If this theoretical collision risk is considered in relation to background mortality for this species (27%)[9], the loss of 4.4 birds per year will represent a negligible increase to the annual mortality rate of 0.018% based on the lowest estimate of the Scottish overwintering population (25,000 individuals). In practice, the presence of the turbines may result in the displacement of some golden plover from the area (Hötker *et al.*, 2006), and consequently the collision rate is likely to be lower than that predicted. Nonetheless, as this collision theoretical rate would not have a discernible effect on the population, impact magnitude is considered to be Low at worst. Coupled with an assessed nature conservation importance of the site during winter as Medium for this species, the effect is considered to be slight (i.e. the effect is **Not Significant**).

12.9 Predicted Effects: Decommissioning

12.9.1 Decommissioning would be subject to a planning condition. However it is likely that the scheme would be decommissioned, turbines would be removed to approximately 1m below ground and buildings removed. Tracks would be left in situ to regenerate naturally or would be maintained by the estate after the 25 year operational period.

[8] Only a single flight of two individual golden plover was recorded from VP1 and from VP4.

[9] http://www.bto.org/about-birds/birdfacts. Accessed on 30 June 2015.

12.9.2 Decommissioning may cause disturbance to birds breeding and foraging within the Development Site although potentially to a lesser extent than during construction as a result of a reduced level of ground works of shorter duration. The level of impact will depend on the bird species present at the time of decommissioning, which cannot be precisely predicted at this stage (though they are likely to be broadly similar to the current baseline). However, it is likely that impact will be temporary, affecting one breeding season. While significant effects are not anticipated, survey work would be commissioned prior to decommissioning to assess the bird community present and to assess likely effects resulting from the decommissioning works.

12.10 Predicted Effects: Cumulative

12.10.1 The combined effects of multiple developments within the home range of birds could include an increased risk of collisions with proposed turbines or their displacement from a relatively large area of habitat. This cumulative assessment has taken account of SNH guidance (SNH, 2012).

Target Species

12.10.2 All predicted effects on birds resulting from the Proposed Development in isolation are either 'Slight' or 'Negligible' and therefore unlikely to contribute to in-combination effects. Nevertheless, given that golden plover and black grouse were regularly present on the Development Site and that black grouse is considered to be of high nature conservation importance in the Dumfries and Galloway / Ayrshire region, both of these species have been considered for the purposes of cumulative assessment.

Search Area

12.10.3 Wind farms that have been built/consented or are in the planning process and that fall within a 10km radius of the Development Site have been considered, where the relevant environmental information can be accessed. The search radius is a compromise between the ecology of the target species being considered (golden plover and black grouse) and the practicality of assessment. Single proposed turbine schemes are not considered, as they are unlikely to have a significant adverse effect on birds and rarely have detailed supporting ornithological information upon which to base the assessment.

Methods

12.10.4 All submitted, consented, under construction and operational wind farms within 10km of the Development Site were identified from **Chapter 9: LVIA**. The relevant council planning websites were searched for details of environmental assessments relating to the identified wind farm developments.

Results

12.10.5 **Table 12.7** provides details of those wind farms present within the search area and related ornithological information that has been identified during the desk study noted above.

Table 12.7 Cumulative Assessment Search Results

Wind Farm Site	Approximate Distance from the Proposed Development**	Status	Number (and height) of Proposed Turbine	Black Grouse Records	Golden Plover Records	Predicted Residual Impacts on Target Species
South Kyle	0.5km	Application	50 (149.5m)	No leks identified within 1.5km of the proposed wind farm during EIA survey work. Historical records from the area and potential for population to re-colonise as result of RSPB/FCS conservation work in the area.	No breeding on-Site (unsuitable habitat). Low number of flights during a single winter season.	A Low residual adverse effect on black grouse as a result of construction- and operation-phase disturbance. A minor to negligible residual adverse effect on golden plover.
Pencloe	2.0km	Application	21 (125m)	A single male black grouse was observed lekking at three different locations during the species-specific surveys. The closest lek sites are 1.2km and 1.4km from the nearest parts of the proposed development. One female black grouse was also recorded out-with the black grouse surveys.	Negligible number on in-flight records.	A Low residual adverse effect on black grouse as a result of construction-, operation- and decommissioning-phase disturbance. No residual effects on golden plover predicted.
Windy Standard	5.0km	Existing	36 (92.5m)	Not recorded during surveys although consultation with the RSPB indicated that black grouse are present in the area.	Unknown.	None.
Windy Standard Extension (Brockloch Rig)	2.5km	Consented	30 (100-120m)	Did not breed on site. Recorded on Windy Standard site, and occasionally on the extension site.	Unknown.	No residual effects on black grouse predicted although effect on golden plover unknown.
Afton	4.0km	Consented	27 (100-120m)	No black grouse or leks were identified during breeding season surveys, with a group of three black grouse recorded within the survey area in winter.	Five golden plover territories on-Site from 2010 surveys. No breeding pairs in 2004 or 2005. A single overwintering flock of 20 recorded in ES surveys.	Effects of minor significance during the construction and operation phases resulting from some disturbance to wintering birds. No residual effects on golden plover predicted.

Wind Farm Site	Approximate Distance from the Proposed Development**	Status	Number (and height) of Proposed Turbine	Black Grouse Records	Golden Plover Records	Predicted Residual Impacts on Target Species
Benbrack	5.0km	Application	18 (130m)	Two leks were identified during breeding season surveys in 2011, with a total of three males recorded. No further records were obtained despite carrying out species-specific surveys in 2013. Historical records from the area were provided by the RSPB. Leks comprised of one to three males and were often of a transient nature and >1km from the nearest proposed turbines.	No records of breeding at the Site and only two records during the surveys.	No residual effects on black grouse or golden plover predicted.
High Park Farm *	6.0km	Existing	1 (75m)	Only desk based appraisal undertaken.	Only desk based appraisal undertaken.	No residual effects on black grouse or golden plover predicted.
Hare Hill	6.5km	Existing	20 (63.5m)	No records.	Unknown.	No residual effects on black grouse predicted although effect on golden plover unknown.
Hare Hill Extension	7.5km	Consented	39 (96m)	ES unavailable.		Unknown.
High Cumnock	9.0km	Application	8 (132m)	One lekking male recorded during black grouse surveys.	No breeding records of golden plover but moderate level of flight activity during the winter period.	No residual effects on golden plover predicted although effect on black grouse unknown.
Polquhairn	9.5km	Application	9 (100m)	No records.	No breeding records. Low level of Site usage during passage periods. CRA output of 1.83 collisions / year.	No residual effects on black grouse or golden plover predicted.
Garleffan	10.0km	Application	6 (135m)	No records.	CRA output of 0.65 collisions / year (winter only).	No residual effects on black grouse predicted and only minor residual effect on golden plover predicted.

Information collected from local planning authority and developer sources in May 2015. * Although only a single turbine scheme, an extension is within the scoping process and as such this scheme remains part of the cumulative assessment. **Distance between nearest proposed turbine at Enoch Hill and approximate centre-point of other wind farm sites as shown in Figure 9.6b.

12.10.6 Of the 12 wind farms identified within the 10km search area, data was obtained for all but one of them (Hare Hill Extension). Three of the sites, Pencloe, South Kyle and Afton, concluded potential residual adverse effects on black grouse, however this is highly precautionary for South Kyle and Afton as no black grouse were recorded at South Kyle and the species was only recorded in winter at Afton with no leks identified. Pencloe surveys recorded a single lekking male >1.2km from the nearest turbine, well outside of potential displacement distance from turbines. The remaining sites either conclude no impacts are likely or residual positive effects as a result of proposed habitat enhancement measures. For the Proposed Development, significant effects are not predicted as and therefore cumulative effects on this species are predicted to be **Not Significant**.

12.10.7 No sites, where information was available, concluded any potential residual effects greater than that of a minor effect on golden plover and as such, cumulative effects on this species are considered to be **Not Significant**.

12.11 Mitigation and Enhancement Measures

12.11.1 A breeding birds protection plan will be produced, and submitted to the planning authority for approval in writing, ahead of the commencement of construction works. This will specify any survey requirements and mitigation measures required in relation to construction works or vegetation clearance to be undertaken between 1st March and 31st August, to ensure compliance with the legislation protecting breeding birds. The specification and mitigation measures shall be implemented as approved under the supervision of a qualified ornithologist.

12.11.2 An Ecological Clerk of Works (ECoW) will be employed for the duration of construction to ensure compliance with ecological mitigation and implementation of good practice methods, including the protection of breeding birds.

12.11.3 A black grouse lek survey will be undertaken, in accordance with the methodology in Gilbert et al., (2006) in each breeding season in which construction is carried out. To avoid disturbing lek sites, no construction will occur within 500m of any identified black grouse lek between 3am and 9am during their breeding season core lekking period (mid-March to the end of May). Where completed new access tracks are located within 500m of a Black Grouse lek, construction and maintenance vehicles using these between before 9am during the core lekking period will observe a 10mph speed limit while passing within this distance and workers will remain in their vehicles.

12.11.4 Surveys identified a merlin nest c.500m from the nearest proposed turbine in 2013. As this nest site was ephemeral as it was located within the bordering plantation, this species is likely to move to a new site each year along the forest edge, adjacent to the Proposed Development. As such, a Schedule 1 raptor survey, specifically for merlin, will be undertaken in accordance with the methodology within Hardey et al., (2013) in each breeding season in which construction is carried out (April to July) and if required, appropriate mitigation will be implemented, to avoid disturbing breeding merlin.

12.12 Residual Effects

12.12.1 With the application of the mitigation measures referenced in **Section 12.11**, no significant effects on ornithological receptors are predicted as result of the Proposed Development. Residual effects are summarised in **Table 12.8**.

Table 12.8 Summary of Residual Effects

Receptor and Summary of Effect	Assessment summary and Mitigation	Importance / Value	Magnitude of Change	Significance
Construction				
Black grouse – Loss of habitat as a result of borrow pit	A small area of black grouse foraging habitat would be lost within the Peat Hill borrow pit search area.	Low	Low	Not Significant
Black grouse – construction disturbance	No main leks within 1km of turbines. Occasional single lekking birds. Works scheduled outside of peak lekking periods.	Low	Low	Not Significant
Golden plover – construction disturbance	No breeding territories onsite although some small overwintering and passage flocks.	Medium	Low	Not Significant
Merlin – construction disturbance	Nest ~500m from the nearest turbine. Schedule 1 raptor survey required pre-construction.	Low	Negligible	Not Significant
Operation				
Loss of habitat from the footprint of the wind farm	A relatively small proportion of the Development Site is to be lost.	Medium to Low	Low or Negligible	Not Significant
Black grouse – operational disturbance	All but one lek outside of potential disturbance displacement distance (500m).	Low	Low	Not Significant
Golden plover – operational disturbance	Small number of passage and overwintering birds may be displaced, though other suitable habitat available outside Proposed Development	Medium	Low	Not Significant
Merlin – operational disturbance	Nest ~500m from nearest turbine.	Low	Negligible	Not Significant
Collisions of target species with turbines	Generally a very low level of flight activity of target species within the collision-risk volume. Theoretical collision rate for golden plover is 4.4 individuals, and evidence from operating wind farms suggests collisions are unlikely.	Medium to Negligible	Low	Not Significant
Decommissioning				
All species - Displacement of target species as a result of disturbance	Effect of similar magnitude to construction and would be temporary.	Medium to Negligible	Low or Negligible	Not Significant

Conclusions of Significance Evaluation

12.12.2 In conclusion, no residual significant effects on birds are predicted as a result of the Proposed Development, or cumulatively or in combination with other developments.

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13. Geology, Hydrology and Hydrogeology

13.1 Non-Technical Summary

13.1.1 This chapter describes the geology, hydrology and hydrogeology baseline conditions within and surrounding the Proposed Development, and assesses the potential (pre-mitigation) and residual (post-mitigation) impacts of the Proposed Development on these conditions.

13.1.2 The Proposed Development lies within the river catchment areas of the River Nith and the Water of Deugh, and includes the Lane Burn and its tributaries. In terms of geology the region is bisected by the Southern Upland Fault (a fault line which runs from Girvan to Dunbar). Most of the Development Site lies to the south of the Fault, and whose geology comprises greywackes and shales of Ordovician age, overlain by some till and peat. To the north of the Fault lie volcanic basalts as well as Carboniferous coal-bearing strata. Both solid and drift geology comprise low productivity aquifers, i.e. those bearing little available groundwater, with the exception of the limestone/Coal Measures lying to the north of the Development Site, which are of moderate productivity.

13.1.3 The receptors that were considered in the assessment include watercourses and aquifers below ground, as well as private water supplies, groundwater dependent terrestrial ecosystems (i.e. wetlands dependent on groundwater flows), and peat hydrology. In addition, the designated Nith Bridge Site of Special Scientific Interest (SSSI) was also considered.

13.1.4 Data was gathered in order to identify the existing conditions that prevail within the Development Site and further down-gradient. This included the completion of a desk-based study to identify potential receptors, a site walkover, and a review of the findings of ecological data collected. In addition, consultation has taken place with Statutory Authorities and other organisations with water environment interests.

13.1.5 Although the design of the Proposed Development has sought to reduce the effects upon the above receptors, the potential for a significant water quality effect during construction has been identified with respect to the high sensitivity River Nith tributaries and the associated Nith Bridge SSSI. As such, there is a requirement for the application of mitigation measures in order to reduce this potential effect to a level that is not significant. These mitigation measures include the following: design of watercourse crossings that would not cause unacceptable changes to water quality or flows; implementation of a Drainage Management Plan; implementation of a Pollution Prevention Plan and Pollution Incidence Response Plan; and adequate pollution control measures throughout the site, together with a drainage inspection strategy.

13.1.6 All mitigation would be included within the Construction Environmental Management Plan for the site, and specific Construction Method Statements would be produced for the most sensitive construction operations. All activities would adhere to best practice guidance and follow appropriate requirements and conditions associated with Controlled Activities Regulations (CAR) licensing.

13.1.7 With the application of the mitigation measures and best practice that has been identified in the assessment, the overall potential effects upon the water environment that may result from the Proposed Development are reduced to a level that is not significant for all potential receptors and for all proposed activities.

13.2 Introduction and Overview

13.2.1 This chapter sets out the methodology and findings of the assessment of the effects on geology, hydrology and hydrogeology during the construction, operation and decommissioning of the proposed Enoch Hill Wind Farm (the 'Proposed Development'). It should be read with reference to the scheme description in **Chapter 4 - Description of the Proposed Development**.

13.2.2 This chapter first summarises relevant policy and legislation and describes the assessment methodology that has been adopted (**Section 13.2**), the overall baseline conditions (**Section 13.3**) and how the scheme design has evolved (embedded mitigation[1]) with respect to the protection of the water environment (**Section 13.4**). The scope (**Section 13.5**) and results (**Sections 13.6-13.8**) of the assessment of the potential (pre-mitigation) effects are then presented, along with details of environmental measures (additional mitigation, **Section 13.9**) to avoid, minimise, mitigate or compensate for any remaining adverse effects. The chapter concludes with a summary of residual effects (standalone and cumulative) and an evaluation of their significance (**Section 13.10**) following the incorporation of these environmental measures into the scheme, and a list of references (**Section 13.11**).

13.2.3 The following appendices also accompany this chapter:

- **Appendix 13.A**: a list of relevant terminology and abbreviations used in the chapter;
- **Appendix 13.B**: an assessment of risks to Groundwater Dependent Terrestrial Ecosystems (GWDTEs);
- **Appendix 13.C**: the private water supply (PWS) dataset provided by the local authorities; and
- **Appendix 13.D**: a PWS risk assessment.

13.3 Methodology and Approach

Policy and Legislative Context

13.3.1 The overarching objective of Scottish Environment Protection Agency (SEPA) policy is to protect and enhance the environment and avoid deterioration in environmental quality. This duty comes from legislation, such as The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (CAR), which provides for implementation of key water pollution aspects of the Water Framework Directive (WFD).

Planning Policy

13.3.2 This Geology, Hydrology and Hydrogeology impact assessment is undertaken with reference to the following planning policy:

- Scottish Planning Policy (SPP), (2014);
- National Planning Framework 3 (NPF3) (2014);
- East Ayrshire Council (EAC) Local Plan (2010);
- East Ayrshire Local Development Plan Proposed Plan (2015);
- Ayrshire Joint Structure Plan (2007);
- Dumfries and Galloway Local Development Plan (2014) and associated Supplementary Guidance;
- Scottish Government (SGt) Specific Advice Sheet on Onshore Wind Turbines (Updated May, 2014);
- Scottish Executive Planning Advice Note (PAN) 50 - Controlling the Environmental Effects of Surface Mineral Workings (1996);
- Scottish Executive PAN 61 - Planning and Sustainable Urban Drainage Systems (2001);

[1] This is the process whereby at an early stage of the design, readily identifiable constraints are taken account of. For example, watercourses were identified on the Development Site and buffered to ensure that all infrastructure (excluding necessary watercourse crossings) and construction activities are located outside of the buffer area.

- Scottish Executive PAN 79 - Water and Drainage (2006);
- Scottish Environment Protection Agency (SEPA) Policy No 19: Groundwater Protection Policy for Scotland v3 (November 2009);
- SEPA (2011) Policy No. 41: Development at Risk of Flooding: Advice and Consultations; and
- SGt Online Planning Advice on Flood Risk (June, 2015).[2]

Legislative Context

13.3.3 In addition to the planning policy described above, there is a range of environmental legislation relevant to the life-cycle of any large development. The key legislative drivers relating to the water environment which have been considered in this assessment include the following:

- Control of Pollution Act 1974;
- Groundwater Directive (1980/68/EEC);
- Environmental Protection Act 1990;
- Environment Act 1995;
- EC WFD (2000/60/EC);
- Water Environment and Water Services (Scotland) Act 2003;
- EC Dangerous Substances Directive (codified version) (2006/11/EC);
- EC Freshwater Fish Directive (codified version) (2006/44/EC);
- Private Water Supplies (Scotland) Regulations 2006;
- Groundwater Daughter Directive (2006/118/EEC);
- Water Environment (Oil Storage) (Scotland) Regulations 2006;
- The Flood Risk Management (Scotland) Act 2009;
- Flood Risk Regulations 2009;
- Flood and Water Management Act 2010;
- The Water Quality (Scotland) Regulations 2010;
- CAR (2011, as amended); and
- Water Environment (Drinking Water Protected Areas) (Scotland) Order 2013.

Other Guidance

13.3.4 Additional guidance which informs the assessment is provided by SEPA, the Construction Industry Research and Information Association (CIRIA) and others as follows:

- Ministry of Agriculture, Fisheries and Food (MAFF) (2000) Good Practice Guide for Handling Soils (2000);
- British Standard (BS) 6031:2009 Code of Practice for Earth Works;
- Department for Food, Environment and Rural Affairs (2009) Construction Code of Practice for the Sustainable Use of Soils on Construction Sites;
- SEPA (2009) Engineering in the Water Environment: Good Practice Guide – Temporary Construction Methods;

[2] http://www.gov.scot/Resource/0047/00479774.pdf

- SEPA (2010) Engineering in the Water Environment: Good Practice Guide – River Crossings;
- SEPA (2010) Engineering in the Water Environment: Good Practice Guide – Sediment Management;
- Forestry Commission Scotland (FCS) and Scottish Natural Heritage (SNH) (2010) Floating Roads on Peat;
- Forestry Commission (FC) (2011) Forests and Water: UK Forestry Standard Guidelines;
- Scottish Government (August 2013) PAN 1/2013 - Environmental Impact Assessment;
- Scottish Renewables / SNH / SEPA / FC / Historic Scotland (2013) Good Practice During Wind Farm Construction;
- SEPA (2014a) Land Use Planning System Guidance Note 31 (LUPSGU31): Guidance on assessing the impacts of developments on groundwater abstractions and groundwater dependent terrestrial ecosystems;
- SEPA Position Statements and Supporting Guidance, namely:
  - WAT-PS-06-02 Culverting of Watercourses, Version 1.2 (December 2006);
  - WAT-PS-07-02 Bank Protection, Version 2 (April 2012);
  - WAT-SG-23 Engineering in the Water Environment, Good Practice Guide, Bank Protection Rivers and Lochs, First Edition (April 2008);
  - WAT-SG-25 Engineering in the Water Environment, Good Practice Guide, River Crossings, Second Edition (November 2010);
  - WAT-SG-26 Engineering in the Water Environment, Good Practice Guide, Sediment Management, First Edition (June 2010);
  - WAT-SG-29 Engineering in the Water Environment, Good Practice Guide, Temporary Construction Methods, First Edition (March 2009);
  - WAT-SG-31 Prevention of Pollution from Civil Engineering Contracts: Special Requirements, Version 2 (June 2006); and
  - WAT-SG-78 Sediment Management Authorisation, Version 1 (December 2012).
- SEPA Pollution Prevention Guidance (PPG) Notes, namely:
  - PPG 1 General guide to the prevention of pollution;
  - PPG 2 Above ground oil storage tanks;
  - PPG 3 Use and design of oil separators in surface water drainage systems;
  - PPG 4 Treatment and disposal of sewage where no foul sewer is available;
  - PPG 5 Works and maintenance in, or near, water;
  - PPG 6 Working at construction and demolition sites;
  - PPG 8 Safe storage and disposal of used oils;
  - PPG 13 Vehicle washing and cleaning; and
  - PPG 21 Pollution incident response planning.
- CIRIA Report C532: Control of Water Pollution from Construction Sites;
- CIRIA Report C624: Development and flood risk - guidance for the construction industry;
- CIRIA Report C648: Control of Water Pollution from Linear Construction Projects;

- CIRIA Report C649: Control of Water Pollution from Linear Construction Projects – Site Guidance;
- CIRIA Report C689: Culvert Design and Operation Guide;
- CIRIA Report C692: Environmental Good Practice on Site, Third Edition;
- CIRIA Report C697: The SUDS Manual;
- CIRIA Report C698: Site handbook for the construction of SUDS; and
- Local and Regional Land Drainage Byelaws.

Baseline Establishment

13.3.5 The Proposed Development is approximately centred on National Grid Reference (NGR) 257360 608630. The present condition of the Development Site is assumed to represent the baseline environment, against which potential and residual impacts are assessed.

13.3.6 The assessment involves the collection and interpretation of a wide range of data and information from published material, plus consultations relating to the local and wider geological, hydrogeological and hydrological environment with statutory bodies, principally SEPA, EAC and DGC, and the findings of an Amec Foster Wheeler site walkover survey undertaken on 15 July 2014. The data and other sources of information collected are listed in **Table 13.1**.

Table 13.1 Geology, Hydrology and Hydrogeology – Sources of Information

Topic	Source of Information
Topography **Elevation, relief**	Ordnance Survey (OS) Explorer 1:25,000 map sheets 327 (Cumnock & Dalmellington) and 328 (Sanquhar & New Cumnock) OS Landranger 1:50,000 map sheets 71 (Lanark & Upper Nithsdale) and 77 (Dalmellington & New Galloway)
Land Use **Land use**	Amec Foster Wheeler site visit (15/07/2014)
Designated Sites **Special Areas of Conservation (SACs)** **Special Protection Areas (SPAs)** **Sites of Special Scientific Interest (SSSI)**	Scottish Natural Heritage Sitelink: http://gateway.snh.gov.uk/sitelink/
Climate **Rainfall**	Natural Environment Research Council (NERC), UK Hydrometric Register 2008 (Centre for Ecology & Hydrology, CEH) Flood Estimation Handbook (FEH)
Surface Hydrology **Water quality** **Flood risk**	SEPA (www.sepa.org.uk/water/river_basin_planning.aspx) Amec Foster Wheeler site visit (15/07/2014) SEPA Flood Map (http://www.sepa.org.uk/flooding/flood_map/view_the_map.aspx)
Geology **Solid geology**	British Geological Survey (BGS) Scotland Sheets 14E (Cumnock) (1976) and 15W (New Cumnock) (1999) 1:50,000, Solid editions
Drift geology	British Geological Survey (BGS) Scotland Sheets 14E (Cumnock) (1980) and 15W (New Cumnock) (1999) Solid & Drift edition 1:50,000
Soils **Soil type**	Soil Survey of Scotland 1:250 000 Map Sheet 7 (South East Scotland)
Groundwater **Groundwater vulnerability**	Groundwater Vulnerability Map of Scotland (Scotland and Northern Ireland Forum for Environmental Research (SNIFFER), 2004)

Topic	Source of Information
Aquifer classification	Bedrock Aquifers Map of Scotland (BGS/SEPA, 2004) Superficial Aquifers Map of Scotland, (BGS/SEPA, 2004) Hydrogeological Map of Scotland (BGS, 1988)
Abstractions and Discharges **Licensed abstractions and discharges**	SEPA
Private water supplies	EAC & DGC

Consultation

13.3.7 Consultee responses within the Scoping Opinion with relevance to the water environment were received from SEPA, EAC, Marine Scotland Science (MSS), and SNH. Scoping responses relevant to the water environment are summarised in **Table 13.2.** Full details of the information provided in the scoping report and the responses received are provided in **Table 2.2** Summary of EIA Scope and **Table 2.3** Scoping Responses.

Table 13.2 Summary of Relevant Consultee Scoping Responses and ES Response

Consultee	Comment / Concern	ES Response
SNH	SNH has recommended that surveys are undertaken to determine the extent of peat deposits within the Development Site to inform the site design and layout. They also recommend engagement with SEPA with regard to excavated peat reuse and disposal. In SNH's response to the scoping report they stated that they were content that the Ayrshire Rivers Trust (ART) will be consulted regarding salmonid watercourse survey requirements for fisheries interests.	Peat site survey results are presented in Technical **Appendices 6.A-6.B**. Consideration of potential impacts to peat hydrology only are considered within this chapter, in **Section 13.6**.
SEPA	Identification of all wetlands or peatland systems, and avoidance of impact on these wetlands by way of careful site layout design; Identification of GWDTEs and avoidance if possible (>100m buffer from roads, tracks or trenches and >250m buffer from borrow pits or foundations); Where avoidance of GWDTEs is not possible, the ES must provide details of how impacts upon wetlands including peatlands are minimised and mitigated; Identification of all groundwater abstractions within and outwith the site boundary, within a radius of i) 100m from roads, tracks and trenches and ii) 250m from borrow pits and foundations. If such infrastructure is within these buffers, then the applicant should consider avoiding them or investigations to demonstrate that "impacts on abstractions are acceptable" will be required; Water engineering activities are to be avoided, but where necessary e.g. watercourse crossings, they are designed such that "every effort has been made to leave the water environment in its natural state"; The details of borrow pits, including water abstraction, if required, are to be provided; If other development projects are present within the same water catchment, then the cumulative impact of scheme on the water environment should be assessed; and Assessment of flood risk.	Peat site survey results are presented in Technical **Appendices 6.A-6.B**. Consideration of potential impacts to peat hydrology only is considered within this chapter, in **Section 13.6**. GWDTEs are identified in **Section 13.3**, and assessed in Technical **Appendix 13.B**. Assessment of effects upon 'actual' GWDTEs is then summarised in **Section 13.6**. All known groundwater abstractions are identified in **Section 13.3**, and assessed in Technical **Appendix 13.D**. Assessment of effects upon those groundwater abstractions considered to be at risk from the Proposed Development is then summarised in **Section 13.6**. Details of water engineering activities are provided in **Chapter 4** of the ES. Details of borrow pits and water abstraction requirements are provided in **Chapter 4** of the ES. The cumulative impact of the scheme on the water environment is assessed in **Section 13.10**. Flood risk is identified in **Section 13.3**, and the need for assessment evaluated within **Section 13.5**. The proposed works are unlikely to result in increased flood risk and therefore a separate flood risk assessment has not been undertaken.
Marine Scotland Science (MSS)	MSS did not comment directly on the Proposed Development but provided recommendations for the preparation of the ES during which careful consideration should be given to activities which can have an impact on fisheries. In particular, a buffer zone of 50 m to watercourses is recommended.	Potential design and construction impacts relating to fisheries interests (survey results set out in **Chapter 11 Technical Appendix 11.H**) have informed the design, as well as mitigation, pre-construction surveys and monitoring requirements.
East Ayrshire Council	EAC has stated that watercourses, tributaries and river catchments will need to be protected. It also requests that *"the effects of construction activities on water quality should be assessed, to avoid in particular, sedimentation and accidental spillages. This will apply to turbine base formation, access road construction and borrow pit extraction operations. Consideration should be given to the need for silt traps and possibly a settlement lagoon and, dependent on effluent quality, a discharge consent from SEPA may be required".*	The baseline water environment is described in **Section 13.3** and water receptors identified in **Section 13.5**. Effects on water quality are assessed in **Section 13.6**.
Scottish Water (SW)	No response	-

Methodology for Establishment of Effects

13.3.8 The assessment methodology employed to evaluate the significance of potential and residual effects of the Proposed Development on geology, surface water and groundwater takes into

account the sensitivity (or importance) of potential receptors and the magnitude of predicted effects on the relevant receptors.

13.3.9 The sensitivity is based on the value of the water feature or resource (**Table 13.3**), including its use. The approach also takes cognisance of the baseline quality of the receptor. For instance, a wetland area may have a statutory designation, but if it is significantly degraded it may be considered to be of reduced value.

Table 13.3 Definitions of Importance / Sensitivity

Sensitivity	Criteria	Examples
Very High	Feature with a high quality and rarity at an international scale, with little potential for substitution. Medium to high flood risk.	Conditions supporting sites with international conservation designations (SAC, SPA, Ramsar sites), where the designation is based specifically on aquatic features. Land use types defined in the SPP as essential civil infrastructure such as hospitals, fire stations, emergency depots etc.
High	Feature with a high yield and / or quality and rarity at a national scale, with a limited potential for substitution. Low to medium flood risk.	Highly productive aquifers and surface water resources, typically used for public water supplies. Public water supplies. Conditions supporting a SSSI. Sites with freshwater fish protected areas. Water quality of receptor water body: Supporting WFD element type (e.g. Priority Substances) classified as 'High', ''Good' or Pass'. Land use types defined in SPP as schools, care homes, ground-based electrical and telecommunications equipment.
Medium	Feature with a medium yield and/or quality at a regional scale, or good quality at a local scale, with some potential for substitution. Low flood risk.	Locally designated geological superficial or solid strata. Medium productivity aquifer and surface water resources, typically used for smaller public water supplies or industrial water supplies. Industrial water supplies. Conditions supporting local nature conservation interest (e.g. National Nature Reserve [NNR]), where the interest features are water-dependent. Water quality of receptor water body: Supporting WFD element classified as at least 'Good' in all cases. Other property types, including dwellings.
Low	Feature with variable yield and/or quality at a local scale, with potential for substitution. Negligible flood risk.	Non-designated geological superficial or solid strata. Low productivity aquifer and surface water resources, typically used for private water supplies or not utilised. Private water supplies; livestock supplies; springs; ponds/lagoons; non-statutory groundwater-dependent conservation sites. Water quality of receptor water body: Supporting WFD element type classified as less than 'Good' in any situation (any supporting element). Undeveloped or agricultural land from a flood risk point of view.
Very Low	Feature with poor yield and / or quality at a local scale, with good potential for substitution.	Unproductive strata. Water quality of receptor water body: Supporting WFD element type classified as 'Poor' or 'Bad', with severely restricted ecosystems and pollution. Small surface water bodies such as drainage ditches and ephemeral ponds that are too small to be classified under WFD and have limited ecological potential due to being artificial or heavily-modified.

13.3.10 The magnitude of any estimated change to the baseline is based on the degree of impact and is independent of the sensitivity of the feature (see **Table 13.4**).

Table 13.4 Overview of Magnitude of Change

Magnitude	Criteria	Examples
High	Results in major impact on feature, of sufficient magnitude to affect its use / integrity.	Large scale change to protected geological site, likely to be permanent or long term. Major reduction in groundwater levels, flow or quality, reducing use and water body status. Major reduction in groundwater levels or water quality leading to a marked deterioration in conditions that support GWDTE features. Deterioration in river flow regime, morphology or water quality, leading to sustained, permanent or long-term breach of relevant SSSI conservation objectives (COs), or downgrading of WFD status (deterioration in current thresholds as defined by current WFD status, including supporting WFD elements). Complete loss of resource or severely reduced resource availability to other water users. Change in flood risk resulting in potential loss of life or damage to nationally critical infrastructure.
Medium	Results in noticeable impact on feature, of sufficient magnitude to affect its use / integrity in some circumstances.	Measurable derogation in geological feature attributes, but with short term and reversible consequences in terms of use and status. Moderate reduction in groundwater levels, flow or quality, reducing use and water body status in some circumstances. Moderate reduction in groundwater levels or water quality leading to some deterioration in conditions that support GWDTE features. Deterioration in river flow regime, morphology or water quality, leading to periodic, short-term and reversible breaches of relevant SSSI conservation objectives, or downgrading of WFD status (deterioration in current thresholds as defined by current WFD status, including supporting WFD elements). Water quality status may impact upon potential future thresholds in relation to objective WFD status – potential for prevention of waterbody reaching its future WFD objectives. Minor reduction in resource availability for other water users. Change in flood risk resulting in potential for major damage to property and infrastructure.
Low	Results in minor impact on feature, with insufficient magnitude to affect its use / integrity in most circumstances.	Measurable derogation in geological feature attributes, but with limited consequences in terms of use and status. Measurable reduction in groundwater levels, flow or quality, but with limited consequences in terms of use and water body status. Measurable reduction in groundwater levels or water quality, leading to a minimal change in conditions that support GWDTE features. Measurable deterioration in river flow regime, morphology or water quality, but remaining generally within SSSI COs, and with no change of WFD status (of overall status or supporting element status) or compromise of Environmental Quality Standards (EQSs). No change in resource availability for other water users. Increase in flood hazard in areas with no flood risk receptors e.g. increased flooding of agricultural land. Change in flood risk resulting in potential for minor damage to property and infrastructure.
Negligible	Results in little or no impact on feature, with insufficient magnitude to affect its use / integrity.	No measurable change in geological baseline. No measurable reduction in groundwater levels or flow. Any change to water quality will be quickly reversed once activity ceases with no consequence in terms of use, water body status (of overall status or supporting element status) or compromise of EQSs. No measurable reduction in groundwater levels or water quality, leading to no change in conditions that support GWDTE features. No measurable deterioration in river flow regime, morphology or water quality, and no consequences in terms of SSSI conservation objectives, WFD designations, water resources or flood risk. Change in flood risk causes more frequent inconvenience and triggering of emergency response measures, but does not result in increased risk of damage to property and infrastructure.

Significance Evaluation Methodology

13.3.11 In terms of the EIA Regulations, it is only impacts that are likely to have significant positive and/or negative environmental effects that require detailed assessment. As the EIA Regulations guide the assessor to focus on effects that are likely to be significant, the outcome of the assessment of a given effect on a particular receptor in its simplest form would be that it is significant or not significant. However, there may be instances where it is appropriate to further sub-divide the category of 'Not Significant', for example by use of the terms 'Slight' and 'Negligible' in terms of the level of effect. The use of the category of 'slight' may for example be used in acknowledgement that there are instances whereby there may be an effect, albeit that this is not likely to be significant - and this approach may better facilitate assessment of cumulative effects where cumulatively several slight effects could be significant. With this consideration in mind, **Table 13.5** illustrates a matrix, which has been used for guidance in the assessment of significance.

13.3.12 Having defined a level of effect, professional judgement, in combination with guidance and standards are then applied to identify which of those levels of effect are then considered to be equivalent to significant effects when discussed in terms of the EIA Regulations. Those levels of effect which are shaded in **Table 13.5** equate to those considered significant under the EIA Regulations with the others constituting no effect or an insignificant effect.

Table 13.5 Derivation of the Level of Effect

Magnitude of Change	**Sensitivity of Receptor**				
	Very High	**High**	**Medium**	**Low**	**Very Low**
High	Substantial	Substantial	Substantial	Moderate	Slight
Medium	Substantial	Substantial	Moderate	Slight	Negligible
Low	Moderate	Moderate	Slight	Negligible	Negligible
Negligible	Slight	Slight	Negligible	Negligible	Negligible

Key:

Shaded Cell = Significant in terms of EIA Regulations.

Unshaded cell = Not significant in terms of EIA Regulations.

13.3.13 It should be noted that the type of categorisations illustrated in **Tables 13.3 to 13.5** provide a guide only, and may be moderated based upon professional judgement and experience. In particular, the divisions between categories of receptor sensitivity, magnitude of change, and level of effect should not be interpreted as definitive, and the lines that represent the boundaries between categories should in many cases be considered as 'blurred'. Where the level of effect is considered to be moderate or less, these are generally not deemed significant in terms of the EIA Regulations. However, depending on the receptor being considered, it is possible that some potentially moderate effects could be judged as significant in terms of the EIA Regulations, and where this is judged to be the case, the rationale for this conclusion has been provided in this chapter.

13.4 Baseline Information

Current Baseline

Introduction

13.4.1 This section characterises the local geological, hydrological and hydrogeological environment so that the potential effects of the Proposed Development can be determined and appropriate mitigation undertaken, if required. It also provides the point of reference against which the success of the adopted mitigation measures can be assessed in terms of residual effects.

13.4.2 The following baseline description is based upon data obtained from the sources listed in **Table 13.1** and the results of the Amec Foster Wheeler site walkover survey. **Figure 13.1** shows the Proposed Development in a local context and illustrates the locations of watercourses and other hydrological features of interest within the Development Site. **Figure 13.2** illustrates the solid and drift geology of the Development Site and its surroundings.

Topography, Land Use and Designated Sites

13.4.3 The Development Site covers an area of approximately 1,466 hectares (ha) and is located approximately 5km south west of New Cumnock in East Ayrshire, and immediately to the north of the Carsphairn Forest.

13.4.4 Ground elevations in the area generally rise from north to south, from the River Nith valley 1-3 km to the north of the Development Site, rising through the site towards the Enoch Hill summit in the south. Ground elevations in the Development Site itself range from 569 metres Above Ordnance Datum (mAOD) on the summit of Enoch Hill (NGR 256214 606744), in the south west of the Development Site, to 210mAOD at Burnside (NGR 258900 611140), in the north eastern corner of the site.

13.4.5 The Proposed Development access road rises from ~313mAOD at the site entrance on the B741 (NGR 254577 610041) to ~565mAOD close to the summit of Enoch Hill at Turbine 4 (NGR 256194 606809). Tracks extend east to Turbine 18 at the eastern-most point, on the southern flank of Benty Cowan Hill at ~430mAOD (NGR 258085 608016).

13.4.6 Topographic gradients within the Development Site are generally steep. For example, the average gradient from Dalleagles (NGR 257230 610540) to the summit of Chang Hill (NGR 256710 608370) is 10%.

13.4.7 The land use of the Development Site consists predominantly of moorland (predominantly used for sheep farming).

13.4.8 The closest conservation interests to the Development Site are the Nith Bridge and the Benbeoch SSSI. Both SSSIs are designated for geological interests, namely quaternary geomorphology and igneous petrology respectively.

13.4.9 Benbeoch SSSI is located ~5 km to the west of the Development Site, at NGR 249200 608500, and is located outwith the catchment areas of the Proposed Development. It comprises an igneous sill intrusion complex, and is a source of evidence for the different processes which affect magmatic evolution.

13.4.10 Nith Bridge SSSI lies ~3km to the north-north east of the Development Site, at NGR 259300 614000. It comprises eroded river bank sections of the River Nith, and constitutes a key reference site for glacial deposits in south-west Scotland. The features are deemed to be in 'Favourable Maintained' condition (February 2002). Management at the site when last reviewed in 2008 includes the use of riprap[3] at the base of the slope, to limit erosion and maintain the stability of the nearby road. A balance is required between having sufficient erosion by water flows in the River Nith to keep exposures clearly visible versus protecting the road. It is noted by SNH that material may need to be cleared from the toe of the slope to re-open exposures.

13.4.11 The nearest SPA is the Muirkirk and North Lowther Uplands, which lies over 7km north east of the Proposed Development, and to the east of the River Nith valley, and is designated for short-eared owl, golden plover, merlin, peregrine and hen harrier during the breeding season; and the latter during winter also.

Climate

13.4.12 The most recent data from the closest rain gauge identified from the UK Hydrometric Register (2008) are presented in **Table 13.6**. Although data are not available for the current period, they

[3] loose stone used to form a foundation for a breakwater or other structure.

nonetheless provide an indication of the rainfall typical of the environmental setting, and remain informative to the assessment here.

Table 13.6 Rain Gauge Information

Location	Distance from site	NGR	Period of measurement	Altitude (mAOD) of gauge	Average rainfall (mm)	Baseflow Index (BFI)
79001 Afton Water at Afton Reservoir	5.6km south east of site	263100 605000	1965-1981	386	2265	0.11

13.4.13 The average annual rainfall for the Crocradie Burn catchment, within the centre of the Development Site, has also been estimated from the FEH. FEH calculates average annual rainfall for the catchment centred on NGR 256424 608240 as 1,673mm/a. The Standard Percentage Runoff (SPR) for the catchment is estimated by FEH to be 52.9%, implying that nearly half of all rainfall is lost as evapotranspiration.

Surface Hydrology

13.4.14 The hydrology of the Development Site and wider area is presented in **Figure 13.1**. The site lies within the surface water catchments of the River Nith to the north and the Water of Deugh to the south.

13.4.15 The majority of the watercourses within the site flow to the north and are confluent with the River Nith. This includes the Polmath Burn in the north west of the Development Site, which issues to the east of Maneight Hill (NGR 255060 608799). The Polmath Burn is fed by a number of unnamed tributaries rising from the south (NGR 254997 609190) and west (NGR 255218 609630) of Blood Moss.

13.4.16 The headwaters of the Bow Burn rise from just within the northern Development Site boundary, to the north (NGR 255330 610135) and north west (NGR 254755 610145) of Peat Hill. Similarly, Lane Burn issues from just inside the northern boundary of the Development Site, to the north east of Peat Hill (NGR 255620 610376).

13.4.17 The Spout Burn issues to the east of Blood Moss (NGR 255642 609665) and is confluent with the Knockburnie Burn at the Development Site boundary. The Knockburnie Burn itself issues from Logan Hill, on the south western boundary of the Development Site (NGR 255753 606670), and flows north along the boundary, past Barbeys Hill, before turning and flowing north easterly around Rigg Hill and through the Knockburnie Glen and exiting the site at Knockburnie (NGR 256250 610425).

13.4.18 An unnamed watercourse issues to the north of Rigg Hill (NGR 256216 609268) and flows north, discharging into the Knockburnie Burn ~500m north of the northern Development Site boundary.

13.4.19 The two headwaters of Littlechang Burn issue from north of Enoch Hill (NGR 256053 607188) and north west of High Chang Hill (NGR 256300 607438), whilst the Catlock Burn issues from north east of High Chang Hill (NGR 256708 607477). These watercourses, in turn, form the headwaters of the Crocradie Burn which flows in a north easterly direction and becomes the Dalleagles Burn ~700m north of the northern Development Site boundary (NGR 257240 609684), where the Trough Burn is confluent.

13.4.20 The Trough Burn is located towards the centre of the Development Site. With tributaries issuing from the south east of Chang Hill (NGR 257074 607697), south west of Benty Cowan Hill (NGR 257470 607694) and north west of Benty Cowan Hill (NGR 257630 608662), this watercourse flows northwards and, as noted, is confluent with the Crocradie Burn to become the Dalleagles Burn beyond the northern Development Site boundary (NGR 257240 609684).

13.4.21 Issuing from the northern side of Benty Cowan Hill (NGR 258109 609058), the Straid Burn flows north, past Straid Farm, and discharges into the Dalleagles Burn some 750m downstream of the

site. The Redhall Burn also flows past Straid Farm, but to the east of it. This watercourse flows in a north westerly direction from Blarene Hill (NGR 258495 609760) and forms a pond (NGR 258260 610120), just before the northern Development Site boundary. The Redhall Burn discharges from the pond and is eventually confluent with the Dalleagles Burn some 900m downstream of the Development Site.

13.4.22 Two tributaries form the headwaters of the Blarene Burn, rising from the north east of Benty Cowan Hill (at NGR 258350 609015 and NGR 258643 608695). The watercourse then flows in a northerly direction through the valley between Blarene Hill and Knocknide Hill, past Burnside (NGR 258900 611140) and then into the Lane Burn ~500m downstream of the Proposed Development.

13.4.23 The Connel Burn issues from the Craig of Bahoun (NGR 257565 606334), in the southernmost part of the Development Site. This watercourse flows in a north easterly then a northerly direction from "The Dungeon" (NGR 259980 609490) and generally forms the eastern Development Site boundary. The Connel Burn leaves the Development Site to the east of Brockloch (NGR 259920 610820) and is confluent with the River Nith at New Cumnock (NGR 261220 613870).

13.4.24 A number of tributaries of the Connel Burn also drain from the Development Site. These include the Polga Burn, which issues from the east of High Chang Hill (NGR 257290 607300), the Purreoch Burn, which issues from the eastern slope of Benty Cowan Hill (NGR 258600 608392), and an unnamed burn, which issues from Brockloch (NGR 259613 610500).

13.4.25 In the Water of Deugh catchment, the Bitch Burn issues from just inside the southern Development Site boundary, east of Enoch Hill (NGR 256574 606897). It flows in a south easterly and southerly direction, through the Carsphairn Forest, into the Water of Deugh (NGR 257830 604974), ~2.2km downstream of the Proposed Development.

13.4.26 The Strathwiggan Burn issues from the southern-most tip of the Proposed Development, south of Enoch Hill (NGR 256505 606314). This watercourse flows south, through the Carsphairn Forest, and eventually converges with the Water of Deugh ~2.6km south of the Development Site.

13.4.27 Further descriptions of the character of the on-site burns is provided in **Chapter 11** – **Ecology (Table 11.7)**.

13.4.28 The closest surface water gauging station to the Development Site that was operated by SEPA was on Afton Water (Gauge 79001 at Afton Reservoir NGR 263100 605000). Flow data for this gauge is available from 1965-1981, and the mean flow over this period is 0.20m^3/s (17.3Ml/d), with a Q95 flow (i.e. the flow exceeded 95% of the time) of 0.01m^3/s (0.9Ml/d). Flow data for the River Nith are also available at Dalgig for the period 1995-2014 (NGR 255849 612789), with mean flow over this period of 1.00m^3/s (86.4Ml/d).

13.4.29 The baseflow index (BFI) is a measure of the proportion of river flow that is derived from storage near the surface. The BFI given for the SEPA gauge at Afton Reservoir has a value of 0.11, suggesting that baseflow is not a significant component of flow. The FEH CD ROM was also reviewed to obtain catchment statistics for the specific catchment within the Development Site boundary. For the catchment of the Crocradie Burn (centred on NGR 256424 608240), the FEH estimates a BFI value of 0.273. This would suggest that baseflow within the Development Site catchment is a higher proportion of river flow than within the Afton Water catchment, although it remains quite a small component of flow.

Flood Risk

13.4.30 Flood risk for the catchment has been assessed using SEPA's online flood mapping. This indicates that none of the areas of infrastructure are at risk of flooding from fluvial or other sources. Although it is likely that the catchments on and near the Development Site are less than the 3km^2 minimum required for SEPA to map, it is considered that any flood event on-site would nonetheless be contained within the steeply incised watercourse channels.

