BLACKWOOD WIND FARM
Environmental Statement

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PREFACE

Force 9 Energy Partners LLP (Force 9 Energy) is seeking planning permission jointly with EDF Energy Renewables (EDF) for the Blackwood Wind Farm. The proposed five turbine wind farm would be located on a site within the Blackwood Estate, Near Auldgirth, approximately 14km to the north of Dumfries. Three of the turbines would be a maximum 140m height to blade tip (100m hub height), and two would be a maximum 120m height to blade tip (80m hub height).

RSK Environment Ltd was commissioned to undertake an Environmental Impact Assessment (EIA) for the Blackwood Wind Farm on behalf of Force 9 Energy and EDF. This Environmental Statement (ES) reports on the findings of the EIA and accompanies the development planning application. The turbine to be used at the wind farm would only be agreed once planning consent had been obtained, however, the candidate turbine used for the EIA is a REPower MM82.

The ES considers potential environmental impacts associated with the construction, operation and decommissioning of the Blackwood Wind Farm. Through the EIA process it was determined that the ES would include the following technical chapters: planning, physical environmental, ecology, ornithology, landscape and visual assessment, archaeology and cultural heritage, noise, traffic and transport, climate change, socio-economics and electromagnetic interference, infrastructure, aviation and safety, and shadow flicker.

Force 9 Energy is committed to ensuring that sympathetic and sustainable design principles are embedded into each project design and also to engaging with local stakeholders for their views and inputs on each project. A public consultation programme has been completed, which included a public exhibition in September 2011.

ES Availability

A hard copy of the ES will be available for examination by members of the public at the following locations:

Dumfries and Galloway Council
Development Planning
Rae Street
Dumfries
DG1 1LW

Closeburn shop and post office
68 Closeburn
Closeburn
Thornhill
DG3 5HR

Auldgirth stores
Auldgirth
Dumfries
DG2 ORZ

Copies of the ES Non Technical Summary (NTS) will also be available from the council office.

Additional hard copies or electronic (CD) copies of the ES can be purchased at a cost of £200 and £2 respectively. Copies of the ES NTS are available free of charge. Please contact:

RSK Environment Ltd
65 Sussex Street
Glasgow
G41 1DX

Updates on the Blackwood Wind Farm and an electronic copy of the ES NTS to view will be available on the Force 9 website http://www.force9energy.com/projects/current/blackwood/

Any requests for further information on the Blackwood Wind Farm or information relating to Force 9 Energy LLP should be made to Andrew Smith at Force 9 Energy LLP, Woodside House, 20-23 Woodside Place, Glasgow, G3 7QF.

Representations on the ES should be made to Mr. Steve Rogers, Head of Planning and Building Standards Services at Dumfries and Galloway Council, at the address above.

1 INTRODUCTION

Purpose of the Environmental Statement

1.1 Under the Town and Country Planning (Scotland) Act 1997, as amended by the Planning (Scotland) Act 2006,[1] planning permission is required from the relevant planning authority to construct and operate electricity generation projects that fall below 50 Megawatts (MW).

1.2 Force 9 Energy Partners LLP (herein referred to as Force 9 Energy) is seeking planning permission jointly with EDF Energy Renewables (EDF) for the construction and operation of the Blackwood Wind Farm (hereafter 'the Development'), which would have a generating capacity of up to 10.25MW. The relevant planning authority is Dumfries and Galloway Council (DGC).

1.3 Under the Town and Country Planning (Environmental Impact Assessment (EIA)) (Scotland) Regulations 2011 (hereafter the EIA Regulations),[2] the Development qualifies as a Schedule 2 development, since it exceeds the threshold of two or more turbines under section 3i 'Installations for the harnessing of wind power for energy production (wind farms)'. Schedule 2 development constitutes 'EIA Development' if it is considered likely to have significant effects on the environment, based on the type of development proposed, its scale and location.