13.4.31 The only areas in the vicinity of the Development Site for which a localised flood risk is indicated is on the River Nith tributary floodplain areas, on and beyond the northern site boundary. This area is classed as having a >0.5% Annual Exceedance Probability (AEP) of flooding, of the following location and extent:

- Dalleagles Burn, west of Littlemark (NGR 257305 610825), and extending up-gradient to the confluence with the Crocradie Burn, with flood water of possibly <0.3m depth;
- Lane Burn, west of Lanemark (NGR 258735 611980), with flood water of possibly 0.3-1m depth;
- Lane Burn, west of Lanemark, comprising additional small patches where flood waters could exceed 1m depth;
- Connel Burn, west of Greenburn Junction (NGR 260650 613630) and extending up-gradient to the west of Benty Cowan, with flood water of possibly >1m depth;
- Connel Burn, north of Greenburn Junction and just before confluence with River Nith (NGR 260805 613740), with flood water possibly of 0.3-1m depth and additional patches where this could exceed 1m; and
- Water of Deugh channel, south of Enoch Hill, with flood water possibly of 0.3-1m depth and additional patches where this could exceed 1m.

13.4.32 Areas of 'High' flood risk are generally contained within the immediate watercourse channel area and, according to the flood map, the only property located within the zones of 'High' likelihood of flooding is that at Lanemark on the Lane Burn (NGR 258778 611956).

13.4.33 The SEPA online mapping does not indicate areas at risk from any other type of flooding.

Surface Water Quality

13.4.34 The Knockburnie Burn/Lane Burn is classified in the SEPA River Basin Management Plan (RBMP, 2008) as being of 'Good' ecological potential and overall status, and an overall chemical status of 'Pass'. However, the River Nith, with which the Lane Burn is confluent, is classified by SEPA as of 'Moderate' ecological potential and overall status, and overall chemical status of 'Pass'. Pressures from morphological alterations and diffuse source pollution as a result of mining and quarrying within the river catchment are the principal reasons for this classification. This status of both watercourses remains at the same classification in 2013.

13.4.35 The Water of Deugh is classified as being of 'Bad' ecological potential and overall status, and an overall chemical status of 'Pass'. Pressures from abstraction, flow regulation and morphological alterations are the principal reasons for this classification, which remains the same in 2013.

13.4.36 None of the other watercourses within the Development Site are classified by SEPA in terms of water quality, as they are smaller than the required 10km^2 minimum catchment size. However, for the purposes of this EIA, it is assumed that all are equivalent in terms of water quality to that of the Knockburnie Burn/Lane Burn i.e. of 'Good' ecological potential and overall status, and an overall chemical status of 'Pass'.

13.4.37 The River Nith and Water of Deugh (as part of the River Dee) are both Freshwater Fish Salmonid Waters. Nonetheless, whilst the Development Site provides suitable salmonid habitats for Atlantic salmon and brown trout, no stretches were found to contain any juveniles during the electrofishing surveys completed for this ES (**Chapter 11; Table 11.7**). A Nith District Salmon Fisheries Board (NDSFB) Fisheries Habitat Survey and Electrofishing Survey Results is presented in **Appendix 11.F**.

13.4.38 Observations regarding watercourse conditions, made during the site visit in July 2014, are presented in **Table 13.7**. The sample locations are indicated on **Figure 13.1**.

Table 13.7 Watercourse Observations

Sample Point	Watercourse Name	Sample Point NGR	pH	Temp (°C)	Visual Observations
1	Polmath Burn	254488 609906	8.4	16.4	Rocky bed. ~1 m wide, 0.1 m deep. Low flow. Water clear.
2	Knockburnie Burn	256293 609385	8.1	14.6	Rocky bed. ~1 m wide, 0.1 m deep. Low flow. Water clear.
3	Crocradie Burn	257000 609483	8.4	16.2	Rocky/bedrock bed. ~2 m wide, 0.1-0.3 m deep. Low-medium flow. Water clear.
4	Trough Burn	257280 609353	8.3	15.4	Rocky/bedrock bed. ~2 m wide, 0.1-0.3m deep. Low-medium flow. Water clear.
5	Little Chang Burn	256183 608000	8.3	12.2	Peaty bed. 0.3-0.8 m wide, 0.1 m deep. Low-medium flow. Water clear peaty colour.

13.4.39 The results from the on-site water quality analysis indicate that it is of a good standard within the Development Site. Waters within the site are characteristically slightly alkaline.

Superficial Geology

13.4.40 The superficial geology underlying the Development Site is presented on the left map in **Figure 13.2**. In general, this indicates that the solid geology is overlain by either peat, till, or hummocky glacial deposits, or that drift cover is thin or absent.

13.4.41 Peat predominates throughout the south, south west and western parts of the site, underlying: Chang Hill, High Chang Hill to the south; south east of Enoch Hill and Barbeys Hill; and to the south of Peat Hill. An additional and large deposit of peat occurs to the east of Benty Cowan Hill.

13.4.42 Deposits of boulder clay (till) extend north east from the south eastern corner of the site, along the eastern site boundary and Connel Burn, to Brockloch. The mapping also indicates that till deposits have accumulated in the floodplains and valleys associated with the Blarene Burn, Straid Burn, Trough Burn, Catlock Burn/Crocradie Burn, Knockburnie Burn and Polmath Burn. Till predominates along the entire northern site boundary. This boulder clay is described as tenacious brown or blue-grey clay with a variable sand content. It also contains many rounded and striated pebbles and boulders, mostly of local rock types but including some erratics.

13.4.43 A small accumulation of glacial meltwater deposits have been laid down along part of the Crocradie Burn (NGR 257000 609500). These comprise predominantly sand and gravel which may form kame terraces, a hummocky topography of irregular mounds or sinuous eskers.

13.4.44 Over the remainder of the Development Site, including Benty Cowan Hill, Connelburn Rig, Knocknide Hill, Blarene Hill, Rigg Hill and to the north of Peat Hill, superficial deposits are mapped as bedrock at or near surface. This implies that the drift cover is thin or absent in these locations.

Solid Geology

13.4.45 The solid geology of the Development Site is presented on the right map of **Figure 13.2**. The site is intersected by the Southern Upland Fault, trending from south west to north east, and dividing the wacke and mudstone geology to the south east of the fault and the basalt and Coal Measures to the north west.

13.4.46 To the south east of the fault, underlying the Enoch, Barbeys, Chang, High Chang, Benty Cowan and Blarene Hills, greywackes and shales of Ordovician age predominate (the Leadhills Supergroup). These strata are generally gently inclined and dip to the south east. From the summit of Enoch Hill to High Chang Hill and at Connelburn Rig/Knocknide Hill, these strata also include conglomerates. Additionally, mudstone and chert outcrop at Benty Cowan Hill and at Connelburn Rig, where an extrusion of altered basaltic spilitic rock also overlies this outcrop.

13.4.47 A number of intrusions also occur to the south east of the Southern Upland Fault. To the south east of High Chang Hill (NGR 257600 606840) and to the south of Benty Cowan Hill (NGR 258065 607330), these intrusions are porphyritic rocks of the Lower Old Red Sandstone (ORS) and comprise compact, fine-grained, reddish or grey rock and contain phenocrysts of andesine, pyroxene or hornblende in a matrix of these minerals and some iron ore. An igneous intrusion of mafite is present to the south west of Connelburn Rig (NGR 259010 608460).

13.4.48 A further, larger, igneous intrusion is present, running virtually parallel to, and to the south east of, the Southern Upland Fault. Stretching from the northern slope of Chang Hill (NGR 257030 609275) to the north eastern corner of the site (NGR 259920 610820), this intrusion comprises quartz-bearing tholeiitic dolerite.

13.4.49 To the north west of the Southern Upland Fault and within the Development Site boundary, igneous extrusive rocks predominate. These comprise basalt and basic andesite of the Carrick Volcanic Formation (CVF). The basic andesite is a dark grey or purple rock in which the plagioclase is less calcic and olivine is normally present.

13.4.50 An outcrop of felsite of the Lower ORS age occurs along the north western side of the Southern Upland Fault. This is a pale, usually pink, fine-grained, compact rock, composed of alkali feldspar, quartz and sparse iron ore. South west of this, conglomerates of Lower ORS age occur. In addition, an isolated outcrop of this conglomerate occurs to the north east of Rigg Hill (NGR 256700 609650). This formation comprises mainly greywacke pebbles and subordinate chert, jasper, quartzite and acid igneous pebbles. An isolated and minor intrusion also occurs to the north western side of the fault (NGR 257000 609500).

13.4.51 In the northern-most fringes of the Development Site, coal-bearing strata predominate. The Lower Coal Measures (LCM) and Middle Coal Measures (MCM) outcrop to the south of Burnside. The MCM comprise cyclic sequences of sandstones, siltstones, mudstones, coals and seatclays which are generally buff, white and grey. The coals are commonly thick and persistent and have been extensively mined in the local area. The upper part of the sequence contains four thin marine bands. The LCM is similar to the MCM, but the thick coals are found mainly in the higher beds, whereas the coals are generally thin and variable in the lower more arenaceous beds.

13.4.52 A narrow band of Passage Formation lies close to the northern site boundary, south of Dalleagles (NGR 258000 610300). These sandstones separate the MCM to the north and the Leadhills Supergroup and the Lower ORS felsites to the south. The Passage Formation also outcrops to the north of the site, north of Peat Hill, between the Upper Limestone Formation (ULF) at the north west site boundary and the Coal Measures further north.

13.4.53 The ULF deposits outcrop in the north east corner of the site, at Brockloch (NGR 259920 610820) and, in the north west of the site, around Craighouse (NGR 254900 610350). These comprise a cyclic sequence of sandstones, siltstones, mudstones, fossiliferous marine limestones, thick coals and seatclays.

13.4.54 Two narrow bands of the Limestone Coal Group, of the Namurian age, Millstone Grit series outcrop south east of Knockburnie (NGR 256290 610290). Again these comprise a cyclic sequence of sandstones, siltstones, mudstones, thick coals and seatclays, but also contain two prominent marine bands. Along the Southern Upland Fault complex, the group is represented by non-cyclic conglomerates.

Soils

13.4.55 Soil type and characteristics provide an important control on the hydrological regime of any catchment. The Soil Survey of Scotland map for this area indicates that the soil type present within the Development Site is predominantly peaty in nature, and therefore poorly drained, with the majority of it covered in blanket peat (including the Peat, Barbeys, Rigg, Enoch, High Chang and Chang hills, and also large parts of Benty Cowan Hill).

13.4.56 In the north of the Development Site, around Knocknarran Hill and Knockburnie, the soils are drifts derived from greywackes, shales and basic lavas. The soils in this area comprise brown forest soils, peaty podzols, noncalcareous gleys and peaty gleys.

13.4.57 The soils occupying the north and north east of the site are drifts derived from Lower Paleozoic greywackes and shales. Around Blarene Hill and Knocknide Hill, these soils comprise peaty gleys, noncalcareous gleys, and brown forest soils.

13.4.58 Peat depth surveys have been undertaken, and the areas of peat are highlighted on **Figure 9** of **Appendix 6.B – Peat Slide Hazard and Risk Assessment (PSHRA)**. Peat is indicated to be widespread across the site, but is generally less than 1m in thickness. There are some localised areas of slightly deeper peat. The thickest peat deposits were found close to Turbines 2 and 17, with peat depths of up to 3.25m. The peat cover is broadly comparable to that mapped by the BGS, although slightly less extensive (**Figure 13.2**).

Groundwater Resources

13.4.59 The Hydrogeological Map of Scotland (BGS, 1988) indicates that the Proposed Development is underlain predominantly by impermeable rocks, generally without groundwater except at shallow depths. On the south eastern side of the Southern Upland Fault the rocks are largely shales and greywackes, with groundwater confined to near-surface cracks and joints. Occasional springs and boreholes produce weakly mineralised water except where contact is made with sulphide-rich black shales.

13.4.60 On the north western side of the Southern Upland Fault, the extrusive rocks (basalt) are generally impermeable to groundwater, but occasional springs may occur from systems of near surface dilated joints, with yields up to 2l/s (0.2 Ml/d). The water is weakly mineralised, with bicarbonate concentrations in the region of 50-80mg/l.

13.4.61 A second aquifer classification is present in the northernmost fringes of the Development Site, where Coal Measure formations occur. This Carboniferous (Westphalian) age geology is classed as a locally important aquifer, in which flow is dominantly in fissures and other discontinuities. Large volumes of water have been pumped from mine workings in the past, but water supply boreholes have not been developed because yields are low and water quality is poor. Electrical conductivity (EC) concentrations are typically greater than 1500µS/cm; iron and fluoride are commonly present in solution in detrimental amounts; bicarbonate concentrations are greater than 500mg/l; and redox potential is typically very low.

13.4.62 The Bedrock Aquifers map for Scotland (BGS/SEPA, 2004) indicates that the majority of the Development Site is underlain by an aquifer of low productivity, where flow is predominantly through fractures. In the limited areas of the site where the Coal Measures occur, the aquifer value increases to one of moderate productivity, where groundwater movement is via fracture and intergranular flow.

13.4.63 The Superficial Aquifers map for Scotland (BGS/SEPA, 2004) provides no indication of the drift aquifers present at the Development Site. It is assumed, given the drift geology described above, that the superficial aquifer for the majority of the Development Site is generally absent or is of low productivity. In the limited area of hummocky glacial deposits, the aquifer is considered to be moderately to highly productive.

13.4.64 Neither SEPA nor DGC have groundwater level monitoring points within the area of interest. The former Scottish Coal Resources Group previously monitored groundwater levels in the River Nith valley. However, these data monitor water levels in the Carboniferous Coal Measures, and not those strata which underlie the majority of site.

13.4.65 Groundwater data are not available for the site, and water levels may only be inferred from the determination of the acrotelm/catotelm interface which was encountered during the peat surveys, typically 0.2m to 0.8m below ground level (mbgl). Given the lack of main aquifer under the area of the site where the surveys were conducted, such a shallow groundwater table suggests locally 'perched' water within the peat deposits, rather than a substantial groundwater body. Five issues are mapped on 1:10,000 OS mapping, on the north side of Peat Hill, as well as one spring on the Development Site (NGR 257595 609643), located on the northern flanks of Benty Cowan Hill, and these could also be evidence of 'perched' water levels.

Groundwater Quality

13.4.66 According to SEPA RBMP mapping, the Development Site predominantly overlies the New Cumnock Bedrock and Localised Sand and Gravel Aquifer, which was classified in 2008 as 'Poor' for its groundwater chemistry and overall status. To the east and south of Enoch Hill, the groundwater catchment is that of the New Galloway Bedrock and Localised Sand and Gravel Aquifer. This is classified as 'Good' for its groundwater chemistry and overall status. It is not entirely clear which water body name replaces this in the new designations in 2013. However, the Upper Nith Valley Water Bodies are at 'Good' overall and chemical status.

13.4.67 There are no designated Source Protection Zones (SPZs) within or around the Development Site, though it sits within a WFD Groundwater Bodies Drinking Water Protected Area. There are no known boreholes currently monitoring groundwater quality in the immediate vicinity of the Development Site.

13.4.68 Protection of the aquifers is generally only provided by the overlying soils. The Vulnerability of Groundwater in the Uppermost Aquifer Map (SNIFFER, 2004) indicates that the classification at the area of interest is Class 4 i.e. the area is vulnerable to those pollutants not readily absorbed or transformed, and may be vulnerable to individual events as well as to persistent activity. This rises to Class 5, i.e. the area is vulnerable to most water pollutants with rapid impact in many scenarios, in the areas where superficial aquifer is un-mapped and likely to be absent.

GWDTEs

13.4.69 GWDTEs, as defined by SEPA in its LUPSGU31 (2014), exist at the Development Site. These areas can be identified from the National Vegetation Classification (NVC) map (**Chapter 11 ref; Appendix 11.A**).

13.4.70 The NVC survey indicates that the potentially highly groundwater dependent mire vegetation M23 rush-pasture communities are present across the site, along with some areas of potentially moderately groundwater-dependent blanket mire vegetation M25 communities. There are also more limited areas of potentially highly groundwater dependant soligenous mire M6 in the western and southern parts of the Development Site. Even more limited in spatial extent are areas of potentially moderately groundwater-dependent grassland U6 communities.

13.4.71 Given the geology and groundwater potential within the Development Site, it is considered that many of these habitats are likely to be fed, almost entirely, by precipitation or very near-surface groundwater within shallow drift deposits and soils. It is therefore considered that the groundwater component supporting these habitats more resembles a surface (or near-surface) water regime, with very local and shallow rain-fed catchments for each GWDTE.

13.4.72 Nonetheless, despite the low productivity aquifers present, due to the presence of faulted bedrock within the area which may offer flow pathways, and the potential for some weathered bedrock providing localised groundwater storage, some habitats may be truly groundwater dependent. As such, further assessment has been made of all potentially highly or moderately groundwater dependent habitats identified. Three truly groundwater dependent habitats have been identified, with details presented within a GWDTE Assessment in **Appendix 13.B**.

Private Water Supplies, Abstractions and Discharges

13.4.73 EAC and DGC have provided details of PWSs located within a 5km radius of the centre of the Development Site. Those supplies that lie within 2km of the Development Site boundary and/or within the catchments of the tributaries draining it are presented in **Figure 13.1**, with further details in **Table 13.8**. Their likely catchments, or 'Zones of Contribution' (ZOCs), are also highlighted.

Table 13.8 Known PWSs Located in the Vicinity of the Proposed Development

PWS ref no.	Supply name	Source NGR	Supply type	Distance from Development Site (km)	Likelihood of being affected by the Proposed Development
EAC PWS					
1	Brockloch Farm	259213 609952	Spring	0	No - located in the Blarene Burn catchment, a tributary of the Lane Burn in the north east of the Development Site, but the PWS catchment is ~1 km away and removed from the catchments of the proposed wind farm infrastructure.
2	Craighouse Cottage	254892 610295	Spring	0	Possibly – located in the Bow Burn catchment, a tributary of the Lane Burn in the north of the Development Site, on the north flank of Peat Hill.
3	Knockburnie Farm	256024 610242	Spring	0	Possibly – located in the Spout Burn catchment, a tributary of the Knockburnie Burn in the north of the Development Site, on the north flank of Peat Hill.
4	Knockenlee	253620 609169	Borehole	1.6	No - located in the River Nith catchment, on the west flank of Maneight Hill, but outside of the Development Site, and its catchment area is unlikely to intersect the Development Site.
5	Laglaff Farm	260500 609900	Spring	0.5	No - located in the Connel Burn catchment, a tributary of the River Nith, on the west flank of Ashmark Hill, but outside of the Development Site, and its catchment area is outside of those within which the proposed wind farm infrastructure is located.
6	Lanehead Farm	255600 610200	Spring	0	Possibly – located in the Bow Burn catchment, a tributary of the Lane Burn in the north of the Development Site, on the north flank of Peat Hill.
7	Maneight Farm	254300 609200	Spring	0.7	No - located in the River Nith catchment, on the west flank of Maneight Hill, but outside of the Development Site, and its catchment area is unlikely to intersect the Development Site.
8	Meikle Hill	252969 609059	Spring	1.7	No - located in the Knockenlee Burn catchment, a tributary of the River Nith on the south east flank of Rig Hill, but its catchment area is unlikely to intersect the Development Site.
9	Nith Lodge	253070 609554	Spring/near surface water	0.7	No - located in the River Nith catchment, on the south east flank of Rig Hill, but outside of the Development Site, and its catchment area is unlikely to intersect the Development Site.

13.4.74 The complete local authority dataset is presented in **Appendix 13.C**. The Auchingee property (NGR 257310 612510) is understood to be on mains supply, and is therefore not listed in **Table 13.8**. Information from the South Kyle Wind Farm application (Vattenfall 2013)[4] identified a supply at Monquhil Farm (NGR 259100 606800), but it is understood to not be in use as the property is now derelict, and is therefore it is also not listed in **Table 13.8**.

13.4.75 Based on the assessment presented in **Table 13.8**, three PWSs have been identified as being potentially affected by the Proposed Development. The PWSs at Craighouse Cottage, Lanehead Farm and Knockburnie Farm lie downgradient from infrastructure of the Proposed Development, but they do not lie within either 100m of proposed new access tracks, or within 250m from proposed wind turbines or borrow pits for the Proposed Development. Nonetheless, further assessment has been made of the risk to these supplies from the Proposed Development within a PWS Risk Assessment, provided in **Appendix 13.D**.

13.4.76 Through the implementation of CAR (2011), SEPA regulates activities such as abstraction, impoundment and engineering activities, as well as pollution. SEPA holds the records for several such activities within a 5km radius of the Proposed Development. The granted authorisations relating to these activities are detailed in **Table 13.9** and located on **Figure 13.1**.

Table 13.9 SEPA Abstraction and Discharge Licences

Site ID	Licence Number	Easting	Northing	Site Name	Abstraction or Discharge
1	CAR/L/1003574	256790	611180	D1 Lagoon House of Water	Discharge
2	CAR/L/1003575	25669 0	612400	D2 Lagoon House of Water	Discharge
3	CAR/L/1000898	254890	612390	D6 Lagoon House of Water	Discharge
4	CAR/L/1003576	255290	612330	D4 Lagoon House of Water	Discharge
5	CAR/L/1000860	256030	612790	D5 Lagoon House of Water	Discharge
6	CAR/L/1000816	256250	613000	D1 Lagoon House of Water	Discharge
7	CAR/L/1033439	256170	612950	D5 Lagoon Greenburn	Discharge
8	CAR/L/1000817	257130	613380	D2 Lagoon Greenburn	Discharge
9	CAR/L/1000818	258020	613290	D3 Lagoon Greenburn	Discharge
10	CAR/L/1090272	256350	612930	BD5 Lagoon Greenburn	Discharge
11	CAR/L/1090272	257750	613240	BD2 Lagoon Greenburn	Discharge
12	CAR/L/1090272	258440	613230	BD1 Lagoon Greenburn	Discharge
13	CAR/L/1090272	257730	613240	BD3 Lagoon Greenburn	Discharge
14	CAR/L/1090272	256920	613250	BD4 Lagoon Greenburn	Discharge
15	CAR/L/1109543	258430	613270	Greenburn Project TE(B)	Discharge
16	CAR/L/1104891	257310	612560	Greenburn Surface Mine GW Abs	Abstraction
17	CAR/L/1011993	257200	613490	Greenburn Surface Mine GW Abs	Abstraction
18	CAR/L/1014479	254600	612140	House of Water Abs from GW	Abstraction

[4] Vattenfall 2013. https://corporate.vattenfall.co.uk/globalassets/uk/projects/south-kyle/14-hydrology-130806-a4.pdf

13.4.77 It is noted that the House of Water surface coal mine, which formerly belonged to Scottish Resources Group and utilised the first six discharge consents and the last abstraction consent listed in **Table 13.9**, is longer in operation.

13.4.78 None of the licenced abstraction or discharge points lie within either 100m of proposed new access tracks, or within 250m from proposed wind turbines or borrow pits for the Proposed Development.

Predicted Future Baseline

13.4.79 Hydrological systems are in a state of constant flux. Two main influences on the temporal variability of the hydrology of the study area have been identified, namely land use and climate change. These have the potential to change the ground infiltration and runoff characteristics (changes in land use) and river flow regime (through changes in rainfall patterns as a result of climate change).

13.4.80 Climate may prove more variable, with observed historical and predicted future changes in global climate due to a combination of both natural and human causes. The main human influence on global climate is increasing emissions of greenhouse gases, such as carbon dioxide and methane, and the water environment baseline may alter in the future as a result of climate change. The Met Office predicts that winters will become generally wetter, with more frequent storm events occurring throughout the year. Changes in rainfall and temperature will result in changes to the magnitude and distribution of river flows and groundwater recharge, and subsequently the water resources available for use and for the water environment.

13.4.81 For this region of Scotland, the latest climate change predictions[5] (using medium emissions scenario with 50% probability level) indicate decreases in summer rainfall of ~13% by the 2050s. This is predicted to be accompanied by increases in winter rainfall of ~15%. As a result, river flows can be expected to increase in the winter, with more frequent storm events occurring throughout the year.

Information Gaps

13.4.82 The groundwater abstractions/discharges information presented above are from the current SEPA database of abstraction and discharge licences. However, it is possible that there are other abstractions/discharges in the area that have not come to the attention of this assessment e.g. unlicensed abstractions/discharges. Similarly, EAC has stated that its PWS data cannot be guaranteed as 100% accurate or up-to-date. Therefore, further PWSs may also exist that have not come to the attention of this assessment.

13.5 Design Evolution

Constraints to Development

13.5.1 A key stage of the design process is to identify water environment constraints at an early stage and use this information to influence the design of the Proposed Development. The constraints discussed below are mapped on **Figure 13.3**.

13.5.2 In accordance with the Scoping Opinion responses of SEPA, MSS and EAC, the 'Good' ecological potential and overall status of the Knockburnie Burn/Lane Burn and downstream Nith Bridge SSSI, and the salmonid sensitivities identified in greater detail in **Appendix 11.F**, a buffer (infrastructure exclusion) zone of 100m has been applied around all the River Nith tributaries. A 50m buffer zone has been applied around all Water of Deugh catchment tributaries, as requested by MSS (**Chapter 11**).

13.5.3 In accordance with SEPA's LUPSGU31, advisory buffer zones of 100m (from tracks and trenches where any excavation is typically < 1m deep) and 250m (from borrow pits and turbine foundations, where excavation is usually > 1m deep) have been applied with regard to all spring and borehole PWSs. For those PWSs which are spring dependent, the protection afforded by SEPA buffer

[5] http://ukclimateprojections.metoffice.gov.uk/21708?projections=23831

zones have been supplemented by so-called 'worst case' ZOCs defined with respect to topographic catchments. The adoption of these buffer zones is intended to minimise the potential interaction between construction activity and water features, both in terms of flow paths and as potential point sources of pollution. In places, where these buffers are encroached upon, additional monitoring and mitigation measures (outlined in **Section 13.9**) would be adopted to minimise impacts on both the surface and sub-surface water environment.

13.5.4 A similar set of advisory LUPSGU31 (100m and 250m) buffers and ZOCs have also been applied to minimise the potential impacts on the three GWDTEs that are considered to contain truly groundwater-dependent NVC communities (**Appendix 13.B**). In places, where these buffers are encroached upon, additional monitoring and mitigation measures (outlined in **Section 13.9**) would be adopted to minimise effects on both the surface and sub-surface water environment.

13.5.5 With respect to flood risk, no development is proposed on the areas with a high-medium likelihood of flooding within the Connel Burn channel area along the western site boundary. In any case, this flood risk area falls entirely within the 100m buffer for this watercourse which has been avoided.

13.5.6 With regard to peat, the layout for the Proposed Development has gone through a series of iterations to ensure that the infrastructure footprint lies, as far as is possible, outwith areas of deeper peat >1m. In places, where deep peat is encroached upon, additional mitigation (outlined in **Section 13.9**), to minimise impacts on both surface and sub-surface water flows, would be adopted.

13.5.7 As well as being shown on **Figure 13.3**, the main hydrological constraints for the Proposed Development are summarised in **Table 13.10** below.

Table 13.10 Constraints to Development

Constraint	**Rationale**
Areas to be avoided	
100m buffer zone around all on site watercourses associated with the River Nith catchment 50m buffer zone around all on site watercourses associated with the Water of Deugh catchment	Risk of soil erosion, accidental spillages, or concrete pollution entering the water environment.
Areas suitable with mitigation	
100m and 250m SEPA buffer zones and ZOCs around spring and borehole PWSs, related to access tracks and turbines/borrow pits respectively.	Risk of soil erosion, accidental spillages or concrete leaching entering groundwater and surface water environment and affecting PWSs and other abstractions. Also; local dewatering or change in flow patterns could disrupt abstraction yield. Construction may be acceptable if monitored and mitigated.
100m and 250m SEPA buffer zones and ZOCs around GWDTEs (moderately and highly groundwater dependant NVC communities), related to access tracks and turbines/borrow pits respectively.	Risk of soil erosion, acidification (via forestry clearance), accidental spillages or concrete leaching entering groundwater and surface water environment and affecting GWDTEs and other abstractions. Also; local dewatering or change in flow patterns could disrupt water supply to these GWDTEs. Construction may be acceptable if monitored and mitigated.
Area of wet ground underlain by deep peat (>1m in depth), where not in the immediate vicinity of watercourses.	Sensitive hydrological regime. Damage to the peat may occur, but construction would be acceptable if mitigated.
Areas suitable without specific mitigation	
Drier, elevated ground well away from watercourses.	Unlikely to result in accelerated runoff rates, except for access roads. Not likely to lead to significant changes in hydrological regime. Effects expected to be minimal in light of best working practices.

Hydrology and Hydrogeology Specific Design Evolution

13.5.8 The constraints identified above have been considered as part of the design of the Proposed Development. In addition to the application of the relevant buffers described above, other design features have been incorporated to the Proposed Development, and are outlined below. Further information of this design mitigation is provided in **Chapter 4**.

13.5.9 The track layout has been designed so as to minimise the total track length. The turbines would be accessed via approximately 12.9km of new onsite access track (**Figure 13.1**), up to 6 m wide, increasing at bends as required. Where possible the tracks are routed to follow topographic contours, so as to prevent them preferentially channelling runoff. Cross-drainage would be provided in areas where roads unavoidably intersect dominant flow pathways.

13.5.10 On-site access tracks have been designed to minimise disruption to peat hydrology. With floating roads across areas of deep (>1m) peat, some interruption of surface and near-surface flows would occur. On areas of steeper peat with a cross slope steeper than a gradient 5%, the use of floating roads may not be appropriate, and excavated roads would be considered. These would need to be cut all the way through the peat, thereby potentially increasing disturbance of the local hydrology. The extent of these tracks would be minimised.

13.5.11 The proposed alignment of the access tracks has sought to minimise the number of watercourse crossings. Six new watercourse crossings would be required for the Proposed Development (**Figure 13.1**), comprising culvert construction. The final watercourse crossings design would need to be agreed in consultation with SEPA to ensure that there is no/minimal overall effect on the flow regime. Exclusion of equipment from watercourses and, as far as possible, from immediate riparian zones during watercourse crossing construction, would be observed, along with measures to minimise change in in-stream substrates.

13.5.12 Underground cables would link the turbines to the on-site control building. Detailed construction and trenching specifications would depend on the ground conditions encountered at the time, but typically cables would be laid in a trench 1,000mm deep and up to 1,200mm wide. The cables would sit in coarse sand or other granular material, and the trenches would then be backfilled with excavated soil and sub-soil which has been sieved and graded to remove stones.

13.5.13 The turbine foundation concrete would be a high strength structural grade which is not prone to the leaching of alkalis, and therefore would minimise adverse impacts to both surface water and groundwater receptors.

13.5.14 The foundation excavations would be designed to be gravity draining, where local topographical conditions allow. This is anticipated for all the turbine locations for the Proposed Development. If this is not possible, the excavation would be dewatered by pumping. The discharges from dewatering operations would be subject to a method statement agreed with the on-site Ecological Clerk of Works (ECoW) and SEPA. The locations of any settlement lagoons, where specified, would be on stable areas of shallower slope, to reduce the risk of the lagoons failing. The size of the settlement lagoons would be appropriate to the amount of dewatering, but if larger quantities of dewatering are anticipated, the potential for more than one lagoon, or for other forms of filtration to be used, would be considered. Where necessary, settling ponds, filter treatment facilities (silt traps and fences) and buffer strips would be installed to remove sediment from pumped water. No water from foundation dewatering operations would be discharged directly into a watercourse. If required, any discharge would occur under the appropriate SEPA consent.

13.5.15 Although drainage would be provided in areas of disturbance as required, areas of hardstanding would be minimised so that this need is reduced. This includes careful design of construction compounds, and minimising the size of crane pads at each turbine location. Drainage design would be undertaken during the detailed design phase, but drainage control measures to be considered include cross drainage and check dams.

13.5.16 Roadstone required for the upgrade and extension of any site access tracks would be sourced predominantly from borrow pits within the Proposed Development (**Figure 13.1**). Three potential borrow pit search areas have been identified. The pits would be excavated on the side of the hills, from the access tracks. The final location within the search areas, number and estimate of material

to be won from each potential site would be determined once full ground investigation works and testing have been completed but comprises a required area of only 19% of the total search areas indicated.

13.5.17 Site restoration would be programmed and carried out to allow restoration of disturbed areas as early as possible and in a progressive manner. This would reduce the risk of site runoff and sediments reaching watercourses as a result of soil exposure.

13.5.18 During the site works tendering process the expected level of environmental control would be included in the tender documents, so that all contractors allow for mitigation measures in their work scope[6].

13.5.19 The site induction for contractors would include a specific session on good practice to control water pollution from construction activities. Contractors would be made aware of their statutory responsibility not to 'cause or knowingly permit' water pollution.

13.6 Scope of Assessment

Key Environmental Issues

13.6.1 The environmental issues that have been scoped out and those that are of most concern with respect to the Proposed Development and taken forward for detailed assessment are summarised below.

13.6.2 Surface runoff in the vicinity of the proposed wind farm infrastructure occurs into the River Nith to the north via its associated tributaries, and to the Water of Deugh to the south via its associated tributaries. Any increased runoff and other disruptions to flow therefore need to be managed to minimise changes to the flow regime of these watercourses. As flooding is contained within steeply incised channels and valleys, flood risk has also been 'scoped out'.

13.6.3 Given the 'Good' WFD water quality status of the majority of the watercourses, and their importance in terms of downstream fishery interests, the risk of pollution to the watercourses within or near the Proposed Development has been assessed and appropriately mitigated where necessary. Of particular importance here is the potential for the construction to increase sediment loading of the downstream watercourses, especially at and near to watercourse crossings.

13.6.4 The potential risks to groundwater flows and quality also need to be considered, even though the Development Site is underlain by low permeability strata. Although the bedrock and superficial aquifers are considered to be of low productivity, the presence of a number of spring and borehole PWSs indicates that either localised areas of higher productivity occur in areas of faults and fractures, or upper weathered zones of bedrock, or that any superficial aquifer can be moderately productive in places. The groundwater resource is therefore considered to be a potential receptor.

13.6.5 The PWSs that the groundwater supports, within or close to the infrastructure of the Proposed Development, namely Craighouse Cottage, Lanehead Farm and Knockburnie Farm, are also potential receptors. These are considered further in the PWS Risk Assessment presented in **Appendix 13.D** and on the basis of that assessment, all except Craighouse Cottage PWS have been 'scoped out' from the EIA. Furthermore, all other PWSs that are more distant from the Proposed Development or whose 'worst case' ZOCs have been determined to not intercept the proposed infrastructure, have also been 'scoped out'.

13.6.6 In addition, there are three GWDTEs located within the Development Site that are potential receptors, and they are considered further in the GWDTE Risk Assessment presented in **Appendix 13.B**. However, other habitats that have been identified as not truly groundwater dependent have been 'scoped out' of the EIA.

[6] SEPA's special requirements for water pollution prevention from civil engineering contracts contain a definitive list of clauses for incorporation into civil engineering contractual documents.

13.6.7 The potential effects of the Proposed Development on peat hydrology has been considered. Consideration of peat in the context of ground conditions e.g. peat slide are addressed elsewhere within the ES (**Appendix 6.B)** Where possible, the design process has avoided areas of any deep peat or possible instability in the subsequent layout of access tracks, turbine locations and other infrastructure. Nevertheless, turbines T2, T7, T17 and T19, and some sections of access track are currently anticipated to sit over deeper (> 1m) peat and this has been considered further in this Chapter.

13.6.8 The surface runoff regime is also pertinent in supporting the geomorphological features of the Nith Bridge SSSI and, as such, an assessment of the effects to this designated site are considered as being akin to a surface water receptor. However, the more distant Benbeoch SSSI has been 'scoped out' of the EIA. There are no further designated geological sites. As such, geology has been 'scoped out' of the EIA.

13.6.9 Other environmental features scoped out from the EIA include the remaining CAR licenses and registrations (not abstractions or discharges with catchments coincident with wind farm infrastructure).

Sensitivity of Potential Receptors

13.6.10 From consideration of the Scoping Opinions and baseline characterisation, a sensitivity 'score' has been allocated to each identified water environment receptor, and these are set out in **Table 13.11**. The receptor sensitivity allocated is based upon the definitions set out within **Table 13.3**, and utilising professional judgement.

Table 13.11 Sensitivity of Water Environment Receptors

Water Environment Receptor	Rationale	Sensitivity
Surface water – River Nith and tributaries*	Under SEPA's RBMP, the River Nith is classified as being of 'Moderate' ecological potential and overall status, and overall chemical status of 'Pass', whilst the Knockburnie and Lane Burns are classified as being of 'Good' ecological potential and overall status, and overall chemical status of 'Pass'. Furthermore, the geomorphologically-designated Nith Bridge SSSI is intrinsically connected to the River Nith, and there are fisheries interests for the River Nith (considered to be of District value in ecological terms [**Chapter 11, Table 11.3**]). Therefore, the sensitivity of these watercourses is considered to be high.	High
Surface water – Water of Deugh and tributaries**	Under SEPA's RBMP, the Water of Deugh is classified as being of 'Bad' ecological potential and overall status, and an overall chemical status of 'Pass'. However, to recognise the fisheries interests in the Water of Deugh further downstream, the sensitivity of these watercourses is considered to be medium.	Medium
Nith Bridge SSSI	Although the designation of Nith Bridge SSSI is for geomorphological (not water feature) considerations, the geomorphology could be affected by changes in surface flows in the River Nith and, therefore, is considered to be of high sensitivity.	High
Aquifers	The Development Site sits on superficial and solid aquifers ranging from limited to moderate groundwater potential. Although the current overall status of the WFD groundwater body which dominates the site is 'Poor', a small portion is underlain by a WFD groundwater body of 'Good' overall status. Whilst the overall groundwater resource supports local baseflow, as evidenced by the presence of springs and PWSs in the area, the wider groundwater resource is regarded as of low sensitivity.	Low
PWS	A detailed consideration of those PWSs within or close to the infrastructure of the Proposed Development, namely Craighouse Cottage, Lanehead Farm and Knockburnie Farm, is provided in **Appendix 13.D**. On the basis of that analysis, only Craighouse Cottage requires detailed assessment. In line with the sensitivity definitions set out in **Table 13.3**, this abstraction is considered to be of low sensitivity.	Low
GWDTEs	Due to the geology of the Development Site i.e. predominantly till, peat or bedrock at surface, overlying low permeability bedrock, and the resultant perched or localised groundwater levels, it is considered that the groundwater component supporting many of the onsite GWDTEs more resembles a surface (or near-surface) water regime, with slow rates of flow, short flow paths and very local and shallow rain-fed catchments. However, the GWDTE Risk Assessment provided in **Appendix 13.B** indicates that three habitats are truly groundwater dependent. These GWDTEs of high or moderate groundwater dependence are regarded as receptors of less than local (equivalent to very low) or district (equivalent to medium) sensitivity, depending on their ecological value, as defined in **Chapter 11 - Ecology**.	Very Low (M23) Medium (M25)
Peat hydrology	The Proposed Development includes areas of peat deposits which, although without water resource interests, nonetheless are sensitive water environments, and so are considered equivalent to local nature conservation status i.e. of medium sensitivity.	Medium

*** Polmath Burn, Polga Burn, Connel Burn, Bow Burn, Spout Burn, Knockburnie Burn, Crocradie Burn, Trough Burn, Dalleagles Burn, Straid Burn, Redhall Burn, Balrene Burn**
****Bitch Burn, Strathwiggan Burn**

Likely Significant Effects

13.6.11 The following types of potential (prior to mitigation) effect of the Proposed Development upon water environment interests have been identified:

- Potential adverse effects on drainage patterns, surface water flows, aquifer recharge, PWS yield, and GWDTEs and peat hydrology, principally in relation to increased runoff and dewatering, and associated with access track and turbine foundation and borrow pit construction; and
- Potential pollution to watercourses, underlying aquifers, PWS, GWDTEs and peat hydrology through increased suspended sediment release on or adjacent to the Development Site from runoff associated with construction activities, acid-rich waters resulting from forestry clearance, accidental spillage from site activities and/or concrete leaching associated with turbine foundations.

13.6.12 The following assessment addresses these potential effects for each stage of construction, operation/maintenance and the subsequent decommissioning of the scheme, on the basis that the only mitigation considered in this part of the assessment is the adherence to the buffer zones described earlier.

13.7 Predicted Effects: Construction

Introduction

13.7.1 This section outlines the potential effects that would be anticipated to occur (from the proposed activities) on the water environment, prior to the implementation of any mitigation measures additional to those incorporated into the design (**Section 13.4**). The assessment methodology is outlined in **Section 13.2**.

Surface Watercourses - Flows

13.7.2 There is potential for the construction of infrastructure to result in the alteration of watercourse flows. The proposed construction is generally most likely to result in increases in flow due to increased runoff from the placement of lower permeability surfaces within the water catchments. Of particular importance are the potential disruptions to flow that could result because of the proposed watercourse crossings.

13.7.3 Generous buffers to the watercourses have been applied (minimum 50m) whilst siting the access tracks, turbines and other infrastructure. This separation between construction and watercourses would help to minimise any potential changes in surface water flow within sensitive watercourses. The potential for increased runoff arising from construction activities involving excavation reaching the watercourses would be further reduced by the presence of the existing intervening vegetation acting to attenuate flows.

13.7.4 Whilst it is noted that the three borrow pit search areas lie within the 100m buffer to the Nith catchment watercourses in places, it is noted from **Table 4.7** that these search areas are much larger than the final borrow pit areas needed to win the required quantities of stone. **Table 4.7** indicates that the combined estimated excavation area is likely to be ~19% of the total borrow pit search area. As such, the final locations should readily accommodate the watercourse buffers. Nonetheless, potential for slight increased runoff from excavation areas may arise if the minimum buffer distance (50m) is not maintained within the borrow pit search area, although any dewatering effects are unlikely to have an effect on surface water flows due to the low contribution of stream baseflow from groundwater.

13.7.5 With respect to the watercourse crossings, construction may introduce barriers to flows, sediment and fish passage, and prevent natural watercourse migration, if the work is not undertaken in a sensitive manner. For example, if culverts are not correctly installed at existing river bed levels, such structures can cause drops or small barriers that can cause changes to flow regime from scour and erosion, watercourse widening, and increase flood risk from confinement of flows or blockages e.g. where fencing crosses watercourses and water gates are not installed (SEPA, 2010).

13.7.6 Taken together, potential effects from changes in flows and increased runoff associated with construction activities are considered to be low in magnitude. With respect to the medium

sensitivity Water of Deugh catchment tributaries, this is equivalent to a slight, and '**not significant**', effect. For the high sensitivity River Nith tributaries and the associated Nith Bridge SSSI, the level of effect is moderate, but still '**not significant**'.

Surface Watercourses – Water Quality

13.7.7 Pollution from the mobilisation of sediment can be caused through various construction activities that involve ground works. Exposure of sediment and subsoil due to construction activities can result in increased silt loadings reaching watercourses during periods of heavy rainfall or site run off.

13.7.8 Furthermore, new drainage systems associated with construction can increase the risk of pollution during discharge into watercourses. Vehicle and plant presence on site would also introduce a risk of pollution from hydrocarbons and other contaminants through accidental spillage of fuel, oil and other engine fluids, as well as during plant/generator refilling. There is also the possibility for concrete leachates to reach nearby watercourses during construction of foundations and operation of any onsite concrete batching plants. Temporary storage of excavated soil could also lead to pollution if not stored at a suitable distance from watercourses or from hydrological connections to watercourses, whilst peat disturbance by way of access track construction can lead to erosion, loss of particulate organic matter and slides of peat that can result in downstream water quality impacts.

13.7.9 As mentioned above with respect to surface water flows, generous buffers (minimum 50m) have been applied during the design of the Proposed Development. This separation between construction activities and watercourses would help to minimise any potential indirect disturbance or degradation of sensitive watercourses. The potential for increased sedimentation arising from construction activities involving excavation reaching watercourses would be lessened through the presence of the existing intervening vegetation acting as a filtration medium.

13.7.10 The construction of watercourse crossings may introduce sediment to these if the work is not undertaken in a sensitive manner. There would also be disturbance to watercourses if there is a need to temporarily divert watercourses to enable the construction of culverts to take place, or from river bank disturbance in order to construct bridge abutments or install gabion baskets.

13.7.11 Taken together, potential effects from sediment loading and pollution during construction would be medium in magnitude. With respect to the medium sensitivity Water of Deugh catchment tributaries, this is equivalent to a moderate and '**not significant**' potential effect. For the high sensitivity River Nith tributaries and the associated Nith Bridge SSSI, the level of effect is substantial and '**significant**'.

Groundwater Body – Flows

13.7.12 The potential risks to groundwater from construction activities also need to be considered, even though the Development Site is predominantly underlain by low permeability metamorphic rocks and superficial deposits.

13.7.13 The main potential effects on groundwater flows result from reduced recharge due to the placement of low permeability surfaces and structures, and groundwater ingress to excavations at turbine foundations, building and compound excavations, and borrow pits, and which might require active dewatering. However, given the limited areal extent (compared to the regional aquifers) and the depth of required excavations (generally <1m for the access road and tracks, 3-4m for turbine foundations and 4m for borrow pits), the impact on the groundwater flow environment would be very limited.

13.7.14 On this basis, the potential impact on groundwater recharge and flow in the low sensitivity aquifers due to the construction of the Proposed Development would be negligible in magnitude and therefore the effect would be negligible, and '**not significant**'.

Groundwater Body – Water Quality

13.7.15 The main potential effect to groundwater quality from construction activities results from risks arising from the potential for accidental spillages and leaking concrete residues. The latter may occur from wind turbine foundations, crane pad hardstandings and building foundations.

13.7.16 Again, given the limited areal extent and the depth of excavations, the impact on the groundwater environment would be very limited. On this basis, the potential impact on groundwater quality within the low sensitivity aquifers due to the construction of the Proposed Development would be negligible in magnitude and therefore the effect would be negligible, and '**not significant**'.

Private Water Supplies

13.7.17 As noted in **Appendix 13.D**, the main potential effect on the PWS at Craighouse Cottage during construction results from lowering of groundwater levels by dewatering at the borrow pit search area adjacent to Peat Hill. Water quality effects are also possible.

13.7.18 Whilst the potential impact on groundwater recharge, flow and quality with respect to the sensitivity aquifers has been assessed above to be negligible in magnitude, at the local scale of a PWS it is possible to have a larger magnitude impact. However, both LUPSGU31 100m and 250m buffer zones as well as 'worst case' ZOCs have been assigned to the PWS, and the PWS Risk Assessment presented in **Appendix 13.D** has also appraised the potential effects on the PWS to be negligible. Given that the PWS is of low sensitivity, potential construction effects are negligible, and '**not significant**'.

GWDTEs

13.7.19 GWDTEs can be potentially affected by construction of the Proposed Development in the same way as PWSs. A similar set of advisory LUPSGU31 (100m and 250m) buffers and 'worst case' ZOCs have, therefore, also been applied.

13.7.20 The GWDTE Assessment in **Appendix 13.B** indicates that the magnitude of change for the three assessed habitats is considered to be low (habitat 41), low (habitat 207), and high (habitat 208). Given that the GWDTEs being considered here have sensitivity values of very low (habitat 41), medium (habitat 207), and very low (habitat 208), the potential effect of construction on the GWDTEs is considered to be slight, at worst, and therefore '**not significant**'.