1.4 Force 9 Energy concluded that the Development could give rise to some local significant effects on environmental receptors and a screening opinion on the need for statutory EIA was not sought from DGC. On behalf of Force 9 Energy and EDF, RSK Environment Ltd (hereafter RSK) has therefore completed an EIA of the Development, taking account of the scoping responses detailed below.

1.5 This Environmental Statement (ES) reports on the findings of the EIA and is submitted on a statutory basis to accompany the planning application for the Development. The information contained in this ES and any responses to the ES provided by stakeholders will be used by DGC to inform their decision as to whether to grant planning consent for the Development.

The Proposed Development

1.6 The Development would be located on a site within the Blackwood Estate (hereafter 'the Site'), Near Auldgirth, Dumfries and Galloway approximately 14km to the north of Dumfries (see Figure 1.1).

1.7 The Development would comprise five turbines, three of which would be 140m in height to blade tip, and two would be 120m to tip. No definitive details of the turbines can be given at this stage as they would be subject to a competitive tendering programme, but the candidate turbine used for the EIA is a REPower MM82. The REPower MM82 turbine has an electricity generation capacity of 2.05 megawatts (MW), providing a combined maximum output of 10.25 MW of electricity.

1.8 A separate application is to be made by the Distribution Network Operator, ScottishPower Power Systems, for a 33kV connection from the Development to the local electricity distribution network. Current studies show some capacity at the Dunscore substation and for the purposes of the planning application this is assumed to be the connection point.

1.9 It is proposed that the Development has a 25 years operational life span. At the end of this period, EDF would have the option to decommission the Site and remove all turbines or apply for an extension to increase the operational period.

1.10 Further detail on the Development, including other elements such as the permanent anemometry mast and substation / control building, is provided in ES Chapter 3: Project Description.

1.11 It is calculated that the Development would provide enough energy to power approximately 5,700 homes[i] and the operation of the Development would result in annual GHG savings of 16,351 tonnes CO_2e, with a total saving of 379,343 tonnes CO_2e over its lifetime (refer to Chapter 12: Climate Change for further details).

Force 9 Energy and EDF

1.12 Force 9 Energy is a dedicated wind farm development company based in and with a focus on the UK market. To date Force 9 Energy has taken six developments through the planning process; four of which have been consented without appeal or Public Inquiry, one of which was refused after public inquiry and one of which was consented on appeal. Two of those developments are now in operation and two are expected to be in construction through 2012. The remaining consented development is likely to be in construction during 2013. Force 9 Energy is continuing to expand its wind farm development portfolio in response to the Government's targets for energy generation from renewable sources.

1.13 Force 9 Energy has a joint development agreement with EDF. Through the agreement Force 9 Energy leads on the development of wind farm proposals through the planning process and up to the start of construction. Should the Development be granted planning consent, EDF would take the lead during construction and subsequently own and operate the Development. Force 9 Energy is supported by EDF both financially and with staff resources requested by Force 9 on issues such as grid studies, access and public relations.

Project Team

1.14 Table 1.1 below summarises the technical specialists who have contributed to the EIA and their respective disciplines.

[i] Calculated using the formula from the renewableuk website http://www.bwea.com/edu/calcs.html

Table 1.1: EIA and Design Team

Organisation	Role
Amec	Ecological and Ornithological Consultant
Eversheds	Legal review of the ES and support to Force 9
Force 9	Developer. Technical assessment for telecommunications, aviation, television and shadow flicker assessment.
Grontmij	Engineering consultancy and design advice, including provision of access study.
PPS	Communications Consultant. Preparation of Statement of Community Involvement and organisers of public consultation exercises.
Roger Tym & Partners	Planning Consultants.
RSK Environment Ltd	EIA Co-ordination. Technical assessment for Landscape and Visual Assessment (and preparation of verified visualisations), Archaeology and Cultural Heritage, Ground Conditions, Flood Risk Assessment and Hydrology, Socio-economics and Climate Change.
The Wind Consultancy	Technical wind farm design advice and assessment of impact on telecommunications, aviation and other infrastructural assets, and shadow flicker.