Peat Hydrology

13.7.21 The Proposed Development is situated in an area where peat deposits are found. During construction, there is potential for the construction of new infrastructure to result in the disturbance of peat hydrology.

13.7.22 Failure to protect peat during construction can lead to peat erosion and degradation, and possibly peat slides, with consequent environmental impacts both on and off-site. The wind farm layout and design has been refined to minimise peat excavation from tracks and turbine infrastructure, but it has not been possible to avoid it entirely.

13.7.23 On this basis, the potential disruption to the medium sensitivity peat hydrology resulted from the construction of the Proposed Development would be low in magnitude, resulting in a slight, but '**not significant**' effect.

13.8 Predicted Effects: Operation

Surface Watercourses – Flows

13.8.1 During operation of the Proposed Development, some increased runoff would potentially continue to arise from the access tracks, whilst some disruption of flows could still occur at the watercourse crossings. However, the cessation of construction activities and the re-vegetation of previously disturbed ground would mean that the potential effects are much reduced compared to those of the construction phase.

13.8.2 On this basis, the potential impact magnitude from increased runoff connected with site operations is considered to be negligible. With respect to both the medium sensitivity Water of Deugh catchment tributaries and the high sensitivity River Nith tributaries and Nith Bridge SSSI, potential effects are considered to be slight, at worst, but '**not significant**'.

Surface Watercourses – Water Quality

13.8.3 During operation of the Proposed Development, some increased sediment loading from the continuing increased runoff would potentially continue to arise from the access tracks, whilst the need for maintenance teams to occasionally visit the site means that the risk of pollution from hydrocarbons and other contaminants through accidental spillage of fuel, oil and other engine fluids, as well as during plant/generator refilling, would remain. However, the cessation of construction activities and the re-vegetation of previously disturbed ground would mean that the potential effects are again much reduced compared to those of the construction phase.

13.8.4 On this basis, the magnitude of change for alterations to surface water quality during operation is considered to be low. With respect to both the medium sensitivity Water of Deugh catchment tributaries and high sensitivity River Nith tributaries and Nith Bridge SSSI, this results in a moderate effect at worst, which is '**not significant**'.

Groundwater Body – Flows

13.8.5 During operation of the wind farm, reduced recharge due to the placement of low permeability surfaces and structures would continue, but ingress of groundwater to excavations and any active dewatering would cease.

13.8.6 On this basis, the potential impact magnitude on groundwater recharge and flow in the low sensitivity aquifers would be negligible and the resulting effect negligible and '**not significant**'.

Groundwater Body – Water Quality

13.8.7 During site operations, the potential effects for accidental spillages and leaking concrete residues remain. Given the limited areal extent and the depth of excavation of the proposed construction, and the need for relatively limited on-site traffic movements during operation, the impact on the groundwater environment would be very limited.

13.8.8 On this basis, the potential impact magnitude on groundwater quality within the low sensitivity aquifers would be negligible and the resulting effect negligible and '**not significant**'.

PWS

13.8.9 As described above, operational activities are considered to have negligible effects on aquifer flows and water quality. With respect to the operational phase, the limited activities would result in a negligible impact on the Craighouse Cottage PWS (**Appendix 13.D**) and given its low sensitivity, this results in an effect which is negligible and '**not significant**'.

GWDTEs

13.8.10 Once construction is completed, any previously disrupted groundwater flow is likely to become re-established via new pathways, such that habitats are maintained by continuing groundwater supply. With a water environment receptor sensitivity of very low (habitat 41), medium (habitat 207), and very low (habitat 208), and a magnitude of change considered to be no higher than that incurred during construction, the potential effect of the operation of the Proposed Development on the GWDTEs is considered to be slight but '**not significant**'.

Peat Hydrology

13.8.11 During site operations, measures to manage and treat site run-off, and prevent soil erosion during restoration works will also be set in place e.g. bunding, and the maintenance of peat water content by watering during dry conditions. Further details are provided in the PMP (**Appendix 6.A**). Once restoration works are complete, a monitoring and inspection regime will be implemented to ensure the status of peat restoration and vegetation re-establishment.

13.8.12 On this basis, the potential disruption to the medium sensitivity peat hydrology would be negligible in magnitude, resulting in a negligible and '**not significant**' potential effect.

13.9 Predicted Effects: Decommissioning

13.9.1 The Proposed Development is expected to have an operational life span of up to 25 years. The current proposals (**Chapter 4 - Description of the Proposed Development**) are to decommission the Proposed Development after 25 years.

13.9.2 Decommissioning is anticipated to involve the dismantling and removal of all above ground structures (turbines, control building/substation, meteorological masts) to ground level. The foundations/crane hardstandings would then be broken out to just below ground level and this material removed; with the remaining parts of these structures below ground being left in-situ. Cabling would be de-energised and cut off below ground level, with buried cabling being left in-situ. Access tracks would also be left for use by the landowner. This approach results in less environmental impact than removal of all below ground infrastructure and re-digging/backfilling of trenches to remove cabling.

13.9.3 To allow decommissioning to take place, vehicle movements and reinstatement works would be required. In addition, there may be a requirement to establish a temporary compound/lay-down area, in order to process the dismantling of turbines and other infrastructure. If such infrastructure is required then this may require minor earthworks, resulting in potential impacts on water flows and quality. As the need for this activity is currently unknown, it is not possible to determine the extent of potential effects precisely.

13.9.4 However, potential effects would be similar to those encountered during the construction phase, and the impact magnitude is expected to be less than or, as a worst case scenario, equal to those associated with the construction phase. Where appropriate, the same mitigation and protection measures adopted during construction and operation would be implemented for construction activities associated with decommissioning. Therefore, no additional impacts over and above those encountered during construction are expected.

13.9.5 In general, as decommissioning is anticipated to last for a much shorter time compared to construction activities, and as all below ground infrastructure would largely be left in place, it is anticipated that potential impacts would be of a lesser magnitude than those identified during construction. As such, potential effects as a result of decommissioning are anticipated to be '**not significant**'.

13.10 Mitigation and Enhancement Measures

Introduction

13.10.1 The mitigation measures focus on maintaining existing site drainage patterns and preventing water pollution. A detailed Construction Method Statement (CMS) would be produced for all aspects of site work listed below, incorporating a Drainage Management Plan (DMP), as well as a Pollution Prevention Plan (PPP), and would require approval from EAC (following consultation with SEPA) prior to commencement of site works. More information on the CMS, DMP and PPP is provided in the project description of this ES (**Chapter 4**). The measures described are essential for pollution prevention and control, and reflect current industry best practice.

Construction Mitigation

Access Tracks and Watercourse Crossings

13.10.2 Where excavation is required, any runoff would flow to track-side drainage channels (dug as the tracks are constructed), and water containing sediment would either infiltrate back into the sub-surface layers or be controlled by sediment-removal methods, such as trackside swales and silt traps. Drains would not be discharged directly into natural channels, ephemeral streams or old ditches. Disruption to groundwater pathways and quality would be minimised by the use of runoff and sediment control measures, as well as track drainage design. The ditch design would be considered in line with the recommendations of the SR/SN/SEPA/FC/HS (2013) guidance, including the use of flat-bottomed ditches to reduce the depth of disturbance.

13.10.3 In instances of drainage close to surface watercourses, discharge from the drainage may be to surface water rather than re-infiltration. In these situations, best practice control measures, including sediment settlement, would be undertaken before the water is discharged into surface water systems. The discharges would be small and collected from only a limited area, rather than draining a large area to the same location.

13.10.4 During construction of new tracks, drainage would be controlled by placing excavated soils on the downhill slopes and lateral drainage ditches on the uphill slopes. The length of drains would be minimised, to prevent either pooling on the upslope side or, at the other extreme, creating long flow paths along which rapid runoff could occur. Regular cross-drains would be required to allow flow to pass across the track, as recommended in SR/SN/SEPA/FC/HS (2013) guidance, with a preference for subsequent re-infiltration on the downslope side, rather than direct discharge to the drainage network.

13.10.5 Cross-drainage would be by culverts or pipes beneath the track, again in line with the SR/SN/SEPA/FC/HS (2013) guidance. Drainage would be installed before or during track construction, rather than afterwards, to ensure that the track design is not compromised. The cross drainage would flow out into shallow drainage, which would allow diffuse re-infiltration on the downslope side. The cross drains would flow out at ground level, and would not be hanging culverts. The avoidance of steep gradients for the tracks would also reduce the risk of erosion occurring at cross-drain outflows. Temporary drainage routes would be provided while upgrading existing tracks, where necessary. Further details regarding cross drainage are provided in **Chapter 4** (**Sections 4.5.55-4.5.56**).

13.10.6 Silt traps/check dams would be used to capture suspended solids generated during construction. These features act to slow the flow of water so allowing sediment to settle out, and help to direct water into the cross drains and so allow natural drainage paths to be maintained as much as possible. The spacing of the check dams would depend on track gradient, spacing of cross drains, and depth of excavation. Regular maintenance and clearing is imperative to ensure their effectiveness is maintained.

13.10.7 Construction of suitable drainage on a temporary and permanent basis would be undertaken to facilitate naturally occurring flow paths. Floating roads would be employed where peat greater than 1m depth is encountered and cannot be avoided by micro-siting. In flat areas, drainage of floating tracks is not required as it can be assumed that rainfall on the road will infiltrate to the ground beneath the tracks or along the verges. In any areas of eroded and hagged peat, which typically contain dendritic and anastomosing patterns of gullying and drainage, maintaining the drainage pattern of the hagged areas would be important to avoid ponding upslope of the tracks. As such, mitigation measures, such as the installation of narrow diameter concrete culverts in areas of concentrated flow, and permeable track bases, would be employed. Furthermore, the management of peat-laden sediment run-off generated by construction activities may include measures such as silt fences to capture entrained peat in the base of gullies, and their regular maintenance and clearing is imperative to ensure their effectiveness is maintained.

13.10.8 Given that SEPA actively discourages culverting, the watercourse crossings would be designed in consultation with SEPA, and would allow for a 20% increase in river flows under current legislative recommendations with respect to climate change. The crossings would be constructed in a manner that does not result in reduced water flows within a particular watercourse, either upstream, downstream, or through a culvert structure. Water flows would replicate prior existing conditions to ensure erosion of river bank or river bed is not exacerbated in any way, and that culverts allow the integrity of watercourse flows to remain unchanged. All watercourse crossings would satisfy the expectations and guidance provided within SEPA's WAT-SG-25. The ECoW appointed to provide advice during the construction and instalment of water crossings with regard to aquatic ecology interest would also ensure that pollution is minimised as far as possible. The ECoW would also advise on the need for any temporary watercourse diversions and the best way for these to be undertaken.

13.10.9 A DMP would be required for the construction and operation stages to ensure that adequate drainage is provided throughout the site in order to prevent run-off entering and polluting nearby

watercourses. The DMP would set out the types of drainage to be specifically installed across the site, and would meet with the requirements of SEPA and its PPG series/CAR guidance.

13.10.10 Construction would be carried out according to the previously listed SEPA and CIRIA guidance for site works. All construction activity would be restricted to clearly defined working areas, primarily the areas of hardstanding around the base of each turbine, access tracks, and temporary turn around and storage areas. Storage of material would be on areas of hardstanding previously identified for such use and suitably located away from sensitive features, e.g. watercourses. All site vehicles would follow established access tracks and site access routes and no fording of watercourses would be allowed unless agreed in advance with SEPA. Fuelling, maintenance and washing of vehicles / plant would only be allowed within designated areas.

Cable Laying

13.10.11 To minimise disturbance impacts, cables would be laid in small trenches along the side of the access tracks as far as possible, and the trenches would be dug during drier periods. The electric cables would be quickly placed within the trenches and soils replaced to minimise the ingress of water into the trenches. If required, regularly spaced clay bunds would be included in the trench backfill to prevent the introduction of preferential flow paths within the cable trenches.

Wind Turbines and Crane Pads

13.10.12 The turbine foundation design minimises excavation requirements in accordance with the BS6031: 1981 Code of Practice for Earth Works. Disturbed areas would be stabilised as soon as possible after construction, and re-vegetation would be encouraged.

13.10.13 Soil movement would be undertaken with reference to best practice guidelines available from Defra in the form of the Good Practice Guide for Handling Soils (MAFF, 2000). In principle, soil excavation would be undertaken during dry periods. Topsoil and subsoil would not be mixed or stored together.

13.10.14 Additional mitigation measures relevant to controlling erosion and runoff from turbine base / crane pad construction include the following:

- Scheduling construction activities to minimise the area and period of time that soil would be exposed, particularly during winter periods;
- Installation of cut-off drains or bunds (in this case excavated soil and subsoil) around the working areas to intercept uncontaminated surface runoff and divert it around the works;
- Minimising the stockpiling of materials and locating essential stockpiles as far away as possible from offsite watercourses;
- The crane pads would be constructed in a manner that allows the hydrology of the local area to be maintained. This might require the construction of interception grips upslope of the excavation to divert flows to existing drainage ditches; and
- If such grips are not utilised, excavations may be mechanically pumped, with all dewatering works carried out in accordance with SEPA's Pollution Prevention Guidelines including discharges through either settling ponds, swales or mechanical silt traps.

Control Building and Contractors Temporary Compounds

13.10.15 During construction and disassembly, similar measures to those implemented during turbine/crane pad construction would be used to control rainfall runoff and prevent concrete pollution and sediment erosion.

Borrow Pits

13.10.16 Mitigation measures in relation to groundwater ingress include drainage by gravity-draining and dewatering. Wherever possible, water should be abstracted to purpose-built drainage channels or settlement lagoons.

13.10.17 Adequate drainage should be designed to cater for expected heavy rainfall events, such that water is not allowed to pond upslope of the excavation.

13.10.18 Similar additional mitigation measures relevant to controlling erosion and runoff from turbine base/crane pad construction are also appropriate for borrow pits, e.g. use of cut-off drains or bunds.

Site Activities

13.10.19 As with all similar construction operations, there would be heavy plant and machinery onsite, and this would result in the need to store oils and diesel. With such storage, and during refilling and maintenance operations, there is the potential for accidental spillages and leaks. To mitigate against these impacts, all chemical storage areas would be within areas of hardstanding in the compound, would be bunded so that 110% of the stored capacity is provided, and would be located at least 50m away from any surface watercourses or drains. Drainage would be directed to an oil interceptor to prevent pollution if any spillage occurred.

13.10.20 Plant and machinery used during the construction phase would be well maintained to minimise the risks of oil leaks or similar. Maintenance and re-fuelling of machinery would be undertaken offsite or within designated areas of temporary hardstanding. In these designated areas, contingency plans would be implemented to ensure that the risks of spillages are minimised. Placing a drip tray beneath plant and machinery during re-fuelling and maintenance would contain small spillages.

13.10.21 The majority of peat spoil from excavation of the wind farm infrastructure would come from the borrow pits, foundations, crane hardstandings and track construction and, to a lesser extent, the temporary compounds. A Peat Management Plan (PMP) has been produced for the Proposed Development (**Appendix 6.A**). The PMP addresses methods in respect of peat excavation, haulage, storage, re-use and degraded habitat restoration. Temporary storage of peat would be required, with site specific drainage to ensure that runoff is sufficiently controlled. Depending on the length of storage and prevailing weather conditions during storage, peat turf conditions would be maintained by regular watering, as determined by regular inspections by the ECoW.

13.10.22 Should excavated, sub-surface peat be in a wet, slurry-like condition, this would be stored in purpose-built, bunded locations with a final peat depth no greater than 1m. Each bunded storage area would be designed with a sedimentation/settling pond to dewater wet peat and to enable sediment retention and drying out. Each settling pond would be designed with appropriate filtration treatment facilities prior to connection into the construction-phase surface water drainage scheme and Sustainable Drainage System (SuDS) for the site. Measures to manage and treat site run-off, and prevent erosion during peat stripping and stockpiling works, would be set in place.

13.10.23 A Construction and Environmental Management Plan (CEMP) would be put in place for the whole period of construction, setting out any specific environmental management requirements such as ECoW requirements for aquatic monitoring requirements and protection measures, pollution control and contingency procedures. The CEMP would include specific CMSs for the most sensitive construction activities with greatest potential impact, including the following:

- Access tracks and drainage management;
- Construction of watercourse crossings and temporary diversions;
- Management of peat, peat slides and spoil storage heaps;
- Water abstraction and water storage requirements; and
- Dewatering of excavations, if required.

13.10.24 During construction, the contractor would at all times prevent the run-off of sediment from areas of the works to watercourses. Production of a PPP and the provision of spill containing emergency equipment on site at appropriate locations would be required. These plans would set out the process for notification of a pollution incident, and would provide contact details for relevant bodies such as the contractor's onsite pollution/environmental officer, SEPA representatives and other environmental staff, where appropriate.

13.10.25 The DMP would be required to ensure that adequate drainage is provided throughout the Proposed Development in order to prevent runoff entering and polluting nearby watercourses. The DMP would set out the types of drainage to be specifically installed across the Proposed Development,

and would meet with the requirements of SEPA and its PPG notes/CAR guidance. The plan would also set out the drainage maintenance strategy, to ensure that drainage features are regularly inspected and cleared out suitable to ensure effective operating. Consultation on this plan would take place with the SEPA/SNH /EAC to ensure that all parties are content with the proposed pollution control measures.

13.10.26 Throughout the construction phase, best working practices would be adopted, and measures to protect the water environment would be taken by adopting recommendations set out in SEPA's PPG notes.

Operational Mitigation

13.10.27 Much of the proposed mitigation for the construction phase for the access roads would comprise a continuing operation of those measures implemented during the construction phase. For example, whilst the ECoW would not expect to have a continued presence during the operation of the Proposed Development, trackside swales and ditches would be used to control track runoff, and silt traps used to capture any sediment entrained runoff.

13.10.28 Flow dampening and retention strategies, incorporated into the Proposed Development, are designed to be sustainable and to cope with storm events. Therefore, only routine maintenance is envisaged to be necessary for the track network within the Proposed Development during the operational phase. Such maintenance would generally be carried out in the summer months when the tracks are dry, reducing further the potential impact on the water environment. In addition, ditches would be kept in good working order.

13.10.29 Following the installation of the cables, and restoration of the soil profile, no mitigation measures regarding electric cable laying would be required during the operational phase of the Proposed Development. Similarly, no further mitigation for wind turbines and crane pads is required during the operational phase of the Proposed Development.

13.10.30 Throughout the operation of the Proposed Development, best working practices would continue to be adopted, and recommendations set out in SEPA's PPG notes would be followed.

Decommissioning Mitigation

13.10.31 During the decommissioning of the Proposed Development, potential impacts on the water environment are expected to be less than those encountered during the construction phase and '**not significant**'. No specific mitigation measures are therefore identified.

13.10.32 Any new legislation or guidelines published prior to decommissioning would need be adhered to and incorporated into the design of mitigation measures prior to decommissioning taking place.

Mitigation Summary

13.10.33 A summary of the key additional mitigation measures and the relevant responsible parties and compliance mechanisms are summarised in **Table 13.12**.

Table 13.12 Incorporated Mitigation Measures

Potential Receptor and Impact	Mitigation Measures	Responsibility for Implementation	Compliance Mechanism
Construction			
Surface watercourses change in flows.	Use of cross drains and other mitigation to maintain natural flow paths; and Implementation of DMP including inspection and maintenance programme.	Contractor. ECoW. Site Environmental Manager.	CEMP; CMSs; and DMP.
Surface watercourse pollution or sedimentation.	Implementation of DMP and PPP including inspection and maintenance programme; No direct discharge of water to natural channels / existing ditches; Use of sediment removal methods (trackside swales / silt dams and fences / settlement lagoons; diffuse re-infiltration; clay bunding); Regular maintenance and clearing of sediment removal features; Prompt re-stabilisation of disturbed areas; Construction activity / storage / traffic routes to take place in clearly defined working areas; and Designated areas for refuelling, maintenance and washing of vehicles / plant.	Contractor. ECoW. Site Environmental Manager.	CEMP; PPP; DMP; SEPA PPG notes; and CAR licensing.
Groundwater change in flows.	Use of cut-off drains / bunds to prevent runoff into excavations.	Contractor. Site Environmental Manager.	CEMP; DMP; SEPA PPG notes; and CAR licensing.
Groundwater pollution.	Storage of material / re-fuelling on defined areas of hardstanding to prevent infiltration to the groundwater body; and Contingency plans to ensure risk of spillages are minimised.	Contractor. Site Environmental Manager.	CEMP; PPP; DMP; SEPA PPG notes; and CAR licensing.
PWS.	Storage of material/re-fuelling on defined areas of hardstanding to prevent infiltration to the groundwater body; and Contingency plans to ensure risk of spillages are minimised.	Contractor. Site Environmental Manager.	CEMP; PPP; DMP; SEPA PPG notes; and CAR licensing.
GWDTEs.	Storage of material/re-fuelling on defined areas of hardstanding to prevent infiltration to the groundwater body; Contingency plans to ensure risk of spillages are minimised; and Abstraction of groundwater from excavations to be utilised for compensatory support.	Contractor. Site Environmental Manager.	CEMP; PPP; DMP; SEPA PPG notes; and CAR licensing.

Potential Receptor and Impact	Mitigation Measures	Responsibility for Implementation	Compliance Mechanism
Peat change in water flow and quality.	Use of sediment removal methods (trackside swales/silt dams and fences/settlement lagoons; diffuse re-infiltration; clay bunding); Regular maintenance and clearing of sediment removal features; Prompt re-stabilisation of disturbed areas; and Use of settling ponds/filtration and bunding to manage storage of peat turves;	Contractor. Site Environmental Manager.	CEMP; PPP; DMP; PMP; and CAR Licensing
Operational			
Surface watercourses change in flows.	Implementation of DMP including inspection and maintenance programme.	Contractor. Site Environmental Manager.	CEMP; CMSs; DMP; and CAR licensing.
Surface watercourse pollution or sedimentation.	Implementation of DMP and PPP including inspection and maintenance programme; and Designated areas for refuelling, maintenance and washing of vehicles / plant.	Contractor. Site Environmental Manager.	CEMP; CMSs; DMP; PPP;; and CAR licensing.
Groundwater change in flows.	Implementation of DMP including inspection and maintenance programme.	Contractor. Site Environmental Manager.	CEMP; DMP; SEPA PPG notes and CAR licensing.
Groundwater pollution.	Implementation of DMP and PPP including inspection and maintenance programme; and Designated areas for refuelling, maintenance and washing of vehicles / plant.	Contractor. Site Environmental Manager.	CEMP; CMSs; DMP; PPP; and CAR licensing.
PWS.	Implementation of PMP including inspection and maintenance programme; and Designated areas for refuelling, maintenance and washing of vehicles/plant.	Contractor. Site Environmental Manager.	CEMP; CMSs; DMP; PPP; and CAR licensing.
GWDTEs.	Implementation of PMP including inspection and maintenance programme; and Designated areas for refuelling, maintenance and washing of vehicles/plant.	Contractor. Site Environmental Manager.	CEMP; CMSs; DMP; PPP; and CAR licensing.
Peat – change in water flow and quality.	Implementation of PMP including inspection and maintenance programme; and Designated areas for refuelling, maintenance and washing of vehicles/plant.	Contractor. Site Environmental Manager.	CEMP; PPP; DMP; PMP; and CAR Licensing
Decommissioning			
As per construction.			

13.11 Residual Effects

Construction

13.11.1 A potentially significant surface water quality effect during construction was identified for the high sensitivity River Nith tributaries and the associated Nith Bridge SSSI. With the application of the specific mitigation and the best practice identified in **Section 13.9** above, the magnitude of change during construction on the water quality would be reduced to low, with residual effects being moderate and '**not significant**' in respect of these two receptors.

13.11.2 No other potentially significant effects have been identified. With the application of the specific additional mitigation and best practice identified in **Section 13.9**, residual effects on the other receptors would be negligible and '**not significant**'.

Operation

13.11.3 No potentially significant effects have been identified for any receptor during the site operation phase.

13.11.4 Nevertheless, where appropriate, the additional mitigation identified in **Section 13.9** for the construction stages would also be applied during operation and maintenance activities, including; operational work being restricted to the areas of hardstanding established at the base of the turbines; work being completed in a controlled manner in accordance with the contractor's CEMP / CMS and PPP; fuel being stored appropriately; fuelling and plant / machinery repair work being undertaken in designated areas; and no unauthorised crossing of watercourses.

13.11.5 Incorporation of this mitigation would ensure that the residual level of effect for all water environment receptors is negligible and '**not significant**'.

Decommissioning

13.11.6 No potentially significant decommissioning effects have been identified.

13.11.7 With the application of mitigation and best practice similar to that for the construction stages, decommissioning effects remain negligible and '**not significant**'.

Cumulative

13.11.8 In terms of cumulative residual effects on the water environment, only proposed developments (either within the planning consent process, consented but not yet constructed, under construction or operational) that would impact upon the River Nith and the Water of Deugh immediately downstream of the tributaries sourced within the Development Site, as well as the Nith Bridge SSSI, would potentially have cumulative effects. The assessment presented here therefore assesses a zone of influence comprising the spatial area of the affected catchments, and within a 10km radius of the Proposed Development (**Chapter 9 - LVIA, Figure 9.8**). Beyond this radius, any effects to the catchments further downgradient are considered to be sufficiently attenuated to negate a measurable impact.

13.11.9 Several wind farm proposals or existing developments located within the same river catchments as for the Proposed Development, and are located within 10km of it.

13.11.10 South Kyle is a proposed wind farm comprising fifty turbines, located in forestry immediately south west of the Proposed Development. Although South Kyle is also located within both the Water of Deugh and River Nith catchments, the cumulative magnitude of impact of the two wind farms would be low and '**not significant**' due to the implementation of similar, effective pollution control and mitigation measures at both sites.

13.11.11 The 'Land at Burnfoot' Wind Farm lies just east of Burnfoot by the B741, within the catchment of Blarene Burn. None of the Proposed Development infrastructure lies upgradient of the Blarene Burn, so it is not anticipated that there would be any cumulative effects on this watercourse.

13.11.12 Benbrack Wind Farm lies within the Water of Deugh catchment. However, the cumulative effects of the two wind farms on the Water of Deugh would be '**not significant**', due to the distance

between the catchments of the Proposed Development and Benbrack Wind Farm, and the implementation of similar, effective pollution control and mitigation measures at both sites.

13.11.13 Distance within the Water of Deugh catchment, as well as the implementation of similar, effective pollution control and mitigation measures also lead to '**not significant**' cumulative effects on the Water of Deugh from the Proposed Development in conjunction with a number of other wind farms, including the existing Windy Standard Wind Farm, the proposed Windy Standard Extension and Windy Standard Phase III Wind Farm, as well as the proposed Knockower Community and Windy Rig wind farms.

13.11.14 Similarly, cumulative effects on the River Nith from the Proposed Development and a number of wind farms, including the proposed Sanquhar, Sanquhar 'Six', Afton, High Park II, Euchanhead, Greenfield Farm, Taiglim Farm, High Cumnock and Mansfield Mains wind farms, as well as the existing Hare Hill Wind Farm (and proposed Hare Hill Extension), are considered '**not significant**', due to the downgradient distance within the Nith catchment, as well as the implementation of effective pollution control and mitigation measures.

13.11.15 Polquhairn Wind Farm lies ~10km north west of the Proposed Development, and lies within a catchment completely outwith that of the Proposed Development. No significant cumulative effects would therefore be anticipated.

13.11.16 No other proposed wind farm developments, or other non-wind farm developments, affecting the Proposed Development catchments are identified at this time.

Conclusions of Significance Evaluation

13.11.17 There is an inherent risk of sediment loading and pollution occurring on all construction sites. However, implementation of the mitigation measures (**Section 13.9**), along with compliance with CAR licensing requirements, reduces the residual magnitude of any potential impact to negligible or low. This results in a residual level of effect that is negligible and '**not significant**' for all water environment interests. A summary of residual effects is provided in **Table 13.13**.

Table 13.13 Summary of Residual Effects

Potential Receptor and Effect	Receptor Sensitivity	Magnitude of Change	Significance of effect for Proposed Development	Rationale
Construction				
Surface watercourses (River Nith and tributaries), change in flows	High	Negligible	Not significant	Design mitigation, specific construction mitigation and application of best practice would ensure no significant effect.
Surface watercourses (Water of Deugh and tributaries), change in flows	Medium	Negligible	Not significant	Design mitigation, specific construction mitigation and application of best practice would ensure no significant effect.
Nith Bridge SSSI, change in flows	High	Negligible	Not significant	Design mitigation, specific construction mitigation and application of best practice would ensure no significant effect.
Surface watercourses (River Nith and tributaries), change in quality	High	Low	Not significant	Design mitigation, specific construction mitigation and application of best practice would ensure no significant effect.

Potential Receptor and Effect	Receptor Sensitivity	Magnitude of Change	Significance of effect for Proposed Development	Rationale
Surface watercourses (Water of Deugh and tributaries), change in quality	Medium	Negligible	Not significant	Design mitigation, specific construction mitigation and application of best practice would ensure no significant effect.
Nith Bridge SSSI, change in water quality	High	Negligible	Not significant	Design mitigation, specific construction mitigation and application of best practice would ensure no significant effect.
Aquifers, change in recharge and flows	Low	Negligible	Not significant	Design mitigation, specific construction mitigation and application of best practice would ensure no significant effect.
Aquifers, change in water quality	Low	Negligible	Not significant	Design mitigation, specific construction mitigation and application of best practice would ensure no significant effect.
PWSs, change in flow and water quality	Low	Negligible	Not significant	Design mitigation, specific construction mitigation and application of best practice would ensure no significant effect.
GWDTEs, change in water flow and quality	Very low to medium	Negligible	Not significant	Design mitigation, specific construction mitigation and application of best practice would ensure no significant effect.
Peat, change in water flow and quality	Medium	Negligible	Not significant	Design mitigation, specific construction mitigation and application of best practice would ensure no significant effect.
Operation				
Surface watercourses (River Nith and tributaries), change in flows	High	Negligible	Not significant	Design mitigation, specific construction mitigation and application of best practice would ensure no significant effect.
Surface watercourses (Water of Deugh and tributaries), change in flows	Medium	Negligible	Not significant	Design mitigation, specific construction mitigation and application of best practice would ensure no significant effect.
Nith Bridge SSSI, change in flows	High	Negligible	Not significant	Design mitigation, specific construction mitigation and application of best practice would ensure no significant effect.
Surface watercourses (River Nith and tributaries), change in water quality	High	Negligible	Not significant	Design mitigation, specific construction mitigation and application of best practice would ensure no significant effect.
Surface watercourses (Water of Deugh and tributaries), change in water quality	Medium	Negligible	Not significant	Design mitigation, specific construction mitigation and application of best practice would ensure no significant effect.

Potential Receptor and Effect	Receptor Sensitivity	Magnitude of Change	Significance of effect for Proposed Development	Rationale
Nith Bridge SSSI, change in water quality	High	Negligible	Not significant	Design mitigation, specific construction mitigation and application of best practice would ensure no significant effect.
Aquifers, change in recharge and flows	Low	Negligible	Not significant	Design mitigation, specific construction mitigation and application of best practice would ensure no significant effect.
Aquifers, change in water quality	Low	Negligible	Not significant	Design mitigation, specific construction mitigation and application of best practice would ensure no significant effect.
PWS (Craighouse Cottage), change in flow and water quality	Low	Negligible	Not significant	Design mitigation, specific construction mitigation and application of best practice would ensure no significant effect.
GWDTEs change in water flow and quality	Very low to medium	Negligible	Not significant	Design mitigation, specific construction mitigation and application of best practice would ensure no significant effect.
Peat, change in water flow and quality	Medium	Negligible	Not significant	Design mitigation, specific construction mitigation and application of best practice would ensure no significant effect.
Decommissioning				
No significant effects identified so residual effect same as pre-mitigation	Not significant	No mitigation required over and above identified construction mitigation.		
Cumulative				
No significant effects identified	Not significant	No mitigation required over and above identified construction mitigation.		

13.12 References

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14. Traffic and Transport

14.1 Non-Technical Summary

14.1.1 This assessment takes account of the traffic levels that would be generated during the construction, operation traffic and decommissioning phases of the Proposed Development, with the construction phase being the main focus as this is when most traffic will be generated. Consideration has been primarily given to Heavy Goods Vehicle (HGV) traffic, although abnormal load movements have also been assessed.

14.1.2 Estimates of traffic generation associated with the construction phase of the Proposed Development have been derived from a first principles approach based on calculations of vehicle loads of imported materials. While it is expected that sufficient materials may be won on site from borrow pits, it is assumed for the purposes of a worst case transport assessment that the bulk of the construction materials (stone aggregate and the materials required for the mixing of concrete) will be sourced from one quarry located approximately 18km north-east of the Development Site.

14.1.3 The route from this quarry to the Development Site has been defined following a route appraisal exercise, which considered the location of receptors sensitive to changes in traffic flows i.e. schools, community facilities, shops etc. The route with the least number of receptors was then selected and progressed as part of the environmental assessment. The route from the quarry to the Development Site is expected to follow the B743, travelling westbound before joining the B713 in the village of Sorn, and continuing through the village of Catrine before joining the A76. From the A76 the route heads south and travels through New Cumnock, where it then joins the B741 heading south-west towards the Site access off this road.

14.1.4 All turbine components will be imported into Scotland via the port at Ayr and delivered to the Development Site by road. The route used to deliver turbine components from the port will be expected to leave Ayr via Waggon Road, before turning right onto Allison Street A79, and then onto A719, the A77 northbound towards the roundabout with the A78. The route then heads further north along the A77, joining the A76 at the roundabout at Kilmarnock heading south before joining the B741 at New Cumnock and heading south-west towards the Site entrance off this road. The route has been assessed and consulted on by Collett and Sons (heavy haulage contractor).

14.1.5 The change in vehicle numbers on the proposed Quarry access route as a result of construction-related traffic for road stone deliveries, concrete material deliveries and abnormal load deliveries has been calculated in percentage terms, relative to the Automatic Traffic Counts (ATCs) carried out from 30th May to 5th June 2015.

14.1.6 The assessment considers that 100% of all road stone required for the construction of on-site access tracks will be imported, although it is highly likely that a significant proportion can be recovered onsite using borrow pits. As such, the assessment presented is considered to be an absolute worst case. In this worst-case scenario, month 3 in the construction programme generates the highest number of trips with a total of 204 movements per day or 18 per hour across a 12 hour working day (Mon-Fri 0700-1900).

14.1.7 The effect on the local highway network has been assessed using The Institute of Environmental Management and Assessment (IEMA) guidelines, which specify general thresholds for traffic flow increases that trigger the need for the assessment of effects. The aforementioned thresholds are expressed in the form of two rules:

- Rule 1: Include roads where traffic flows are predicted to increase by more than 30% (or where the number of HGVs are predicted to increase by more than 30%); and
- Rule 2: Include any specifically sensitive areas (schools, shops, community facilities etc.) where traffic flows are predicted to increase by 10% or more.

14.1.8 The following environmental effects which are listed in the IEMA guidelines have been considered in this assessment: severance; driver delay; pedestrian delay; pedestrian amenity; accidents and safety; fear and intimidation; and dust and dirt. In respect of these, and with the incorporation of appropriate mitigation measures included within a Construction Traffic Management Plan (TMP), no significant effects are predicted.

14.2 Introduction and Overview

14.2.1 This chapter assesses the potential Traffic and Transport related environmental effects of the Proposed Development. It should be read with reference to the scheme description in **Chapter 4 - Description of the Proposed Development**.

14.2.2 Following a summary of relevant policy and legislation, this chapter describes the assessment methodology that has been adopted, the overall baseline conditions and how the scheme design has evolved to incorporate topic specific embedded mitigation. The scope of the assessment and a detailed assessment of the likely significant effects are then presented, along with details of environmental measures (additional mitigation) to avoid, minimise, mitigate or compensate for any remaining adverse effects. The measures will be incorporated into a TMP, the contents of which is outlined within this chapter. The chapter concludes with a summary of residual effects and an evaluation of their significance following the incorporation of these environmental measures into the Proposed Development.

14.2.3 It should be noted that the assessment has considered the impacts of a worst case construction scenario whereby all road stone used in the construction of the internal site access tracks is sourced externally. It is likely that borrow pits can be established and will supply the site with the required stone, however, in the interests of presenting a robust assessment, it has been assumed that borrow pits will not be available.

14.3 Methodology and Approach

Policy and Legislative Context

14.3.1 The following policy and guidance documents have been taken into account in this assessment.

National Planning Policy and Advice

14.3.2 Advice on transportation is provided within the Scottish Planning Policy (SPP) and Planning Advice Note (PAN) 75: Planning for Transport (2005). PAN75 provides guidelines for planning authorities and developers. One of the objectives of the document is to highlight the link between planning and transportation systems.

14.3.3 The objectives of PAN75 and SPP are to integrate planning and transport at the national, regional, strategic and local level and to promote more sustainable transport modes for both carrying people and moving freight.

Development Plan Policies

14.3.4 The statutory Development Plan applicable to the Development Site comprises the approved Ayrshire Joint Structure Plan (2007) and the adopted East Ayrshire Local Plan (2010). Full details regarding all Development Plan policies of relevance to the Proposed Development are provided in **ES Chapter 5 – Planning Policy Context**.

14.3.5 Structure Plan Policies of specific relevance to this technical assessment are Policy STRAT 1 – Sustainable Development and Policy ECON 6 - Renewable Energy.

14.3.6 Local Plan Policies of specific relevance to this technical assessment are:

- Policy SD1 – General Strategic Policy;
- Policies CS12 – Renewable Energy Developments (General);
- Policy T3: Roads; and

- Policy T9: Rights of Way.

Other Planning Policy Considerations & Guidance Documents

14.3.7 East Ayrshire Council are currently preparing the East Ayrshire Local Development Plan (LDP) which, once adopted, will replace the current Structure and Local Plans that are the statutory Development Plan for East Ayrshire at the time of writing. The East Ayrshire LDP Proposed Plan was published for consultation between March and April 2015. Proposed policies of relevance to this technical assessment are:

- Overarching Policy OP1;
- Policy RE1 Renewable Energy Developments; and
- Policy T4 Development and Protection of Core Paths and Natural Routes.

14.3.8 *Transport Assessment Guidance* (Transport Scotland, 2012) provides guidance on the preparation of Transport Assessments (TAs) for development proposals in Scotland, setting out requirements according to the scale of development being proposed. The 2002 Scottish Executive publication 'Guide to Transport Assessment for Development Proposals in Scotland' also provides relevant advice and guidance.

14.3.9 The only document available which sets out a methodology for assessing potentially significant environmental traffic and transport related effects from proposed developments is the IEMA publication Guidance Note No. 1: *Guidelines for the Environmental Assessment of Road Traffic* (hereafter referred to as 'the IEMA guidelines', published in 1993. The methodology contained in the IEMA guidelines has been adopted for this assessment.

Baseline Establishment

Data Sources

14.3.10 The following data sources were used to inform this assessment:

- The Department for Transport (DfT) Annual Average Daily Traffic (AADT) flow statistics have been used to identify current levels of traffic on highways assessed;
- Automatic Traffic Counts (ATCs) were undertaken by Nationwide Data Collection (NDC) between Saturday 30th May to Friday 5th June 2015; and
- Web resources have been used to identify quarries local to the Development Site that could be used to supply the required construction material.

14.4 Methodology for Establishment of Effects

14.4.1 Guidance on the establishment of effects is presented within the IEMA guidelines. This provides guidance on defining receptors; the threshold of impact triggering the need for an assessment of environmental effects; and the environmental effects that need to be considered.

14.4.2 The following environmental effects are listed within the IEMA guidelines: Noise; Vibration; Visual Effects; Severance; Driver Delay; Pedestrian Delay; Pedestrian Amenity; Accidents and Safety; Fear and Intimidation; Hazardous Loads; Air Pollution; Dust and Dirt; Ecological Effects; and Heritage and Conversation Areas.

14.4.3 Not all of the effects listed are relevant to this chapter, with noise, ecological effects and heritage and conservation covered in the relevant chapters of this ES. The only other effects not considered in this chapter are 'Hazardous Loads', since none of the materials/components being delivered as part of the wind farm construction are classed as hazardous, and 'Air Pollution' as a significant effect in this respect is unlikely.

Significance Evaluation

14.4.4 The significance of each effect has been considered against the criteria within the IEMA guidelines, where possible. However, the IEMA guidelines state that:

"*…for many effects there are no simple rules or formulae which define the thresholds of significance and there is, therefore, a need for interpretation and judgement on the part of the assessor, backed-up by data or quantified information wherever possible. Such judgements will include the assessment of the numbers of people experiencing a change in environmental impact as well as the assessment of the damage to various natural resources.*"

14.4.5 The IEMA guidelines also state that:

"*…the detailed assessment of impacts is…likely to concentrate on the period during which the absolute level of an impact is at its peak, as well as the hour at which the greatest level of change is likely to occur.*"

14.4.6 Despite the difficulties in establishing initial significance criteria, the IEMA guidelines specify general thresholds for traffic flow increases triggering the need for assessment of effects, which are expressed in the form of two rules:

- Rule 1: Include roads where traffic flows are predicted to increase by more than 30% (or where the number of HGVs are predicted to increase by more than 30%); and
- Rule 2: Include any specifically sensitive areas (schools, shops, community facilities etc.) where traffic flows are predicted to increase by 10% or more.

14.4.7 It should be noted that increases below 10% are generally considered to be insignificant given that daily variations in background traffic flow may fluctuate by this amount. Changes in traffic flow below this level are therefore assumed to result in no discernible environmental impact and thus the assessment of effects is not considered necessary.

14.4.8 **Table 14.1** summarises the potential significance criteria based on Rules 1 and 2 above, whereby an assessment of effects on receptors would be required.

Table 14.1 Significance Criteria

Parameter of Assessment	Significance	Outcome
Change in traffic flows and HGVs of 30% or more	Potentially Significant	Assessment of environmental effects required
Change in total traffic flows of 10% or more in sensitive areas	Potentially Significant	Assessment of environmental effects required
Change in traffic flows and HGVs below 30%	Not significant	No assessment required
Change in total traffic flows less than 10% in sensitive areas	Not significant	No assessment required

14.5 Baseline Information

Introduction

14.5.1 The following sections provide an overview of the current baseline with regards to:

- The existing local highway network and the surrounding land uses adjacent to the local highway network;
- Current traffic flows; and
- Personal Injury Accident data.

Highway Network – Proposed Development Traffic Route

Quarry Route: B743 (westbound) – B713 – B705 – B713 – A76 - B741

14.5.2 The quarry from which it is assumed the bulk of the construction materials (stone aggregate and the materials required for the mixing of concrete) will be sourced is located approximately 18km from the Development Site. The route from the quarry to the Development Site is expected to use the B743 westbound, join the B713 in the village of Sorn, and continue along the B713 through the village of Catrine, before joining the A76 southbound. The route, which is shown on **Figure 14.1**, will then lead into New Cumnock where it will join the B741 south-westbound towards the Development Site access.

14.5.3 An alternative route would be to proceed south along the B705 through Auchinleck. However the level of frontage access and the presence of sensitive receptors such as Auchinleck Academy on this part of the route reduce its suitability in comparison to the route noted above (though this also has some sensitive receptors, details of which are provided below).

14.5.4 The B743 is a single two-way carriageway subject to the national speed limit. The highway has a carriageway width of approximately 6m and is afforded grass verges on either side. The highway is rural in nature and routes predominantly through agricultural land uses, with groups of dwellings interspersed along its length.

14.5.5 The B713 is a single two-way carriageway subject to a 30mph speed limit through the village of Sorn before returning to the national speed limit upon leaving the settlement. The highway width is approximately 5.5m and it is bounded by grass verging and hedgerows on either side. The highway is predominantly rural in nature and routes through mostly agricultural land. When traversing the village of Catrine the route passes Daldorch House School and Catrine Nursery School, both of which are considered to be sensitive locations and are assessed later in this chapter.

14.5.6 The section of the B705 on the route is a single two-way carriageway, which is subject to a 30mph speed limit within the village of Catrine. The highway width is approximately 7m and it is fronted initially by agricultural land before entering Catrine, where the land uses change to residential properties, which are set back from the highway. There are pedestrian footpaths on both sides of the carriageway with street lighting columns present within the vicinity of the village.

14.5.7 The A76 is a strategic highway connecting Kilmarnock in the north to Dumfries in the south. The highway provides a single two-way carriageway, which is subject to the national speed limit. The carriageway has a width of approximately 7m and within the context of the section on the route, is fronted predominantly by agricultural land uses, with the exception of the section in New Cumnock. New Cumnock follows a linear settlement pattern along the A76 and the B741, with low density development along the former and interspersed development clusters along the latter.

14.5.8 From its junction with the A76, the B741 provides a single two-way carriageway highway subject to a speed limit of 30mph. Within approximately 2 miles of the aforementioned junction the speed limit increases to the national speed limit, with some reduction (typically to 40mph) when passing through some of the small villages/hamlets. The highway is fronted mainly by residential properties upon leaving New Cumnock, and agricultural land uses heading towards the Development Site access.

Port Route: A719 – A77 (northbound) – A76 (southbound) – B741

14.5.9 Turbine components are expected to be delivered by sea to Ayr Port. The route from Ayr Port will follow Waggon road, before turning right onto the A79 Allison Street, and then onto the A719, the A77 northbound, before turning onto the A76 southbound towards New Cumnock.

14.5.10 Waggon Road is single carriageway road fronted by residential dwellings and light industry on either side of the carriageway. Waggon Road is subject to a 20mph speed limit in the section fronted by residential dwellings, and a 30mph speed limit along sections devoid of residential development. The road is street lit and has footways on either side of the carriageway.

14.5.11 The vehicles will exit Waggon Road onto the A79 Allison Street, which is a dual carriageway with a central reservation and footways on either side of the carriageway. The A79 is street lit and fronted by residential properties which are set back from the carriageway.

14.5.12 The delivery vehicles will then proceed along the A719, which is a dual carriageway with a central reservation, with footways on either side of the carriageway. The A719 is fronted by residential properties, which are set back from the carriageway, is lit and subject to a 40mph speed limit.

14.5.13 The A77 is a single carriageway road, which is lit and subject to the national speed limit. The A77 is a strategic highway providing an outer ring road to Ayr, which is located along its western edge.

14.5.14 The A76 and the B741 are as described above in the quarry route section.

14.5.15 Collett and Sons (Heavy Haulage Contractor) have undertaken as assessment of the access routes for a number of E.ON's wind farms in south west Scotland. The information from this report which is relevant for the Proposed Development has been extracted and is provided within **Appendix 14.A**. The report sets out the proposed route, the type of equipment required to transfer the various turbine components, swept path analysis plans for key pinch points and details of the consultation undertaken with the relevant roads authorities.

14.5.16 On page 20 of the revised report (**Appendix 14.A**) which describes the first part of the abnormal load survey route, the route continues northwards from survey location 1.04 shown, and survey locations 1.05, 1.06 and 1.07 should be disregarded as they relate to the abnormal load route to another proposed development.