Structure of the Environmental Statement

1.15 The ES has been divided into three volumes as follows:

- Volume 1 Main Text and Figures which reports on the findings of the individual technical assessments, cumulative impacts and mitigation measures;
- Volume 2 Landscape and Visual Impact Assessment (LVIA) figures and visualisations, to accompany the LVIA and Archaeology and Cultural Heritage assessments in Volume 1; and
- Volume 3 Technical Appendices – these contain technical information to support the various assessments in Volume 1 as follows:
  - Appendix 1.1 Scoping Consultation Responses;
  - Appendix 5.1 Flood Risk Assessment;
  - Appendix 6.1 Baseline Ecology Report;
  - Appendix 6.2 Bat Survey Report;
  - Appendix 7.1 Ornithology Survey Data;
  - Appendix 8.1 Landscape Character Type – indicative wirelines;
  - Appendix 9.1 Archaeology – Gazetteer;
  - Appendix 9.2 Archaeology – Figures, Plates and References;
  - Appendix 10.1 Noise Assessment Methodology;
  - Appendix 10.2 Wind Speed Modelling;
  - Appendix 10.3 Noise Monitoring Locations;
  - Appendix 10.4 Noise Meter Certificates of Calibration;
  - Appendix 10.5 Noise Monitoring Data;
  - Appendix 10.6 Predicted Noise Level Graphs
  - Appendix 11.1 Access Study;

- Appendix 12.1 Climate Change Calculation Sheet;
- Appendix 15.1 Shadow Flicker Modelling Results; and
- Appendix 15.2 Cumulative Shadow Flicker Results.

1.16 The remainder of this Volume I of the ES follows the following structure:

- Chapter 2: Project Alternatives and Design Evolution;
- Chapter 3: Project Description, including a site description and details of the Development;
- Chapter 4: Planning Context;
- Chapter 5: Physical Environment (Geology, Hydrology and Hydrogeology);
- Chapter 6: Ecology;
- Chapter 7: Ornithology;
- Chapter 8: Landscape and Visual Assessment;
- Chapter 9: Archaeology and Cultural Heritage;
- Chapter 10: Noise;
- Chapter 11: Traffic and Transport;
- Chapter 12: Climate Change;
- Chapter 13: Socio-Economics (including potential impacts on recreation and tourism);
- Chapter 14: Electromagnetic Interference, Infrastructure, Aviation and Safety;
- Chapter 15: Shadow Flicker; and
- Chapter 16: Environmental Management.

1.17 In accordance with the EIA Regulations a Non Technical Summary of the ES has also been produced. This provides a concise description of the Development, the predicted environmental impacts and mitigation measures in non-technical language.

EIA Methodology

Introduction

1.18 EIA is the procedure by which a development's likely significant environmental impacts are methodically identified and assessed, for all stages of its lifecycle. The EIA for the Development has been completed in accordance with the EIA Regulations and current best practice guidance including:

- Scottish Government, 2011, Planning Circular 3, The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2011;
- Scottish Natural Heritage, 2009, A Handbook on Environmental Impact Assessment; and
- Institute of Environmental Management and Auditing (IEMA), 2004 (and updated 2006), Guidelines for Environmental Impact Assessment.

Screening

1.19 As noted previously a formal 'Screening Opinion' as to the need for an EIA has not been sought from DGC. Instead the EIA has been undertaken and submitted in recognition that the proposals constitute EIA Development.

Scoping

1.20 In line with the EIA Regulations and best practice guidance a Scoping Report was completed to identify the environmental issues to be addressed in the EIA, which is described in greater detail in the following section.

Environmental Statement

1.21 Schedule 4 Part 2 of the EIA Regulations specifies the minimum information requirements for an ES. Schedule 4, Part 1 of the EIA Regulations sets out the information *"as is reasonably required to assess the environmental effects of the development and which the applicant can, having regard in particular to current knowledge and methods of assessment, reasonably be required to compile".* This ES has been formulated to comply with the requirements of Schedule 4 Parts 1 and 2 of the EIA Regulations.