Traffic Flows

14.5.17 Traffic flow data has been obtained through the use of ATCs and the DfT's online database.

14.5.18 The DfT data is available for all 'A' classified highways throughout the UK and is presented as Annual Average Daily Traffic flows (AADT) for the latest 10 year period. The traffic counts are fully classified and therefore an HGV percentage has also been derived.

14.5.19 Only data for the Quarry route has been obtained since the vehicle movements associated with turbine component delivery will be relatively few in number.

14.5.20 **Table 14.2** provides a summary of the data obtained from the DfT count points and ATC flows.

Table 14.2 Traffic Flow Summary

Route No	AADF 2013 (24 hour)	HGV (24 hour)	07:00 – 19:00 Total Traffic	07:00 – 19:00 HGV	07:00 – 19:00 HGV %
B743	1,193	80	998	74	7%
B705	4,130	77	3,312	68	2%
B741	795	27	653	26	4%
A76*	6,420**	912	5,059	719	14%

*12 hour flows derived from Table TRA0307 provided by the DfT.
**Data was recorded in 2014.

Personal Injury Accident (PIA) Data

14.5.21 Contact was made with Ayrshire Roads Alliance to obtain Personal Injury Accident (PIA) data for a 5 year period. The only available data for public dissemination is the number of accidents categorised by severity (slight, serious or fatal), and this data would not include any specific information such as the dates of the incidents, the causations or the specific locations. As such no meaningful analysis can be undertaken.

Surrounding Land Uses

14.5.22 A review has been undertaken of the land uses along the four classified highways that comprise the proposed HGV route in order to identify sensitive locations. A summary of the review is provided within **Table 14.3**.

Table 14.3 Land Use Summary

Highway	Side of the highway	Description
B743	North	Agricultural
	South	Agricultural Residential dwellings (Sorn)
B713	North	Agricultural Residential dwellings (Sorn) Light industrial use Education
	South	Agricultural Residential dwellings (Sorn) Education
B705	North	Residential Dwellings (Catrine)
	South	Residential Dwellings (Catrine)
A76	East	Agricultural Residential dwellings (New Cumnock) Light industrial use Community facilities e.g. post office, community centre (New Cumnock)
	West	Agricultural Residential dwellings (New Cumnock) Railway Station (New Cumnock)
B741	North	Agricultural Residential dwellings (New Cumnock & small hamlets)
	South	Agricultural Residential dwellings (New Cumnock & small hamlets)

14.5.23 The majority of the adjacent land uses are not considered to be sensitive, although where the route passes through residential areas, there is the potential for sensitive user groups to be present. A more detailed description of the villages located on the quarry route is presented below.

Sorn

14.5.24 The B743 and B713 route through the village, where residential development fronts the highway. Properties along the B743 are afforded drive ways and front gardens, providing some segregation from the carriageway. The existing footway is relatively narrow, however, two 'build out' speed calming features are in place upon entering the village from the east, reinforcing the 30mph speed limit present in the village. Along the B713, the number of dwellings reduces significantly, with the majority set well back from the carriageway and segregated by boundary walls/hedgerows.

Catrine

14.5.25 The route through the centre of Catrine uses both the B705 and the B713. Residential properties front the highway on both sides of the carriageway along both highways and a nursery school is served from the latter. Upon entering the village via the B705 the residential development is set well back from the edge of the carriageway and is segregated by a large grassed verge. As the route continues onto the B713, the dwellings fronting the highway are set back from the carriageway and are segregated by wide footways and designated on-street parking bays. Numerous uncontrolled crossing points are also provided along this section of the route. Within proximity to Catrine Nursery School, a zebra crossing is provided along with a vehicle activated sign, warning approaching traffic of the crossing. The road then returns to the national speed limit heading towards the A76 upon leaving the village.

New Cumnock

14.5.26 The A76 routes through New Cumnock (as well as the residential estate of Pathhead located immediately to the north) where residential and commercial properties front the carriageway on both sides. The properties are for the most part segregated from the highway by a wide footway and designated car parking bays, situated parallel with the carriageway. Other properties are afforded boundary walls along the frontage, providing further segregation from the edge of the carriageway. A number of community facilitates are served from the A76 and include a community centre, leisure centre, parish church, pharmacy and primary school. All are afforded wide footways along the existing frontages and the primary school is situated adjacent to the signal controlled crossing.

14.5.27 The A76 meets the B741 heading south-west towards the Development Site access. The properties along the B741 are for the most part either set back from the carriageway, segregated by a wide footway or both.

Predicted Future Baseline

14.5.28 The IEMA guidelines recommend that:

> *'…assessment should be undertaken at the year of opening of the development or the first full year of its operation. For a phased development it may be necessary to consider the first year of each phase.'*

14.5.29 As is standard with wind farm developments, the level of traffic generated during the operational phase is extremely low and typically consists of one vehicle a month undertaking a standard site inspection. As such, it is considered more appropriate to use the existing baseline data in this instance given construction traffic is the most onerous phase of the development.

14.5.30 Furthermore, the application of traffic growth would also reduce the predicted impact of the construction traffic by providing an increased traffic number baseline from which to compare the relevant impact of the construction phase. As such, an assessment undertaken using baseline data (2015) is considered to be a more robust approach.

Information Gaps

14.5.31 The construction programme has been generated based on previous project experience and may change following the appointment of a construction contractor by the Developer.

14.5.32 To ensure that a robust construction programme is presented, Amec Foster Wheeler has assumed a worst case scenario with regards to the delivery of materials, including materials required for concrete mixing, which is anticipated to be batched on the Development Site using stone from borrow pits. However, for the purposes of the assessment all materials have been assumed to be sourced externally.

14.5.33 As noted in **Section 14.5.21**, the PIA information available is not sufficient for a meaningful assessment to be undertaken. However, it is anticipated that a TMP (the contents of which is outlined within Section 14.8) and appropriate mitigation measures (e.g. wheel washing to keep highways debris free) will be implemented during construction and therefore it is expected that there will be no adverse effect as a result of the Proposed Development in respect of road safety. As such, this information gap is not considered to adversely affect the robustness of this assessment.

14.6 Scope of Assessment

14.6.1 The assessment of traffic and transport related environmental effects on receptors was based on exceedance of the thresholds previously identified:

- Rule 1: Include roads where traffic flows are predicted to increase by more than 30% (or where the number of HGVs are predicted to increase by more than 30%); and

- Rule 2: Include any specifically sensitive areas where traffic flows are predicted to increase by 10% or more.

Potential Receptors

14.6.2 The methodology used in this assessment (which adopts that advocated by the IEMA guidelines) evaluated:

- Potential effects on local roads and the users of those roads, including public transport users, pedestrians and cyclists; and
- Potential effects on land uses and environmental resources fronting those roads, including the relevant occupiers and users.

14.6.3 The IEMA guidelines also identify groups, locations and areas which may be sensitive to changes in traffic conditions and which should be considered for assessment. These potentially affected groups include: People at home; People in work places; Sensitive groups including children, elderly and the disabled; Sensitive locations (e.g. schools, hospitals, churches and historical buildings); Walkers; Cyclists; Open spaces, recreational sites and shopping areas; Sites of ecological/nature conservation value; and Sites of tourist/visitor attraction.

14.6.4 It should be noted that groups such as ‘people at home’ or ‘people at work’ are not considered to be pertinent within this chapter, given the impacts on these receptors is likely to be noise orientated, which is outside the scope of this chapter.

14.6.5 Receptors along the construction route are confined to local settlements, however not all are considered to be overly sensitive. With reference to the route and village descriptions contained within **Section 14.5**, the following sets out the assumed level of sensitivity with regards to IEMA Rules 1 and 2.

14.6.6 The B743 serves the village of Sorn, which has a relatively short frontage comprising several dwellings situated along the southern side of the carriageway. Development along the northern side of the carriageway is limited to a short cul-de-sac and as such only a single point of access is provided on to the highway. There are no overly sensitive land uses along this section of the HGV route, with the exception of the local shop/post office. However, the road is traffic calmed and visibility along the highway is excellent. As a result, the B743 is not considered sensitive to change and will be assessed against IEMA Rule 1.

14.6.7 The village of Catrine is primarily served by the B705 and B713 and is fronted by both dwellings and a nursery school. The dwellings are set back from the edge of the carriageway and the nursery school is provided with a zebra crossing and traffic calming features, however due to the presence of the dwellings along both sides of the carriageway and the daily requirement for pedestrians (including children) to cross the road, the village is considered to be sensitive to change. Therefore the B705 will be assessed against IEMA Rule 2.

14.6.8 New Cumnock is served by the A76 and the B741. Along the frontage of the former, residential development and community facilities are present, including a primary school, parish church and leisure centre. The town forms a linear development pattern along the A76 and there is likely to be a significant degree of interaction between local residents and HGV traffic whilst crossing the highway to access local services. It is noted that a signal controlled crossing is present adjacent to the primary school, however, given the size of the village and the presence of sensitive land uses, the A76 will be assessed against IEMA Rule 2.

14.6.9 The B741 between the village of New Cumnock and the Development Site access is largely rural in nature, with the majority of the highway fronted by agricultural land uses. There are a small number of dwellings located towards the east of the B741 and several farms situated at various intervals along the highway. Given the low level of development and rural nature of the highway it is considered that the B741 is not overly sensitive to changes in traffic flow and therefore it will be assessed against IEMA Rule 1.

Potentially Significant Effects

14.6.10 The environmental effects on 'existing road users' considered within this assessment are as follows: Severance; Driver Delay; Pedestrian Delay; Pedestrian Amenity; Fear and Intimidation; and Accidents and Safety.

14.6.11 Bespoke assessment criteria for each of the effects referenced above are provided below.

Severance

14.6.12 Severance is the perceived division that can occur within a community when it becomes separated by a major traffic artery and is used to describe the factors that separate people from other people and places. For example, severance may result from the difficulty of crossing a heavily trafficked road or a physical barrier created by the road itself. It can also relate to quite minor traffic flows if they impede pedestrian access to essential facilities.

14.6.13 Severance can affect motorists, pedestrians or residents. The IEMA guidelines suggest that changes of traffic flow of 30%, 60% and 90% are regarded as producing 'slight', 'moderate' and 'substantial' changes in severance respectively. However, there are no predictive formulae which give simple relationships between traffic factors and levels of severance.

14.6.14 The IEMA guidelines state that marginal changes in traffic flow are unlikely to create or remove severance, but that in determining whether severance is likely to be an important issue, consideration should be given to factors such as road width, traffic flow and composition, traffic speeds, the availability of crossing facilities and the number of movements that are likely to cross the affected route. Consideration should also be given to different groups such as the elderly and young children.

Driver Delay

14.6.15 Delays for drivers can occur at different points on the local highway network as a result of the additional traffic that would be generated by a development. The IEMA guidelines state that delays are only likely to be significant when the traffic on the network surrounding the development is already at, or close to, the capacity of the system.

Pedestrian Delay

14.6.16 Changes in the volume, composition or speed of traffic may affect the ability of people to cross roads. Therefore, increases in traffic levels are likely to lead to greater delays to pedestrians. Delays would also depend upon the general level of pedestrian activity, visibility and the general physical conditions of the crossing location.

14.6.17 Given the range of local factors and conditions that can influence pedestrian delay, the IEMA guidelines do not recommend that thresholds be used as a means to establish the significance of pedestrian delay, but recommend that reasoned judgements be made instead. However the IEMA guidelines note that, when existing traffic flows are low, increases in traffic of around 30% can double the delay experienced by pedestrians attempting to cross a road.

Pedestrian Amenity

14.6.18 Pedestrian amenity is broadly defined as the relative pleasantness of a journey, and is considered to be affected by traffic flow, traffic composition and pavement width/separation from traffic.

14.6.19 The IEMA guidelines note that changes in pedestrian amenity may be assessed as significant where the traffic flow is halved or doubled, with the former leading to a beneficial effect and the latter an adverse effect.

Fear and Intimidation

14.6.20 The scale of fear and intimidation experienced by pedestrians is dependent on the volume of traffic, its HGV composition, its proximity to people or the lack of protection caused by factors such as narrow pavement widths, together with factors such as the speed and size of vehicles.

14.6.21 There are no commonly agreed thresholds by which to determine the significance of fear and intimidation effects. However, the IEMA guidelines note previous work that has been undertaken, which puts forward thresholds that define the degree of hazard to pedestrians based on factors which include the average traffic flow, HGV flow and average speed (mph) over an 18 hour/day.

14.6.22 For traffic flow, increases of 600-1,200 vehicles are considered moderate, 1,200 to 1,800 vehicles great and more than 1,800 vehicles severe. For HGV flow, increases of 1,000 – 2,000 HGVs is considered moderate, 2,000 – 3,000 HGVs is considered great and more than 3,000 HGVs is considered severe. For average speed, increases between 10 and 15mph are considered moderate, increases between 15 and 20 mph are considered great and increases more than 20mph are considered severe.

14.6.23 The IEMA guidelines also note that special consideration should be given to areas where there are likely to be particular problems, such as high speed sections of road, locations of turning points and accesses. Consideration should also be given to areas frequented by school children, the elderly and other vulnerable groups.

Accidents and Safety

14.6.24 Due to the numerous local causation factors involved in personal injury accidents, the IEMA guidelines do not recommend the use of thresholds to determine significance. Instead professional judgement should be applied to the assessment. If a particular accident cluster is identified, then this may also justify further analysis and the implementation of measures to mitigate effects.

14.7 Predicted Effects: Construction Traffic

Predicted Traffic Movements

14.7.1 During the 12 month construction period, the following will access the Development Site:

- Low loaders to deliver equipment to the Development Site;
- Flat-bed trucks to deliver building materials;
- Semi-low extendable trailers, to deliver turbine components;
- Cranes, delivered as mobile units with associated low-loaders;
- Deliveries of concrete aggregate and stone;
- Deliveries of fuel and water by tanker; and
- Construction personnel to arrive by light commercial vehicle, car and minibus.

14.7.2 To estimate the generated traffic flows over the construction period, an assessment of a likely construction programme was undertaken to establish concurrent activities and the vehicle movement requirements of each activity. It should be noted that the monthly traffic movements are estimates based on the potential spread of construction activities over the anticipated 12 month construction period. While the actual number of movements per month may differ for a number of reasons, for example if weather delays progress or if the appointed construction contractor has a larger team than anticipated, the assumptions set out below allow a robust assessment to be made.

14.7.3 The definition of a traffic 'movement' is a two-way trip to/from the Development Site. The total traffic 'movements' generated during the 12 month construction programme are as follows:

- Circa 24,000 construction HGVs over 12 months; and
- 91 HGVs on an average day based on 22 working days per month (which assumes a 4 week month and a 5.5 day week).

14.7.4 **Tables 14.4** and **14.5** summarise the total number of movements by construction activity and show the expected monthly distribution over the construction year.

Table 14.4 Scenario 1: All Stone Imported

Activity	Total loads	Total trips (two way)
Delivery of plant and equipment	30	60
Road stone for Enabling Tracks and Compounds	4,990	9,980
Culvert and Bridge Materials	5	10
Stone for Crane Pads	1,328	2,656
Concrete for Control Building compound and HV Plinths	60	120
Geogrid	15	30
Delivery of Road Stone for Construction Compound	450	900
Delivery of Backfill Stone for Turbines	1,197	2,394
Delivery of Road Stone for Substation*	891	1,782
Delivery of Compound General Equipment	37	74
Delivery of Electrical Equipment	60	120
Cabling	10	20
Sand	124	248
Turbine Bases (concrete)	2,375	4,750
External Transformers	7	14
Reinforcing Steel + Shuttering	73	146
Base Rings	7	14
Concrete for WTG Transformer foundations (ext.)	29	58
Delivery of Met Mast concrete	5	10
Delivery of Met Mast equipment	8	16
Crane Delivery and Removal	15	30
Delivery of HV Plinth Concrete	63	126
Delivery of Turbines (abnormal loads only on delivery)	190	380
Removal of Plant and equipment	30	60
Total	**11,999**	**23,998**
Total without delivery of turbines	**11,809**	**23,618**
***Includes the delivery of road stone for control building compound.**		

Table 14.5 Monthly Construction Programme

Activity	Month												
	1	2	3	4	5	6	7	8	9	10	11	12	Total
Delivery of temporary compound fencing and huts		37											**37**
Delivery of plant and equipment	60												**60**
Road stone for tracks and temporary compounds	2,720	2,720	2,720	2,720									**10,880**
Culvert and bridge materials	5	5											**10**
Stone for crane pads		664	664	664	664								**2,656**
Stone for substation compounds	891	891											**1,782**
Concrete for control building compound and HV plinths		123	123										**246**
Geogrid	10	10	10										**30**
Delivery of control building equipment							30	30					**60**
Delivery of SS electrical equipment							30	30					**60**
Cabling							10	10					**20**
Sand						125	125						**250**
Turbine bases (concrete)			950	950	950	950	950						**4,750**
External transformers					4	4	4	2					**14**
Reinforcing steel and shuttering				41	35	35	35						**146**
Base rings				3	3	3	3	2					**14**
Concrete for WTG transformer foundations (ext.)					14	14	14	16					**58**

Activity	Month												
	1	2	3	4	5	6	7	8	9	10	11	12	Total
Delivery of met mass concrete					10								**10**
Delivery of met mass equipment						16							**16**
Crane delivery							15						**15**
WTG Backfill						798	798	798					**2,394**
Delivery of turbines (abnormal loads only on delivery)									190	190			**380**
Crane removal											15		**15**
Removal of plant and compound equipment											37	60	**97**
Total without deliveries of concrete for turbine bases	**3686**	**4450**	**3517**	**3428**	**730**	**995**	**1064**	**888**	**190**	**190**	**52**	**60**	**19250**
Total with delivery of concrete for turbine bases	**3686**	**4450**	**4467**	**4378**	**1680**	**1945**	**2014**	**888**	**190**	**190**	**52**	**60**	**24000**
Movements/day (average)*	**168**	**204**	**204**	**200**	**78**	**90**	**92**	**42**	**10**	**10**	**4**	**4**	**1106**
Movements/hr (average 12hr day)*	**14**	**18**	**18**	**18**	**8**	**8**	**8**	**4**	**2**	**2**	**2**	**2**	**104**
***Including delivery of concrete for turbine bases and rounded up to the nearest even number to take account of an arrival and departure trip**													

14.7.5 Month 3 in the construction programme generates the highest number of trips (4467) with a total of 204 movements per day or 18 per hour across a 12 hour working day (Mon-Fri 0700-1900)[1]. The figures for month 3 will be used to present the worst-case for the assessment.

Percentage Impact

14.7.6 The effects of construction related traffic identified in **Tables 14.4** and **14.5** above, have been calculated, in percentage terms, relative to the background traffic numbers based on 2015 data as noted in the 'Predicted Future Baseline' section.

[1] While month 2 and 3 are equivalent in terms of daily and hourly movements when rounding these up to the nearest even number to take account of an arrival and departure trip as noted in Table 14.5, the raw numbers in month 3 are marginally higher than month 2 (4467 and 203.0 total and daily movements respectively in comparison to 4450 and 202.2).

Table 14.6 Predicted Percentage Impact During Construction Period

Road	Base traffic flows			Construction traffic (HGVs)	Base + Construction			% change in traffic flows	
	Total Vehicles	HGVs	% HGV		Total Vehicles	HGVs	% HGV	Total vehicles	HGVs
B743	998	74	7%	204	1,202	278	23%	+20%	+16%
B705	3,312	68	2%	204	3,516	272	8%	+6%	+6%
A76	5,264	878	17%	204	5,468	1,082	20%	+4%	+3%
B741	653	26	4%	204	857	230	27%	+31%	+23%

14.7.7 With reference to **Table 14.6** it can be seen that for the B743, B705 and the A76, the increase in both total vehicles and HGV% is well below the respective 30% and 10% thresholds that necessitate the assessment of affects for the B743 (30% threshold), B705 (10% threshold) and A76 (10% threshold). It can therefore be concluded that an assessment of effects for the Quarry route, as well as the villages located along these roads is not required. Along the B741 however the total number of vehicles does exceed the 30% threshold that necessitates the assessment of effects. An assessment of effects is provided below.

Severance

14.7.8 Severance is the perceived division that can occur within a community when it becomes separated by a major traffic artery and is used to describe the factors that separate people from other people and places. In the case of the B741, there are no public facilities present along the highway between New Cumnock and the Site Access. Development fronting the highway is low density and well dispersed along its length. As such the need to cross the highway is considered to be extremely limited and therefore there are not considered to be any issues with severance.

Effect on Severance: **Not Significant.**

Driver Delay

14.7.9 The level of traffic utilising the B741 is well below the typical link capacity for a rural single carriageway highway (S2). In accordance with DMRB TA46/97 an S2 category highway can accommodate up to 13,000 AADT. Given the current level of traffic is below 1,000 AADT, no impact on driver delay is anticipated.

Effect on Driver Delay: **Not Significant.**

Pedestrian Delay

14.7.10 Development along the highway is sparse and well dispersed. As specified there are unlikely to be a significant number of pedestrians crossing the highway due to the lack of facilities, as such no impacts to pedestrian delay are anticipated.

Effect on Pedestrian Delay: **Not Significant.**

Pedestrian Amenity

14.7.11 As mentioned in **Section 14.6.19**, an impact on pedestrian amenity is only discernible when the traffic flows either halve or double. Given the anticipated increase is significantly below this threshold, no impact on pedestrian amenity is anticipated.

Effect on Pedestrian Amenity: **Not Significant.**

Fear and Intimidation

14.7.12 As mentioned in **Section 14.6.22**, an impact on fear and intimidation is considered to be moderate when traffic flows increase between 600-1200 vehicles a day. Given the increase in vehicles numbers will reach a maximum of 204, no impact on fear and intimidation is expected.

Effect on Fear and Intimidation: **Not Significant.**

14.8 Mitigation and Enhancement Measures

14.8.1 The following sets out the proposed contents of the TMP, which will form a separate standalone document. It is expected that additional measures from the appointed haulier and the Roads Authority will also be incorporated prior to its implementation.

Construction Traffic Management Plan (TMP)

14.8.2 Following planning approval of the Proposed Development, further detailed discussions will be held with the roads authorities by the appointed construction contractor to agree any variations or additions to the Construction TMP proposed hereunder:

- Further detailed discussions will be held with the roads authorities by the appointed construction contractor to agree the traffic control requirements during the construction phase;
- Police presence and assistance with traffic control will be arranged from the port of entry (anticipated to be the Port of Ayr) and along the route as the long low-loader vehicle's manoeuvring speeds will be slow at junctions and will encroach onto the opposing lane on tight bends and around some roundabouts;
- Abnormal load deliveries would be planned to leave the port mid-morning, and arrive on the Development Site mid-afternoon i.e. prior to nightfall;
- During times of abnormal load deliveries and peak construction traffic activity, trained monitors with two-way radios will be stationed at key points to control the flow of traffic to the Development Site to allow free-flow two-way traffic;
- The road haulier will obtain the required permits for abnormal loads from Transport Scotland, who liaise with the relevant affected councils and other interested organisations, for the total route from port of entry to the Development Site;
- Construction traffic movements (equipment and materials) will, where possible, be scheduled to avoid the peak traffic periods at the beginning and end of each day and other sensitive periods (including school drop off and pick up times), in order to minimise any potential disturbance to local traffic;
- Information will be provided by the construction contractor to the roads authorities, affected councils, and community leaders to facilitate the distribution of information relating to the construction period, including construction traffic flows. Residents on the local roads will also be kept informed by the contractor on a regular basis during the construction works, to follow good practice;
- Signage would be erected on the main routes advising of the frequency and overall period of abnormal load vehicle convoy movements to allow motorists advance warning;
- Wheel washing and road sweeping will be carried out where required to ensure that local highways are kept clear of mud and debris; and
- All HGVs transferring loose material will be covered to mitigate against any spillage onto the highway or any adjacent footways.

14.8.3 A summary of the incorporated mitigation measures is presented within **Table 14.7**.

Table 14.7 Incorporated Mitigation Measures

Potential Receptor and Effect	Mitigation Measure	Responsibility for Implementation	Compliance Mechanism
Accidents and Safety **Construction vehicles could carry mud and debris onto the carriageway** **Motorists, especially motorcyclists** **Pedestrians, Cyclists**	The increase in traffic flows during the construction period is unlikely to result in increased frequency of accidents or reduced safety. A TMP will include measures such as wheel washing and preventing debris on the carriageway. Wash down facilities will be installed on the access road should this be identified as a problem, with works being halted prior to installation in such instances.	Developer through contractual arrangements with construction contractor.	Planning condition relating to the production of TMP. Daily observations should be made to confirm whether the wheel washing facility is effective.

Potential Receptor and Effect	Mitigation Measure	Responsibility for Implementation	Compliance Mechanism
Driver Delay **Effect of abnormal loads on traffic flow**	Police escorts and possible timing of deliveries within quiet periods. Use of accompanying police and escort vehicles to control traffic on the route in advance of the abnormal load passing through. Abnormal Movement Licence. Temporary highway signing. Advertising.	Developer through contractual arrangements with appointed haulier.	Planning condition relating to the production of the TMP to be agreed with Roads Authority. Agreement with local constabulary and submission of the relevant applications.
Effect of abnormal loads on the highway	Accommodation/Reinstatement works.	Developer through contractual arrangements with construction contractor.	Works to be agreed with Roads Authority.
Changed traffic flows on local roads **Driver Delay, Severance, Pedestrian Amenity** **Local residence, motorists, pedestrians, cyclists**	Specific travel routes to and from the Development Site will be defined for delivery vehicles.	Developer through contractual arrangements with construction company.	Planning condition relating to the production of the TMP to be agreed with Roads Authority.

14.9 Evaluation of Residual Effects

Construction

Severance

14.9.1 The effect will remain **Not Significant**.

Driver Delay

14.9.2 The effect will remain **Not Significant**.

Pedestrian Delay

14.9.3 The effect will remain **Not Significant**.

Pedestrian Amenity

14.9.4 The effect will remain **Not Significant**.

Accidents and Safety

14.9.5 As part of the Construction TMP, all loads carrying loose material will be covered and wheel wash facilities will be installed if carried debris is noted to be an issue.

14.9.6 It is therefore considered that the effect will be **Not Significant**.

Operational Effects

14.9.7 As noted earlier, effects associated with the operation of the Proposed Development will not be significant since the number of regular trips to the site will be limited to monthly inspections carried out in a 4x4 off road vehicle.

Decommissioning Effects

14.9.8 The magnitude of any change during decommissioning is likely to be less than during construction, particularly against a background of increasing baseline traffic flows in the future.

14.9.9 As part of the decommissioning process, all turbine components (towers, nacelle, hub, blades and electrical kiosk) will be broken down on site and removed using standard HGV vehicles, negating the need for any future abnormal loads. Concrete bases will be broken down to below ground level

and covered as opposed to being removed entirely, all cables will be cut to ground level and left underground and all access tracks will remain in situ.

14.9.10 As a result of the decommissioning process the traffic generation potential will be significantly lower than during construction. Furthermore, with the implementation of an appropriate TMP, significant effects are not anticipated. However, a separate assessment of effects could be conducted nearer the time should there be any concerns in respect of decommissioning.

14.10 Predicted Effects: Cumulative

14.10.1 In the case of this assessment it has been considered appropriate to take account of consented wind farms located within a 30km radius of the Development Site. A summary of each of the schemes is presented within **Table 14.8**. Whether or not these schemes will have a cumulative effect with the Proposed Development depends on the timing of the construction of these and on which supplier they source their construction material from, which will influence their proposed construction route. Where insufficient information is known about a scheme and its construction programme, it is possible that the traffic routes and programme could overlap; and therefore it is possible that there could be cumulative effects. For those schemes where the number of turbines is low i.e. less than five, or where construction is currently underway or its start imminent and is therefore likely to finish prior to Enoch Hill commencing, cumulative effects with Enoch Hill are unlikely.

14.10.2 A review of the locations for each of the cumulative developments has been undertaken, alongside a review of any supporting documents.

Table 14.8 Summary of Cumulative Assessment

Scheme	No. of Turbines	Access from	Anticipated Impact	Potential cumulative impact with Enoch Hill
Windy Standard Extension	30	Unknown	Currently in development according to Fred Olsen Renewables website.	Possibly
Afton	27	A76	The developer has stated that Afton Wind Farm will not be built in conjunction with Enoch Hill Wind Farm.	No
Hare Hill Extension	39	A76	Consented, being scheduled for construction.	No
Mansfield Mains	1	Mansfield Road (accessed from the A76)	Approved. No information available.	Approved in 2011, no details on whether works have commenced, but given the proposal is for a single turbine, cumulative impact is unlikely to be significant.
Sanquhar	12	A76	Consented, not in development.	There are no details available of the construction programme. As such, the potential to clash with Enoch is considered to be possible.
Dersalloch	23	B7045	Access to the site is via the B7045, further south of the Development Site. No construction traffic associated with this development is expected to use the highways being considered within the Enoch Hill assessment.	No
Whiteside Hill	11	A76 via Blackaddie Road, Sanquhar	Consented wind farm transferred to Blue Energy effective from 29th May 2015. Not in construction phase but developer website states construction will start in 2015 and be completed by 2017.	Possibly

Scheme	No. of Turbines	Access from	Anticipated Impact	Potential cumulative impact with Enoch Hill
Torrs Hill	2	Likely to be the A713	No accompanying report supporting the consented scheme has been identified. However, given the size of the scheme, it is not anticipated that the traffic generated during construction would be significant enough to warrant any further assessment of cumulative effects.	No
Sunnyside	2	Unknown	No accompanying report supporting the consented scheme has been identified. However, given the size of the scheme, it is not anticipated that the traffic generated during construction would be significant enough to warrant any further assessment of cumulative effects.	No
Penbreck	6	Unknown	No accompanying report supporting the consented scheme has been identified. However, given the size of the scheme, it is not anticipated that the traffic generated during construction would be significant enough to warrant any further assessment of cumulative effects.	No
Twentyshilling Hill	9	A76	Currently in construction phase according to energy supplier project website. No details regarding construction flows available.	No
Knockman Hill	5	A702	Access to the site is via the A702, which routes in the opposing direction to the Enoch Hill Development Site. No construction traffic associated with this development is expected to use the highways being considered within the Enoch Hill assessment.	No
Blackcraig Hill	23	A75	Access to the site is via the A75, which routes further to the south than the proposed development at Enoch Hill. No construction traffic associated with this development is expected to use the highways being considered within the Enoch Hill assessment.	No
Galawhistle	22	M74, J11	Construction work to commence in the second half of 2015 and 2016. No construction traffic associated with this development is expected to use the highways being considered within the Enoch Hill assessment.	No

14.10.3 While there is some uncertainty as to the construction programme/routes of some of these projects, in the event of parallel construction activities on the same routes, a joint Traffic Management Plan (TMP) may be developed. This would be aimed at minimising the adverse environmental effects associated with the traffic and transport during construction. On this basis, cumulative effects of construction traffic are unlikely to be significant.

14.11 Summary of Residual Effects

14.11.1 Residual effects are limited to the construction phase of the Proposed Development only and all are assessed to be negligible and thus not significant. **Table 14.9** sets out a summary of the residual effects.

Table 14.9 Summary of Residual Effects

Potential Receptor and Effect	Effect	Significance	Summary Rationale
Severance	No Effect	NS	This summary rationale applies to all receptors. A maximum average of 204 vehicles per day is estimated to be generated during month 3. This equates to an average of 18 HGVs per hour for delivery and return journey over a 12 hour working day. This level of increase is considered to be insignificant in terms of having an effect on severance, driver delay, pedestrian delay and amenity, fear and intimidation and accidents and safety. Furthermore, all changes are temporary and abnormal loads will be escorted. Good practice measures such as wheel washing/wash down facilities at the Development Site exit will minimise risk of accidents. The Development Site will also be controlled through a Construction TMP.
Driver Delay	No Effect	NS	
Pedestrian Delay	No Effect	NS	
Pedestrian Amenity	No effect	NS	
Fear and Intimidation	No Effect	NS	
Accidents and Safety	No Effect	NS	
Key/ Footnotes:	No Effect Negligible Slight Slight/Moderate Moderate Moderate/ Substantial Substantial Very Substantial	S = Significant NS = Not Significant	

14.12 References

Institute of Environmental Management and Assessment (1993) Guidance Notes No. 1: Guidelines for the Environmental Assessment of Road Traffic. Horncastle: IEMA.

15. Socioeconomics, Tourism & Recreation

15.1 Non Technical Summary

15.1.1 This chapter considers potential changes to land use, socio-economics, tourism and recreation as a result of the Proposed Development.

15.1.2 It is estimated that the capital cost of constructing the Proposed Development could equate to up between £73.4m and £112.8m (including turbine manufacturing) and up to £13.6m could be spent locally. During the construction phase, the Proposed Development could directly support up to 98.6 Full Time Equivalent (FTE) local jobs and up to 294.3 FTE jobs within Scotland for the duration of the construction phase. During its operational phase, operations and maintenance related employment could directly support up to 67.2 FTE jobs, of which up to 27.9 FTE jobs would be likely to be within East Ayrshire and up to 39.3 FTE jobs would be likely to be within Scotland. Other employment is also likely to be supported or generated through induced and indirect economic and employment effects throughout all phases of the Proposed Development. Therefore whilst significant economic and employment effects at council or national levels are not anticipated, the Proposed Development is predicted to result in temporary, beneficial significant economic effects at a local council ward level during the construction phase.

15.1.3 The construction, operational and decommissioning phases of the Proposed Development, whether individually or cumulatively, are not predicted to result in significant effects on tourism or recreational receptors or specific recreational pursuits identified. During construction and decommissioning, public access within the Development Site will be subject to temporary restriction, however once operational the Proposed Development offer improved access to the Development Site.

15.2 Introduction & Overview

15.2.1 This chapter describes the likely significant socio-economic impact of the proposed Enoch Hill Wind Farm (hereafter 'the Proposed Development') which would be located in East Ayrshire, approximately 5km to the south west of New Cumnock and approximately 7km to the north east of Dalmellington. The assessment considers the potential socio-economic effects of a wind farm consisting of up to 19 turbines being built in this location.

15.2.2 This chapter qualitatively assesses the potential impact of the Proposed Development on the baseline socio-economic, tourism and recreational situation of the local community and wider environment in the area, including Dumfries and Galloway adjacent to East Ayrshire. This chapter should be read with reference to the scheme description in **Chapter 4: - Description of the Proposed Development** and in conjunction with other relevant ES chapters.

15.2.3 Following a summary of relevant policy and legislation (see **Section 15.5**), this chapter describes the assessment methodology that has been adopted, the overall baseline conditions and how the scheme design has evolved. An assessment of the potentially significant effects of the final scheme design is then presented, followed by details of proposed mitigation and enhancement measures and a summary of residual effects.

15.2.4 The current baseline situation has been established with reference to publicly available information sources to reflect likely changes in demographics and economic circumstances in the study area. Previous research findings in relation to public and tourist attitudes towards wind farms have been referred to.

15.2.5 The Proposed Development may result in socio-economic effects at the regional level, for example, in relation to economic development, and also at the district/local level, principally affecting those who live in or visit the surrounding area. The potential effects resulting from the construction, operation and decommissioning of the Proposed Development considered in this chapter are:

- Direct effects on economic activity (e.g. business rates payable by the wind farm operator);
- Indirect and induced effects on economic activity at a regional and local level (e.g. supply chain, multiplier effects, economic stimulus generated from the expenditure of additional employment income);
- Direct effects on employment levels (e.g. construction workers);
- Direct effects on land use within the Development Site (e.g. loss of agricultural land, core paths); and
- Indirect effects on recreational use and tourism related business.

15.2.6 It is also pertinent to note that from a socio-economic context, the Proposed Development would make a contribution to the alleviation of the adverse consequences of global warming by providing a renewable source of energy that does not involve the emission of greenhouse gases during operation, compared with the greenhouse gas emissions associated with electricity produced using fossil fuels. For the purpose of this assessment, the amount of renewable electricity generation and total level of emissions avoided are considered beneficial.

15.3 Methodology & Approach

Guidance

15.3.1 There are no specific guidelines or requirements for socio-economic assessment either set out by the Electricity Works (Environmental Impacts Assessment) (Scotland) Regulations 2000 or in any other statutory or advisory guidance regarding the preparation of EIAs. The method adopted is therefore one of determining the existing circumstances (the baseline) through desk-based analysis, drawing on a range of statistical information and consultations with regional and local representative bodies as well as members of the community during public exhibitions, opinion polls and through various forms of correspondence.

15.3.2 The potential effects of the Proposed Development on this baseline are then assessed using knowledge gained from previous wind farm developments and using professional judgement to assess the nature and implications of any residual effects after mitigation is taken into account. Where possible (and quantifiable), the significance will be assessed by way of comparison of the factor (e.g. construction jobs) with the variance of related factors within the local economy. Where effects cannot be quantified, the assessment of significance will be undertaken using professional judgement and experience. Whilst acknowledging there are no specific guidelines or requirements for this type of assessment, there are a number of methodologies, guidance and studies available for undertaking socio-economic assessments. The documents considered for undertaking this assessment are:

- BiGGAR Economics for Renewable UK. (2015) Onshore Wind: Economic Impacts in 2014 for Renewable UK (The BiGGAR Report 2015);
- BiGGAR Economics for DECC & Renewable UK. (2012) Economic Impact of Onshore Wind: Direct & Wider Economic Impacts (BiGGAR Economics) Report (The BiGGAR Report 2012);
- DECC. (2011) Review of the Generation Costs and Deployment Potential of Renewable Energy Technologies in the UK;
- IEMA. (2004) Guidelines for Environmental Impact Assessment;
- Morris, P and Therivel, R. (2009) Methods of Environmental Impact Assessment[1];

[1] This document explains how the EIA process works and provides best practice guidance to ensure that EIA is carried out correctly. It demonstrates the relationship between the overall EIA process and constituent subject specific assessments including socio-economic impact assessments.

- O'Herlihy and Co Ltd (2006). Windfarm Construction: Economic Impact Appraisal, A Report to Scottish Enterprise (The O'Herlihy Report)[2];
- Scottish Natural Heritage. (2014) A handbook on environmental impact assessment: Guidance for Competent Authorities, Consultees and others involved in the Environmental Impact Assessment Process in Scotland; and
- The Economic Impacts of Wind Farms on Scottish Tourism: A Report for the Scottish Government. The Moffat Centre for Travel and Tourism Business Development. (March 2008) Glasgow Caledonian University.

Baseline Establishment

15.3.3 The assessment includes an extensive review of publicly available information sources to establish the baseline conditions relating to local population levels, key components of the local economy, existing land uses, and potential tourism and recreational receptors located within 35km of the Development Site. Given that the Proposed Development is not expected to result in any changes to housing needs, the baseline situation regarding housing provision was not considered and effects related to housing were scoped out of the assessment.

15.3.4 The assessment uses standard socio-economic and demographic data from available datasets including the 2011 Census, NOMIS and the Office for National Statistics website, standard sources of tourist and visitor data found on Visit Scotland's website, and other individual research reports. Relevant conclusions from polls and surveys carried out regarding public and tourist attitudes to wind farms have also been considered.

Assessment Study Areas

15.3.5 The socioeconomic study area used within this assessment is based on the administrative boundary for East Ayrshire Council and, in particular, the Cumnock and New Cumnock ward within which the Development Site is located. Low level socio-economic data for the three 2011 census output areas (OA S00099809, OA S00100714 and OA S00099810) and two data zones (DZ S01001269 and DZ S01001276) which partially fall within the Development Site is also reported where it is available. In addition, the Dumfries and Galloway Council area and the Doon Valley ward of East Ayrshire Council have been included in this assessment as comparator areas given their close proximity to the Development Site. The findings from this desk based study form the baseline for this socio-economic assessment and are reported in **Section 15.7**.

15.3.6 The tourism and recreation Study Area used within this assessment is derived from the landscape and visual assessment (LVIA) reported within **Chapter 9** of this ES which, in accordance with current SNH guidance, utilised a 35km visual study area. Potential tourism and recreational receptors within the same study area are identified within the baseline section (**Section 15.7**) of this assessment.

15.3.7 Recreational and tourist receptors located outwith 35km radius from the Development Site are excluded from both the LVIA and from this assessment as there would be very limited potential effects on visitor attractiveness and tourism due to the limited magnitude of visual change likely to occur beyond this distance. Receptors located outwith 10km of the Development Site and which are assessed in the LVIA as not experiencing significant adverse visual effects (excluding receptors identified by Visit Scotland as being within the top five regional visitor attractions in 2013), and receptors located outwith the zone of theoretical visibility (ZTV) have also been excluded from this socio-economic assessment. In both cases, these receptors (listed in **Appendix**

[2] This report presents the findings of a review of three Scottish wind farm developments. The review was undertaken on behalf of Scottish Enterprise Lanarkshire and Scottish Enterprise Dumfries and Galloway. The report provides a financial and economic model which factors in design complexity, scale and planning processes to an overall calculation of the economic contribution from proposed wind farm developments. The model and its derivatives have been used extensively by commercial organisations to support their planning applications since its publication.

15.A) are unlikely to experience significant effects in terms of visitor attractiveness and tourism potential taking account of the result of the **Chapter 9 - LVIA** and distance.

Consultation

15.3.8 This socio-economic, tourism and recreation assessment closely follows the approach set out in the Enoch Hill EIA Scoping Report (November 2012) and conforms with the subsequent Scoping Opinion issued by the Scottish Government (March 2013). In doing so it takes into consideration associated consultation responses from statutory consultees. Consultation responses of particular relevance to this socio-economic, tourism and recreation assessment were received from several organisations, as detailed in **Table 15.1**.

Table 15.1 Relevant Scoping Consultation Responses

Consultee	Summary of Consultation Response
Dalmellington Community Council (DCC)	Objected to the Proposed Development on concerns on the impact to the Scottish Dark Sky Observatory within Galloway Forest Dark Sky Park.
East Ayrshire Council	If any re-routing of paths is required alternative routes should be highlighted for consideration.
Visit Scotland	Visual impact on hill walkers should be assessed from areas such as Cairnsmore of Carsphairn and Windy Standard and Loch Doon. Requested impact on Scottish Dark Sky Observatory and on Craigengillan Estate be considered.

15.4 Methodology for Establishment of Effects

15.4.1 The Proposed Development has the potential to generate a range of socio-economic, tourism and recreational effects. The method adopted for this assessment draws on publicly available information and is based upon the approach set out in Morris and Therivel (2009) as follows:

- Establishing the baseline to determine the existing socio-economic characteristics of the Development Site and its surrounding area (receptors);
- Defining receptor sensitivity to wind farm development where possible;
- Identifying the potential change that the receptor would experience as a result of the Proposed Development, with consideration given to its magnitude, duration (e.g. short/long term, temporary/permanent) and valency (i.e. adverse/beneficial);
- Identifying the significance of potential socio-economic effects;
- Identifying mitigation measures where significant adverse effects are predicted; and
- Identifying any residual effects after mitigation.

15.4.2 Predicted economic and employment effects from the construction, operational and decommissioning phases of proposed onshore wind energy developments have been calculated using the guidance set out in the O'Herlihy Report (2006), the BiGGAR Report (2012) and the updated BiGGAR Report (2015).

15.4.3 The guidance used to assess effects on recreational activities (including public outdoor access) accords with guidance contained within Appendix 5 of 'A handbook on environmental impact assessment' (SNH, 2013). In particular, the assessment of potential impacts on physical access considers any changes to existing access arrangements during the construction, operation or decommissioning phases of the Proposed Development.

15.4.4 The tourism assessment follows the standards set out in the recommendations of the Moffat Report (2008). Therefore the assessment of predicted effects on leisure and tourism interests takes

account of the findings detailed in **Chapter 7** (Noise), **Chapter 9** (Landscape and Visual Assessment), **Chapter 10** (Historic Environment) and **Chapter 14** (Traffic and Transport).

15.4.5 Where possible, guidance has been used to establish the potential effects. Where there is no prescribed guidance, professional judgement and previous experience of wind farm development has been used.

15.4.6 The employment impacts within the study area are defined in terms of Full-Time Equivalent (FTE) jobs[3] associated with predicted capital expenditure. The assessment has therefore focused on the following impact categories:

- Direct economic impacts: jobs and capital spend that are wholly or largely related to construction, decommissioning, and operation and maintenance of the Proposed Development;
- Indirect economic impacts (positive and negative): jobs and capital spend generated in the economy of the study area in the chain of suppliers of goods and services to the direct activities;
- Induced economic impacts: jobs and capital spend created by direct and indirect employees' spending in the study area or in the wider economy; and
- Wider economic (catalytic) impacts (positive and negative): employment and income generated in the economy related to the Proposed Development. This will include the effects on inward investment elsewhere within the construction sector, (e.g. as a result of worker supply) and on other sectors of the economy.

15.4.7 For employment effects the availability of labour and skills is critical in accommodating the demands, needs and requirements of the Proposed Development. Adequate labour and skills capacity results in a low sensitivity, while limited labour and skills capacity results in a high sensitivity. Sensitivity criteria in terms of employment are shown below in **Table 15.2**.

Table 15.2 Employment Sensitivity

Sensitivity	**Definition**
High	Where there is a low / limited availability of labour and skills
Medium	Where there is a constrained supply of labour and skills
Low	Where there is a readily available labour force and skills

15.4.8 The magnitude of potential changes/impacts on socio-economic receptors are assessed as defined in **Table 15.3**. In the case of employment effects, this is based on participants within the labour force; and the level of occupational skills available in the study area (**see Table 15.2**).

Table 15.3 Industry and Economic Magnitude of Change

Magnitude of Change	**Definition**
Large	Changes as a result of the Proposed Development that are of greater than local scale or which exceeds recognised standards
Medium	Changes as a result of the Proposed Development that are likely to be noticeable at a local scale
Small/Negligible	Slight to no change as a result of the Proposed Development

3 Full Time Equivalent (FTE) jobs are not officially defined in the UK but are usually considered to be jobs which involve a minimum of 35 hours work per week.

15.4.9 Public access, tourism and recreational receptors will only be adversely affected where the physical impacts (landscape, visual, noise, land-use, etc.) of the Proposed Development adversely affects visitor/user experience, visitor/user numbers or associated levels of expenditure. As such, any potential variation in expenditure or visitor/user numbers affecting individual receptors, and consequent effects on business turnover or employment are of key importance.

15.4.10 Recreational behaviour will be affected where a development potentially leads to a change in recreational habits or activities. Recent guidance from SNH[4] notes that factors which might lead to changes in recreational behaviour include loss, closure, or diversion of access routes; obstructing access routes; enhancing access; reduction in amenity or intrusion; enhancement in amenity; and changes in the setting of recreational receptors.

15.4.11 The potential effect on recreational users and tourist visitors is likely to be a factor of the proximity of the Proposed Development to receptors, the receptor/resource type and usage (e.g. a town centre indoor recreational facility compared to a hill top view point), visibility of the Proposed Development from receptors, and the need for any public access diversion due to the Proposed Development's presence.

15.4.12 The main factors considered relevant when defining the sensitivity of receptors relating to public access, recreation and tourism are outlined in **Table 15.4**.

Table 15.4 Sensitivity of Tourism and Recreational Receptors

Sensitivity	**Definition**
High	Where the receptor or resource is defined as being of International or National status or high visitor/user numbers
Medium	Where the receptor or resource is defined as being of regional status or medium visitors/user numbers
Low	Where the receptor or resource is defined as being of local status or low visitor/user numbers

15.4.13 The magnitude of change will be gauged by estimating the level of change on the receptor as a result of the Proposed Development. The magnitude of change will be evaluated in line with the criteria detailed in **Table 15.5**.