1.22 The content of this ES is based on the Scoping Report and subsequent Scoping Opinion received from DGC, together with a combination of baseline studies, consultations, calculations and modelling completed as required for the agreed technical assessments.

1.23 The EIA has been completed based on the detailed description of the construction, operation and decommissioning of the Development, as set out in ES Chapter 3: Project Description. Information obtained during the EIA process has been used to inform the Development design, to reduce or avoid potential environmental impacts as far as is reasonably practicable.

1.24 Throughout the EIA process a 'reasonable worst-case' scenario for the Development has been considered. Any relevant assumptions made and limitations to the EIA are noted in Paragraph 1.50 and in the individual technical ES chapters.

Scoping and Consultation

1.25 An underlying principle of the EIA process is that it should concentrate on environmental issues where impacts associated with a development proposal have the potential to be significant. The Development was subject to a detailed scoping exercise in May 2011, in order to determine those issues that should be addressed in the EIA and the form that individual assessments should take.

1.26 The scoping exercise involved: a review of available documentation related to the form and status of the existing environment; consultation with statutory and non-statutory agencies and other environmental bodies with knowledge of the proposed development site and surrounding areas; preliminary desk-based and site-based appraisals and surveys; and knowledge of the potential environmental implications of comparable schemes (based on direct past project experience and other published experience and guidance).

1.27 A Scoping Report was produced for the Development that recorded the outcomes of the scoping exercise, specifically identifying the environmental issues of genuine potential significance to be assessed in the EIA and the assessment methodologies to be followed within each technical assessment. The report accompanied a formal request

for a Scoping Opinion, submitted to DGC in May 2011. The Scoping Opinion was received on 1st July 2011.

1.28 A copy of the consultation responses received in the Scoping Opinion is contained in Technical Appendix 1.1. A summary of the key points in the responses and the ES chapters in which they are addressed in provided in Table 1.2 below

Table 1.2 Summary of Scoping Consultation Responses

Organisation	Response	Relevant ES chapter
Auldgirth Community Council	Many questions raised about the scheme including confirmation on Dunscore grid connection and distance between turbines	2: Alternatives and 3: Project Description
	Requested EIA consider potential impacts on a number of identified properties and facilities, including the Burntkettle Shooting Ground and the community woodland of Clauchrie, and local notable tourist spots including the Dunscore churchyard.	13: Socio-economics
	Cumulative assessment needs to consider Dalswinton, Auchencairn and Harestanes / Forest of Ae wind farms. Visual assessment needs to consider views from A76 and A75, and impact of new section of access track. List of possible viewpoints also provided.	8: Landscape and Visual Assessment
	Access: EIA needs to address potential upgrades required to existing access track and potential disruption to residents at Low Auldgirth.	11: Traffic and Transport
	Noise – assessment needs to consider combined impact of wind farm with Dalswinton, and consider whether turbines would have an impact on noise created by the shooting ground.	10: Noise
	Ecology and Ornithology: Goshawks noted in the area and impacts on bats need to be assessed.	6: Ecology and 7: Ornithology
DGC Environmental Standards	A site specific noise assessment should be carried out following the principles in ETSU-R-97 and a noise assessment in relation to construction should also be undertaken following the guidance of BS5228.	10: Noise
DGC Flood Risk Management	The applicant should take into account surface flows from the site so that the flood risk is not increased elsewhere.	5: Physical Environment.
DGC Highways	All highways should be termed roads. The ES should include details of the turbine components, delivery vehicles, trips, access routes, alterations to the public road network, location and route of grid connection, borrow pits and a traffic management plan. Transport Scotland and Network Rail should be consulted regarding access via the A76 and the railway bridge respectively. The proposed access route would require agreement with the Roads Authority, together with a schedule of any improvements required.	11: Traffic and Transport. Note the grid connection will be the subject of a separate application.
DGC Archaeologist	Need to consider interim planning policy on wind energy development (June 2011) Assessment methodology proposed considered to be appropriate. A number of cultural assets were highlighted for assessment (reference Appendix A) Heritage tourism requires consideration in the assessment.	9: Archaeology and Cultural Heritage