Table 15.5 Tourism and Recreational Magnitude of Change

Magnitude of Change	**Definition**
Large	Where the extent of changes (e.g. changes in visitor attractiveness, visitor numbers, etc.) on receptors (routes, activities, resources, or businesses) is large scale and a large number of people or activities will be affected.
Medium	Where the extent of changes (e.g. changes in visitor attractiveness, visitor numbers, etc.) on receptors is small in scale, but a large number of people or activities will be affected; or alternatively where the extent of effects on activities, resources and/or businesses is large in scale but only a small number of people or activities will be affected.
Small/Negligible	Where the extent of changes (e.g. changes in visitor attractiveness, visitor numbers, etc.) on receptors is small in scale and will only affect a small number of people or activities.

[4] A handbook on environmental impact assessment (SNH, 2013)

15.4.14 In line with standard EIA practice and taking into account professional judgement, the sensitivity of receptors, as defined in **Table 15.2** and **Table 15.4** are generally considered against the magnitude of change (**Table 15.3** and **Table 15.5**) to determine the significance of resultant effects. A matrix showing this relationship is provided in **Table 15.6**.

Table 15.6 Establishing the Level of Effect

		Receptor Sensitivity		
Magnitude of change		**HIGH**	**MEDIUM**	**LOW**
	LARGE	VERY SUBSTANTIAL	SUBSTANTIAL	SLIGHT / MODERATE
	MEDIUM	SUBSTANTIAL	MODERATE	SLIGHT
	SMALL	SLIGHT / MODERATE	SLIGHT	NEGLIGIBLE / SLIGHT

15.4.15 Based on the approach summarised in **Table 15.6**, predicted changes from the baseline position that would result in either substantial or very substantial levels of effect are considered to be significant in terms of the EIA Regulations and these cells in **Table 15.6** are shaded in grey.

15.5 Policy Context

15.5.1 National, regional and local planning policies as well as policies in respect of economic development, tourism, and wider social and community effects have influenced the design of the Proposed Development, and as such these must be considered within this assessment.

15.5.2 National, regional and local planning policy sets out a presumption in favour of renewable energy development. Local Planning Authorities are also required to balance the benefits delivered by renewable energy schemes against any predicted adverse effects. **Chapter 5 – Planning Policy Context** and **Chapter 6 – Renewable Energy Policy, Carbon Balance and Peat Management** provide an overview of all relevant planning and energy policies.

15.5.3 The following policy documents were examined for their relevance to the socio-economic, tourism and recreation assessment of the Proposed Development:

- National Planning Framework (NPF) 3 (2014);
- The Scottish Planning Policy (SPP) (2014);
- Scotland's Economic Strategy (2015);
- A Low Carbon Economic Strategy for Scotland (2011);
- The Ayrshire Joint Structure Plan (approved 2007);
- The East Ayrshire Local Plan (adopted 2010);
- East Ayrshire Local Development Plan Proposed Plan (2015);
- East Ayrshire Economic Development Strategy 2014 - 2025;
- Ayrshire & Arran Tourism Strategy 2012-2017;
- East Ayrshire Tourism Strategy and Action Plan 2009-2015;
- Dumfries and Galloway Local Development Plan (LDP) (2014); and

- Dumfries and Galloway Regional Tourism Strategy 2011 – 2016.

Scottish Plans, Policies & Strategies

National Planning Framework 3 (NPF3) (Scottish Government, 2014)

15.5.4 The NPF3 provides a statutory framework around which to orientate Scotland's long-term spatial development. The Framework represents the spatial expression of the Scottish Government's Economic Strategy and it highlights the spatial planning implications of multiple national policy documents and commitments, including the binding decarbonisation targets enshrined within the Climate Change (Scotland) Act 2009.

15.5.5 The NPF3 identifies Scotland's key economic sectors including energy; food and drink; and tourism. It recognises the important role of rural areas in supporting economic sectors including tourism, food and drink and other primary industries and notes that "*growth and investment in these sectors relies on the continuing environmental quality of our countryside, infrastructure and the sustainable use of our natural resources*". This is balanced by a recognition that development in rural areas should not be unnecessarily constrained.

Scottish Planning Policy (SPP) (Scottish Government, 2014)

15.5.6 The SPP's 'Supporting Business and Employment' Subject Policy identifies the following of relevance to the Proposed Development:

- *"Promote business and industrial development that increases economic activity while safeguarding and enhancing the natural and built environments as national assets; and*
- *Give due weight to net economic benefit of proposed development".*

15.5.7 The SPP further states that proposals "should take into account surrounding sensitive uses, areas of particular natural sensitivity or interest and local amenity, and make a positive contribution towards placemaking".

Scotland's Economic Strategy (Scottish Government, 2015)

15.5.8 This document identifies the transition to a low carbon economy, including the deployment of renewable energy technologies, as a "*key aspect*" of the current Economic Strategy for Scotland.

A Low Carbon Economic Strategy for Scotland (Scottish Government, 2010)

15.5.9 This strategy explains how the Scottish Government intends to transition Scotland's current economy towards a low carbon one and explores the predicted socio-economic impacts of this transformation, including on inward investment and employment. Energy generation is identified as a key economic sector where substantial decarbonisation is required in order to meet statutory climate change targets. The document observes that "*onshore wind is still the technology that can make the most immediate positive impact on our low carbon economy*" (:90) and therefore envisages the continued deployment of onshore wind farms, stating that "*the Scottish Government will continue to encourage large, medium and small scale developments that are sited appropriately*" (:90).

Regional & Local Plans, Policies & Strategies

Ayrshire Joint Structure Plan (2007)

15.5.10 The Ayrshire Joint Structure Plan recognises the potential for renewable energy developments to "*act as an economic and sustainable driver of local economies for the future*". The potential benefits wind farm developments can bring to local communities and the role they can play in economic regeneration are specifically noted.

15.5.11 Policies of potential relevance to this socio-economic impact assessment are:

- Policy STRAT 1 – Sustainable Development;
- Policy ECON 6 Renewable Energy;
- Policy ECON 7 – Wind Farms;

- Policy ECON 14 – Rural Diversification;
- Policy ENV 1 - Landscape Quality;
- Policy ENV 2 – Landscape Protection; and
- Policy ENV 7 – Natural Heritage Designations.

East Ayrshire Local Plan (2010)

15.5.12 Policies of potential relevance to this socio-economic impact assessment are:

- Policy CS12 – Renewable Energy Developments;
- Policy CS14 - Wind Energy Development;
- Policy CS15 – Renewable Energy Fund;
- Policy CS17 – Cumulative Effects of Wind Farms;
- Policy ENV15 – Rural Landscape Features;
- Policy ENV16 - Landscape Character of Rural Areas; and
- Policy ENV17 – Land in Rural Areas.

15.5.13 Of particular relevance to this socio-economic assessment is Local Plan CS15, which states that for commercial wind farm developments renewable energy funds should be set up to compensate local communities affected by the development. The policy requires that for the first 10 years of a project's life, the fund should be used solely for local projects within 10km of the development. Thereafter, the fund should be split evenly between local projects and projects across the wider East Ayrshire area. Section **15.13** of this chapter provides further details of the community fund that has been pledged by the applicant in connection with the Proposed Development.

East Ayrshire Local Development Plan Proposed Plan

15.5.14 The following proposed policies are relevant to this socio-economic impact assessment:

- Policy OP1: Overarching Policy;
- Policy RE1: Renewable Energy Developments;
- Policy RE3: Wind energy proposals over 50 metres in height;
- Policy RE5: Wind Energy and the Landscape;
- Policy TOUR4: The Dark Sky Park;
- Policy TOUR5: Galloway and Southern Ayrshire Biosphere;
- Policy T4: Development and Protection of Core Paths and Natural Routes;
- Policy ENV7: Wild Land and Sensitive Landscape Areas;
- Policy ENV8: Protecting and Enhancing the Landscape; and
- Policy ENV12: Water, Air and Light and Noise Pollution.

East Ayrshire Economic Development Strategy 2014-2025

15.5.15 The current economic development strategy for East Ayrshire sets out the baseline economic position of East Ayrshire and a series of economic development priorities with associated key actions for the local authority over the period 2014- 2025. The Strategy is aligned with the vision set out in the approved East Ayrshire Community Plan (2015), namely to create:

"*A thriving area with a strong local economy delivering higher levels of sustainable growth and employment for the benefit of existing and future residents*".

15.5.16 Six key priorities are identified to implement this economic development vision:

- Integrate East Ayrshire with the regional economy;
- Facilitate economic restructuring;
- Improve the vibrancy of our town centres;
- Improve the quality of the tourism offer;
- Increase economic participation in our communities; and
- Accelerate the pace of infrastructure improvements.

15.5.17 Under Priority 2 – Economic Restructuring, renewables is identified as a "*primary growth sector*" and the need to "*support rural diversification and spread the benefits of investment across our communities*" is acknowledged.

Ayrshire & Arran Tourism Strategy 2012-2017

15.5.18 Published by the Ayrshire Economic Partnership, this strategy is supported by four relevant objectives:

- "Increase annual number of visitors coming to Ayrshire and Arran by 10%, from 3.50 million to 3.85 million;
- Increase annual spend by visitors by 20% from £348 million to £418 million;
- Increase employment supported by the sector by 10% from 8,915 jobs to 9,807 jobs; and
- Enhance and conserve the region's natural, heritage and cultural assets".

15.5.19 The strategy identifies eight important tourism offers in Ayrshire and Arran, all of which have significant growth potential: "Culture & Heritage, including Burns; Activities & Natural Environment, Golf, Sailing, Food & Drink, Islands, Weddings & Civil Partnerships, and Business Tourism".

East Ayrshire Tourism Strategy and Action Plan 2009-2015

15.5.20 This document outlines a strategic ambition to grow tourism revenue by 10% in real terms in East Ayrshire by 2015. It highlights the importance of sustainable tourism development and specifically calls for growth in the green tourism sector. One of the strategy's key objectives is to strengthen the promotion of East Ayrshire as a green tourism destination.

Dumfries & Galloway Local Development Plan

15.5.21 As detailed in **Chapter 5 – Planning Policy**, multiple policies within the Dumfries and Galloway LDP (2014) are of relevance to the Proposed Development. Of these, the following policies are potentially relevant to this socio-economic impact assessment:

- Policy IN1: Renewable Energy;
- Policy IN2: Wind Energy;
- Policy ED12: Dark Sky Park; and
- Policy CF4: Access Routes.

Dumfries and Galloway Regional Tourism Strategy (2011 – 2016)

15.5.22 This strategy acknowledges the importance of the tourism sector to the local and regional economy, noting that tourism is one of the top three employment sectors in Dumfries & Galloway.

15.6 Review of Tourism & Public Attitudes to Wind Farm Development Studies

15.6.1 A number of studies have been consulted to gather information on public attitudes towards wind farm development and in particular the potential effects of wind farm development on tourism. Several surveys and research studies have been reviewed as part of this assessment:

- DECC (August 2014) Public attitudes tracking survey: wave 10 - headline findings;
- ComRes (August 2014) REG Windpower – On-shore Wind Public Survey;
- ComRes (July 2014) RenewableUK – Renewable Energy Survey;
- YouGov (February 2013) YouGov/Scottish Renewables Survey Results;
- MORI. (April 2013) Renewable UK Wind Power omnibus research;
- Demski, C., Spence, A. and Pidgeon, N. (2013) Transforming the UK Energy System: Public Values, Attitudes and Acceptability – Summary findings of a survey conducted August 2012. (UKERC: London);
- MORI. (September 2002) Tourist Attitudes towards Wind Farms. British Wind Energy Association and Scottish Renewable Forum;
- Moffat Centre. (March 2008) The Economic Impacts of Wind Farms on Scottish Tourism: A Report for the Scottish Government. Glasgow Caledonian University; and
- Visit Scotland. (2012) Wind Farm Consumer Research.

15.6.2 **Appendix 15.B** provides an overview of these surveys and polls and summarises pertinent conclusions from 'The Economic Impacts of Wind Farms on Scottish Tourism: A Report for the Scottish Government' (referred to as 'the Moffat Report').

15.6.3 Overall, the evidence provided in **Appendix 15.B** suggests that whilst there are clearly different views on the acceptability of wind farms, there is no conclusive data to demonstrate that tourism is generally adversely affected by wind farm developments. Indeed, in the final report of its inquiry into the achievability of the Scottish Government's 2020 renewable energy targets the Scottish Parliament's Economy, Energy and Tourism Committee concluded that "*no witness has provided the Committee with robust, empirical evidence, as opposed to anecdotal comment and opinion, that tourism is being negatively affected by the development of renewable projects*" (Scottish Parliament, 2012: 8).

15.6.4 Nevertheless, it is necessary to consider the associated impacts of wind energy development on tourism and wider recreational activities as a result of impacts upon landscape and visual amenity, hydrology, cultural heritage and traffic. This assessment therefore identified predicted effects from the Proposed Development on tourism and recreational receptors.

15.7 Baseline Information

Renewable Energy Industry

Manufacturing & Supply Chain

15.7.1 At the time of writing, there are large scale wind turbine manufacturing plants located at Chepstow and Machrihanish near Campbeltown. The Wind Towers (Scotland) Ltd facility at Machrihanish currently employs approximately 130 workers. It should be noted that the Chepstow plant is due to close in September 2015. There are further facilities distributed throughout northern Europe.

15.7.2 In addition to this, several leading engineering and energy companies have announced their intention to invest significant funds in deploying large-scale, next generation renewable energy technologies across Scotland, including at Fife Energy Park and Clydeport's Hunterston site. Businesses across Scotland are involved in developing secondary components for wind turbines, including gear boxes, although it should be noted that these components are not required solely for wind turbines.

Employment & Investment

15.7.3 In January 2014 Scottish Renewables published a report entitled 'Employment in Renewable Energy in Scotland' by O'Herlihy & Co. which demonstrates that in 2013 there were at least 11,625 FTE posts within Scotland's renewable energy sector. This includes 3,397 FTE posts within the onshore wind subsector, which has at least 343 firms operating in it, 103 of which are involved

exclusively with onshore wind projects. Scottish Renewables recognises that this study is likely to have underestimated the numbers as it relied on a survey methodology which means that there are likely to be organisations who were not included and who are either directly active in, or supply services to the renewable energy sector in Scotland. Nonetheless, these statistics demonstrate the national and regional employment significance of both the renewables sector generally, and specifically the onshore wind industry.

15.7.4 The Onshore Wind: Economic Impacts in 2014 report (BiGGAR Economics for RenewableUK, 2015) updates a previous report[5] from 2012 which was jointly commissioned by Renewable UK and DECC to evaluate the economic impacts of the UK onshore wind industry at national, regional and local scales. This updated report continues to assess the direct and indirect economic impacts of the commercial onshore wind sector using similar case studies and economic modelling methodologies.

15.7.5 The report concludes that throughout the period between 2012 and 2015, the percentage of expenditure from individual development projects coming into the UK has increased for development and construction phases and that a higher percentage of this is spent within local supply chains, however these trends are not evident for operations and maintenance. This means that projects including the Proposed Development are now predicted to generate greater positive economic and employment impacts during their construction phase than would have been calculated using the figures previously contained within the 2012 report.

15.7.6 From a detailed economic analysis of onshore wind case studies, the report concludes that for each 1MW installed capacity 69% of total expenditure on onshore wind farm projects takes place within the UK. This takes account of the following reported expenditure in the UK: 98% of development: 48% of construction: and 87% of operation and maintenance. The report also calculates that the onshore wind medium-large subsector currently contributes 13,600 jobs and £906 million in gross value added (GVA) to the UK economy.

15.7.7 The Review of the Generation Costs and Deployment Potential of Renewable Energy Technologies in the UK report (DECC, 2011) analyses the deployment potential and generation costs of renewable electricity technologies in the UK up to 2030. It states that onshore wind energy "*still has significant deployment potential of around 17.3GW by 2030*". This report estimates total capital costs for onshore wind farms greater than 5MW to between £1.18m and £1.82m per MW installed, and an operating expenditure of between £30,000/MW/year and £73,000/ MW/year (page 21).

Socio-Economic Overview of Development Site

15.7.8 Covering an area of approximately 1,466ha, the Development Site is located approximately 5km to the south west of New Cumnock and approximately 7km to the north east of Dalmellington. The majority of the Development Site comprises undulating rough grazing land and is currently used as sheep pasture. The B741 is located directly to the north and the Carsphairn Forest bounds the Development Site to the west, south and south east, with open cast mining to the north and moorland to the east. The nearest residential property is located at Maneight, approximately 310m from the Development Site and approximately 1,741m from the nearest proposed turbine.

15.7.9 The terrain of the Development Site is relatively undulating and steep in some places. The landform at the south of the Development Site comprises Enoch Hill, falling eastward to form High Chang Hill. The northern landform comprises Barbeys Hill, Chang Hill, Rigg Hill and Peat Hill. Benty Cowan Hill is located in the eastern part of the Development Site. A number of small watercourses cross the Development Site.

Transport Network

15.7.10 The Development Site is situated approximately 5km south west of the A76, which runs between Dumfries and Kilmarnock and passes through settlements including Thornhill, Sanquhar, New

[5] Economic Impact of Onshore Wind: Direct & Wider Economic Impacts Report (BiGGAR Economics for Renewable UK, 2012)

Cumnock, Cumnock, Auchinleck and Mauchline. The nearest railway station, New Cumnock Station, is located approximately 4.2 km north east of the Development Site.

15.7.11 For the purposes of the tourism and recreation impact assessment component contained herein, three local roads (B741 between Auchenroy and New Cumnock, Afton Road and the B7046 between Burnton and Skares [Skares Road]) have been identified within 10km of the Development Site and within the ZTV of the Proposed Development. Stretches of the following transport routes are also located within 35km of the Development Site and within the ZTV of the Proposed Development:

- M77 Motorway;
- A713 National Tourist Route (situated to the south west of the development site, on the other side of the Carsphairn Forest);
- Other 'A' class and Trunk Roads: A70, A71, A76 (part of the 'Burns Heritage Trail'), A77, A78, A719, A735 and A759;
- Glasgow to Stranraer railway line via Ayr; and
- Glasgow to Carlisle railway line via Kilmarnock and Dumfries.

Population

15.7.12 **Table 15.7** provides an overview of the current demographic profile of relevant geographies, as recorded by the 2011 Census.

Table 15.7 Key Population Statistics from 2011 Census

Geographical Area	Total Population - 2011 Census (2001 Census)	Percentage Under 16	Percentage 16-64	Percentage 65 and over	Population Density (persons per hectare)
Scotland	5,295,403 (5,062,000)	17.3	65.9	16.8	0.68
East Ayrshire	122,767 (120,200)	17.6	65.1	17.4	0.97
Dumfries and Galloway	151,324 (147,800)	16.6	61.5	21.8	0.24
Cumnock and New Cumnock Ward	14,401	16.7	64.8	18.5	0.40
Doon Valley Ward	11,242	18.3	64.0	17.7	0.48

15.7.13 **Table 15.7** shows that at the last census, the overall population structure within East Ayrshire including ward level was very similar to the national structure, while Dumfries & Galloway had a notably larger pensionable age cohort and smaller working age cohort. A large difference in population density was evident between the two local authority areas, reflecting differences in the overall level of urbanisation between the areas.

15.7.14 **Table 15.8** shows recent demographic trends within relevant geographies, as measured by mid-year population estimates from Scottish Neighbourhood Statistics.

Table 15.8 Total Population (Mid Year Estimates) from Scottish Neighbourhood Statistics

Year	New Cumnock Ward Data zones (DZ)*	Cumnock and New Cumnock Ward	Doon Valley Ward	East Ayrshire	Dumfries and Galloway	Scotland
2003	5,601	14,501	11,786	119,860	147,860	5,068,500
2004	5,536	14,453	11,871	120,210	148,690	5,084,300
2005	5,515	14,352	12,009	120,280	149,620	5,110,200
2006	5,548	14,262	12,278	120,450	149,780	5,133,100
2007	5,540	14,343	12,316	120,950	150,370	5,170,000
2008	5,436	14,226	12,293	121,590	151,010	5,202,900
2009	5,358	14,198	12,270	122,110	151,160	5,231,900
2010	5,353	14,118	12,185	122,410	151,100	5,262,200
2011	5,294	14,068	12,154	122,690	151,410	5,299,900
2012	5,281	13,957	12,138	122,720	150,830	5,313,600
2013	5,248	13,927	12,097	122,440	150,270	5,327,700
2014	-	-	-	-	-	5,347,600

*New Cumnock Ward DZs: S011001276, S011001279, S011001280, S011001281 and S011001282.

15.7.15 The data in **Table 15.8** indicates that while the overall population of Scotland has increased steadily since 2003, there has also been steady increases in population levels across East Ayrshire and Dumfries and Galloway. This table also shows that the population within the Cumnock and New Cumnock ward, which the Development Site is located within, fell slightly from 2003 to 2013, while the population of the adjacent ward, Doon Valley, increased slightly.

15.7.16 **Tables 15.9** and **15.10** show recent changes in working age and pensionable age populations within relevant geographies.

Table 15.9 % Population of Working Age (16-64) Trend from 2001-2011 (SNS)

Year	New Cumnock Ward DZs*	Cumnock and New Cumnock ward	Doon Valley ward	East Ayrshire	Dumfries and Galloway	Scotland
2003	59.79	60.57	60.93	61.57	58.64	62.45
2004	59.29	60.74	60.90	61.64	58.75	62.55
2005	59.20	60.93	61.22	61.80	58.66	62.70
2006	59.11	61.19	61.39	61.91	58.66	62.81
2007	59.76	61.19	61.03	61.90	58.36	62.76
2008	59.02	60.97	60.76	61.80	58.12	62.70
2009	58.93	61.16	60.44	61.71	57.82	62.61
2010	58.72	61.20	60.74	61.68	57.85	62.68

Year	New Cumnock Ward DZs*	Cumnock and New Cumnock ward	Doon Valley ward	East Ayrshire	Dumfries and Galloway	Scotland
2011	59.27	61.35	61.29	61.92	58.04	62.96
2012	60.46	61.47	61.14	61.76	58.05	62.96
2013	60.89	61.50	61.22	61.79	58.09	63.08

*Mean of New Cumnock Ward DZs: S011001276, S011001279, S011001280, S011001281 and S011001282.

Table 15.10 % Population of Pensionable Age (65+) Trend from 2001-2011 (SNS)

Year	New Cumnock Ward DZs*	Cumnock and New Cumnock ward	Doon Valley ward	East Ayrshire	Dumfries and Galloway	Scotland
2003	21.31	20.01	18.90	19.22	23.25	18.89
2004	22.24	19.98	19.01	19.31	23.50	19.00
2005	22.70	20.26	19.08	19.43	23.73	19.06
2006	23.12	20.44	19.14	19.59	23.91	19.14
2007	23.38	20.79	19.78	19.85	24.37	19.37
2008	24.10	21.40	20.37	20.12	24.77	19.58
2009	25.11	21.64	20.72	20.39	25.20	19.80
2010	25.63	22.17	21.02	20.62	25.40	19.88
2011	25.47	22.02	20.42	20.51	25.39	19.75
2012	24.87	22.08	20.66	20.67	25.63	19.83
2013	25.15	22.19	20.54	20.76	25.76	19.81

*Mean of New Cumnock Ward DZs: S011001276, S011001279, S011001280, S011001281 and S011001282.

15.7.17 The data in **Tables 15.9** and **15.10** indicates two general trends across all geographies: relatively stable working age populations coupled with population ageing. As shown in **Table 15.10**, the pensionable age population within the New Cumnock DZs is noticeable higher than within the wider ward area and East Ayrshire Council area. The trend for New Cumnock DZs is more aligned with Dumfries and Galloway Council. These trends suggest firstly that there is a relatively stable labour pool within relevant geographies and secondly that public services in these areas may come under increased pressure if recent increases in the pensionable aged population continue.

15.7.18 The latest available demographic projections for East Ayrshire and Dumfries and Galloway are shown in **Tables 15.11** and **15.12** respectively. Demographic projections are unavailable at lower spatial scales.

Table 15.11 Projected Population by Age Group in East Ayrshire to 2037 (GROS, 2014)

	Base Year	Projected Years					
Age Group	**2012**	**2015**	**2020**	**2025**	**2030**	**2035**	**2037**
0-15	21,562	21,312	21,652	21,563	21,005	20,328	20,027

	Base Year	Projected Years					
Age Group	**2012**	**2015**	**2020**	**2025**	**2030**	**2035**	**2037**
16-29	20,558	20,414	18,969	17,854	17,737	18,113	18,155
30-49	33,378	31,468	29,266	28,508	28,290	27,305	26,789
50-64	24,980	25,854	27,469	27,103	24,440	22,002	21,519
65-74	12,565	13,520	14,328	14,590	16,225	17,316	17,251
75+	9,677	10,330	11,746	14,051	15,641	17,382	18,187
All ages	122,70	122,898	123,430	123,669	123,368	122,446	121,928

Table 15.12 Projected Population by Age group in Dumfries and Galloway to 2037 (GROS, 2014)

	Base Year	Projected Years					
Age Group	**2012**	**2015**	**2020**	**2025**	**2030**	**2035**	**2037**
0-15	24,616	23,761	23,781	23,512	23,356	22,690	22,267
16-29	21,995	21,932	20,549	18,897	17,783	17,757	17,625
30-49	36,466	33,735	30,761	30,717	31,365	30,304	30,058
50-64	33,415	33,825	34,077	31,902	27,162	24,179	23,452
65-74	18,860	20,105	20,707	20,294	21,737	21,879	21,150
75+	15,478	16,504	18,869	22,184	24,274	26,129	27,067
All ages	150,830	149,862	148,744	147,506	145,677	142,938	141,619

15.7.19 **Tables 15.11** and **15.12** indicate that populations of East Ayrshire and Dumfries & Galloway are projected to decrease over the period to 2037, with a particularly noticeable fall being experienced in Dumfries & Galloway. Within East Ayrshire the working age population cohorts (ages 16-64) are all projected to decrease, however the population aged 65 or over is projected to increase sharply. If these projections are borne out they would generate multiple implications for the available labour force, employment trends and public service delivery within East Ayrshire and Dumfries & Galloway.

Employment & Economic Activity

15.7.20 The Development Site is situated within the Ayrshire and Kilmarnock Travel to Work Area statistical unit, which includes major settlements such as Kilmarnock, Ayr, Prestwick and Girvan. Numerous factors influence the supply and demand of labour in the economy including working age population, migration, unemployment, skills and wages. The supply of appropriate labour to support the construction and operation of the Proposed Development will be a key factor in ensuring benefits are realised in the local economy.

15.7.21 Data from NOMIS (2015) shows that over the 2014 calendar year, 77.5% of the East Ayrshire population were economically active, higher than Dumfries and Galloway (75.9) and identical to the average for Scotland (77.5%). The percentage of self-employed people in East Ayrshire (7.1%) was lower than the average for Scotland (10%). The percentage of self-employed people in Dumfries and Galloway was much higher (13.5%), potentially reflecting the rural nature of the local economy.

15.7.22 Data from the 2011 Census indicates that the level of unemployment within East Ayrshire was 6%, with an unemployment rate of 8% in the locality of New Cumnock, the nearest large settlement to the Development Site. Both of these statistics compare unfavourably to the national employment rate recorded in the 2011 Census of 4.8%.

15.7.23 The East Ayrshire Economic Development Strategy 2014 – 2025 notes that whilst business start-ups in 2012 within East Ayrshire reached 279 new companies, the rate of growth in businesses over the period 2009-2012 was slower than the Scottish average and the number of new businesses dropped in 2013 compared with 2012. . This strategy also states that the area's "*job density figure is below the Scottish average, which presents considerable problems for our job seekers in terms of entering the labour market locally. It effectively means that in East Ayrshire we have 77,900 people of working age (between 16 and 64) and we have a total number of jobs in the area of 45,000 or that for each job available there are two people looking for that work*".

15.7.24 The level of earnings is an important indicator of the general health of the local economy but also reflects economic activity in the area. In general, higher earnings indicate a prosperous economy comprised of sectors that pay well, whilst low earnings indicate the opposite. The 2014 average gross weekly pay for East Ayrshire (£491.70) was lower than the Scottish average (£520.20) but higher than the average for Dumfries and Galloway (£432.40) (NOMIS, 2015).

15.7.25 The Scottish Index of Multiple Deprivation (SIMD) identifies small area concentrations of multiple deprivation across all of Scotland. 38 indicators of deprivation are used within SIMD 2012, looking at seven dimensions which are: Income; Employment; Health; Education; Housing; Access to Services; and Crime. The SIMD is separated out into data zones which are able to identify small areas of deprivation, with the level of deprivation increasing with the SIMD score.

15.7.26 The 15% most deprived data zones in Scotland are shared out among local authorities to give the National Share of most deprived data zones. In 2012, East Ayrshire had 3.3% of the National Share (10th highest out of 32) and Dumfries and Galloway had 1.3% of the National share (17th highest out of 32). The SMID is also represented as a Local Share, which is the percentage of the local authority's data zones which fall within the 15% most deprived data zones in Scotland. Out of the 32 local authorities, East Ayrshire was the 9th highest with a local share of 20.8%. Dumfries and Galloway was 17th highest with local share of 6.7%.

15.7.27 One of the factors contributing to the SIMD is educational attainment. Data from the 2011 Census indicates that 34.1% of the population of East Ayrshire aged 16 and above have no qualifications, a significantly higher level than the national average (26.8%). 24.4% of East Ayrshire's population aged 16 and above only have qualifications equivalent to "Level One"[6], higher than average for Scotland of 23.1%. Just 17.9% of East Ayrshire's population aged 16 and above have qualifications equivalent to "*Level Four*"[7], which is significantly lower than the average for Scotland (26.1%).

15.7.28 The findings above regarding unemployment and deprivation in East Ayrshire are emphasised within the East Ayrshire Economic Development Strategy 2012-2017, which observes that "*the area's employment profile lags behind its neighbours and is linked to levels of deprivation and inequality within our communities. Economic restructuring over decades has seen some sectors disappear from the area; jobs have not always been replaced in the same location; and some residents have struggled to adapt to a new labour market".*

Industry & Economy

15.7.29 The East Ayrshire Local Plan 2010 (paragraph 4.1) notes that *"the business and industry profile of East Ayrshire is characterised by:*

[6] Standard Grade, Access 3 Cluster, Intermediate 1 or 2, GCSE, CSE, Senior Certification or equivalent; GSVQ Foundation or Intermediate, SVQ level 1 or 2, SCOTVEC Module, City and Guilds Craft or equivalent; Other school qualifications not already mentioned (including foreign qualifications).

[7] Degree, Postgraduate qualifications, Masters, PhD, SVQ level 5 or equivalent; Professional qualifications (for example, teaching, nursing, accountancy); Other Higher Education qualifications not already mentioned (including foreign qualifications).

- A decline in agriculture and traditional engineering, textile and extraction industries;
- Under representation of service, technology and business industries;
- Pockets of high levels of deprivation and unemployment;
- A legacy of brownfield and despoiled land generally unsuited for the needs of modern companies; and
- Increased commuting to the Glasgow conurbation".

15.7.30 Both the East Ayrshire Local Plan (2010) and the East Ayrshire LDP Proposed Plan (2015) highlight the current and historical importance of mining and tourism industries within rural areas, and light industrial and commercial industries within the main settlements of East Ayrshire. The East Ayrshire Economic Development Strategy 2012-2017 notes that "*in sector terms, the service sector accounts for over half of all economic output from East and North Ayrshire with services accounting for 62% of total GVA while industrial activities including manufacturing and construction accounting for 37%. This indicates a greater reliance on the industrial sector than for Scotland as a whole, where the sector only accounts for 24% of GVA. The area is performing relatively well in public and other services, manufacturing, distribution, transport and communications and less well in financial and business service*".

15.7.31 A breakdown of employment by industry across relevant geographies including relevant wards is detailed in **Table 15.13**.

Table 15.13 % Employment by Industry (2011 Census)

% all in employment who work in	Cumnock and New Cumnock Ward	Doon Valley Ward	East Ayrshire	Dumfries and Galloway	Scotland
Agriculture, forestry and fishing (a)	4.0	2.6	2.5	8.7	2
Mining and quarrying (b)	4.55	2.8	1.4	0.5	1.4
Manufacturing (c)	10.20	14.9	10.3	8.4	7.7
Electricity gas steam and air conditioning (d)	0.52	0.5	0.7	0.7	0.8
Water supply, sewage waste management and remediation activities (e)	1.02	0.9	0.8	1.1	0.8
Construction (f)	9.54	9.58	9.4	8.7	8.0
Wholesale and retail trade, including repair of motor vehicles and motorcycles (g)	13.32	16.96	15.6	15.8	15.0
Transport and storage (h)	5.39	5.49	4.8	5.3	5.0
Accommodation and food service activities (i)	3.70	5.21	4.7	6.8	6.3
Information and communication (j)	0.98	0.64	1.7	1.2	2.7
Financial and insurance activities (k)	1.70	1.02	2.8	1.3	4.5
Real estate activities (l)	0.88	0.68	0.8	1.2	1.2
Professional scientific and technical activities (m)	2.03	1.72	3.4	3.2	5.2

% all in employment who work in	Cumnock and New Cumnock Ward	Doon Valley Ward	East Ayrshire	Dumfries and Galloway	Scotland
Administrative and support service activities (n)	3.69	3.88	4.6	3.3	4.3
Public administration and defence - compulsory social security (o)	7.55	5.09	7.0	6.1	7.0
Education (p)	7.06	5.77	6.8	7.2	8.4
Human health and social work activities (q)	19.67	25.24	18.3	16.3	15.0
Other industries (r, s, t, u)	4.19	4.49	4.5	4.3	4.9

15.7.32 **Table 15.13** indicates that East Ayrshire has a relatively diverse economic base, not dissimilar to that of Scotland as a whole, with strong health & social care, retail, construction and manufacturing sectors. **Table 15.13** also highlights the presence of localised high concentrations of employment in agriculture, mining, manufacturing, construction and transport within the two wards relevant to the Development Site. A high concentration of employment with human health and social work is noted within the Doon Valley Ward.

15.7.33 It is clear from **Table 15.13** that Dumfries and Galloway also has a diverse economic base, however there is a relatively high percentage of employment in agriculture, forestry and fishing due to the area's rural nature.

15.7.34 Data from the Scottish Government (2015) indicates that the energy sector (including renewables) within East Ayrshire generated £59.9m GVA in 2012. The Scottish Government estimate that at the national level the low carbon employment sector accounted for 44,800 jobs in 2013 of which 5,400 were within the onshore wind energy subsector (Scottish Government, 2015). These statistics demonstrate the importance of the renewable energy sector to the regional and national economy.

Accommodation

15.7.35 Data from the Ayrshire & Arran Tourism Strategy 2012-2017 indicates that accommodation across the region comprises a stock of 21,620 beds, split between serviced (7,360 beds) and non-serviced (14,260 beds) accommodation. A number of hotels and Bed & Breakfasts are located within the Cumnock and New Cumnock council ward which the Development Site lies within.

15.7.36 The Tourism in Scotland's Regions 2013 report indicates that average monthly hotel occupancy levels across the Ayrshire & Arran and Dumfries & Galloway regions were 60% and 46% respectively. This data also shows distinct seasonal trends in hotel occupancy levels focused around peak summer months (both Ayrshire & Arran and Dumfries & Galloway recorded peak occupancy levels of 79% and 63% respectively in August 2013, with the lowest levels in January and December 2013). These peak hotel occupancy levels are lower than the peaks achieved in regions such as Edinburgh & Lothians (93%), Angus & Dundee (84%) and Aberdeen & Grampian (82%), and they indicate that there is currently significant spare capacity within hotels across Ayrshire & Arran and Dumfries & Galloway.

Recreation

15.7.37 The majority of the site is subject to the 'right to roam' under the Land Reform (Scotland) Act 2003 such that access for recreation (including walking and horse riding) is permitted over most of the Development Site. However, the Development Site does not include any publicly accessible footpaths (designated or non-designated) which could easily facilitate recreational activities.

15.7.38 The upland grassland characteristics of the Development Site are considered to offer a variety of potential recreational pursuits including but not limited to: walking, running, orienteering and wild

camping. Similar recreational pursuits can be undertaken within the surrounding area due to the presence of similar topography and similar land uses.

15.7.39 Although the Development Site itself does not contain waterbodies likely to be suitable for water based recreational activities, suitable waterbodies (including the River Nith and Water of Deugh) are located within 3km and are directly connected to tributaries which originate within the Development Site (including Polmath Burn, Bow Burn, Knockburnie Glen, Catlock Burn, Bitch Burn and Strathwiggan Burn). It should also be noted that the River Nith and Water of Deugh (as part of the River Dee) are both designated Freshwater Fish Salmonid Waters.

15.7.40 There are no Core Paths or other designated or non-designated walking routes within the Development Site boundary. Core Paths (adopted by either East Ayrshire Council or Dumfries and Galloway Council) located within 5km of the Development Site and within the ZTV of the Proposed Development are:

- DGC Core Path No. 667 Water of Deugh Trail;
- EAC Core Path No. C12: New Cumnock Circular;
- EAC Core Path No. C10: Coalfield Cycle Route; and
- EAC Core Path No. C14: Glen Afton.

15.7.41 Scottish Hill Tracks and Heritage Paths located within 10km of the Development Site and within the ZTV of the Proposed Development are:

- 81 Barr to Dalmellington / 78b Glen Trool Village to Dalmellington by Tunskeen;
- 84 New Cumnock to St John's Town of Dalry by Glen Afton; and
- Old Road from New Cumnock to Dalquhairn.

15.7.42 National recreational routes within 35km of the Development Site and within the ZTV of the Proposed Development are:

- Southern Upland Way; and
- National Cycle Route (NCR) 7.

Tourism: Economics

15.7.43 The Scottish Government's Annual Business Statistics for 2012 (the latest available edition at the time of writing) indicate that turnover in tourism related industries amounted to £6.37 billion in 2012, with GVA at basic prices from this sector amounting to £3.21 billion (Scottish Government, 2014). Similar levels of turnover and GVA at basic prices were recorded in the four preceding years. In 2012 the largest components of tourism related industries by turnover were restaurants & mobile food service activities, hotel & similar accommodation, and beverage serving activities respectively.

15.7.44 In terms of the regional economic importance of tourism, the latest available statistics at the time of writing indicate that tourism-related employment provided 1,800 jobs and generated £30.1m GVA at basic prices in East Ayrshire in 2012, with corresponding values of 4,500 tourism related jobs and £68.9m GVA in Dumfries and Galloway. These regional statistics compare with corresponding national values of 166,900 tourism related jobs and £3,240.2bn GVA at basic prices (Scottish Government, 2014). All of these statistics emphasise the importance of the tourism sector to both the regional and national economic base.

Tourism: Visitor Statistics & Attractions

15.7.45 The latest available visitor statistics are contained within the Tourism in Scotland's Regions 2013 report, published by Visit Scotland in July 2014. This document estimates that in 2013 UK tourists made approximately 709,000 trips, staying for an average of 3.3 nights and spending £123m in the Ayrshire & Arran area, which includes East Ayrshire. The document also estimates that in 2013, UK tourists made approximately 654,000 trips, staying for an average of 2.8 nights and spending

£99m whilst in the Dumfries & Galloway region. These regional statistics compares to 12.1m trips made by UK tourists with spend of £2.9bn across Scotland overall[8].

15.7.46 Overseas visitors to the Ayrshire and Arran area made approximately 72,000 trips in 2013, staying for an average of 5.9 nights and spending £46m. Overseas visitors to the Dumfries and Galloway area made around 40,000 trips, staying for an average of 4.9 nights and spending approximately £14m.

15.7.47 The Trends and Statistics – September 2013 report (Visit Scotland, 2013b) noted that GB resident overnight trips to Northern and Southern Scotland had increased in the year to May 2013, compared to 2012, although overnight trips to Scotland as a whole were down by 1.5% (4.4m fewer). Expenditure within Scotland by GB residents up to May 2013 was noted to reach £901 million, also down on the same period the previous year (-3.7%). Expenditure per trip, as noted in the report, was £206, the second highest level behind 2012 since 2009.

15.7.48 Visit Scotland's Tourism in Scotland's Regions 2013 report identifies the top visitor attractions within Ayrshire & Arran and Dumfries & Galloway in 2013. Of these, Dean Castle Country Park (1,279,003 visitors) and the Galloway Forest Park[9] (423,000) are the only attractions which are within the ZTV of the Proposed Development.

15.7.49 **Figure 9.5a** – **ZTV to blade tip height** indicates that the Proposed Development may be visible from the tourist destinations and visitor attractions listed in **Table 15.14**, which are all within 35km of the Development Site. It should be noted that this list of tourist destinations excludes transport and recreational routes which have already been identified in this ES chapter.

Table 15.14 Tourist Destinations and Visitor Attractions within 35km ZTV of Proposed Development

Identified Summits/Hillwalking Areas
Merrick 843m AOD (Corbett)
Cairnsmore of Carsphairn 797m AOD (Corbett)
Corserine 814m AOD (Corbett)
Shalloch on Minnoch 775m AOD (Corbett)
Blackcraig Hill 700m AOD (Graham)
Windy Standard 698m AOD (Graham)
Mullwharchar 692m AOD (Graham)
Craignaw 645m AOD (Graham)
Lamachan Hill 717m AOD (Graham)
Green Lowther 732m AOD (Graham)
Tourist Attractions
Dean Castle Country Park
Craigengillan Garden and Designed Landscape (GDL)
Knockshinnock Lagoons Local Nature Reserve

[8] Figures rounded to 1 decimal place.

[9] The Galloway Forest Park covers the same land area as the internationally recognised Galloway Forest Dark Sky Park

Identified Summits/Hillwalking Areas
Galloway Forest Park and Galloway Forest Dark Sky Park
Loch Doon
Burn's Memorial
Dumfries House
Blairquhan
Kilkerran
Rozelle (La Rochelle)
Loudon Castle
Carnell
Culzean Castle and Culzean Country Park (National Trust for Scotland site)
Dundonald Castle
Scottish Industrial Railway Centre, Dalmellington (Dunaskin Heritage Centre)
Andy Goldsworthy's Striding Arches on top of Benbrack, Colt Hill and Bail Hill
Golf Courses
Royal Troon Golf Course
Barassie Golf Course
Prestwick Golf Courses including St Nicholas and St Cuthbert
Belleisle and Seafield Golf Courses
Roodlea Gold Course
Sorn Castle Golf Club, Catrine

Predicted Trends in the Absence of Development

15.7.50 From the information acquired for this assessment, there is no indication that the baseline is in the process of any significant transition which would affect the evaluation of the Proposed Development.

Information Gaps

15.7.51 No pertinent information gaps have been identified with regard to the baseline socio-economic situation.

15.8 Design Evolution

15.8.1 As detailed within **Chapter 2 – Site Selection & Design Evolution**, the design of the Proposed Development has fully taken account of all known technical and environmental constraints within the Development Site and has sought to minimise predicted landscape and visual effects (see **Chapter 9 – LVIA**).

15.8.2 Given that adverse visual effects have the potential to result in adverse effects on the attractiveness or tourism potential of some receptors, and that the scale of the Proposed

Development largely determines predicted economic and employment effects, the design process has indirectly taken account of potential socio-economic, tourism and recreation effects.

15.9 Scope of Assessment

15.9.1 The remainder of this chapter describes and assesses the predicted socio-economic effects of the Proposed Development upon the baseline situation presented above. The Scope of Assessment set out in the Scoping Report focused on a desk based assessment to determine direct and indirect effects on economy and employment, indirect effects on tourism and recreational interests; and any cumulative effects on the economy, employment, tourism and recreation when taking into account other wind farm development.

15.9.2 The following areas have been scoped out of the socio-economic, tourism and recreational assessment, either during the scoping stage or through the EIA process:

- Effects on local residents and the local community due to visual impact (**Chapter 9**), traffic (**Chapter 14**), noise (**Chapter 7**) and shadow flicker (**Chapter 8**) as these are considered in the relevant ES chapter as noted;
- Demographic effects due to the relatively short construction period (approximately 12 months) and the low magnitude of local employment generated. It is predicted that any local demographic changes would be of negligible magnitude and there would be no discernible effects at regional and national levels; and
- Effects on the visitor attractiveness or tourism potential of identified tourism and recreational receptors located: outwith 35km from the Development Site; within 35km of the Development Site but out with the ZTV of the Proposed Development; or located beyond 10km from the Development Site, but which are assessed in the LVIA (**Chapter 9**) as not experiencing significant adverse visual effects. In all cases, these receptors (listed in **Appendix 15.A**) would experience only limited and not significant adverse landscape and visual effects, so it is considered there is no possibility that these receptors could experience significant effects in terms of visitor attractiveness and tourism potential.

15.9.3 **Sections 15.10 - 15.12** describe the potential effects that could arise from the construction, operation and decommissioning of the Proposed Development on the economy, employment and industry, on land use, public access and recreation, tourism and leisure. The cumulative effects that could occur are discussed in **Section 15.13**.

15.9.4 Inclusion of effects in **Sections 15.10-15.12** does not imply that likely residual effects would be significant, only that potential effects have been considered. Mitigation and enhancement measures are described in **Section 15.14** with an assessment of the residual effects of the Proposed Development provided in **Section 15.15.**

15.10 Predicted Effects: Construction & Decommissioning

15.10.1 All of the socio-economic, tourism and recreation effects which are predicted to occur during decommissioning are anticipated to be similar in nature to the effects experienced during construction, albeit on a reduced scale. Decommissioning is expected to be of a shorter duration than the construction period, therefore the magnitude of all socio-economic, tourism and recreation impacts which occur during decommissioning would be lower than the same impacts occurring during the construction phase of the Proposed Development.

Economics Effects

15.10.2 As noted in **Section 15.4,** where effects cannot be quantified, the assessment of significance will be undertaken using professional judgement and experience. This is considered to be the case for economic effects resulting from the capital investment made in constructing, operating and decommissioning a wind farm where the assessment of significance is effectively based on the magnitude of change in monetary terms. The Proposed Development has the potential to generate

a range of economic benefits for local businesses as it is anticipated that a reasonable proportion of the cost of the civil, electrical and grid connection work will be spent in Scotland, and locally in East Ayrshire and Dumfries and Galloway.

15.10.3 Indicative construction and decommissioning requirements for the Proposed Development are detailed in **Table 15.15**.

Table 15.15 Indicative Construction and Decommissioning Requirements

Required Services	Details
Accommodation	Workers would require the use of local accommodation within approximately 20km of the Development Site.
Local amenities	All workers during the construction period will require food, drink and other provisions, bringing trade to the local area.
Development Site security	Throughout the construction and decommissioning phases of Proposed Development, security workers from the local area will be required to protect assets and ensure compliance with CDM Regulations.
Abnormal Load (turbines) and Crane Haulage	Specialist haulage contractors will be required to deliver turbine components and cranes to the Development Site during the construction period.
Road construction	New and upgraded access roads and tracks within the Development Site will be required. A local supplier may be required for road surfacing.
Balance of Plant construction	Infrastructure including temporary construction compounds and borrow pits will be required. This work will be undertaken by civil engineering contractors.
Substation detailed design and construction	Specialist contractors will be required to design and construct the on-site control building and substation, which will house all electrical and communications equipment for the Proposed Development.
Turbine foundation detailed design and construction	The final design of the foundations depends on the ground conditions and exact turbine specifications.
Turbine manufacture	The turbine manufacturer and manufacturing location is still to be confirmed. This is likely to be outside the UK. However there are two potential UK manufacturing options: the Wind Towers Scotland facility in Machrihanish near Campbeltown and the Mabey Bridge plant in Chepstow.
Turbine erection	Once transported to the Development Site, all turbines would be erected into position by specialist contractors likely to be available within Scotland.
Landscaping	Post construction landscaping works may be undertaken by a local contractor.
Electrical switchgear design & installation	The Proposed Development requires the design and on-site installation of complex electrical systems and cabling.
Power transmission design	All electricity transmission cabling will need to be designed by a specialist company.
Meteorological mast installation	A specialist company will be required to install two meteorological masts and monitoring equipment.
Fencers	Temporary construction fencing, and any permanent fencing required, may be installed by local contractors.
Fuel supplies and delivery	Machinery used during construction will require fuel supplies provided by a local distributor.
Construction materials supply and delivery	Materials for the construction phase will be sourced from local suppliers where possible including bricks, mortar, cement, concrete, stone, wood, steel, cabling, electricity poles etc.
Sub-contractors	Electrical fitters, carpenters, painters & decorators, plumbers may be required during the construction phase for various tasks.

15.10.4 The Review of the Generation Costs and Deployment Potential of Renewable Energy Technologies in the UK report (DECC, 2011) estimates the total capital cost of a wind farm greater than 5MW constructed in 2015 to be between £1.17m and £1.80m per MW installed[10]. On the basis of the maximum deployment of 19 x 3.3MW turbines, the Proposed Development has the potential to generate up to 62.7 MW (depending on the final turbine specification). Therefore using DECC's

[10] Figures rounded to 2 decimal places

figures from 2011 the capital cost of the Proposed Development is estimated to be up to between £73.4m and £112.9m[11].

15.10.5 The BiGGAR report 2015 found that the weighted average construction cost per MW was £1.32m, with the majority of case study projects spending within 15% of this figure. On this basis, with up to 62.7MW installed capacity, the construction phase of the Proposed Development (including turbine manufacture) could result in expenditure of up to £82.7m.

15.10.6 The Generation Costs and Deployment Potential of Renewable Energy Technologies in the UK (2011) report, the BiGGAR report (2015) and the O'Herlihy report (2006) all recognise the importance of the capital spend during construction. The economic impact assessment set out within the O'Herlihy report (2006) splits construction spend by turbine manufacturing and construction and installations costs. This is of particular relevance to the Proposed Development, as the case studies used are of a similar scale to the Proposed Development. The O'Herlihy report (2006) identifies that approximately 65% of the total capital spend for a proposed wind farm relates to the cost of manufacturing wind turbines, with the remaining 35% related to onsite construction (balance of plant) and installation work. The BiGGAR Report (2015) supports this analysis as it calculates that turbine manufacturing accounts for 64.4% of total capital expenditure, balance of plant contracts account for 28.6% and grid connections account for 7.1%.

15.10.7 Using the expenditure distribution profile from the O'Herlihy report (2006) and figures from The Generation Costs and Deployment Potential of Renewable Energy Technologies in the UK (2011) report, the manufacturing of the turbines for the Proposed Development could generate capital expenditure of between £47.7m and £73.4m. Other (on-site) construction works including potential grid connection work could generate capital spend of between £25.7m and £39.5m. Using the latest available figures from the BiGGAR Report (2015), the manufacturing of the turbines could result in capital expenditure of up to approximately £53.3m, the balance of plant construction phase could result in capital expenditure of up to approximately £23.7m and grid connection work could result in capital expenditure of up to approximately £5.9m[12].

15.10.8 The BiGGAR (2015) report states that 12% of the total capital costs of an onshore wind farm (i.e. including turbine manufacturing, balance of plant and grid connection) are typically spent locally (East Ayrshire), 36% spent in the Region/Nation (Scotland) and 47% spent within the UK. For the Proposed Development this results in a range of between £8.8m (12% of £73.4m) and £13.6m (12% of £112.9m) being spent locally and a range of between £26.4m (36% of £73.4m) and £40.6m (36% of £112.9m) spent within Scotland. Considering this and taking account of the presence of required facilities, amenities, construction materials and labour skills, it is reasonable to predict that a large proportion of 'local' spend will be in proximity to the Development Site.

15.10.9 Based on these assumptions, the on-site contribution to the economy would result in a Small magnitude of change at the local level (across East Ayrshire and Dumfries & Galloway), and a Medium to Large magnitude of change within the locality of the Development Site (i.e. the Cumnock and New Cumnock Ward and Doon Valley Ward). At ward level, this would result in a beneficial temporary moderate to substantial effect on the local economy which could potentially be **'significant'**. At the wider council level the effect would be slight to moderate and **'not significant'**, but beneficial. At a national level, taking account of both on-site work and potential offsite turbine manufacturing within the UK, this level of investment would result in a Low magnitude of change, which is considered to be **'not significant'**.

15.10.10 It is therefore considered that the economic effects during the construction of the Proposed Development would result in temporary, beneficial effects that has the potential to be 'significant' at local ward level, but 'not significant' when considered at a wider council and national level. The effects generated by the decommissioning of the Proposed Development are considered to be temporary, beneficial and **'not significant'**.

[11] All calculated figures in this section are rounded to 1 decimal place.

[12] All figures rounded to 1 decimal place

Accommodation

15.10.11 Employment associated with the construction of the Proposed Development would be likely to increase occupancy in nearby hotels and other short term accommodation, as well as increasing trade in local hospitality establishments. However, it is not likely to result in an overwhelming influx of local accommodation or hospitality bookings at a particular point in time. These potential changes are considered to represent a Medium positive magnitude of change on local accommodation receptors, resulting in a temporary beneficial moderate effect which is considered '**not significant**'. The effects generated by the decommissioning of the Proposed Development are considered to be temporary, beneficial and '**not significant**'.

Employment Effects

15.10.12 The BiGGAR (2015) report in Table 6: GVA and Employment Ratios (Construction Phase) estimates that average total turnover per employee during the construction phase of a wind farm is £137,942. If replicated during the construction of the Proposed Development this could result in local employment across East Ayrshire and Dumfries & Galloway ranging from up to 63.8 FTE (£8.8m ÷ £137,942) to 98.6 FTE (£13.6m ÷ £137,942), and Scottish level employment ranging between up to 191.4 FTE (£26.4m ÷ £137,942) and 294.3 FTE (£40.6m ÷ £137,942) throughout the construction period.[13]

15.10.13 In addition to the predicted employment levels calculated above, it is expected that further employment would be sustained or created through induced and indirect economic effects. This would be likely to occur through the supply chain and the impact of wages and salaries on the local economy including increased hotel occupancy rates, with the baseline identifying that the tourism and hospitality industry is an important source of employment in East Ayrshire. This would enable the retention of employment related economic benefits in the local economy. However, the extent of these indirect and induced employment effects cannot accurately be determined until individual contractors are appointed, which would only take place after any consent for the Proposed Development is granted by Scottish Ministers. Furthermore, indirect and induced employment benefits would also be dependent on the extent to which employees of the successful contractors decide to spend their income on local goods and services.

15.10.14 It should be noted that the number of construction workers employed would depend on the duration of the construction programme and may vary if the programme is altered. It is further acknowledged that the number of construction related FTEs would vary depending on project specific requirements and that construction phase employment would only be sustained for a temporary period.

15.10.15 On the basis of the assessment outlined above and the methodology identified in **Section 15.3**, a qualitative assessment has been carried out. Employment at the local level is considered to have medium sensitivity across East Ayrshire & Dumfries and Galloway and locally of the Development Site (i.e. within the Cumnock and New Cumnock Ward and Doon Valley Ward) owing to the level of construction workforce in these geographical areas (see **Table 15.13**). The predicted increase in employment during the construction phase would be of temporary/short term benefit and is considered to represent a Small to Medium magnitude of change at the local level (i.e. at council level and local ward level) owing to the number of jobs created. This would result in a temporary beneficial Slight level of effect across East Ayrshire and Dumfries & Galloway, and a temporary beneficial Moderate level of effect within the locality of the Development Site (i.e. the ward level). At the national level, the predicted increase in employment during construction is a temporary/short term beneficial effect of Negligible-Small magnitude of change, owing to the limited number of jobs created when compared with the national levels of jobs in the renewable energy sector (11,625

[13] It is acknowledged that these calculations do not provide a breakdown of predicted turbine manufacture, balance of plant and grid connection employment split across local, regional (Scotland) and UK geographies, however providing such statistics would involve more complicated analysis which would be of limited value, especially given that the location of all contractors would not be confirmed until after any consent is granted for the Proposed Development by Scottish Ministers.

FTE jobs – Scottish Renewables, 2014). This would also result in a temporary, beneficial but '**not significant**' effect.

15.10.16 It is therefore considered that the construction related employment effects of the Proposed Development would result in temporary, beneficial effects that are considered **not significant** in EIA terms. The effects generated by the decommissioning of the Proposed Development are considered to be temporary, beneficial and **'not significant'**.

Land Use Impacts

15.10.17 The Development Site is currently used by tenant farmers as grazing land for livestock (sheep). The construction process would require the temporary closure of this grazing land in construction areas and may result in temporary relocation of livestock within the wider Development Site. Once operational, the Proposed Development will not affect future grazing within of the Development Site.

15.10.18 Owing to its current land use, the Development Site is considered to be of Low sensitivity to land use change. Therefore with a Small magnitude of change predicted there would be a temporary, neutral land use change effect during construction and decommissioning, which is considered '**not significant**'.

Recreation

15.10.19 Core Paths and other designated walking routes would not be directly affected by construction activities. However, during the construction phase the public 'right to roam' normally enjoyed through the provisions of the Land Reform (Scotland) Act 2003, would be restricted within the Development Site for health and safety reasons and to ensure compliance with the CDM Regulations 2015.

15.10.20 Taking into account the lack of any identified public access receptors within the Development Site it is considered that the construction of the Proposed Development would result in a temporary Small magnitude of change to public access within a low sensitivity site. The resulting negligible effects on public access would therefore be '**not significant**'.

15.10.21 Aside from temporarily halting 'right to roam' access, the construction of the Proposed Development is not expected to generate any direct effects on specific recreational pursuits within the Development Site. Given that much of the construction work (excluding turbine erection) would only be visible from within the Development Site itself, indirect (visual) effects on recreational activities would only result in a temporary Negligible magnitude of change on a low sensitivity site, which is not significant in EIA terms.

15.10.22 **Chapter 10, Geology, Hydrology and Hydrogeology** of the ES concludes that with the adoption of recommended mitigation measures the Proposed Development would not result in any residual significant effects on water quality within waterbodies on and off the Development Site. As a result, no adverse effects are predicted for angling and water related recreational activities (e.g. canoeing, kayaking, etc.).

15.10.23 Taking into account the lack of any identified public access receptors within the Development Site it is considered that the construction of the Proposed Development would result in a temporary Small magnitude of change to public access within a low sensitivity site. The resulting negligible effects on public access would therefore be '**not significant**'.

15.10.24 It is therefore considered that the construction and decommissioning stages of the Proposed Development would result in temporary effects on recreational receptors that are considered **not significant** in EIA terms.

Tourism

15.10.25 Any significant effects on tourism during the construction period (12 months) are unlikely given the temporary nature of this activity and the fact that much of the construction work (excluding turbine erection) will only be visible from within the Development Site boundary.

15.10.26 **Chapter 14 – Traffic & Transport** of this ES predicts that the construction of the Proposed Development will result in a maximum average increase in HGVs of 204[14] daily movements, estimated to be generated during month 3 of the construction programme. This equates to an average of 18 HGVs per hour for delivery and return journey over a 12 hour working day. The construction of the Proposed Development will seek to avoid the peak traffic periods at the beginning and end of each day and other sensitive periods (including school drop off and pick up times) where achievable as stipulated within the Construction Traffic Management Plan (TMP). The assessment provided in **Chapter 14** of the ES concludes that the predicted temporary increase in construction traffic would represent a '**not significant**' effect in EIA terms.

15.10.27 In relation to abnormal load movements, **Chapter 14** concludes that with the implementation of the proposed TMP, the actual movement of abnormal vehicles would result in a '**not significant**' level of adverse traffic effects. Adverse effects on road users including tourists during construction would therefore also be '**not significant**'.

15.10.28 Taking into account limited visibility and the predicted traffic effects, the construction and decommissioning effects on tourism receptors are considered **not significant** in EIA terms.

15.11 Predicted Effects: Operation

Economics Effects

15.11.1 The BiGGAR report (2015) estimates the level of operational investment for a wind farm of greater than 5MW to be between £23,000 and £130,000 per year per MW installed. The report explains that the large differential in this cost range is due to differences in the size of developments, land contracts and whether or not turbines were still under warranty across the case study projects examined. The weighted average cost was £59,867 per MW installed per annum.

15.11.2 On this basis the Proposed Development has the potential to generate up to between £1.4m and £8.2m each year during its operational life[15]. Using the weighted average operations and maintenance cost of £59,867 per MW installed per annum quoted within the BiGGAR report (2015), this would generate up to approximately £3.8m of operations and maintenance expenditure per annum throughout the Proposed Development's operational life. Therefore, over the 25 year period of operation, the Proposed Development is predicted to generate total operations and maintenance expenditure of up to between £35m and £205m.

15.11.3 In terms of the geographical distribution of operations and maintenance expenditure, the BiGGAR report (2015) states that 42% of expenditure occurs locally and 58% is within the region/nation. Therefore it is predicted that the Proposed Development could result in up to between £588,000 and £3.4m of local annual operations and maintenance expenditure and up to between £812,000 and £4.8m of annual operations and maintenance expenditure within Scotland. It should however be noted that the BiGGAR report (2015) identifies that operating costs vary throughout the life of a wind farm, with costs noticeably increasing from the baseline position after five years due to increased maintenance requirements.

15.11.4 The operation and maintenance of the Proposed Development would provide an annual contribution to the local economy throughout its consented operating period. Within the locality of the Development Site (i.e. Cumnock and New Cumnock Ward and Doon Valley Ward) this would represent a Small magnitude of change due to an anticipated noticeable increase in expenditure. At local, regional and national scales, predicted economic effects associated with the operation of the Proposed Development are considered to be long term and beneficial but '**not significant**'.

[14] The 204 HGVs movement during month 3 considers that 100% of all road stone required for the construction of on-site access tracks will be imported and therefore, represents a likely theoretical worst case scenario. It is highly likely that a significant proportion of stone can be recovered onsite using borrow pits.

[15] All figures in this section are rounded to 1 decimal place.

15.11.5 Wind farms are liable for business rates. This will generate an additional economic effect in addition to operations and maintenance expenditure. The rateable value of wind farms in Scotland is determined on a case-by-case basis based on the installed capacity and load rate; the Scottish Assessors Association has published Practice Note 2, Valuation of On-shore Turbines/Wind Farm in order to help calculate the rateable value. It suggests where the load rate is unknown a figure of 25% is used giving a rateable value of £18,557 per MW for a wind farm of >10MW. On this basis, the rateable value for a 62.7MW wind farm is therefore £1,163,523.90 per year. Using the Scottish Assessors Multiplication Rates (48.2 pence in the pound for 2014/2015 including supplement (http://www.saa.gov.uk/ratespayable.html)) the business rates payable by the Proposed Development are estimated at £560,818.52 per year. At the national level, this is considered to be a Negligible magnitude of long term beneficial change which would result in a Slight to Negligible level of effect, which is considered '**not significant**'. It should be noted that: these rates may be subject to relief or supplements that are not known at this stage; and the rateable multipliers are reviewed on a five-yearly basis, the last of which took place in 2010.

15.11.6 Overall the proposed effects during the operation phase of the Proposed Development on the economy would result in a long term and beneficial effect that is considered '**not significant**'.

Accommodation

15.11.7 A number of hotels and bed and breakfasts are located within the Cumnock and New Cumnock council ward which the Development Site lies within, as well as within the wider surrounding area.

15.11.8 Operations and maintenance activities would be likely to increase occupancy in nearby hotels and other short term accommodation, as well as increasing trade in local hospitality establishments, throughout the operational phase of the Proposed Development. However, is not likely to result in an overwhelming influx of local accommodation or hospitality bookings at a particular point in time. Owing to the predicted limited frequency and scale of operations and maintenance activities, these potential changes are considered to represent a Small-Negligible positive magnitude of change on local accommodation receptors, resulting in a long term beneficial slight effect which is considered '**not significant**'.

15.11.9 Whilst there could be theoretical and actual visibility of the Proposed Development from tourist accommodation receptors there is no quantifiable evidence available to indicate that this would be likely to generate any significant adverse effects relating to the visitor attractiveness or tourism potential of such receptors (thus also in terms of accommodation, occupancy levels, business turnover and wider socioeconomic effects). This conclusion is supported by findings from the review of academic research, surveys and polls regarding public and tourist attitudes to wind farms which is detailed in **Appendix 15.B**.

Employment Effects

15.11.10 There will be potential for both national and local employment creation through the requirement for maintenance of the Proposed Development. It is not anticipated that the Proposed Development will result in job losses taking account of the neutral effect on land use and the not significant effect on tourism and recreation receptors as assessed below.

15.11.11 The BiGGAR (2015) report in Table 9: GVA and Employment Ratios (Operations and Maintenance) estimates that average total turnover per employee during the operational phase of a wind farm is £121,935. If replicated during the operational phase of the Proposed Development this could result in total employment ranging from up to 11.5 FTE (£1.4m ÷ £121,935) to 67.2.FTE (£8.2m ÷ £121,935) per annum.

15.11.12 In terms of the geographical distribution of predicted operations and maintenance employment:

- Local annual operations and maintenance expenditure (within East Ayrshire) could create up to between 4.8 FTE (£588,000÷121,935) and 27.9 FTE (£3.4m÷£121,935) jobs per annum in East

Ayrshire during the operational phase of the Proposed Development[16]. The location and duration of all jobs would depend upon specific operations and maintenance requirements; and

- National annual operations and maintenance expenditure (within Scotland) could create up to between 6.7 FTE (£812,000÷£121,935) and 39.3 FTE (£4.8m/£121,935) jobs per annum in Scotland during the operational phase of the Proposed Development[17]. The location and duration of all jobs would depend upon specific operations and maintenance requirements.

15.11.13 In summary, the Proposed Development is predicted to generate operations and maintenance related employment ranging between 4.8 FTE – 27.9 FTE jobs in East Ayrshire and 6.7 – 39.3 FTE within Scotland. This increase in employment is considered to be a beneficial Negligible magnitude of change across East Ayrshire and Dumfries and Galloway but a Small magnitude of change within the locality of the Development Site (i.e. within the Cumnock and New Cumnock council ward). Operational effects on employment at the national level would not be discernible. Therefore, the operation of the Proposed Development is predicted to have a beneficial slight to negligible effect on employment at the local level. These effects are considered '**not significant**'.

Land Use Impacts

15.11.14 In terms of land use change, the long term land management practices can continue unaffected by the Proposed Development with normal agricultural practices continuing unimpeded. In addition, a new viable land use (i.e. a wind farm) would be established, which is considered to represent a beneficial land use change. This Small magnitude of change would result in a long term beneficial effect, which is considered '**not significant**'.

Recreation

15.11.15 During the operational phase of the Proposed Development, the public would enjoy unrestricted access to the Development Site under the general 'right to roam' enshrined in the Land Reform (Scotland) Act 2003. Temporary public access restrictions would only apply if it is necessary to undertake intensive maintenance or upgrading to on-site infrastructure including turbines and access tracks, in accordance with the CDM Regulations 2015.

15.11.16 During the operational phase, the public would have access to approximately 12.9km of new tracks and 5 watercourse crossings (or six, if the central borrow pit search area is utilised) which would be created through the Proposed Development. This would provide a new network of publicly accessible routes across the Development Site and beyond, thereby facilitate relatively easy public access. Taking account of the baseline position, namely that the Development Site is not currently served by any designated footpaths, the development of a 12.9km access track network with watercourse crossings is considered to result in a beneficial permanent Moderate level of effect on public access, which is considered '**not significant**'.

15.11.17 No Core Paths or other designated walking routes are located within the Development Site, so the Proposed Development would not result in adverse effects on public access to these statutorily protected routes. However, given that Core Paths located within 10km of the Development Site have the potential to experience significant adverse visual effects from the operation of the Proposed Development, an assessment of operational effects on the attractiveness of these Core Paths is provided in **Table 15.16**.

[16] Figures rounded to 1 decimal place

[17] Figures rounded to 1 decimal place

Table 15.16 Assessment of Operational Effects on Core Paths

Core Paths	
DGC Core Path No. 667 Water of Deugh Trail	This Core Path is located approximately 2.8km from the Development Site at its closest point. ES Viewpoint 3: Core Path 667 Water of Deugh (**Figure 9.29**) illustrates a short stretch of the Core Path where clear views are available at approximately 4.5km distance to the Proposed Development. The rest of the route is almost entirely within commercially managed coniferous woodland, so only glimpses of the Proposed Development would be visible through dense forestry. The visual assessment provided in **Chapter 9 – LVIA** concludes that the magnitude of change would range from Zero to Medium and the level of effect would be No View to Substantial/Moderate, and therefore significant. Taking account of the consented Windy Standard Extension Wind Farm and the proposed South Kyle Wind Farm, the level of cumulative visual effect would be substantial and significant. Owing to the fact that visibility would be confined to a short section of this Core Path the Proposed Development would generate a Small magnitude of change on the attractiveness of this receptor. The predicted level of effect is considered '**not significant**'.
EAC Core Path No. C12: New Cumnock Circular	This Core Path is located approximately 3.9km from the Development Site at its closest point. The ZTV analysis suggests that views of the Proposed Development would be available from the entire stretch of the Core Path within 5km of the Development Site. In practice, the built form and vegetation would screen the views from Bankglen, but clear open views of the Proposed Development would be available from the majority of the route. The visual assessment provided in **Chapter 9 – LVIA** therefore concludes that the magnitude of change would range from Zero to Medium and the level of visual effect would be Substantial/Moderate and significant. Cumulative wind farm development would not alter this conclusion. The Core Path is easily accessible from New Cumnock, but it is not currently suitable for all abilities. The primary function of this path is considered to be general access to the wider countryside and the provision of a link between other paths to forms a network. Users of this Core Path would experience significant visual effects as a result of the Proposed Development; however taking account of the main function of the path (general access) it is considered that the Proposed Development would generate a Medium magnitude of change on the attractiveness of this receptor. The predicted level of effect is considered '**not significant**'.
EAC Core Path No. C10: Coalfield Cycle Route	This Core Path is located approximately 4.2km from the Development Site at its closest point. The only stretch of the route within 5km of the Development Site which is covered by the blade tip ZTV is a 250m section of the Core Path located east of Laight Farm. At this location roadside and riparian vegetation would screen most views of the Proposed Development. The remainder of the route within 5km of the Development Site would not experience any views of the Proposed Development. The Core Path stretches to 24km in length and has been designed to be suitable for all abilities. Owing to very limited visibility combined with a lack of immediate proximity to the Development Site, the Proposed Development would generate a Small magnitude of change on the attractiveness of this receptor, which relates to access to the wider countryside. The predicted level of effect is considered '**not significant**'
EAC Core Path No. C14: Glen Afton	This Core Path is located approximately 4.5km from the Development Site at its closest point. Intervening riparian vegetation along Afton Water would screen all theoretical views of the Proposed Development. The Core Path is not currently suitable for all abilities. It links with centre of New Cumnock, the Glen Afton and Robert Burn connections. Owing to no visibility, the Proposed Development would generate a Negligible magnitude of change on the attractiveness of this receptor. The predicted level of effect is therefore considered '**not significant**'

15.11.18 Given that the specific site of the Proposed Development is not a recognised tourism destination and is not actively used for specific land based recreational purposes other than for general walking activities, the operation of the Proposed Development would not result in direct effects upon specific recreational activities.

15.11.19 **Chapter 10, Geology, Hydrology and Hydrogeology** of the ES concludes that with the adoption of recommended mitigation measures the Proposed Development would not result in any residual significant effects on water quality within waterbodies on and off the Site. As a result, no adverse effects are predicted for angling and water related recreational activities (e.g. canoeing, kayaking, etc).

15.11.20 In relation to operational effects on recreational receptors, the Proposed Development would result in beneficial permanent local access effects within the Development Site. The overall predicted operational level of effect on recreation is considered '**not significant**'.

Tourism

15.11.21 The Proposed Development has the potential to indirectly affect tourism and recreational activities outwith the Development Site boundary through generating landscape and visual effects at tourism destinations, areas/routes where recreational pursuits are undertaken, and communication routes regularly frequented by tourists.

15.11.22 Owing to the expected minimal level of maintenance activity required, **Chapter 14 – Traffic & Transport** of this ES concludes that traffic associated with the operational phase of the Proposed Development would not result in any significant traffic or transport related effects which could potentially generate wider socio-economic tourism or recreational effects.

15.11.23 Individual tourism receptors located within 35km of the Development Site and within the ZTV of the Proposed Development are listed in **Table 15.14** (see **Section 15.7** – Baseline Information). Detailed assessments of potential landscape and visual and cultural heritage effects on these receptors have been undertaken where appropriate, as detailed in **Chapter 9 – LVIA** and **Chapter 10 – Historic Environment**. It is important to note that any adverse effects identified within **Chapters 9 and 10** of this ES relate only to those subject specific assessments, rather than necessarily to potential effects on visitor attractiveness and tourism.

15.11.24 Informed by the aforementioned subject specific assessments, an assessment of effects on visitor attractiveness and tourism potential at relevant receptors is provided below in **Table 15.17**.

15.11.25 Tourist receptors located outwith 35km radius from the Development Site or outwith the 35km ZTV of the Proposed Development have been scoped out of this assessment as there would be very limited or no potential effects on visitor attractiveness and tourism due to the Negligible or No magnitude of visual change likely to occur. With the exception of the Galloway Forest Park and Dean Castle Country Park, which were identified by Visit Scotland as being within the top five visitor attractions in Ayrshire & Arran and Dumfries & Galloway respectively in 2013, all tourism receptors located beyond 10km from the Development Site and which, as assessed individually within **Chapter 9 - LVIA** and/or **Chapter 10 – Cultural Heritage**, would not experience significant visual effects or significant effects on the setting of historic assets, have been scoped out of this tourism assessment. Owing to limited visibility and no significant adverse landscape and visual or cultural heritage effects, it is considered there is no possibility that these receptors would experience significant effects in terms of visitor attractiveness and tourism potential.

15.11.26 The determining factor within the assessment provided below is the extent to which predicted adverse effects on the physical environment may reduce the attractiveness of individual tourist destinations or visitor attractions, thereby potentially resulting in a reduction in visitor numbers. The assessment of tourist routes and destinations presented in Table 15. 17 concludes that the effect on tourism receptors as a result of the Proposed Development would be '**not significant**'.

Table 15.17 Assessment of Operational Effects on Visitor Attractiveness and Tourism Potential

Receptor Name	Assessment
Potential Tourist Routes	
Local roads within 10km of the Development Site: **B741 between Auchenroy and New Cumnock -** Figure 9.24 **B7046 –** Figure 9.20 **Afton Road –** Figures 9.20 **and** Figure 9.30	The ZTV analysis indicates that the Proposed Development would be visible along approximately 85% of the 18km stretch of the B741 which lies within 10km radius of the Development Site, although visibility would be significantly reduced by vegetation and built form screening. Owing to differential visibility of the Proposed Development along the B741 and differences in the proximity of the Development Site to parts of the B741, the visual assessment provided in **Chapter 9 – LVIA** concludes that the overall magnitude of change would range from Zero to High and the overall level of effect would range from No View to Substantial/Moderate, with significant effects occurring from within approximately 4.5km of the Proposed Development. Cumulative wind farm development would not alter this conclusion The ZTV analysis indicates that the Proposed Development would be visible along approximately 18% of the 7.2km long Afton Road, which is located entirely within 10km radius of the Development Site. Although theoretically visible from three stretches of Afton Road, field surveys confirmed that one of these stretches would have no visibility due to screening from dense woodland. The visual assessment provided in **Chapter 9 – LVIA** concludes that the overall magnitude of change would be Medium to Zero and the level of effect would be Substantial/Moderate and significant to No View. The ZTV analysis indicates that potential views of the Proposed Development would be available from only a short east-west section of the B7046 west of Skares. However, in practice the intervening commercial forestry to the south of the route would screen all views of the Proposed Development. None of the aforementioned roads are tourist destinations in their own right; rather they are potential receptors due to their role in facilitating access to visitor attractions and forming part of a holistic visitor experience. As such the determining factors for this assessment are the extent to which the Proposed Development would adversely affect the visitor experience of road users, and whether or not this may result in high numbers of tourists avoiding travelling to visitor attractions or tourist destinations using these roads. Views of the Proposed Development would be intermittent along all of the assessed roads, so within the context of a longer travel journey these views would be experienced within a varied landscape setting. Furthermore, the primary focus of drivers would be on the road rather than surrounding landscapes. Taking these factors into account it is considered that whilst visibility of the Proposed Development (both individually and in combination with other wind farms) could momentarily affect visitor experience (a Medium magnitude of change) this would be insufficient to affect overall visitor experience (a Small to negligible magnitude of change). Consequently the level of effect regarding the attractiveness of these roads to tourist users would be '**not significant**'.
A76 (part of the Burns Heritage Trail) (Figure 9.25**)**	The ZTV analysis indicates that the Proposed Development would be visible along approximately 89% of the 8.8km stretch of the A76 which lies within 10km radius of the Development Site, although visibility would be significantly reduced by vegetation and built form screening. This section of road forms part of the Burns Heritage Trail, a 327km circular driving route which passes through Mauchline, Cumnock, New Cumnock, Sanquhar to Dumfries, south-west to Kirkcudbright then north towards Ayr and out to Kilmarnock Owing to differential visibility of the Proposed Development and differences in the proximity of the Development Site to parts of the A76, the visual assessment provided in **Chapter 9 – LVIA** concludes that the overall magnitude of change would range from Medium to Zero and the overall level of effect would range from Moderate to No View, which would be not significant in EIA terms. Taking account of existing and consented development would not alter this conclusion, however also taking account of the proposed High Cumnock and Garleffan wind farms the level of cumulative visual effect would be Substantial/Moderate, which would be significant in EIA terms. Owing to screening from vegetation and built form, views of the Proposed Development would be intermittent along the A76. Consequently, within the context of a longer travel journey these views would be experienced within a varied landscape setting. Taking this into account it is considered that whilst visibility of the Proposed Development (both individually and in combination with other wind farms) could momentarily affect visitor experience (a Small magnitude of change) this would be insufficient to affect overall visitor experience (a Negligible magnitude of change). Consequently the level of effect regarding the attractiveness of the A76 (part of the Burns Heritage Trail) to tourist users would be '**not significant**'.

Receptor Name	Assessment
A713 National Tourist Route between Waterside and Dalmellington (Figure 9.20)	The nearest section of the A713 with theoretical visibility of the Proposed Development is located 8km from the Development Site. Field surveys have confirmed that roadside vegetation would screen the majority of the views towards the Proposed Development to the east of the A713. The visual assessment provided in **Chapter 9 – LVIA** therefore concludes that the overall magnitude of change would range from Zero to Low and the level of effect would range from No View to Moderate. Visual effects on the A713 would therefore not be significant in EIA terms. Given that views of the Proposed Development would only be experienced along two relatively short sections of the A713 and would largely be screened by roadside vegetation, it is considered that whilst visibility of the Proposed Development (both individually and in combination with other wind farms) could momentarily affect visitor experience (a negligible to Small magnitude of change) this would be insufficient to affect overall visitor experience (a Negligible magnitude of change). Consequently the level of effect regarding the attractiveness of the A713 National Tourist Route to tourist users would be '**not significant**'.
Scottish Hill Tracks and Heritage Paths	
81 Barr to Dalmellington / 78b Glen Trool Village to Dalmellington by Tunskeen (Figure 9.21)	This Scottish Hill Track is located approximately 8.1km to the west of the Development Site. The B741 sequential assessment viewpoints 2, 3 and 4 illustrate views from the part of this track overlapping with the B741. The majority of the 4.2km long section of the track within 10km of the Development Site is located within the blade tip ZTV. Due to limited screening over the intervening Bogton Loch, walkers would experience views of the Proposed Development with up to 19 turbines visible at a distance across the horizon, although from most sections of the track only the upper parts of between 1 and 14 turbines would be visible. The intervening roadside vegetation and commercial forestry would wholly or partly screen the views in many instances, especially in the summer months. Therefore the visual assessment provided in **Chapter 9 – LVIA** concludes that the magnitude of change would range from Low to Zero and the level of effect experienced by walkers would range from Moderate to No View, which would not be significant in EIA terms. Taking account of existing and consented development would not alter this conclusion, however if application sites are also considered the combined level of effect would range from Substantial/Moderate and significant (due to the Keirs Hill application scheme) to No View. Owing to limited visibility combined with a lack of proximity to the Development Site, the Proposed Development would generate a Small magnitude of change on the attractiveness and tourism potential of this receptor. The predicted level of effect is therefore considered '**not significant**'.
84 New Cumnock to St John's Town of Dalry by Glen Afton (Figure 9.21)	This Scottish Hill Track is located approximately 4.2km from the Development Site at its closest point. The only stretch of the route within 10km of the Development Site and which is covered by blade tip ZTV is a 250m section of path located east of Laight Farm. Roadside and riparian vegetation would screen most views of the Proposed Development at this location. The remainder of the Track within 10km of the Development Site would not experience any views of the Proposed Development. Significant individual or cumulative visual effects are not predicted within **Chapter 9 – LVIA**. Owing to very limited visibility combined with a lack of immediate proximity to the Development Site, the Proposed Development would generate a Negligible magnitude of change on the attractiveness and tourism potential of this receptor. Therefore regardless of the level of sensitivity afforded to this receptor, the predicted level of effect is considered '**not significant**'.
Old Road from New Cumnock to Dalquhairn (Heritage Path) (Figure 9.21)	This Heritage Path follows the same route as the Afton Road and is located at a distance of approximately 4.2km from the Development Site at its closest point. Beyond the southern end of Afton Road it follows the same route as Scottish Hill Track 84. The only stretch of the route within 10km which is covered by blade tip ZTV is a 250m section of path located east of Laight Farm. Roadside and riparian vegetation would screen most views of the Proposed Development at this location. The remainder of the Track within 10km of the Development Site would not experience any views of the Proposed Development. Significant individual or cumulative visual effects are not predicted within **Chapter 9 – LVIA**. Owing to very limited visibility combined with a lack of immediate proximity to the Development Site, the Proposed Development would generate a Negligible magnitude of change on the attractiveness and tourism potential of this receptor. Therefore the predicted level of effect is considered '**not significant**'.
Identified Summits/Hillwalking Areas	

Receptor Name	Assessment
Cairnsmore of Carsphairn 797m AOD (Corbett) (Figure 9.36)	Cairnsmore of Carsphairn is a hill located to the south-east of Dalmellington. ES Viewpoint 8: Cairnsmore of Carsphairn illustrates the views from this summit. The Proposed Development would appear against the landscape at a distance of approximately 8.7km to the north. All of the 19 proposed turbines (including 18 hubs) would be visible and would appear as a simple and cohesive design with minimal overlapping. The visual assessment provided in **Chapter 9 – LVIA** concludes that the magnitude of change would be Low and the level of effect would be Moderate and not significant. Taking account of existing, consented and application wind farms the combined level of effect would be Substantial and significant due to the consented Windy Standard Extension Wind Farm. Taking account of all aspects of hillwalking as a recreational and tourist activity, it is considered that the predicted not significant level of visual effect would not represent a substantial infringement on the enjoyment of hillwalkers using this receptor. Combined with a lack of immediate proximity to the Development Site, the Proposed Development would generate a Negligible magnitude of change on the attractiveness and tourism potential of this hillwalking receptor. Therefore the predicted level of effect is considered '**not significant**'. Whilst some significant adverse cumulative visual effects could occur as a result of the Proposed Development in combination with other proposed and consented schemes, there is no quantifiable evidence available to indicate that this would be likely to generate any significant adverse effects in terms of visitor attractiveness or tourism potential. Therefore the predicted level of likely cumulative effect is considered '**not significant**'.
Blackcraig Hill 700m AOD (Graham) (Figure 9.34)	Blackcraig Hill (700m) is a hill in the Southern Uplands located to the south of New Cumnock and to the northeast of the Development Site. ES Viewpoint 6: Blackcraig Hill illustrates the views from this summit. The Proposed Development would appear partially across the horizon and against the landscape at a distance of 6.7km. All of the proposed turbines (including all hubs) would be visible to the southwest and would appear as a simple and cohesive design with minimal overlapping. The visual assessment provided within the LVIA therefore concludes that the magnitude of change would be Medium and the level of effect would be Substantial/Moderate and Significant. Taking account of existing and consented wind farms the combined level of effect would be Substantial and significant due to the consented Hare Hill Extension, Sanquhar and Afton wind farms. Also taking account of application schemes the combined level of effect would be Substantial and significant due to the consented Hare Hill Extension, Sanquhar and Afton wind farms and the South Kyle, Pencloe and Quantans Hill application schemes. Whilst it is acknowledged that the Proposed Development would result in some significant adverse visual effects at the summit of this receptor, there is no quantifiable evidence available to indicate that this would generate any significant adverse effects in terms of visitor attractiveness or tourism potential, especially taking account of the lack of immediate proximity of this receptor to the Development Site and of all aspects of hillwalking as a recreational and tourist activity. On this basis, the Proposed Development would generate a Small magnitude of change on the attractiveness and tourism potential of this hillwalking receptor. Therefore the predicted level of effect is considered '**not significant**'. Whilst some significant adverse cumulative visual effects could occur as a result of the Proposed Development in combination with other proposed and consented schemes, there is also no quantifiable evidence available to indicate that this would be likely to generate any significant adverse effects in terms of visitor attractiveness or tourism potential. Therefore the predicted level of likely cumulative effect is considered '**not significant**'.
Windy Standard 698m AOD (Graham)	Windy Standard is a hill summit in the Southern Uplands located to the southeast of the Afton Reservoir. The summit and much of its slopes to the north-west are covered with the turbines of the existing Windy Standard Wind Farm. The Proposed Development would appear behind the existing turbines in the foreground, partially across the horizon and against the landscape at a distance of 7km. All of the 19 proposed turbines (including 17 hubs) would be visible and would appear as a simple and cohesive design with minimal overlapping. The magnitude of change would be Low and the level of effect would be Moderate and not significant. Taking account of existing and consented wind farms the combined level of effect would be Substantial and significant due to the consented Hare Hill Extension, Sanquhar and Afton wind farms. Also taking account of application schemes the combined level of effect would be Substantial and significant due to the Existing Windy Standard scheme, the consented Windy Standard Extension, the consented Afton Wind Farm and the South Kyle, Pencloe and Benbrack application schemes. Taking account of all aspects of hillwalking as a recreational and tourist activity, it is considered that the predicted not significant level of visual effect would not represent a substantial infringement on the enjoyment of hillwalkers using this receptor. Combined with the lack of immediate proximity to the Development Site, the Proposed Development would generate a Negligible magnitude of change on the attractiveness and tourism potential of this hillwalking receptor. Therefore the predicted level of effect is considered '**not significant**'. Whilst some significant adverse cumulative visual effects could occur as a result of the Proposed Development in combination with other consented and proposed schemes, there is no quantifiable evidence available to indicate that this would be

Receptor Name	Assessment
	likely to generate any significant adverse effects in terms of visitor attractiveness or tourism potential. Therefore the predicted level of likely cumulative effect is considered '**not significant**'.
Tourist Destinations	
Knockshinnoch Lagoons Local Nature Reserve	The blade tip ZTV indicates that views of the Proposed Development would be available throughout this local nature reserve. However, some views (especially in the north and north eastern parts of the reserve) of the Proposed Development would be screened in summer where birch woodland has been allowed to vegetate close to the edges of the path. Built form at New Cumnock and Connell Park would further screen views. The visual assessment provided in **Chapter 9 – LVIA** concludes that the magnitude of change would be Medium where views are available. The level of visual effect would range from Substantial / Moderate to No View and significant. Taking account of existing and consented developments would not alter this conclusion, however also taking account of proposed schemes the cumulative level of visual effect would be Substantial / Moderate and significant due to the proposed High Cumnock and Garleffan wind farms. Whilst some significant adverse cumulative visual effects could occur as a result of the Proposed Development in combination with other proposed schemes, there is no quantifiable evidence available to indicate that this would be likely to generate any significant adverse effects in terms of visitor attractiveness or tourism potential. In particular it is considered that predicted adverse significant visual effects at this receptor would not represent a substantial infringement on the enjoyment of visitors to the local nature reserve, as visitors are likely to be primarily attracted to the receptor by localised ecological and landscaping features rather than wider scenic views. Therefore the predicted level of effect is considered '**not significant**'.
Burns Memorial	The ZTV indicates that there would be visibility of up to 9 blades (no hubs), however, both sides of the Afton Road at this point, and the area around the cairn and picnic benches, are planted with mature broadleaved trees which screen views to the west towards the Proposed Development. Views from the cairn are orientated east towards Glen Afton Water. It is unlikely that any views would be available in summer and in winter only glimpses of the Proposed Development may be available. The visual assessment provided in **Chapter 9 – LVIA** therefore concludes that the magnitude of change (where views are available) would be Negligible and the level of visual effect would range from Slight to No View and not significant. Cumulative wind farm development would not alter this conclusion. Owing to very limited predicted limited visibility, the Proposed Development would generate a Negligible magnitude of change on the attractiveness and tourism potential of this receptor. Therefore the predicted level of effect is considered '**not significant**'.
Craigengillan Estate GDL (Figure 9.19 **and** Figure 9.37**)**	The ZTV analysis indicates that there would be views of 15 to 19 turbines from the western part of the estate, gradually reducing to none along the eastern boundary. There would be very limited theoretical visibility from estate properties and wireframes confirm that views of one blade tip would be theoretically visible from the estate house. Other potential views are heavily screened by mature broadleaf estate trees and woodland. Views would be available from the facing slopes and summits of hills rising behind the estate house. ES viewpoint 11: Auchenroy Hill illustrates the view from the nearby hill summit located within the GDL, from which 19 of the proposed turbines including 16 hubs would be partially visible. The visual assessment provided in **Chapter 9 – LVIA** concludes that the overall magnitude of change would range from Low to Zero and the level of effect would be Moderate to No view and not significant. Taking account of existing and consented wind farms there would be successive views of the Proposed Development with the consented Dersalloch Wind Farm to the west from some parts of the estate, at a distance of approximately 1.4km. The combined level of effect would range from Substantial/Moderate and significant to No View. Also taking account of application schemes, the combined level of effect would range from Substantial and significant to No View due to the Keirs Hill and Glenmount application schemes. Owing to limited visibility combined with a lack of immediate proximity to the Development Site, the Proposed Development would generate a Negligible magnitude of change on the attractiveness and tourism potential of this receptor. Therefore the predicted level of effect is considered '**not significant**'. Whilst

Receptor Name	Assessment
	some significant adverse cumulative visual effects could occur as a result of the Proposed Development in combination with other consented and proposed schemes, there is no quantifiable evidence available to indicate that this would be likely to generate any significant adverse effects in terms of visitor attractiveness or tourism potential. Therefore the predicted level of likely cumulative effect is considered '**not significant**'.
Galloway Forest Park (including Corserine, Merrick and Shalloch an Minnoch hill summits), Galloway Forest Dark Sky Park and Scottish Dark Sky Observatory (Figure 9.19, Figure 9.36 and Figures 9.44-9.47)	The Galloway Forest Park, managed by Forestry Commission Scotland, covers the same land area as the internationally recognised Galloway Forest Dark Sky Park. The Scottish Dark Sky Observatory, located within the Craigengillan Estate, was established in connection with the Galloway Forest Dark Sky Park. The main area of the Forest Park is located at a distance of approximately 10.6km from the Development Site at its closest point. Theoretical visibility across the Park is fragmented and limited almost solely to the hill summits including Corserine, Merrick and Shalloch an Minnoch. A number of ES viewpoints illustrate potential views of the Proposed Development from within the Forest Park including viewpoints 18, 19, 20 and 21. The visual assessment provided in **Chapter 9 – LVIA** concludes that the magnitude of change would range from Negligible to Zero. The overall level of effect would be Slight to No View and not significant. Taking account of existing and consented wind farms, there would be simultaneous views of the Proposed Development with the existing Bankend Rig, Hare Hill and Windy Standard wind farms and the consented Windy Standard Extension, Hare Hill, Afton and Sanquhar wind farms to the northeast. There would also be successive views of the existing Hadyard Hill Wind Farm and the consented Dersalloch Wind Farm to the north at a distance of approximately 27km and 12.4km respectively. The LVIA concludes that the combined level of effect due to existing and consented cumulative development (specifically the consented Dersalloch) would range from Substantial/Moderate and significant to No View. Taking account of application schemes, the combined level of effect would range from Substantial and significant to No View due to the Glenmount application scheme. ES viewpoint 10 specifically considers the potential for visual effects at the Scottish Dark Sky Observatory, and the viewpoint assessment provided as **Appendix 9.B** concludes that there would be a Negligible magnitude of change resulting from the Proposed Development. The predicted level of visual effect is therefore slight and '**not significant**'. Whilst taking account of cumulative wind farm developments would increase this level of effect, cumulative visual effects would remain not significant. In addition, the applicant has commissioned a report from Dr Stuart Lumsden, Associate Professor in the School of Physics and Astronomy at the University of Leeds, regarding the impact of infrared military aviation lights mounted on the proposed 19 wind turbines on the Galloway Forest Dark Sky Park and the Scottish Dark Sky Observatory. The executive summary of this report, provided in full within **Appendix 15.C** states: *"The final conclusion is that there is no effect from the proposed aviation lights on the Gold Tier status of the Dark Sky Park as a whole.* ***The Scottish Dark Sky Observatory will not be significantly affected for the main purpose of their work, namely facilitating viewing of the night sky for visitors and amateur astronomers****. The direct line of sight to all but one of the lights is blocked by local topography. No quantitative astronomy is carried out within the first few degrees of the horizon because of the increased atmospheric opacity, so even the one remaining light lies outside a region that would normally be observed. There may be some minor impact on the general amenity for amateur astronomy from other locations within the Galloway Forest Park, but only for those possessing suitable equipment able to detect infrared radiation, and only from locations that are not designated as main viewing sites within the Park (mostly well away from any roads). Most night-time visitors to the Park would in general lack suitable detecting equipment, and therefore would not notice the infrared lights from any viewpoint. They would still experience the full benefit of the Dark Sky Park".* Owing to a lack of immediate proximity to the Development Site, in relation to visual matters the Proposed Development would generate a Negligible magnitude of change on the attractiveness and tourism potential of the Galloway Forest Park. Whilst some significant adverse cumulative visual effects could occur as a result of the Proposed Development in combination with other proposed schemes, there is no quantifiable evidence available to indicate that this would be likely to generate any significant adverse effects in terms of visitor attractiveness or tourism potential. In relation to visual matters there would also be a Negligible magnitude of change on the attractiveness and tourism potential of the Galloway Forest Dark Sky Park and the Scottish Dark Sky Observatory, as any potentially significant visual effects arising from the Proposed Development would occur during daylight hours so would be very unlikely to deter visitors from their primary purpose of viewing the night sky. Furthermore, from the evidence provided in **Appendix 15.C** it is clear that neither the Galloway Forest Dark Sky Park nor the Scottish Dark Sky Observatory would experience significant adverse light pollution effects from the Proposed Development. Consequently in terms of both visual and light pollution matters it is considered that the Proposed Development would generate a Negligible magnitude of change on the attractiveness and tourism potential of these receptors. The predicted level of effect is therefore considered '**not significant**'.