Organisation	Response	Relevant ES chapter
Closeburn Community Council	The wind farm would be the first to infringe into the Nith valley properly and would significantly add to the cumulative visual and noise impact of the area in combination with Dalswinton, Harestanes (consented) and Auchencairn (application submitted). Noise and visual assessments requested for a number of properties around the Site.	8: Landscape and Visual Assessment 10: Noise
	Site is not located in an area identified as suitable for wind energy in the DGC interim planning policy, and is located adjacent to a Dark Skies / Regional Scenic area designation.	8: Landscape and Visual Assessment
	Carbon balance needs to be considered in the ES, planting of trees required for carbon offsetting. Project Description needs to include details of any tree felling	12: Climate Change and 3: Project Description
	Closeburn Community in negotiations with the Forestry Commission to lease the adjacent Clauchrie Plantation as a community forest, developing it as a centre for education and training. Potential impacts due to noise and disturbance of tranquillity. The Community Council considers tourism would be impacted.	13: Socio-economics
	Potential wildlife impacts – goshawks stated to nest locally and badgers use the Clauchrie Burn valley.	6: Ecology
Dumfries and Galloway Constabulary	Should planning permission be granted early discussions would be required with the police regarding escort of abnormal loads and consultation with the Crime Reduction Officer would be recommended to discuss site security.	11: Traffic and Transport 3: Project Description.
HSE	No comment on scope or methodologies.	
Historic Scotland	Notes the Scheduled Ancient Monument Mullach Fort and the potential for impacts on its setting. A wireframe or photomontage should be supplied in the ES to help illustrate potential impacts. Use recently published HS guidance on assessment of setting of historic environment assets	9: Archaeology and Cultural Heritage
Keir Community Council	Potential concerns were raised with regard to: • Number of wind farms in the Nith valley • Visual impact on an area of scenic beauty • Noise impact on local residents • Negative impact on local community and general area	8: Landscape and Visual Assessment 10: Noise 13: Socio-economics
NATS	Provided generic comments on potential impacts of wind farms.	14: EMI, infrastructure, aviation and safety
Nith District Salmon Fishery Board	Importance of gathering fisheries information during EIA process. Potential for wind farms to impact on fisheries during construction process through deposition of silt in watercourses, crossing of watercourses, and location of borrow pits	5: Physical Environment and 6: Ecology
Ministry of Defence	Provided generic advice on potential impacts of wind farms.	14: EMI, infrastructure, aviation and safety
RSPB	Potential on site for peregrine, merlin and hen harrier to be considered. Breeding waders and goshawk known to be present in the general area. Year round vantage point watches and breeding	7: Ornithology