Receptor Name	Assessment
Dean Castle Country Park	The visual assessment provided in **Chapter 9 – LVIA** concludes that there would be no significant effects resulting from the views of the Proposed Development due to intervening screening by built form of Kilmarnock and the intervening distance. Owing to limited visibility, the Proposed Development would generate a Negligible magnitude of change on the attractiveness and tourism potential of this receptor. Therefore the predicted level of effect is considered '**not significant**'.
Loch Doon (Figure 9.39)	Loch Doon is located approximately 9.6km from the Development Site at its closest point. The ZTV analysis indicates that views of the Proposed Development would only be available from the south western shores of the Loch, at a distance exceeding 10km from the Development Site. ES viewpoint 13 illustrates views from the south western shore of Loch Doon. Owing to a lack of proximity to the Development Site, the limited availability of views and the plethora of other scenic views provided at Loch Doon, it is considered that the Proposed Development would generate a Small magnitude of change on the attractiveness and tourism potential of this receptor. Therefore the predicted level of effect is considered '**not significant**'.
Scottish Industrial Railway Centre, Dalmellington (Dunaskin Heritage Centre)	This receptor is a partly open-air industrial heritage museum, located 10.8km from the Development Site between Dalmellington and Waterside on the A713. The ZTV analysis indicates that up to 4 turbines would be theoretically visible from the museum's location, however in practice the large industrial building which comprise the museum itself would screen the majority of views. The visual assessment provided in **Chapter 9 – LVIA** concludes that the magnitude of change would be Negligible and the level of effect would be Slight and not significant. Taking account of existing and consented wind farms would not alter this conclusion. However, also taking account of application sites the level of cumulative visual effect would be Substantial and significant due to the Keirs Hill application scheme. Owing to a lack of visibility and also considering the inward looking focus of this receptor, the Proposed Development would generate a Negligible magnitude of change on the attractiveness and tourism potential of this receptor. The predicted level of effect is therefore considered '**not significant**'. Whilst some significant adverse cumulative visual effects could occur as a result of the Proposed Development in combination with other proposed schemes, there is no quantifiable evidence available to indicate that this would be likely to generate any significant adverse effects in terms of visitor attractiveness or tourism potential. Therefore the predicted level of likely cumulative effect is considered '**not significant**'.

15.12 Predicted Effects: Cumulative Impact

Economic and Employment

15.12.1 **Figures 9.6a and b** illustrates proposed and existing cumulative wind farm schemes within 35km of the Development Site. All phases of these schemes are considered to have the potential to give rise to cumulative socio-economic effects due to their proximity to the proposed wind farm.

15.12.2 Considering the Proposed Development together with existing wind farms nearby, this is likely to generate a beneficial effect for the local economy as a result of local employment and local expenditure throughout all phases of each wind farm. These economic and employment effects would increase further if all of the proposed wind farm schemes detailed on **Figures 9.6a and b** were also consented, constructed, operated and decommissioned. Given the scale of impacts predicted for the Proposed Development alone, it is considered that there is the potential for '**significant'** beneficial effect on the local economy at ward level when considered specifically in combination with other existing or wind farms within the planning system. The cumulative impact at a national (Scotland) level represents a Small magnitude of change, resulting in a '**not significant** 'effect.

Recreation & Tourism

15.12.3 There is the potential for cumulative landscape and visual related effects on tourism, recreation and the amenity value of the local area. Details of the cumulative visual effects are set out in **Chapter 9**. As set out in **Table 15.17**, whilst significant cumulative visual effects would be experienced from some tourist and recreational receptors, this would not result in any significant adverse cumulative effects in terms of visitor attractiveness or the tourism potential of individual receptors.

15.12.4 In summary, the cumulative effect on recreation and tourism as a result of the Proposed Development is considered to be '**not significant**'.

15.13 Mitigation and Enhancement Measures

15.13.1 The assessments detailed in Section **15.7** indicates that the Proposed Development has the potentially individually and cumulatively to result in temporary, beneficial local economic significant effects during its construction phase at ward level. All other predicted effects during construction, operation and decommissioning as predicted in Sections **15.7 -15.12** are considered not significant.

15.13.2 Notwithstanding this, the applicant has pledged to provide local community funding which would be delivered during the operational phase of the Proposed Development. In accordance with the Scottish Government's Good Practice Principles for Community Benefits from Onshore Renewable Energy Developments document (2013, revised in 2015 for factual accuracy), this funding aims to ensure that local communities share the socio-economic benefits which would be generated from the Proposed Development. Given that the applicant would provide £5,000 per MW of installed capacity, the Proposed Development has the potential to generate up to £7,837,500 (£313,500 per annum for 25 years) of local community funding.

15.14 Residual Effects

15.14.1 The assessments presented in this ES chapter demonstrate that the Proposed Development would potentially result in significant residual temporary, beneficial local (council ward level) economic effects during construction. Residual economic effects during operation and decommissioning would be beneficial, but not significant. Additional economic, employment and land use effects during construction, operation and decommissioning of the Proposed Development would be not significant.

15.14.2 The upgraded and new access tracks proposed for the Development Site would improve access and would also be a permanent beneficial effect, although this positive long term effect would not

be significant in EIA terms. The Proposed Development would also not result in any adverse significant effects on identified tourism or recreational receptors.

15.15 References

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16. Infrastructure, Telecommunications and Safety

16.1 Non-Technical Summary

16.1.1 This chapter addresses the potential impact of the Proposed Development on telecommunications and utility infrastructure situated in the vicinity of the Development Site. Consultation has been carried out with organisations which own or operate infrastructure on or close to the Development Site.

16.1.2 A number of telecommunications and infrastructure consultees have indicated that they operate telecommunications links or plant in the vicinity of the Development Site. However none of these are directly affected by the proposed turbines or infrastructure. Suitable buffer and separation distances have been incorporated into the layout design (as requested by the operators) to mitigate against any possible effects on telecommunications and infrastructure.

16.1.3 The Proposed Development will be constructed and operated in accordance with all relevant UK health and safety legislation to ensure the risk to public safety is minimised. The Development Site will be appropriately signed to indicate the presence of construction work, therefore no significant effects are expected.

16.2 Introduction and Overview

16.2.1 This chapter considers the potential effects of the Proposed Development on infrastructure (including utilities), telecommunications, and also considers potential safety issues[1]. These matters have been investigated through consultation with the relevant system operators and accounted for in the iterative wind farm design process.

16.2.2 The design process undertaken for the Proposed Development has ensured that wherever possible, the proposed turbines are located in areas where there would be no effects on infrastructure or telecommunications interests. Where this has not been possible, mitigation measures will be implemented so that these services will not be affected by the wind farm.

16.3 Methodology and Approach

Policy and Legislative Context

16.3.1 All national and Development Plan policies and other considerations of relevance to the Proposed Development are outlined in **Chapter 5 – Planning Policy Context**.

Scottish Planning Policy and Advice

16.3.2 Of specific relevance to the technical assessments provided in this ES chapter, the Scottish Planning Policy (2014) at paragraph 169 notes that considerations in the determination of applications for energy infrastructure developments are likely to include "*impacts on telecommunications and broadcasting installations, particularly ensuring that transmission links are not compromised*".

16.3.3 The Scottish Government's Specific Advice Sheet regarding Onshore Wind (updated May 2014) states that: *"Wind turbines (in common with all electrical equipment) produce electro-magnetic radiation which can interfere with broadcast communications and signals. The Radiocommunications Agency* (RA) *register of all civil radio communications installations in the* UK *can identify any radio installations in the neighbourhood of a wind farm site, but will not identify*

[1] The potential effects of the Proposed Development on aviation issues are considered in Chapter 17.

their owners. Applicants should make direct contact with any authorities or bodies likely to have an interest, in particular, the local emergency services, local authority services departments, gas and electricity companies".

Local Planning Policies and Guidance

16.3.4 Policy ECON 7 within the Ayrshire Joint Structure Plan (2007) requires proposed wind energy developments located outside of Areas of Search to be assessed against criteria including effects on "*broadcasting installations*".

16.3.5 An addendum to the Technical Report informing Structure Plan Policy ECON 7 was published in 2009, entitled *Addendum to Ayrshire Joint Structure Plan Technical Report TR03/2006: Renewables* (2009). The document makes reference to the impact wind turbines could have on various telecommunications as follows:

"Broadcasting Installations 34. Wind turbines have the potential to interfere with electronic communication media, this includes television, radio and micro wave links. These interference effects can be reduced through changes to turbine siting and discussion with operators.

Television & Radio Reception 35. Wind farms can cause interference if the viewer is in the "shadow" of and within a few kilometres of a wind farm if the aerial is pointing through the wind farm. Interference can also be created through a "bounce" effect over significant areas of water. The effect is to create interference and a loss of picture and or sound. A "ghosting" effect is also possible.

Micro Wave Communications 36. Micro waves can be affected by reflection, diffraction, or blocking if the turbines are in "line of sight" of the transmitting or receiving station. A minimum clearance distance of 200m should be set between the alignment of the microwave and any turbine."

16.3.6 Policy CS14 – Wind Energy Developments within the adopted East Ayrshire Local Plan (2010) requires impacts on "*broadcasting installations*" to be considered in the determination of all applications for wind farm development. Proposed policy RE1: Renewable Energy Developments within the East Ayrshire LDP Proposed Plan (2015) states that proposed renewable energy developments will be supported by the Council "*where it can be demonstrated that there will be no unacceptable significant adverse impacts on all of the relevant Renewable Energy Assessment Criteria set out in Schedule 1 of the LDP…*", and similar policy wording is included in proposed policy RE3: Wind Energy Proposals over 50 Metres in Height specifically in relation to proposed wind energy developments. Schedule 1 mirrors the SPP at paragraph 169 and therefore requires impacts on telecommunications infrastructure and broadcasting installations to be assessed.

Baseline Establishment

16.3.7 An important stage in establishing both the baseline and nature of potential effects for the infrastructure and telecommunications assessment is consultation. The consultation process carried out at the EIA scoping stages has established infrastructure, and communications service providers with interests in the area of the Proposed Development.

Consultation

16.3.8 A series of desk-based consultation exercises were carried out during feasibility studies (2011) and developed on during the EIA process (July 2012 onwards) to establish the baseline relating to infrastructure, utilities and telecommunications. Additional consultation work has continued throughout the design process of the Proposed Development.

16.3.9 The result of these consultations are summarised as part of the baseline information presented in **Section 16.4**.

Methodology for Establishment of Effects

16.3.10 This assessment adopts a qualitative approach that has been employed in previous wind farm assessments and accepted as best practice, has been used to assess the significance of effects.

16.3.11 When considering infrastructure and telecommunications impacts; appropriate design of the wind farm can avoid potential impacts to these interests. Where siting of turbines or associated infrastructure to avoid potential impacts is not feasible, a range of technical solutions can be implemented to mitigate any identified significant impacts.

16.3.12 The risk presented to the public from the construction, operation and decommissioning of the Proposed Development (due to public access to the Development Site and general health and safety risks) has been qualitatively assessed using relevant guidance documents (Specific Advice Sheet Onshore Wind Turbines (2011, updated 2014)) and professional judgement based on experience gained during work relating to a large number of previous wind farm projects.

16.3.13 The assessment of residual effects is based on a consideration of the success of proposed mitigation measures, whether fully, substantially or partly mitigated. These are defined as follows:

- Fully - Effect fully mitigated and no significant residual effects predicted;
- Substantially - Mitigation would be largely successful at reducing significant effects. Some residual significant effects possible, which are discussed in **Section 16.8**; and
- Partially - Mitigation would be successful at reducing effects, but some significant residual effects likely. These effects are discussed in **Section 16.8**.

16.4 Baseline Information

Current Baseline

16.4.1 Telecommunications and Infrastructure assets are shown on **Figure 16.1**. In terms of safety, it is noted that the Development Site is undeveloped and is located in a rural location.

Infrastructure

16.4.2 An enquiry was entered into the LinesearchBeforeUDig website[2] as part of the EIA process in 2015. LinesearchBeforeUDig *"provides a single point of contact for all initial enquiries relating to the apparatus owned and/or operated by our Members, which now totals over 30,000kms of assets such as buried underground transmission gas/oil pipelines and fibre optic cable ducts".*

16.4.3 The results of this enquiry confirmed that the Proposed Development is not in the zone of interest for any of the LinesearchBeforeUDig members; this includes National Grid gas and electricity transmission networks (not including all other national grid or other local high pressure gas pipelines and lower pressure mains). An assessment of the National Grid Gas Pipelines was undertaken within a confidential database. No high pressure pipelines were found to traverse the Development Site.

16.4.4 Scottish Power Energy Networks confirmed the presence of a number of low voltage (LV), 11kV (under and over ground) and 33kV power lines in the area. For the most part these run outside the site boundary to the immediate north, east and north west of the site. However, a single 11kV power line runs from the east into the Development Site to the residential property at Brockloch, while a single LV underground cable runs from the north west onto a radio tower located just inside the site boundary near the B741, close to the proposed site entrance.

16.4.5 A 33kV substation is located approximately 260m to the north east of the site boundary. A number of 33kV pole mounted power lines run north, east and south from this substation, but none cross the Development Site.

16.4.6 Scottish Gas Networks have confirmed that they have no infrastructure present in the area surrounding the Development Site which would be affected by the Proposed Development.

[2] http://www.linesearchbeforeudig.co.uk

16.4.7 Scottish Water has responded to consultation with maps showing that they do not have any infrastructure located within the Development Site.

16.4.8 BT (British Telecom) Openreach have responded to consultation showing that they have an overhead telephone line which runs along the B741 to the north of the site. In places this is replaced with underground armoured cables, however these do not enter the Development Site. While maps supplied by BT show this cable running along the south side of the B741 close to the site entrance, site visits have shown that it is actually located to the north of this road and it is therefore not anticipated that it would interfere with access to the Development Site.

16.4.9 Four private water supplies (PWS) have been identified within the Site (see **Chapter 13 - Geology, Hydrology and Hydrogeology** for details). These generally consist of a source, along with a storage tank.

16.4.10 Utilities and Infrastructure consultations are summarised in **Table 16.1.**

Table 16.1 Summary of Utilities and Infrastructure Consultees

Consultee	Response
Linesearch	Details of the Proposed Development were entered into LinesearchBeforeUDig website in 2015. None of the members, including National Grid Transmission, were identified as being affected by the Proposed Development.
ScottishPower (SP)	Responded in April 2015 with details of their 33kV, 11kV and LV infrastructure running across the Development Site. SP also operate a 33kv substation located approximately 240m to the north east of the Development Site, close to Cascaya.
Scottish Gas	Responded in May 2015 stating they have no gas mains in the vicinity of the Development Site.
Scottish Water	Responded in June 2015 with maps showing they have no infrastructure on the Development Site. Some properties alongside the B741 have mains water supplies (infrastructure does not cross the Development Site) but most have PWS.
BT Openreach	Responded in May 2015 with details of an overhead telephone line and buried, armoured cable running along the B741 to the north of the Development Site. No BT infrastructure will be affected by the Proposed Development.

Telecommunications

16.4.11 An initial 2013 desk-based consultation exercise with Ofcom identified two service providers that have radio communication links in the vicinity of the Proposed Development. Ofcom confirmed that the links were operated by BT (one link) and Airwave Solutions Limited (two links). Airwave Solutions indicated that a charge would be levied to provide link information.

16.4.12 A report was commissioned from R4telecom Ltd in July 2014 to provide information on the links operated by Airwave Solutions Ltd. The report was undertaken on the basis of the 23 turbine feasibility layout, and concluded that the turbine layout would have no impact on their network. The link end coordinates were not provided, but a map was included in the report showing that the links do not cross the part of the Development Site where turbines, or other proposed development with the potential to affect the link, are proposed to be sited.

16.4.13 BT responded in February 2014 with details of a microwave link running across the site. They requested a 100m + blade tip buffer to the link. As noted on **Figure 16.1**, a 150m buffer was applied to the microwave link, which is approximately 600m away from the nearest proposed turbine location.

16.4.14 Further consultation during the EIA scoping process was undertaken with Ofcom (June 2015) who confirmed that the same 3 links described above were still in operation, and that no additional links were present.

16.4.15 Atkins and the Joint Radio Company (JRC) have also been consulted with regards to scanning telemetry links. Both operators have confirmed that they have no infrastructure in the area which would be affected by the Proposed Development.

16.4.16 A summary of telecommunications consultations is provided in **Table 16.2**.

Table 16.2 Summary of Telecommunication Consultations

Consultee	Response
Ofcom	April 2013 - Provided information on microwave links registered with Ofcom which may be affected by the Proposed Development. These comprise one link operated by BT and two links operated by Airwave Solutions Ltd. Provided contact details for the providers and stated that Ofcom require that full co-ordination is made with each link operator. June 2015 – confirmed that the same three links were still present across the site and no additional links have been identified.
BT	April 2013 - Provided microwave link details and requested a 100m + blade length buffer. Link is located approximately 600m to the east of the nearest proposed turbine.
Airwave Solutions (via R4telecom Ltd)	July 2014 - Stated that the Proposed Development will not present a problem to Airwave Microwave Radio Links or tetra network in the region, using the coordinates supplied.
Atkins	November 2013 and June 2015 - Have no objection to the Proposed Development in relation to the Ultra High Frequency (UHF) scanning telemetry communications used by their client in the vicinity of the Development Site.
JRC	January 2014 and June 2015 - cleared with respect to radio link infrastructure operated by ScottishPower and Scotia Gas Networks.

Predicted Future Baseline

16.4.17 On the basis of consultations undertaken, there are no additional planned infrastructure or telecommunications developments in the vicinity of the Development Site. If the Proposed Development is consented and built, any future infrastructure or telecommunications developments would be required to take account of the presence of the Proposed Development in their implementation.

Information Gaps

16.4.18 No information gaps have been identified.

16.5 Design Evolution

16.5.1 The Proposed Development has been designed with due cognisance of telecommunication links and other elements of infrastructure that cross proposed development sites, based on the consultation responses from relevant organisations.

16.5.2 The design process incorporated the BT microwave link into the process, and it is approximately 600m from the closest proposed turbine in the final design layout.

16.5.3 No other elements of infrastructure which could potentially be affected by the Proposed Development and therefore should be accounted for in the layout and design of the Proposed Development were reported through the consultation exercise.

16.6 Scope of Assessment

Potential Receptors

16.6.1 The methodology used in this chapter includes evaluating:

- Safety;

- Potential effects on utility infrastructure; and
- Potential effects on telecommunications.

16.6.2 With regards to potential receptors, no utility operators have objected to the Proposed Development, and no infrastructure has been identified which would be affected by the Proposed Development.

16.6.3 During the design process, consultation with the link operators BT, Airwave, Atkins and JRC has confirmed that the Proposed Development would not affect any microwave links.

16.7 Predicted Effects

Predicted Effects: Utilities and Infrastructure

16.7.1 No significant effect on utility infrastructure is anticipated as a result of the Proposed Development.

Predicted Effects: Microwave Links

16.7.2 No significant effect on microwave links is anticipated as a result of the Proposed Development.

Predicted Effects: Television Reception

16.7.3 It is known that wind farms have the potential to adversely affect terrestrial television reception, usually up to a maximum distance of 5km (BBC et. al.1999, and Ofcom 2009).

16.7.4 Both analogue and digital television signals are transmitted using Ultra High Frequencies (UHF). There are two main mechanisms whereby a wind farm could potentially interfere with television reception. These are ‘shadowing’ effects and ‘reflection’/or ’scattering’ effects.

16.7.5 Just as a solid object causes a shadow to develop in the visible spectrum, a similar effect can occur in the UHF spectrum. If an object is placed between a terrestrial television transmitter (analogue or digital) and a receiver, a ‘shadow’ zone may develop whereby there is a reduction in signal strength, which may reduce picture and audio quality. In relation to a turbine, the size of the shadow is dependent on the blade orientation and is greatest when the axis of the rotor is in line with the direction of the transmitted signal. The signal strength within a shadow caused by a turbine will vary in a cyclical manner related to the rotor frequency. The ‘shadow’ zone will decrease in overall effect with distance up to a maximum of 5km.

16.7.6 When a transmitted television signal (analogue or digital) is incident upon a static or moving wind turbine, there is the potential for the signal to be scattered, i.e. reflected. If a receiver then picks up a scattered signal, a time delay would have occurred between the originally received signal and the scattered signal (i.e. it would have travelled a longer path). This can cause a reduction in picture quality through a phenomenon known as ‘ghosting’ for analogue receivers. This is less likely to occur with digital receivers, which are more robust.

16.7.7 When several turbines are sited in close proximity, the interactions of these interference mechanisms are complex and difficult to predict. There are, however, several ways that any potential problems can be mitigated. The BBC *et al*. (1999) recommend that turbines should be sited at least 500m away from a viewer, although it should be noted that this applies to terrestrial signals. It should be noted that since the nearest dwelling is located approximately 1,741m from the nearest turbine, it is assumed that television would not be watched within 500m of a turbine. This will help reduce the likelihood and severity of any interference.

Predicted Effects: Public Safety

Construction

16.7.8 Safety precautions for workers and the general public will be considered under relevant legislation.

Operation

16.7.9 As with any tall structure, wind turbines can be susceptible to lightning strike, and a very small number of wind turbines have been known to fail due to lightning or mechanical failure, though such incidents are very rare.

16.7.10 In cold weather, ice can build up on blade surfaces when operating. The ice could be thrown from the blades without sufficient protection in place. The applicant is an experienced wind farm operator and has stringent operational procedures to minimise the risk posed by ice throw (see **Section 16.8.10**).

Predicted Effects: Cumulative

16.7.11 All potential effects in respect of telecommunications, infrastructure and utilities have been mitigated therefore no cumulative effects will arise.

16.8 Mitigation Measures

Television

16.8.1 If a reduction in television reception quality does occur in the surrounding area, it is most likely to be apparent when the Proposed Development becomes operational. To mitigate any problems with reception arising, the applicant will accept a planning condition to assess current television signals in advance of the construction of the Proposed Development and will mitigate post-development problems with television reception arising from effects attributable to the Proposed Development.

16.8.2 The planning condition will require the applicant to meet the cost of investigating and effectively rectifying any problems should they arise and to implement solutions in a timely manner so as to minimise any inconvenience to residents. It is expected that issues, if they arise, will arise in the first year of operation of the Proposed Development and any remedial work will be limited to this period only.

16.8.3 Viewing quality can be remedied by considering each, or a combination, of the following mitigation techniques:

- Replace or upgrade the receiving aerials (e.g. with directional receiving aerials) for the affected households;
- Re-tune the television receivers at the affected households;
- Re-align the television aerial to an alternative transmitter and re-tune the receiver at the affected households; and
- Provision of a bespoke 'self-help' solution (this could comprise a new low powered transmitter, a cable network, a satellite receiver or a combination of these measures).

16.8.4 By utilising these techniques it is predicted that any television reception issues as a result of the Proposed Development would be fully mitigated with no significant residual effects.

Public Safety

Construction

16.8.5 In order to ensure the risk to public safety is minimised during the construction phase of the Proposed Development, the applicant and their Contractors will adhere to the Construction (Design and Management) Regulations 2015[3] and other relevant UK health and safety legislation including:

[3] If planning permission is granted, the Applicant will produce a Construction Phase Health and Safety Plan in accordance with the Construction (Design and Management) Regulations (CDM) 2015. The purpose of the Health and Safety Plan would be to outline and define the approach to health and safety that will be adopted specifically for the Proposed Development and to draw attention to the hazards known to the applicant regarding the construction

- Health and Safety at Work Act 1974;
- Management of Health and Safety at Work (Amendment) Regulations 2006;
- Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (1995) (RIDDOR); and
- Guidelines for Health and Safety in the Wind Energy Industry Sector, Renewable UK, 2010.

16.8.6 All potentially hazardous areas such as excavations and electrical installation works will be fenced off and all unattended machinery will be stored in the site compound or immobilised to prevent unauthorised use.

16.8.7 Appropriate warning signage will be installed concerning any hazards, areas where access is restricted or prohibited such as transformers, switchgear and metering systems and to alert any Development Site users to the potential for increased risks under certain meteorological and operating conditions.

Operation

16.8.8 Wind turbines installed at the Development Site would comply with the BS EN 61400 series which provides the design requirements for onshore and offshore wind turbines.

16.8.9 Wind farms have a proven good public safety track record. Appropriate measures are included in the turbine design to conduct lightning strike down to earth and minimise the risk of damage to turbines. Occasionally however, lightning can strike and damage a wind turbine blade. Modern wind turbine blades are manufactured from a glass-fibre or wood-epoxy composite in a mould, such that the reinforcement runs predominantly along the length of the blade. This means that blades will usually stay attached to the turbine if damaged by lightning, and in all cases, the turbine will automatically shut down if damaged.

16.8.10 In cold weather, ice can build up on blade surfaces when operating. The turbine can continue to operate with a very thin accumulation of snow or ice, but will shut down automatically as soon as there is a sufficient build up to cause aerodynamic or physical imbalance of the rotor assembly. Once the ice has thawed and the turbine re-starts in circumstances such as this, there is a slight possibility that fragments of ice or snow will be released from the rotor and will drop within close vicinity of the turbine. The risk to public safety is extremely low due to the initial slow rotational speed of the rotor and because such fragments are sufficiently small and lightweight to allow the rotor assembly to be back in balance before restarting.

16.8.11 Turbine control and monitoring systems operate with several levels of redundancy to protect the plant from damage. In the case of faults arising, including over-speed of the blades, overpower production, or loss of grid connection, turbines shut down automatically through braking mechanisms. In addition, turbines may be fitted with vibration sensors so that if, in the unlikely event a blade is damaged, the turbine will automatically and immediately shut down.

Summary of Mitigation

16.8.12 **Table 16.3** summarises the mitigation that has been incorporated into the Proposed Development as detailed in the preceding sections.

site which may affect the execution of the works. The applicant will appoint a Project Manager for the duration of the detailed design, procurement and construction phases who will work with the Principal Contractor and CDM Co-ordinator as defined in the CDM Regulations 2015.

Table 16.3 Summary of Mitigation Measures

Effect	Incorporated mitigation / enhancement measure	Extent to which effect mitigated	Monitoring requirements (if any)	Means by which mitigation, or enhancement measure may be secured
Construction				
Safety	Relevant UK health and safety legislation will be adhered to; site construction management practices will include, but are not limited to: relevant signage and fencing at potential hazardous construction areas where appropriate.	Fully	None	Standard Site Management practices incorporated into construction contracts.
Infrastructure	All relevant health and safety legislation will be followed, and industry best practice guidance adhered to.	Fully	None	Health Safety Security Environment (HSSE) guidance and best practice will be followed at all times.
Operation				
Possible interference to television reception at scattered properties near to the Proposed Development	A mixed solution is likely to be required which may include: - Re-tuning some TVs to an alternative transmitter, which may overcome possible interference for some; and - A transposer system could overcome possible reception difficulties.	Fully	None	Planning Condition
Operational Safety	Turbines installed at the Development Site would comply with the BS EN 61400 series and relevant UK health and safety legislation. Safety measures also include the incorporation and installation of appropriate warning signage where necessary on-site.	Fully	On-going maintenance	Site design and on-going maintenance.

16.9 Residual Effects

Conclusions of Significance Evaluation

16.9.1 If a reduction in television reception quality occurs in the surrounding area, it is most likely to be noticed when the proposed development becomes operational. However, a number of fully effective mitigation solutions are available and the applicant will accept a planning condition to mitigate post-development where effects are attributable to the Proposed Development.

16.9.2 The Proposed Development will be constructed and operated in accordance with all appropriate health and safety guidance and standards to ensure the risk to public safety is minimised and kept within acceptable levels.

16.9.3 As such, there will be no significant effects to infrastructure, telecommunications or safety arising as a result of the Proposed Development.

16.10 Residual Cumulative: Effects

16.10.1 All potential effects in respect of television reception and public safety have been mitigated therefore no cumulative effects will arise.

16.11 References

BBC, Radio communications Agency and Independent Television Commission, 1999. The Impact of Large Buildings and Structure(s) on Terrestrial Television Reception.

LinesearchBeforeUDig website http://www.linesearchbeforeudig.co.uk

Ofcom, Tall structures and their impact on broadcast and other wireless services, August 2009

Scottish Government Onshore Wind Turbines Information (First published February 14, 2011 updated February 14 & 25, 2011, August 5, 2011, January 27, 2012, March 14, 2012 , May 02, 2012, August 28, 2012, October 24, 2012, July 17, 2013, December 2013 and last updated May 28, 2014).

http://www.scotland.gov.uk/Resource/0044/00440315.pdf

17. Aviation

17.1 Non-Technical Summary

17.1.1 The Proposed Development is within the operational range of National Air Traffic Services (NATS) Lowther Hill and Great Dun Fell En Route Primary Surveillance Radar (PSR) systems and Glasgow Prestwick Airport Air Traffic Control (ATC) PSR. At a maximum height of 130 m to blade tip, all nineteen proposed turbines are considered likely to be within Line of Sight (LoS) of, and therefore detectable by the Lowther Hill and Glasgow Prestwick Airport (GPA) ATC PSRs.

17.1.2 NATS, at the request of the applicant, has completed a Technical and Operational Assessment (TOPA) of the Proposed Development in which an impact on the Lowther Hill PSR is predicted, though no impact was declared to the Great Dun Fell PSR (NATS, 2015 a). Therefore the Great Dun Fell PSR was not considered further in the assessment.

17.1.3 The Proposed Development would be situated beneath a portion of the Scottish Terminal Control Area (TMA) and a portion of the GPA Controlled Area (CTA). The Scottish TMA is established for the protection of commercial flights into and out of Edinburgh Airport, Glasgow Airport and GPA. The GPA CTA in the region of the Proposed Development provides protection for aircraft climbing out and descending into GPA. Due to the theoretical detectability of the turbines to the aforementioned PSRs, the Proposed Development may create an operational and / or cumulative effect to NATS utilising the Lowther Hill En-route PSR and to GPA utilising the GPA ATC PSR.

17.1.4 It has been identified during LoS analysis that the Proposed Development will be theoretically detectable by the NATS En-route Lowther Hill and the GPA ATC PSRs which will create clutter to be presented on radar displays. For the Lowther Hill PSR, Project Raytheon Modification may be an acceptable mitigation solution for NATS. Resolution Infill Technology, through the use of emerging technologies should, on agreement with GPA, mitigate the effect created to the GPA PSR. It is considered that with the collaboration of NATS and GPA, technically and operationally acceptable solutions could be implemented within 18-24 months of agreement on mitigation strategy, should consent be granted.

17.1.5 Initially the Ministry of Defence (MOD) indicated that it had concerns with the Proposed Development with regard to an effect on military Low Flying activities within Tactical Training Area (TTA) 20T. Within TTA 20T, military operational low flying is permitted to as low as 100 feet Minimum Separation Distance from the ground, water or any object. The MOD's objection at that time was based on there being insufficient airspace between the blade tips (at this time the proposed tip height was 150 metres) and the base of the GPA controlled airspace above for military aircraft to transit beneath (without entering controlled airspace).

17.1.6 During further consultation with the MOD, the highest potential elevation of the turbines was presented to them. In a subsequent letter from Defence Infrastructure Organisation (DIO) to Osprey, the MOD stated that it will remove its objection to the Proposed Development as sufficient airspace existed above the turbines for military aircraft to transit safely beneath the GPA controlled airspace above; subject to suitable MOD accredited aviation lighting being fitted to the highest practicable point on all turbines. Since the consultation response was received from DIO, the layout of the Proposed Development has changed and the blade tip height of the turbines has decreased from 150 m to 130 m. The new layout provides for sufficient airspace above the turbines and below controlled airspace, as accepted in the removal of the objection on the previous layout. It is anticipated MOD will have no objection to the Proposed Development.

17.2 Introduction and Overview

17.2.1 This chapter of the EIA has been prepared by Osprey Consulting Services Ltd, a technical consultancy providing aviation expertise to the wind industry. It identifies and assesses the potential effects that the Proposed Development may have on civilian and military aviation and air

safeguarding in the study area, and if required, the mitigation measures to be implemented to prevent, reduce or offset any potential adverse effects where possible.

17.2.2 The potential impacts of wind turbines on aviation interests have been widely publicised. There are two dominant scenarios:

- Physical obstruction: turbines can present a physical obstruction at, or close to, an aerodrome or other aviation activity area; and
- Radar / Air Traffic Services: turbine clutter appearing on a radar display can affect the safe provision of air traffic services (ATS) as it can mask unidentified aircraft from the air traffic controller and / or prevent him from accurately identifying, or maintaining identity of, aircraft under his control. In some cases, radar reflections from the turbines can affect the performance of the radar itself.

17.3 Methodology and Approach

Policy and Legislative Context

17.3.1 All national and Development Plan policies and other considerations of relevance to the Proposed Development are outlined in **Chapter 5 – Planning Policy Context**.

17.3.2 Of specific relevance to the technical assessments provided in this ES chapter, the Scottish Planning Policy (2014) at paragraph 169 notes that considerations in the determination of applications for energy infrastructure developments are likely to include "*impacts on aviation and defence interests and seismological recording*". The Scottish Government's Online Renewables Planning Advice regarding Onshore Wind Turbines (last updated 28th May 2014) includes guidance regarding potential impacts on aviation safeguarding and the need for aviation and military authorities to be consulted regarding proposed wind energy developments.

17.3.3 Policy ECON 7 within the Ayrshire Joint Structure Plan (2007) requires proposed wind energy developments located outside of Areas of Search to be assessed against criteria including effects on "*aviation and defence interests*". Policy CS14 – Wind Energy Developments within the adopted East Ayrshire Local Plan (2010) also requires impacts on "*aviation and defence interests*" to be considered in the determination of all applications for wind farm development. Proposed policy RE1: Renewable Energy Developments within the East Ayrshire LDP Proposed Plan (2015) states that proposed renewable energy developments will be supported by the Council "*where it can be demonstrated that there will be no unacceptable significant adverse impacts on all of the relevant Renewable Energy Assessment Criteria set out in Schedule 1 of the LDP…*" and similar policy wording is included in proposed policy RE3: Wind Energy Proposals over 50 Metres in Height specifically in relation to proposed wind energy developments. Schedule 1 mirrors the SPP at paragraph 169 and therefore requires impacts on aviation and defence interests to be assessed.

Assessment Methods

17.3.4 This Chapter presents a summary of the results of an Aviation Impact Assessment (AIA) undertaken by Osprey on behalf of the applicant (Osprey, 2012). The study identifies the aviation stakeholders in the area of the Proposed Development and provides an objective assessment of the effects and, if applicable, any necessary mitigation measures.

17.3.5 Osprey considered the potential for the Proposed Development to have an effect on the aviation interests, in terms of the radar and operations of the MOD, NATS and airport operations at Glasgow Prestwick Airport (GPA). There are no other aviation stakeholders that are considered to have the potential to be affected by the Proposed Development.

17.3.6 Analysis was conducted in accordance with Civil Aviation Authority (CAA) Civil Air Publication (CAP) 764, Policy and Guidelines on Wind Turbines (CAA, 2013). Potential aviation stakeholders were identified and for each receptor, the physical obstruction and / or radar impact, and then subsequently the operational effect, were evaluated. The operational effect pays heed to, but is

not limited to, consideration of: the orientation of airfield approach and departure routes, physical safeguarding of aircraft operations and airspace characteristics.

17.3.7 Radar performance and propagation modelling has been undertaken to determine the theoretical detection of wind turbines by the region's radar infrastructure. Osprey utilised the Advanced Topographic Development and Images (ATDI) ICS LT (Version 3.9.92) tool to model the terrain elevation profile between the identified Primary Surveillance Radar (PSR) and wind turbine positions within the Development Site, to provide a graphical representation of the intervening terrain and theoretical direct Line of Sight (LoS), in order to determine the affected radar systems within the Baseline.

Assessment Guidance

17.3.8 The Aviation Industry and the provision of Air Navigation Services are regulated through extensive legislation, with the mechanism for wind development enabled through the consenting system and in accordance with regulatory guidance. The following policy and guidance documents were considered during the baseline definition and assessment activities:

- CAP 393 Air Navigation: The Order and the Regulations (known as the Air Navigation Order (ANO) (CAA, 2015 a);
- CAP 764: CAA, Policy and Guidance on Wind Turbines (CAA, 2013);
- The MOD Specification for Infra-Red (IR) and Low Intensity Red Vertical Obstruction Lighting (MOD, 2014); and
- RenewableUK Guidance on Low Flying Activity and Onshore Tall Structures Including Anemometer Masts and Wind Turbines (RenewableUK, 2012).

17.3.9 Other data sources and guidance considered during the baseline definition and assessment activities include the following:

- CAA Visual Flight Rules Chart (CAA, 2015 b);
- Military Aeronautical Information Publication (Mil AIP) (MOD, 2015);
- MOD UK Low-Flying System (UKLFS) Priority Areas Map (MOD, 2011); and
- CAA, CAP 32 UKIAIP. The UKIAIP is the main resource for information and flight procedures at all licensed UK airports as well as airspace, en-route procedures, charts and other air navigation information (NATS, 2015 b).

Stakeholder Consultation

17.3.10 The approach to the assessment has identified those radars or systems and practices, which have the potential to interact with the Proposed Development. The following **Table 17.1** highlights the pre-application consultation undertaken with the operators of those systems which are considered in the impact assessment.

Table 17.1 Stakeholder Consultation Activity

Consultee	Summary Response	Action Taken
MOD	The MOD was contacted for a response to Scoping during January 2013. Based on the layout and height of the turbines presented to them (27. turbines at 150 m to tip), the MOD stated that they would object to the Proposed Development based on an unacceptable effect on military Low Flying operations.	A meeting was held with the DIO on the 14th August 2013 to discuss the MOD objection to the Proposed Development. DIO are responsible for the safeguarding of MOD infrastructure and operations.

Consultee	Summary Response	Action Taken
		The MOD's objection to the Proposed Development was based on there being insufficient airspace between the maximum blade tip height and the base of the GPA controlled airspace above for military aircraft to transit beneath (without entering controlled airspace). During the meeting the highest elevation of the turbines (550 m, producing a tip altitude of 2,330 m Above Ordnance Datum (AOD)) was presented to DIO and in a letter from the DIO to Osprey (DIO, 2013), the MOD stated that it will remove its objection to the Proposed Development as sufficient airspace would exist above the turbines for military aircraft to transit safely beneath the GPA controlled airspace above, subject to suitable MOD accredited aviation lighting being fitted to the highest practicable point on all turbines. Since the consultation response was received from the DIO, the layout of the Proposed Development has changed, however the blade tip height of the turbines has decreased to 130 m. The highest tip elevation for the new layout will be 2,270 m AOD, which increases the airspace between the top of the turbines and controlled airspace.
NATS	NATS provided generic general guidance on the response to Scoping, NATS provided information on the online planning tools available to developers. A NATS TOPA was requested by the Applicant, the results of which predicted an impact to the NATS Lowther Hill PSR.	Potential impact and radar LoS results on this Stakeholder are reported in **Section 17.6.5 to 17.6.8** below.
GPA	GPA stated their intention to object to the proposed development during a response to Scoping Table 2.3 based on radar detectability of the turbines by the GPA PSR.	Potential impact and radar LoS results on this Stakeholder are reported in **Section 17.6.10 to 17.6.12** below.

Methodology for Establishment of Effects

17.3.11 Potential aviation stakeholders were identified in accordance with the guidance in CAP 764 (CAA, 2013), with the suggested anticipated extents of impact utilised as a minimum. It is, however, acknowledged that objections from beyond the recommended aviation stakeholder consultation distances can potentially be sustainable and valid and the threshold used for identifying potential aviation stakeholders is not a definitive limit on the extent of potential impacts arising from the Proposed Development.

17.3.12 Consideration is given to any aviation infrastructure where the Proposed Development lies within operational range of that infrastructure. Operational range varies with radar type or operations and therefore the study areas are defined on a case by case basis in this respect.

17.3.13 The LoS analysis is a limited and theoretical desk based study; in reality there are variable levels of signal diffraction and attenuation within a given radar environment that can influence the probability of a turbine being detected. The analysis is designed to give an indication of the likelihood of the turbine being detected such that the operational significance of the wind farm relative to nearby aviation stakeholders can be assessed.

17.3.14 An AIA (Osprey, 2012) has been conducted which includes a previous design layout consisting of proposed twenty three wind turbines at the Proposed Development at a maximum anticipated blade tip height of 150 metres (m). The AIA also provides a detailed scope and methodology. While the final layout consists of only nineteen turbines within the Development Site, it is considered that the AIA provides a robust analysis of the initial perceived aviation effects of the Development Site.

17.3.15 A radar LoS analysis has been completed on the nineteen turbine layout at a blade tip of 130 m and this analysis concludes that all turbines will be theoretically detectable by the NATS Lowther Hill En-route PSR and the GPA PSR. Six of the turbines (Turbines 4, 6, 7, 9, 10 and 11) will theoretically be detectable by the NATS Great Dun Fell En-route PSR; although analysis cannot rule out occasional detectability of one further turbine (Turbine 8) by this PSR. However, NATS does not predict an impact to the Great Dun Fell PSR and it is therefore scoped out of the assessment.

17.3.16 The analysis contained in the AIA involves a systematic review of the charts and data available through the Mil AIP (MOD, 2015), as well as utilisation of CAA Visual Flight Rules charts (CAA, 2015 b). The review seeks to identify all potential aviation stakeholders, the location of their operations and procedures relative to the potential effects of the Proposed Development. The analysis considers the possible options that could mitigate the effect on the operations of identified aviation stakeholders.

Sensitivity Criteria

17.3.17 The sensitivity of a receptor is subjective in aviation terms and therefore difficult to quantify. Whereas an Air Defence Radar system would be an obvious high value and high sensitivity receptor (due to its role in UK national security), the sensitivity of a local aerodrome can also often be rated high if the Planning Authority considers the receptor to be a significant asset to the local area. The identified receptors in this analysis are considered to have a high sensitivity to effects, given their safety critical function.

Magnitude Criteria

17.3.18 The magnitude of potential effects on aviation and radar receptors is assessed using the method and terminology given in **Table 17.2**.

Table 17.2 Impact Magnitude Criteria

Descriptor/Criteria	**Description**
High	Receptor unable to continue safe operations or safe provision of air navigation services (radar) in the presence of the wind turbines. Technical and/or operational mitigation of the effect is required.
Medium	Receptor able to continue safe operations but with some restrictions or non-standard mitigation measures in place.
Low	Receptor able to continue operations with standard mitigation in place.
Negligible	No impact on this receptor.

Significance Criteria

17.3.19 Significance criteria for aviation impacts are typically difficult to establish; they are not strictly based on the sensitivity of the receptor or magnitude of change but on whether the industry regulations for safe obstacle avoidance or radar separation (from radar clutter) can be maintained in the presence of the wind turbines.

17.3.20 The following approach identified in **Table 17.3** is used and summarises the assessment of significance.

17.3.21 The determined effects have been informed by the results of the desktop assessment and additional consultation with reference to the existing evidence base regarding the effects of wind turbines on aviation receptors.

Table 17.3 Significance Criteria

		Sensitivity			
		High	**Medium**	**Low**	**Negligible**
Magnitude	**High**	Significant	Significant	Significant	Not Significant
	Medium	Significant	Significant	Not Significant	Not Significant
	Low	Significant	Not Significant	Not Significant	Not Significant
	Negligible	Not Significant	Not Significant	Not Significant	Not Significant

17.4 Baseline Information

17.4.1 In the UK Flight Information Region (FIR) and Upper Information Region (UIR), airspace is classified as A, C, D, E and G in accordance with International Civil Aviation Organisation (ICAO) standards (Note: there is no airspace designated as Class B or F in UK airspace). Airspace Classes A to E are variants of controlled airspace (CAS) in which aircraft require an Air Traffic Control (ATC) clearance. Class G Airspace is designated as uncontrolled airspace in which aircraft can operate autonomously without any clearance required.

17.4.2 The airspace in the vicinity of, and above the Proposed Development is categorised as follows:

- Class G uncontrolled airspace up to 4,000 ft. above mean sea level (amsl); any aircraft can operate in this area of uncontrolled airspace without any requirement to be in communication with an Air Navigation Service Provider (ANSP), although it will be good practice for aircraft operating in the region of the Proposed Development underneath the GPA CTA to inform GPA ATC of their intentions. Pilots of aircraft operating Visual Flight Rules (VFR) in Class G airspace are ultimately responsible for seeing and avoiding other aircraft;
- Above 4,000 ft. amsl is established Class D controlled airspace which forms the GPA CTA-6, up to the base of the Scottish TMA, this airspace provides greater protection for aircraft operating to and from GPA;
- Class D controlled airspace of the Scottish TMA from 5,500 ft. amsl up to Flight Level (FL) 195 (approximately 19,500 ft.); aircraft operating within this airspace must be in receipt of an ATS from NATS Scottish Area Control Centre (ScACC) or GPA, the air traffic controller is responsible for maintaining typically 5 Nautical Miles (NM) lateral separation between aircraft; and
- Class C controlled airspace is established above the Scottish TMA; all aircraft operating in this airspace must be in receipt of an air traffic service from NATS or Military controllers located at a NATS ACC.

17.4.3 NATS uses the Lowther Hill PSR system to support their provision of navigational services to flights into and out of Edinburgh, Glasgow and GPA Airports, aircraft operating between UK airports and mainland Europe and also to those overflying the UK Flight Information Region (FIR).

17.4.4 The UKLFS covers the open airspace of the whole UK and surrounding overseas areas from surface to 2,000 ft. above ground level (agl) or amsl. Additionally, there are three areas, known as Tactical Training Areas (TTA), which are considered suitable for flying lower than the standard training heights due to their challenging terrain and generally sparse population. This added capability of military low flying training in the TTAs allows aircrews to enhance their skills in preparation for deployment onto operations. Consequently, the addition of significant physical

obstructions into the low-level environment has the potential to have an effect on low-flying training. However, the MOD does permit a degree of wind energy development in these areas.

17.4.5 The Proposed Development would be located within Low Flying Area (LFA) 16. This area is located in the south of Scotland, including the Borders Region, Dumfries and Galloway and other counties up to and including those within the central belt of Scotland. Furthermore, the Proposed Development would also be located within Tactical Training Area (TTA) 20T. TTA 20T is utilised, when required, for operational low flying to meet operational readiness requirements. Height in the UKLFS can be referred to in terms of MSD. This is the distance that must be maintained between any part of an aircraft in flight and the ground, the water or any other object. In an LFA aircraft can operate down to 250 ft. MSD; however, in a TTA fast-jets can fly at 100 ft. MSD and helicopters can fly down to 100 ft. agl or down to ground level.