Organisation	Response	Relevant ES chapter
	bird surveys recommended, following latest SNH guidance. Consult with Dumfries and Galloway Raptor Study Group.	
Prestwick Airport	The wind farm would be over 67 km to the south east of the airport and entirely terrain shielded from the airport radar. Notes that NATS En Route may have objections due to potential interference to Lowther Hill and Great Dun Fell radars.	14: EMI, Infrastructure, Aviation and Safety
Scottish Environment Protection Agency	Reference Good Practice During Wind Farm Construction	3: Project Description
	Flood risk should be included in the EIA (for info a FRA was completed by Kaya Consulting for Riverside Lodge, a residential development at Auldgirth). Flood risk should be considered with respect to the access tracks, anemometer mast, grid connection building and site office.	5: Physical Environment
	Carbon balance should be systematically analysed. Comments were also made in relation to potential peatlands habitat and the need for assessment and mitigation.	5: Physical Environment 12: Climate Change
	Wetland ecology – a phase 1 Habitat Survey should be completed for the entire Site and the layout should be designed to avoid impacts on wetlands. The assessment should consider potential impacts on groundwater dependent terrestrial ecosystems.	6: Ecology
	Details of groundwater abstractions in the area should be provided and considered in the EIA. Any proposed abstractions should also be detailed.	5: Physical Environment.
	All aspects of site work should be identified that might impact on the environment or create a pollution risk and a schedule of mitigation produced including a timetable of works. Principles of Construction Management to be set out in the ES. This should include consideration of opportunities for improvements.	3: Project Description and 16: Environmental Management
	The Development should meet the requirements of the Water Framework Directive (WFD)	5: Physical Environment
	Information should be provided on borrow pit location, size, and nature including depth of floor and final reinstated profile, proposed drainage and settlement traps, turf and overburden removal and storage for reinstatement. Impacts of borrow pits should be considered in the ES.	3: Project Description, 5: Physical Environment and 16: Environmental Management.
	Air Quality – consultation with Environmental Health officers should be sought on potential nuisance issues during construction and decommissioning phases of the project	3: Project Description and 16: Environmental Management
Scottish Natural Heritage	River Nith and tributaries known to host otter, Nith Valley known to host Great Crested Newt and several species of bat. Red squirrel has also been noted on site. In addition to a Phase 1 Habitat Survey, appropriate protected species surveys are required, together with survey for water vole and badger. Impacts on fish (notably Atlantic Salmon and Lamprey) should also be assessed.	6: Ecology
	Ornithology: The site does not have an RSPB sensitivity rating, but may be used by a number of bird species throughout the year. The ornithological assessment to be completed should include local information, and should assess impacts from direct habitat loss, displacement through indirect loss of habitat, and potential collision risk (with the turbines).	7: Ornithology

Organisation	Response	Relevant ES chapter
	Landscape: borrow pits should be included in visualisations less than 10km from the site. It is preferable for transformers to be contained within turbines. ZTV requested in accordance with SNH guidance in order to agree viewpoints. Design Statement required in the ES setting out the rationale for the layout and the turbine heights and iterative process for the final layout. Should be confirmed that the connection from the turbines to the control building would be underground.	8: Landscape and Visual Assessment
	SNH wishes the ES to include an assessment of the off-site impacts of improving the public roads to allow access.	3: Project Description
	Current recreational activities within the study area to be identified and potential impacts on these activities assessed, including potential impacts on views from these facilities.	13: Socio-economics
Scottish Water	No concerns raised though investigation ongoing with regard to telemetry links	
The Scottish Government	Advised no information available relevant to the proposal, no comments made.	
Thornhill Community Council	Comments as per Closeburn Community Council	
Transport Scotland	Stated there would be minimal impact on the trunk road during the operation of the wind farm. Many of the construction loads may be categorised as abnormal therefore authorisation from BEAR Scotland may be required. Recommend consultation with BEAR as to feasibility of transport of items to site.	11: Traffic and Transport

1.29 Further consultation was undertaken as an integral part of the EIA; the consultations completed are detailed in each of the ES technical chapters 5 to 14.

Public Consultation

1.30 The Development is classed as a "local development" under paragraph 4, Regulation 2(1) of the Town and Country Planning (Hierarchy of Developments) (Scotland) Regulations 2009. Statutory pre-application consultation (PAC) with local communities prior to the submission of a planning application is not required for a local development.

1.31 However, in addition to the consultations described above, Force 9 Energy chose to undertake a programme of public consultation on the Development, which included a public exhibition in September 2011. The public consultation is reported separately to the ES in the Statement of Community Consultation (prepared by PPS) but key consultation activities can be summarised as follows:

- Local community councils were sent an introductory letter about the Development in June 2011 which was followed up with correspondence via telephone and email;
- Prior notification of the Public Exhibition: letters containing details of the public exhibition with an invitation to attend were sent out to 300 residential addresses

in the Auldgirth area and to local stakeholders and politicians. Advertisements were also placed in the Dumfries and Galloway Standard and Dumfries Courier;

- Public Exhibition: this was held in the Auldgirth village hall on Wednesday 28th September from 11am-8pm; and
- Follow up to public exhibition: letters and emails were issued to local stakeholders and politicians to update them on the Development following the exhibition and a presentation of updated proposals was provided to Closeburn Community Council.

Technical Assessment and ES Chapter Format

1.32 Once the issues to be addressed in the EIA had been confirmed with DGC, technical assessments were undertaken to identify potential constraints and opportunities for the Development and inform its design, and assess the likely significant impacts associated with the finalised Development.

1.33 Each environmental issue assessed was assigned a separate chapter in the ES (Chapters 5 to 14) and all technical chapters are structured as set out below:

Introduction

1.34 This section provides a brief summary of the topic and means of assessment in the chapter.

Policy Context

1.35 This section contains a review of relevant legislation and best practice guidance together with reference and due consideration of the adopted and emerging planning policies (national, regional and local) as detailed in Chapter 4: Planning.

Method of Assessment

1.36 This section sets out the approach to the assessment including data sources, consultations, models used and any limitations or assumptions made in the assessment. It also includes a set of assessment significance criteria, specific to the environmental aspect, with details of the criteria sources and justification for their use.

Baseline Environment

1.37 This provides a detailed description of the baseline environment (with relevance to the assessment), which has been established through collation and review of existing information, data and reports, completion of desk top studies and field survey work as necessary. Potential sensitive receptors and resources are also identified and modelled future conditions without the Development are included if appropriate.

Project Characteristics

1.38 A section of the chapter that distils the key construction, operational activities and decommissioning activities of the Development that could cause impacts in respect of the topic to be assessed.

Predicted Impacts

1.39 This section describes the prediction and/or modelling of future conditions with the Development, identification of the environmental impacts that would result from the construction, operation and decommissioning of the Development and an evaluation of their magnitude and significance. This process uses the most appropriate combination of definitive standards and legislation, technical guidance, best practice and professional judgement.

Mitigation

1.40 This contains a description of the mitigation measures (above and beyond those inherent within the design) committed to in order to counter or offset predicted impacts.

Residual Impact

1.41 Provides confirmation of the impacts that remain following the implementation of the mitigation measures.

Cumulative Impacts

1.42 Summarises potential cumulative impacts arising from the Development in combination with existing and proposed wind farm developments in the surrounding area.

Assessment Criteria

1.43 Schedule 3 of the EIA Regulations notes that the potential significant environmental impacts of a development must be considered with regard to the following:

- Extent of the impact (geographical area and size of the affected population);
- Transfrontier nature of the impact (not applicable for the Development);
- The magnitude and complexity of the impact;
- The probability of the impact; and
- The duration, frequency and reversibility of the impact.

1.44 In addition Schedule 4 of the EIA Regulations notes that both *'direct effects and any indirect, secondary, cumulative, short, medium and long-term, permanent and temporary, positive and negative effects of the development'* should be described in the ES.

1.45 Each technical chapter therefore includes a specific set of assessment criteria to reflect the above requirements. Within this ES impact significance is generally defined through consideration of the sensitivity of the receptor in combination with the predicted impact magnitude; an example table is provided in Table 1.3. It should be noted that this table varies according to the assessment topic, the assessment guidelines and methodology followed, applicable standards and professional judgement. Specific variations are required for some topics e.g. the noise assessment considers compliance or exceedence of standards rather than a gradation of impact.

1.46 Impact magnitude may be established through consideration of the number of the receptors affected; the scale or extent of impact i.e. local, district, regional or national level; the duration of the impact and whether the impact is direct or indirect, primary or

secondary, reversible or irreversible. The sensitivity of the receptor or receiving environment has generally been determined through assessment of its level of scarcity, value, importance and/or protection. Other factors such as number of visitors for a tourist attraction, or frequency of use, may also be of note for some assessment topics.