Predicted Future Baseline

17.4.6 It is anticipated that the airspace would continue to be used by the identified aviation stakeholders, and the baseline would remain as currently defined.

17.5 Scope of Assessment

Potential Receptors

MOD

17.5.1 Low flying is a demanding but essential skill for military aircrew, gained through progressive training and continuous practice within the UKLFS. The ability to operate effectively at low level by day and night is vital to fast jet, transport aircraft and helicopters as they support forces on the ground, and hence the UKFLS is a high value receptor. The Proposed Development is located within the UKLFS Low Flying Area (LFA) 16 and, when required, TTA 20T. Generally, the MOD's sensitivity of the Low Flying activities in these areas is determined to be high, however, during pre-application consultation the MOD withdrew its initial objection to the Proposed Development subject to suitable MOD accredited aviation lighting being fitted to the highest practicable point on all turbines.

NATS

17.5.2 NATS is the UK civil en-route Air Navigation Service Provider (ANSP). NATS operate a number of long range radars positioned to provide maximum coverage of UK airspace, which are important for the safe provision of air traffic services to civil and military, national and international air traffic.

17.5.3 The Proposed Development is within the operational range of the NATS Lowther Hill PSR system, on an approximate range and bearing of 266˚ and 32 km (17.2 NM). The Lowther Hill PSR contributes to the network of en-route radars providing coverage of UK airspace. With regards to the Lowther Hill PSR, the sensitivity of the receptor is determined to be high.

GPA

17.5.4 GPA is wholly owned by The Scottish Government and is located approximately 2 km to the northeast of the town of Prestwick, South Ayrshire. The Proposed Development is within the operational range of the GPA PSR, located on an approximate bearing of 127˚ and at a range of 26 km (14 NM). The airport PSR provides coverage to support to the airport's operational tasks in the region of the Proposed Development; the sensitivity of the receptor is determined to be high.

17.6 Predicted Effects

MOD

Construction

17.6.1 The infrastructure required in the process of the turbine construction, in particular large crane structures, may present a physical obstruction and affect operations of Military Low Flying aircraft. Standard mitigation practices as detailed in **Section 17.8** will reduce the effect to not significant.

Operation

17.6.2 The proposed wind farm would be located within LFA 16 and, when active, within TTA 20T. LFA 16 and TTA 20T are considered by the MOD to be areas of key importance for low flying training.

17.6.3 Due to the withdrawal of the MOD objection, the magnitude of the effect is low and due to the use of non-standard mitigation of lighting turbines below 150 m agl, the sensitivity of the receptor is determined to be medium; the effect has been assessed as not significant.

Decommissioning

17.6.4 The infrastructure required in the process of the turbine decommissioning may present a physical obstruction and affect operations of Military Low Flying aircraft. Standard mitigation practices as detailed in paragraphs 17.3.8 and 17.3.9 will reduce the effect to not significant.

NATS

Construction

17.6.5 The infrastructure required in the process of the construction of the Proposed Development would have no significant effect on the NATS Lowther Hill PSR system. This is because the static nature of the infrastructure is such that it should not be processed and presented onto ATC display screens by the PSR system. It would be expected that potential 'non-moving' returns would be removed through use of well understood, normal, radar system techniques and thus returns above a pre-set vector threshold would only be shown. No significant effect on radars and operations is expected ahead of the turbines commencing operation.

Operation

17.6.6 Air Traffic Controllers are responsible for maintaining typically 5 NM lateral separation between aircraft. Where turbines are detectable by a PSR system, they may appear as aircraft targets and could mask genuine aircraft responses. The radar may also be de-sensitised by clutter processing within the sector containing turbines, meaning that real aircraft targets may not be detected or may disappear from radar. At an anticipated maximum height of 130 m to blade tip, the Proposed Development is predicted to cause clutter to be presented on NATS displays utilising the Lowther Hill PSR.

17.6.7 Radar propagation modelling has been undertaken and the interaction of radar with the proposed wind turbines is well understood (Osprey, 2012). Therefore, the magnitude of the effect is high. The sensitivity of the receptor is also high. This effect has therefore been assessed as **significant**.

Decommissioning

17.6.8 Agreed mitigation is required to remain operational until the Proposed Development has been fully decommissioned; consequently, this phase would have no significant effect on the NATS Lowther Hill PSR system.

GPA

Construction

17.6.9 The infrastructure required in the turbine construction process will have no significant effect on the GPA PSR. This is because the static nature of the infrastructure is such that it will not be processed and presented onto ATC display screens by the PSR system.

Operation

17.6.10 GPA requires an accurate PSR system to support their provision of ATS to aircraft operating to and from, or requesting a service in the vicinity of, the Airport.

17.6.11 LoS analysis concluded that theoretically all of the turbines of the Proposed Development would be detectable by the GPA PSR (Osprey, 2015) (**Appendix 17.A**) and create clutter to be presented onto controllers displays. The Development Site is located directly beneath the flight path for aircraft approaching the Airport on Runway 31, in addition, departures from Runway 13 routing towards the Proposed Development would also be affected, resulting in the possibility of increased track miles being flown by aircraft which are vectored by controllers around the clutter.

17.6.12 The magnitude of effect is high, the sensitivity of the receptor is also determined to be high; the effect has been assessed as **significant**.

Decommissioning

17.6.13 Agreed mitigation is required to remain operational until the Proposed Development has been fully decommissioned; consequently, this phase would have no significant effect on the GPA PSR.

Micro-siting

17.6.14 No additional effect on any recognised receptor is anticipated should the micro-siting of any individual turbine(s) be required.

17.7 Predicted Effects: Cumulative

17.7.1 'There are a number of existing and proposed wind farms, including the Proposed Development, located in areas understood to be visible to GPA and NATS PSRs. Without mitigation, the Proposed Development would have cumulative effects on the GPA and NATS radars with these other projects, in terms of the area affected by radar clutter and the distances between areas of clutter on the radars. Discussions are ongoing with NATS and GPA regarding potential mitigation measures as described in **Section 17.8**.

17.7.2 Following implementation of mitigation, it can be expected that the stand-alone and cumulative effects of the Proposed Development on the GPA and NATS radar will be reduced to an insignificant level,

17.7.3 While the proliferation of turbines within LFA 16 and TTA 20T is a general concern for the MOD regarding Low Flying operations in this region; in this case they withdrew their objection to an earlier layout and no adverse effects are therefore predicted as a result of the Proposed Development.

17.8 Mitigation and Enhancement Measures

17.8.1 It is good practice to notify Aviation Stakeholders of the location and dimension of any wind energy development and the associated construction activities. Information regarding construction should be passed to the Defence Geographic Centre (DGC) and the General Aviation Awareness Council

(GAAC) at least 6 weeks in advance of the erection of the first turbine and to follow up on the day with a confirmation that the activity has taken place. The data should include:

- Location, height (of all structures over 150 ft., date of erection, date of removal and lighting type (none, infra-red or lighting brightness);
- Local aerodromes identified during consultation should be notified, particularly any police helicopter or air ambulance unit;
- RenewableUK should be copied on the submission of all such information as an independent record and because they might share the information with other relevant official agencies; and
- Appropriate information about the site construction and any associated lighting (where applicable), for example the height and temporary location of construction cranes, will be provided to the UK Aeronautical Information Service (NATS AIS) for promulgation throughout the UK Integrated Aeronautical Information Package (UKIAIP) (NATS, 2015 b).

17.8.2 Analysis has identified that the effects of the Proposed Development may be significant; namely on the NATS Lowther Hill En-route PSR and the GPA PSR. For these receptors, potential mitigation solutions are considered in this section to prevent, reduce or offset any possible effects where applicable.

17.8.3 It is expected that there will be no objection from the MOD as the new layout of the Proposed Development further reduces the effects on Low Flying operations in this region.

MOD UKLFS

Construction

17.8.4 Pilots will plan their flying activities in advance to be familiar with any en-route obstacles that they may encounter. Appropriate information about the site construction and any associated lighting (where applicable), for example the height and temporary location of construction cranes will be provided as per the notification requirements outlined in **Section 17.8.1**.

Operation

17.8.5 Pilots plan their flying activities in advance and are familiar with any en-route obstacles that they may encounter. During the flight, weather conditions or military exercises may necessitate route adjustments; however, pilots are ultimately responsible for seeing and avoiding tall structures, including wind turbines.

17.8.6 The Development Site is in an area where the MOD anticipates the construction of wind turbines is a concern due to an effect on military Low Flying operations. In a letter dated 1 November 2013 (DIO, 2013), the MOD removed its objection to the Proposed Development as the highest elevations of the turbines allow sufficient airspace for military aircraft to transit beneath the GPA CTA. Although the turbine layout of the Proposed Development has changed since MOD removed its objection, the new layout provides an increased volume of airspace between the turbines and base of controlled airspace. Furthermore, the MOD will require that all turbines are installed with *"MoD accredited 25 candela omni-directional aviation lighting or infra-red lighting with an optimised flash pattern of 60 flashes per minute of 200 ms to 500 ms duration at the highest practicable point on all turbines will be required"* (DIO, 2013). This can be implemented under a suitably worded planning condition.

17.8.7 The MOD removed their objection from a previous layout of the Proposed Development based on there being sufficient airspace to transit safely below the GPA CTA and a letter confirming this is appended to this ES (**Appendix 17.B**). There has been a reduction in blade tip elevation therefore it is assumed that the no objection from the MOD stands.

17.8.8 Agreement in respect of the MOD lighting requirement will be determined once the layout is finalised to confirm the MOD lighting requirements for air safety.

17.8.9 Information on the Proposed Development and construction infrastructure will be promulgated to the UK Aeronautical Information Service (AIS) and with the DGC such that it can be depicted on appropriate aviation documentation and charts as detailed in **Section 17.8.1**.

Decommissioning

17.8.10 In order to safeguard general use of the area by military traffic, the applicant will adhere to the notification requirements outlined in **Section 17.8.1**.

NATS

Construction

17.8.11 As stated at **Section 17.6.5** above, no significant effect on NATS radar systems and operations is expected during the turbine construction process; clutter should not be apparent until turbines are rotating, therefore there is no requirement for the implementation of mitigation in relation to the Lowther Hill PSR system during the construction phase.

Operation

Project Raytheon Modification (Project RM)

17.8.12 Raytheon Canada, the supplier of the Lowther Hill ASR-23 radar, and NATS have developed and are implementing a technical solution upgrade for mitigating the effects of wind turbines on ASR-23 PSR systems, through a combination of software and hardware solutions. The "Project RM" mitigation solution aims to remove the turbine-generated radar clutter from a controller's display screen whilst ensuring the essential ability to detect, track and provide navigational assistance to aircraft is maintained. Lowther Hill is the first NATS PSR to be upgraded under Project RM.

17.8.13 To enable successful mitigation, the following criteria applies:

- The wind turbines are located at a distance greater than 9km from the radar; and
- Aircraft are required to be operating greater than 1.2° or higher in elevation above the turbine blade tips.

17.8.14 Assessment has indicated that the potential base of PSR coverage that may exist with a Project RM upgrade to the Lowther Hill PSR is approximately 4,600 ft. amsl at 1.2° elevation and 3,800 ft. amsl at 0.8° elevation. As a result of the airspace structure above the Proposed Development, it is considered that operationally, Project RM may not be suitable for mitigation at an elevation of 1.2°, NATS are in a process to develop the mitigation to decrease the angle to 0.8°, whereby the desired operational coverage may be sufficient to mitigate the effects of the turbines on the Lowther Hill PSR. Consultation with NATS is ongoing and subject to agreement from NATS, the implementation of this solution is anticipated to reduce the level of significance to the Lowther Hill PSR to **not significant**.

Decommissioning

17.8.15 Any agreed mitigation would remain operational until the Proposed Development has been fully decommissioned; as such this phase would have no significant effect on the Lowther Hill PSR system.

GPA

Construction

17.8.16 As stated at **Section 17.6.10** above, no significant effect on the GPA PSR and operations is expected during the turbine construction process; there is no requirement for the implementation of

mitigation of the GPA PSR, turbines in LoS of a PSR will only be apparent when turbines are operational.

Operation

17.8.17 GPA are known to be developing a 'regional strategy' designed to technically mitigate the effects of wind energy developments on their radar and operations. The strategy is believed to be based on the procurement of a form of Resolution Infill technology as described below.

Resolution Infill

17.8.18 An additional radar sensor can potentially be located within or adjacent to a wind farm, or alternatively can be co-located with the affected PSR system, such as the GPA PSR in this instance. The sensor must be capable of identifying real aircraft returns from those generated by wind turbines, and subsequently reject the turbine returns as clutter. The clutter free coverage volume can then be used to replace the affected area on the ATC display screen or to enhance the display by suppressing the wind turbine returns.

17.8.19 There are three leading technologies in this field which are considered as possible technical solutions to mitigate the effects of the Proposed Development on the operations and air traffic service provision at GPA:

- Aveillant Holographic Radar™: A radar system designed to be co-located with the affected system or installed within a wind farm site, to provide 3D coverage of the airspace above. The Holographic Radar can distinguish between aircraft and wind turbines, providing data for an infill ‘patch’ on the affected radar display;
- C Speed LightWave Radar : The radar system, designed to be co-located with an existing traditional PSR, has a higher operating frequency and high Doppler filter resolution, allowing it to distinguish between returns from aircraft and returns from wind turbines. The LightWave PSR is understood to have a range of 20-25 NM (approximately 37-46 km) which is within range of the Proposed Development from the GPA PSR; and
- Terma Scanter 4002: maritime radar which could be used as air surveillance radar with the benefit of providing inter-turbine visibility and the ability to track aircraft inside and around wind farms.

17.8.20 All three aforementioned technologies are considered by aviation stakeholders and wind developers alike to have strong potential as credible mitigation solution options. Consultation with GPA will determine the suitability and availability of Resolution Infill options to mitigate any potential effects on the GPA PSR.

Further Emerging Technologies

17.8.21 Emerging technology options may potentially serve to mitigate the effects of the Proposed Development on the GPA PSR. These include:

- Thruput Midas (III and IV): These systems are hardware-based solutions designed to clean up the radar display allowing aircraft returns to be more clearly identified from the background clutter caused by the wind turbines;
- Cassidian ASR-NG: A combined Primary/Secondary radar system which includes technology that allows for safe guidance of aircraft in the vicinity of wind turbines; and
- The Cyrrus Aerium 3i+: A stand-alone system which takes data from multiple radars and utilises algorithms designed to suppress radar returns if they are determined to be from a wind farm, or display the radar returns if the data is validated to be an aircraft.

Conclusions

17.8.22 Consultation with GPA will determine the likelihood and suitability of potential technical mitigation options to minimise the effects of the Proposed Development to an acceptable level. Should consent be granted for the Proposed Development, it is considered that, with GPA's involvement, a technically and operationally acceptable solution can be implemented, within the timespan of a planning consent.

Decommissioning

17.8.23 Any agreed mitigation would remain operational until the Proposed Development has been fully decommissioned; as such this phase would have no significant effect on the GPA PSR system.

17.9 Residual Effects

17.9.1 The Proposed Development is considered to be within the operational range of a number of Aviation Stakeholder radar systems. Project RM for the Lowther Hill PSR may be an acceptable mitigation solution for NATS. Resolution Infill Technology, through the use of emerging technologies should, on agreement with GPA, mitigate the effect created to the GPA PSR. It is considered that with the collaboration of NATS and GPA, a technically and operationally acceptable solution could be implemented within 18-24 months of agreement on mitigation strategy, should consent be granted.

17.9.2 Appropriate resolution and agreement in respect of Proposed Development with regard to the MOD lighting requirement will be determined through on-going consultation.

Conclusions of Significance Evaluation

17.9.3 Analysis has identified that the Proposed Development will theoretically be detectable by regional radar systems operated by NATS and GPA and therefore will have an operational effect on the provision of ATS that utilise these systems. Should a requirement for the implementation of a technical mitigation solution be substantiated by NATS and GPA, following agreement of a technically feasible mitigation solution, there would be an insignificant residual effect to the affected PSRs.

17.9.4 The MOD removed their objection from a previous layout of the Proposed Development based on there being sufficient airspace to transit safely below the GPA CTA. There has been a reduction in blade tip elevation, increasing the volume of airspace available below the GPA CTA and it is therefore assumed that the no objection from the MOD stands.

17.9.5 With the turbines being fitted with MOD accredited aviation obstruction lighting, the MOD determined that the Proposed Development would be manageable in terms of an effect on military Low Flying training. The implementation of this mitigation, together with notification in aviation documents detailed in **Section 17.8.1** confirms an insignificant residual effect on military Low Flying operations.

17.10 References

NATS. (2015 a). Technical and Operational Assessment. NATS.

Scottish Government. (2014). Scottish Planning Policy. Scottish Government.

Osprey (2012). Aviation Impact Assessment. Osprey.

CAA. (2013). Policy and Guidance on Wind Turbines. CAA.

NATS (2015 b. UK Integrated Aeronautical Information Package. NATS.

CAA. (2015 a). Air Navigation: The Order and the Regulations. CAA.

MOD. (2014). Specification for IR and Low Intensity Red Vertical Obstruction Lighting. MOD.

RenewableUK. (2012). Guidance on Low Flying Aircraft and Onshore Tall Structures including Anemometer Masts and Wind Turbines. RenuwableUK.

CAA. (2015 b). Visual Flight Rules Charts. CAA.

MOD. (2015). Military Aeronautical Information Publication. MOD.

DIO. (2013). MOD Actions from 14th August 2013 Meeting (Ref: DE/C/SUT/43/10/1/Mgt-LH). (DIO).

Osprey (2015). Radar Line of Sight Results. Osprey.

18. Summary of Mitigation and Residual Effects for the Proposed Development

18.1.1 **Table 18.1** details the mitigation and enhancement measures that the applicant has committed to implement during the construction, operation and decommissioning of the Proposed Development. The measures are set out according to the technical topic in question, along with details of responsibility for implementation and the compliance mechanism. This is presented as a table that could form a base component of an Environmental Management Plan (EMP) that will be produced post consent to provide visibility into a strategy employed to ensure that mitigation measures set out in this ES are implemented.

18.1.2 The EMP may be produced by the applicant post-consent and it is assumed this will be undertaken as an aid to discharging conditions. Contractors will be required to contribute to the EMP and to adhere to the measures set out in it and any conditions associated with the planning permission. However, it is the developer who retains ultimate responsibility for ensuing that the Contractors comply with the EMP and planning conditions.

18.1.3 The significance of effects following implementation of mitigation measures is noted within **Table 18.1**. The definition of significance, particularly in respect to how this relates to and relates to "significant effects" in terms of the EIA Regulations, is described within **Chapter 2**, **Section 2.1**. A definition of how the terms are derived for each topic is set out in the corresponding technical chapter along with the relevant explanation and descriptions of receptor sensitivity, magnitude of change and levels of effect that are considered significant in terms of the EIA Regulations.

Table 18.1 Summary of Mitigation and Enhancement Measures

Topic	Potential Receptor and Effect	Outline Mitigation/Enhancement Measure	Significance of Effect Following Implementation	Responsibility	Compliance Mechanism	Summary Rationale
Contents						
Chapter 4 Description of the Proposed Development Section 4.4	Air Quality.	The main measures for managing dust that will be used where necessary are: ▶ Adequate dust suppression facilities will be used on site. This will include the provision of on-site water bowsers with sufficient capacity and range to dampen down all areas that may lead to dust escape; ▶ Any storage on site of aggregate or fine materials prone to dust generation will be managed using enclosures and screening if required so that dust escape from the site is avoided. Sheeting can also be provided for the finer materials that are prone to '*wind whipping*'; ▶ HGVs entering and exiting the Development Site will be fitted with adequate sheeting to totally cover any load carried that has the potential to be '*wind whipped*' from the vehicle; ▶ Vehicles used on site will be regularly inspected and maintained, to minimise vehicle emissions and the risk of leaking diesel or hydraulic fluids; ▶ Good housekeeping or 'clean up' arrangements will be employed so that the Development Site is kept as clean as reasonably practicable. There will be regular inspections of the working areas and immediate surrounding areas to ensure that any dust accumulation, litter or spillages are removed/cleaned up as soon as possible; and ▶ A site liaison person will investigate and take appropriate action where complaints or queries about construction arise.	Not significant.	Contractor.	Environmental controls specified in contracts.	There is the potential for an increase in dust during construction. However, as well established and effective dust control measures are used during the construction of wind farms, it is not expected that air quality will be affected.

Topic	Potential Receptor and Effect	Outline Mitigation/Enhancement Measure	Significance of Effect Following Implementation	Responsibility	Compliance Mechanism	Summary Rationale
Chapter 4 Description of the Proposed Development Section 4.5	Peat excavated during construction.	A draft Peat Management Plan (PMP) has been prepared and it will be finalised prior to construction and following completion of detailed ground investigations and micro-siting. The PMP will be further refined and detailed methods and specifications agreed with the Scottish Environmental Protection Agency (SEPA) and Scottish Natural Heritage (SNH). This will address methods in respect of peat excavation, haulage, storage, re-use and degraded habitat restoration. The PMP will ensure that peat excavated during construction is safely and suitably re-used within the extent of the Development Site wherever possible.	Not significant.	Contractor.	By planning condition following consent.	A draft PMP has been produced (**Appendix 6.A**, Peat Management Plan) which outlines the estimated volumes of excavated peat associated with the Proposed Development. It also includes control measures to protect peat, including temporary storage and restoration, which are designed to minimise potential peat waste. This will form the basis of the final PMP.
Chapter 4 Description of the Proposed Development Section 4.5	Track drainage.	Where tracks are to be placed on slopes, lateral drainage will be installed on the upslope side of the track. The length of drains will be minimised, to prevent either pooling on the upslope side or, at the other extreme, creating long flow paths along which rapid runoff could occur. Regular cross-drains will be required to allow flow to pass across the track (as recommended in SEPA's Position Statement WAT-PS-06-02 Culverting of Watercourses [December 2006]), with a preference for subsequent re-infiltration on the downslope side, rather than direct discharge to the drainage network. Water from drainage ditches will not be discharged directly to a watercourse. Instead it will pass through silt fences, silt traps or other best practice pollution control features. Drains will not be discharged directly into natural channels, ephemeral streams or old ditches. Check dams (small dams built across channels or ditches) may be required at regular intervals in the drainage ditches alongside an excavated track. The spacing of the check dams will depend on the following factors: ▶ The gradient of the track; ▶ The spacing of cross-drains; and	Not significant.	Contractor.	Environmental controls specified in contracts.	The need for drainage on the access track network will be considered for all parts of the track network separately, since slope and wetness vary considerably across the Development Site. In flat areas, drainage of floating tracks are not required as it can be assumed that rainfall onto the road will infiltrate to the ground beneath the tracks or along the verges. Track-side drainage will be avoided where possible, in order to prevent any local reductions in the water table or influences on the track structure and compression (the latter can occur where a lower water table reduces the ability of the peat to bear weight, increasing compression).

Topic	Potential Receptor and Effect	Outline Mitigation/Enhancement Measure	Significance of Effect Following Implementation	Responsibility	Compliance Mechanism	Summary Rationale
		▶ The depth of excavation. Regular maintenance and clearing of the check dams is imperative to ensure their effectiveness is maintained				
Chapter 4 Description of the Proposed Development Section 4.5	Borrow Pits	Once detailed intrusive investigations have been completed a detailed plan for each borrow pit will be developed and agreed with key consultees, i.e. East Ayrshire Council (EAC), SEPA and SNH. The plan would address establishment, extraction and restoration phases with the management protocols for the borrow pits included in the Construction Method Statement (CMS), which is envisaged to be subject to an appropriate planning condition. Any quarrying activities will also follow the Approved Code of Practice, Health and Safety at Quarries Regulations 1999. Nonetheless the likely effects and proposed mitigation that would be anticipated to address effects is likely to include: ▶ Traffic – The majority of traffic moving stone will use on-site access tracks. Any requirement to access highways will be addressed through a Traffic Management Plan (TMP); ▶ Blasting – Effects from blasting will be controlled through use of relevant protocols, blast mats and through appropriate communication and publicity about blasting occurrence. Blasts at each borrow pit can be expected to be infrequent, and at some distance from residential receptors and are therefore not anticipated to be of any substantive concern, nor likely to give rise to significant effects;	Not significant.	Contractor.	By planning condition following consent.	The measures to be taken to reduce or mitigate the environmental impact of the borrow pit construction process will be captured in the Construction Environmental Management Plan (CEMP), Pollution Prevention Plan (PPP), Site Waste Management Plan (SWMP) and emergency procedures that will all fall under the wider CMS. The CMS and supporting documents will be submitted for agreement with EAC and bodies such as SEPA prior to construction and development. It is assumed that the production and content of these documents would be specified by planning condition. In order to ensure that the specified measures are adhered to by the appointed contractors, an independent and suitably qualified Engineer, who will also liaise with the various environmental advisers employed during the construction phase, will be appointed to monitor implementation and provide specialist advice.

Topic	Potential Receptor and Effect	Outline Mitigation/Enhancement Measure	Significance of Effect Following Implementation	Responsibility	Compliance Mechanism	Summary Rationale
		▶ Noise / vibration – Potential effects arise from blasting itself as well as the use of excavation and stone crushing equipment. Use of appropriately silenced equipment, publicity over blasting, adherence to operational hours (10.00 to 16.00 on Monday to Friday and 10.00 to 12.00 on Saturdays for borrow pits as per the anticipated planning conditions) and the distance to residential receptors provide the main mitigation for such effects which are anticipated to be well within limits of acceptability established by guidance; ▶ Dust – Residential receptors are at a considerable distance from potential borrow pit areas (closest at ~500m) and thus no dust effects on them are expected. Some potential for dust to be deposited on adjacent vegetation exists, though with damping down of surfaces or use of mist sprays as appropriate, this should avoid any significant effects (and this would be assessed by the appointed ECoW); ▶ Visual intrusion – Construction effects will be discernible through the presence of construction machinery. Long term, an appropriate restoration plan for the borrow pit(s) will be developed in agreement with consultees (SEPA, SNH, EAC) which is expected to include some re-grading of the final profile and measures to encourage re-vegetation and potentially peat habitat restoration; ▶ Water - The potential for sediment laden water to be released will be controlled through appropriate design and treatment facilities at the borrow pit(s). Design will be specific to each location and where possible will encourage natural infiltration;				

Topic	Potential Receptor and Effect	Outline Mitigation/Enhancement Measure	Significance of Effect Following Implementation	Responsibility	Compliance Mechanism	Summary Rationale
		▶ Water - The potential for ingress of water to excavations will be controlled by gravity drainage to settlement lagoons, and encouraging natural infiltration. Where dewatering is required, giving rise to additional potential effects of excavations on the surrounding groundwater levels, the re-use of filtrated water from the settlement ponds may be used to provide a compensatory water source for any groundwater-dependent features by discharging to a vegetated surface just upgradient of their location; and ▶ Wastes – Any waste arisings will be handled as per other construction wastes.				
Chapter 7 Noise Section 7.9	Construction Noise.	As good practice, the following embedded mitigation measures concerning construction noise will be implemented: ▶ Restricted hours of working for most HGV movements (07:00 to 19:00 Monday to Friday, 07:00 - 12:00 Saturdays) to avoid sensitive periods. Any requirement to work outside these periods will only occur through prior agreement with EAC (for example turbine erection requires low wind speed conditions and may require longer working hours if conditions are poor at the time); ▶ All construction activities will be undertaken in accordance with good practice as set out in BS 5228-1:2009+A1:2014; ▶ All employees on the construction site will be advised of quieter methods of operating plant and tools, and to report any damage to noise control measures as soon as they are identified;	Not significant	Contractor.	By planning condition following consent and environmental controls specified in contracts.	No specific mitigation is required for receptors with regard to construction noise. However noise impact will be controlled by following standard industry practices and applying best practicable means.

Topic	Potential Receptor and Effect	Outline Mitigation/Enhancement Measure	Significance of Effect Following Implementation	Responsibility	Compliance Mechanism	Summary Rationale
		▶ Where practicable, for any particular activity, suitable plant, machinery and working practices will be adopted. All equipment will be maintained in good working order and will be fitted with appropriate noise controls at all times (e.g. silencers, mufflers and/or acoustic hoods); and ▶ Construction plant capable of generating significant noise and vibration levels will be operated in a manner to minimise the duration of the higher magnitude levels.				
Chapter 8 Shadow Flicker	No mitigation measures will be required since no predicted shadow flicker effects have been identified.	NA	NA	NA	NA	NA
Chapter 9 LVIA	Visual Impact.	The development of the wind farm would draw upon the guidance set out in SNH guidance '*Good Practice during Wind farm Construction*'. The key measures that would be implemented, as part of the Construction Method Statement (CMS) and the supporting Construction Environmental Management Plan (CEMP) in order to avoid or reduce potential construction effects include: • Using designated routes around the Development Site for construction vehicles and operation of construction plant such as cranes. Minimising the creation of any wheel ruts and subsequent clear up of any that are created. • Implementation and monitoring of site management procedures, such as regular litter sweeps of the immediate environs to ensure the removal of all litter arising from the construction activities.	Significant operational visual effects would extend out to within approximately 7km distance of the Proposed Development. Significant effect on views from the small settlement at Burnside and from the south western edge of New Cumnock, along Connel View and at the Cemetery.	Contractor.	By planning condition following consent.	The measures to be taken to reduce or mitigate the environmental impact of the construction process will be captured in the Construction Environmental Management Plan (CEMP), Pollution Prevention Plan (PPP), Site Waste Management Plan (SWMP) and emergency procedures that will all fall under the wider CMS. The CMS and supporting documents will be submitted for agreement with EAC and bodies such as SEPA prior to construction and development.

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		• Removal, reinstatement, and clear up of the temporary construction compound and any related construction arisings.	Significant effects on the views from part of the B741 and Afton Road (also promoted as a Scottish Hill Track / Heritage Path) near New Cumnock Cemetery, two core paths within 5km, the views from the Knockshinnock local nature reserve and the hill summits of Blackcraig Hill and Windy Standard.			In order to ensure that they are being suitably adhered to by the appointed contractors, an independent and suitably qualified Engineer, who will also liaise with the various environmental advisers employed during the construction phase, will be appointed to monitor implementation and provide specialist advice.
Chapter 10 Historic Environment Section 10.11	Direct effects on unrecorded heritage assets within the site.	Potential direct effects can be effectively mitigated by an agreed programme of archaeological work to be overseen by an Archaeological or Environmental Clerk of Works (ACoW/ECoW). The details of this work will be contained within a Written Scheme of Investigation including a Post-Excavation and Research Design (PERD) to be agreed with West of Scotland Archaeology Service (WoSAS), but in principle it will comprise the following elements: ▶ Micro-siting of access tracks to avoid/minimise direct effects; ▶ Photographic survey and recording of the Peat Hill boundary bank (HER 7988) including identification of areas of poor preservation that may be utilised as a crossing point; ▶ Monitoring of intrusive groundworks within areas of deep peat; ▶ Archaeological Recording: any archaeological features or deposits of archaeological or palaeoenvironmental importance which cannot be preserved in situ will be excavated to standards agreed with WoSAS; and	Not significant.	Archaeological or Environmental Clerk of Works (ACoW/ECoW).	By planning condition following consent.	Known features have been avoided, with the exception of a localised isolated area of the Peat Hill boundary bank. Effect can be mitigated by recording. Disturbance of previously unrecorded heritage features anticipated to be of lesser-regional importance and sparsely distributed. These are expected to predominantly relate to peat deposits and watercourses within the Development Site. Effect can be mitigated by recording.

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		▶ Analysis, archival, reporting and dissemination: standards for analysis and archival of archaeological and palaeoenvironmental material with subsequent reporting.				
Chapter 11 Ecology - Construction Section 11.10	Temporary habitat loss / degradation. Running Water (habitat loss / degradation/pollution). Protected and/or Notable Species (disturbance, killing, injury, habitat loss / degradation / fragmentation).	Reinstatement of areas subject to temporary disturbance. Preparation and adherence to CEMP. Adherence to pollution prevention guidelines etc. as fully detailed in **Chapter 13.** All working areas would be clearly defined. Pre-construction surveys for protected species with relevant Method Statements and Licences produced as necessary. An ECoW would provide advice in the event of any expected or unforeseen protected species issues that arise during the construction and to oversee the implementation of mitigation requirements. Water quality protection measures (e.g. adherence to SEPA Pollution Prevention Guidance [PPGs]). Water crossing construction to follow SEPA and Scottish Government culvert design requirements and avoid sensitive time period for salmonids (spawning, egg deposition & fry emergence). Removal of vegetation/spoil/brash piles to be supervised by ECoW. No water crossings will be constructed during key sensitive spawning periods for salmonids (i.e. between January and May) to ensure no interference or damage to eggs or alevins that may potentially be present in the gravels, either at the water crossings or downstream.	Not significant.	Contractor and ECoW.	By planning condition following consent.	In view of the likely effects taking into account the design evolution (see **Chapter 11, Section 11.5**), all potential effects on Valued Ecological Receptors (VERs) are considered to be 'not significant'. Therefore there is no strict requirement for any additional mitigation (i.e. additional to that embedded at the design phase) with respect to valued ecological receptors. However, mitigation is also required where there is a potential for protected species legislation to be contravened. Furthermore, although no significant effects are predicted on VERs, in the interests of best practice, a range of additional mitigation measures which may further minimise effects are included.

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Chapter 11 Ecology - Operation Section 11.10	Protected and/or Notable Habitats (habitat loss / degradation). Protected and/or Notable Species (disturbance, killing, injury, habitat loss / degradation / fragmentation).	Water quality protection measures (e.g. adherence to SEPA PPGs). All maintenance working areas would be clearly defined.	Not significant.	Contractor and ECoW.	By planning condition following consent.	
Chapter 11 Ecology - Decom missioning Section 11.10	Protected and/or Notable Habitats (habitat loss / degradation). Protected and/or Notable Species (disturbance, killing, injury, habitat loss / degradation / fragmentation).	Preparation of a Restoration and Decommissioning Plan.	Not significant.	Developer.	By planning condition following consent.	
Chapter 12 Ornithology Section 12.11	Disturbance of breeding birds.	A breeding birds protection plan will be produced, and submitted to the planning authority for approval in writing, ahead of the commencement of construction works. This will specify any survey requirements and mitigation measures required in relation to construction works or vegetation clearance to be undertaken between 1st March and 31st August, to ensure compliance with the legislation protecting breeding birds. The specification and mitigation measures shall be implemented as approved under the supervision of a qualified ornithologist. An Ecological Clerk of Works (ECoW) will be employed for the duration of construction to ensure compliance with ecological mitigation and implementation of good practice methods, including the protection of breeding birds.	Not significant.	Developer.	By planning condition following consent.	Mitigation measures would result in reduction for potential of disturbance of breeding birds.

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Chapter 12 Ornithology Section 12.11	Disturbance of black grouse.	A black grouse lek survey will be undertaken, in accordance with the methodology in Gilbert et al., (2006) in each breeding season in which construction is carried out. To avoid disturbing lek sites, no construction will occur within 500m of any identified black grouse lek between 3am and 9am during their breeding season core lekking period (mid-March to the end of May). Where completed new access tracks are located within 500m of a Black Grouse lek, construction and maintenance vehicles using these before 9am during the core lekking period will observe a 10mph speed limit while passing within this distance and workers will remain in their vehicles.	Not significant.	Developer.	By planning condition following consent.	Mitigation measures would result in reduction for potential of disturbance of black grouse.
Chapter 12 Ornithology Section 12.11	Disturbance of merlin.	A Schedule 1 raptor survey, specifically for merlin, will be undertaken in accordance with the methodology within Hardey et al., (2013) in each breeding season in which construction is carried out (April to July) and if required, appropriate mitigation will be implemented, to avoid disturbing breeding merlin.	Not significant.	Developer.	By planning condition following consent.	Mitigation measures would result in reduction for potential of disturbance of merlin.
Chapter 13 Geology, Hydrology and Hydrogeology Construction, operation and decommissioning Section 13.9	Surface watercourses change in flows.	Use of cross drains and other mitigation to maintain natural flow paths; and Implementation of Drainage Management Plan (DMP) including inspection and maintenance programme.	Not significant.	Contractor; ECoW; and Site Environmental Manager.	CEMP; CMS; PPP; DMP; SEPA PPG notes; and Controlled Activities Regulations (CAR) licensing.	Mitigation measures, e.g. silt traps and cut off drains, would result in limited residual surface flow and water quality effects It is considered that the 'embedded' mitigation (i.e. that incorporated into the design of the Proposed Development) and additional specific mitigation would together result in no significant effects during construction.
	Surface watercourse pollution or sedimentation.	Implementation of DMP and PPP including inspection and maintenance programme; No direct discharge of water to natural channels / existing ditches; Use of sediment removal methods (trackside swales / silt dams and fences / settlement lagoons; diffuse re-infiltration; clay bunding);	Not significant.	ECoW; Contractor; and Site Environmental Manager.	CEMP; CMS; PPP; DMP; SEPA PPG notes; and CAR licensing.	

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		Regular maintenance and clearing of sediment removal features; Prompt re-stabilisation of disturbed areas; Construction activity / storage / traffic routes to take place in clearly defined working areas; and Designated areas for refuelling, maintenance and washing of vehicles / plant.				
	Groundwater change in flows.	Use of cut-off drains / bunds to prevent runoff into excavations; and Implementation of DMP including inspection and maintenance programme.	Not significant.	Contractor. Site Environmental Manager.	CEMP; DMP; SEPA PPG notes; and CAR licensing.	
	Groundwater pollution.	Storage of material / re-fuelling on defined areas of hardstanding to prevent infiltration to the groundwater body; Contingency plans to ensure risk of spillages are minimised; Implementation of DMP and PPP including inspection and maintenance programme; and Designated areas for refuelling, maintenance and washing of vehicles / plant.	Not significant.	Contractor. Site Environmental Manager.	CEMP; CMS; PPP; DMP; SEPA PPG notes; and CAR licensing.	
	PWS.	Storage of material/re-fuelling on defined areas of hardstanding to prevent infiltration to the groundwater body; Contingency plans to ensure risk of spillages are minimised; Implementation of PMP including inspection and maintenance programme; and Designated areas for refuelling, maintenance and washing of vehicles/plant.	Not significant.	Contractor. Site Environmental Manager.	CEMP; PPP; DMP; SEPA PPG notes; and CAR licensing.	
	GWDTEs.	Storage of material/re-fuelling on defined areas of hardstanding to prevent infiltration to the groundwater body; Contingency plans to ensure risk of spillages are minimised; and	Not significant.	Contractor. Site Environmental Manager	CEMP; CMS; PPP; DMP; SEPA PPG notes; and	

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		Abstraction of groundwater from excavations to be utilised for compensatory support; Implementation of PMP including inspection and maintenance programme; and Designated areas for refuelling, maintenance and washing of vehicles/plant.			CAR licensing.	
	Peat change in water flow and quality.	Use of sediment removal methods (trackside swales/silt dams and fences/settlement lagoons; diffuse re-infiltration; clay bunding); Regular maintenance and clearing of sediment removal features; Prompt re-stabilisation of disturbed areas; and Use of settling ponds/filtration and bunding to manage storage of peat turves; Implementation of PMP including inspection and maintenance programme; and Designated areas for refuelling, maintenance and washing of vehicles/plant.	Not significant.	Contractor. Site Environmental Manager.	CEMP; PPP; DMP; PMP; and CAR Licensing	

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Chapter 14 Transport Section 14.8	Accidents and Safety. Construction vehicles could carry mud and debris onto the carriageway. Motorists, especially motorcyclists. Pedestrians, Cyclists.	The increase in traffic flows during the construction period is unlikely to result in increased frequency of accidents or reduced safety. A Traffic Management Plan (TMP) will include measures such as wheel washing and preventing debris on the carriageway. Wash down facilities will be installed on the access road should this be identified as a problem, with works being halted prior to installation in such instances.	Not significant.	Contractor.	By planning condition following consent. Daily observations should be made to confirm whether the wheel washing facility is effective. Developer through contractual arrangements with construction contractor.	Following planning approval of the Proposed Development, further detailed discussions would be carried out with the highways authorities by the appointed construction contractor to agree any variations or additions to the Construction TMP proposed. As part of this plan, the contractor will seek to avoid the peak traffic periods at the beginning and end of each day and other sensitive periods (including school drop off and pick up times) where achievable. This will reduce the number of HGVs travelling during the times where 'walkers' and 'sensitive groups' are most likely to be using the footway network. Furthermore, measures to ensure construction HGV drivers adhere to speed limits (or lower) and vehicles are covered and wheels washed will be included within the Construction TMP.
	Driver Delay. Effect of abnormal loads on traffic flow.	Police escorts and possible timing of deliveries within quiet periods; Use of accompanying police and escort vehicles to control traffic on the route in advance of the abnormal load passing through; Abnormal Movement Licence; Temporary highway signing; and Advertising.	Not significant.	Contractor.	Planning condition relating to the production of the TMP. Agreement with local constabulary and submission of the relevant applications. Developer through contractual arrangements with construction contractor.	

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	Effect of abnormal loads on the highway.	Accommodation/Reinstatement works.	Not significant.	Contractor.	Works to be agreed with Highway Authority. Developer through contractual arrangements with construction contractor.	
	Changed traffic flows on local roads. Driver Delay, Severance, Pedestrian Amenity. Local residents, motorists, pedestrians, cyclists.	Specific travel routes to and from site will be defined for delivery vehicles.	Not significant.	Contractor.	Planning condition relating to the production of the TMP to be agreed with Roads Authority. Developer through contractual arrangements with construction contractor.	
Chapter 15 – Socio economics Section 15.14	No significant effects anticipated.	No significant effects are anticipated, however, notwithstanding this, the applicant has pledged to provide local community funding which would be delivered during the operational phase of the Proposed Development. In accordance with the Scottish Government's Good Practice Principles for Community Benefits from Onshore Renewable Energy Developments document (2013, revised in 2015 for factual accuracy).	Not significant.	Developer.	In accordance with government guidance.	The local community funding aims to ensure that local communities share the socio-economic benefits which would be generated from the Proposed Development. Given that the applicant would provide £5,000 per MW of installed capacity, the Proposed Development has the potential to generate up to £7,837,500 (£313,500 per annum for 25 years) of local community funding.

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Chapter 16 – Infrastructure Section 16.8	Effects on television reception.	To mitigate any problems with reception arising, the applicant will accept a planning condition to assess current television signals in advance of the construction of the Proposed Development and will mitigate post-development problems with television reception arising from effects attributable to the Proposed Development. Viewing quality can be remedied by considering each, or a combination, of the following mitigation techniques: ▶ Replace or upgrade the receiving aerials (e.g. with directional receiving aerials) for the affected households; ▶ Re-tune the television receivers at the affected households; ▶ Re-align the television aerial to an alternative transmitter and re-tune the receiver at the affected households; and ▶ Provision of a bespoke 'self-help' solution (this could comprise a new low powered transmitter, a cable network, a satellite receiver or a combination of these measures). By utilising these techniques it is predicted that any television reception issues as a result of the Proposed Development would be fully mitigated with no significant residual effects.	Not significant.	Developer.	By planning condition following consent.	The switch over to a digital television signal suggests adverse effects may not occur and that in the unlikely event that interference does occur, this will be localised. The planning condition will require the applicant to meet the cost of investigating and effectively rectifying any problems should they arise and to implement solutions in a timely manner so as to minimise any inconvenience to any affected residents. It is expected that issues, if they arise, will arise in the first year of operation of the wind farm and any remedial work will be limited to this period only.
	Construction Safety.	Relevant UK health and safety legislation will be adhered to; site construction management practices will include, but are not limited to: relevant signage and fencing at potential hazardous construction areas where appropriate. All relevant health and safety legislation will be followed, and industry best practice guidance adhered to.	Not significant.	Contractor.	Standard Site Management practices incorporated into construction contracts.	Health Safety Security Environment (HSSE) guidance and best practice will be followed at all times.
	Operational Safety.	Turbines installed at the Development Site would comply with the BS EN 61400 series and relevant UK health and safety legislation.	Not significant.	Contractor.	Site design and on-going maintenance.	

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		Safety measures also include the incorporation and installation of appropriate warning signage where necessary on-site.				
Chapter 17 – Aviation Construction Section 17.8	National Air Traffic Services (NATS).	No significant effect on NATS radar systems and operations is expected during the turbine construction process; clutter should not be apparent until turbines are rotating, therefore there is no requirement for the implementation of mitigation in relation to the Lowther Hill Primary Surveillance Radar (PSR) system during the construction phase.	Not significant.	n/a	n/a	n/a
	Glasgow Prestwick Airport (GPA).	No significant effect on the GPA PSR and operations is expected during the turbine construction process; there is no requirement for the implementation of mitigation of the GPA PSR, turbines in Line of Sight (LoS) of a PSR will only be apparent when turbines are operational.	Not significant.	n/a	n/a	n/a
Chapter 17 – Aviation Operation Section 17.8	NATS.	The Project Raytheon Modification (Project RM) would be implemented. To enable successful mitigation, the following criteria applies: ▶ The wind turbines are located at a distance greater than 9km from the radar; and ▶ Aircraft are required to be operating greater than 1.2° or higher in elevation above the turbine blade tips.	Not significant.	Developer / NATS.	By planning condition following consent. NATS through contractual arrangements with Raytheon Canada.	The Project RM mitigation solution aims to remove the turbine-generated radar clutter from a controller's display screen whilst ensuring the essential ability to detect, track and provide navigational assistance to aircraft is maintained. Subject to agreement from NATS, the implementation of this solution is anticipated to reduce the level of effect to the Lowther Hill PSR to not significant.
	GPA.	GPA are known to be developing a 'regional strategy' designed to technically mitigate the effects of wind energy developments on their radar and operations. The strategy is believed to be based on the procurement of a form of Resolution Infill technology.	Not significant.	Developer / GPA.	By planning condition following consent. GPA in agreement with wind farm developers.	There are three leading technologies in this field which are considered as possible technical solutions to mitigate the effects of the Proposed Development on the operations and air traffic service provision at GPA:

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						▶ Aveillant Holographic Radar™: A radar system designed to be co-located with the affected system or installed within a wind farm site, to provide 3D coverage of the airspace above. The Holographic Radar can distinguish between aircraft and wind turbines, providing data for an infill 'patch' on the affected radar display; ▶ C Speed LightWave Radar : The radar system, designed to be co-located with an existing traditional PSR, has a higher operating frequency and high Doppler filter resolution, allowing it to distinguish between returns from aircraft and returns from wind turbines. The LightWave PSR is understood to have a range of 20-25 NM (approximately 37-46 km) which is within range of the Proposed Development from the GPA PSR; and ▶ Terma Scanter 4002: maritime radar which could be used as air surveillance radar with the benefit of providing inter-turbine visibility and the ability to track aircraft inside and around wind farms.

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						All three aforementioned technologies are considered by aviation stakeholders and wind developers alike to have strong potential as credible mitigation solution options. Consultation with GPA will determine the suitability and availability of Resolution Infill options to mitigate any potential effects on the GPA PSR.