Table 1.3 Impact Significance Criteria – Example Table

Impact Magnitude	Receptor Sensitivity				
		High	**Medium**	**Low**	**Negligible**
	High	Major	Moderate	Minor to Moderate	Negligible
	Medium	Moderate	Minor to Moderate	Minor	Negligible
	Small	Minor	Minor	Negligible	Negligible
	Negligible	Negligible	Negligible	Negligible	Negligible

1.47 Within each chapter clarification is also provided on whether the identified impacts are significant environmental impacts. These conclusions are drawn based on a combination of professional judgement and experience and relevant standards and guidance as appropriate.

Cumulative Assessment

1.48 Potential cumulative impacts can take two forms:

- A combination of individual impacts from the Development experienced by an individual receptor e.g. a residential receptor could experience both noise and visual impact; and
- Impacts from several different developments on a receptor – impacts from the individual developments may not be significant, but there could be a significant impact when considered cumulatively.

1.49 Cumulative impacts are considered in the individual technical ES chapters, with a focus on impacts of the Development with those of other wind farms. Wind farm developments that are operational; have consent and/or are under construction (together termed “committed developments”) or are in the planning system have been identified within a 60km radius of the Site, as identified on Figure 8.26. As discussed in Chapter 8, only committed developments within the 60km radius have been assessed in detail for the LVIA.

Assumptions and Limitations

1.50 The principal assumptions that have been made and any limitations that have been identified during the EIA are set out below. Assumptions specifically relevant to each environmental aspect are set out in the appropriate chapter.

- Baseline comprises the Site as existing in 2011, unless stated;
- Information received from third parties is assumed to be accurate, complete and up to date;

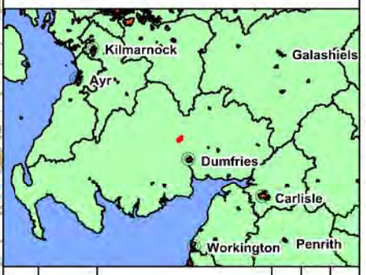
- Candidate turbines will consist of three turbines of a maximum of140m in height to blade tip and 100m hub height, and two turbines of a maximum of 120m in height to blade tip and 80m to hub height; and
- It has been assumed in each assessment that the grid connection would be at 33kV and consist of an underground cable routed along roadside verges. However, the final decision about route and whether elements of this would be underground or pole-mounted lies with SP Power Systems.

Chapter 1 References

[1] Town and Country Planning (Scotland) Act 1997, as amended by the Planning etc (Scotland) Act 2006 asp 17

[2] Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2011.

Site Boundary



Rev	Date	Description	Drn	Chk	App
01	10.01.12	Legend	BF	MK	MK
00	03.11.11	Site Location	BF	MK	MK

FORCE 9 ENERGY

Blackwood Wind Farm

RSK

Figure 1.1: Site Location and Boundary

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FILE NAME: P:\ENVIRONMENT\190000 - EIA Glasgow\P190282 Blackwood Wind Farm\06 GIS\ES Fig 1.1 - Site Location and Site Boundary Wor

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2 PROJECT ALTERNATIVES AND DESIGN EVOLUTION

Introduction

2.1 Under the Town and Country Planning (Environmental Impact Assessment) Scotland Regulations 2011, an Environmental Statement (ES) is required to provide "*an outline of the main alternatives studied by the applicant or appellant and an indication of the main reasons for the choice made, taking into account the environmental effects*".

2.2 This chapter describes the process followed by Force 9 Energy in selecting the Blackwood Estate as a potential location for the Development and the evolution of the Development design into that which forms the basis of the planning application (as described in Chapter 3 and shown in Figure 3.2).

2.3 Planning policy and justification for the Development is described in ES Chapter 4: Planning and a more detailed discussion of relevant legislation, strategy and policy is contained in the planning statement that accompanies the planning application.

Site Selection

2.4 Force 9 Energy Partners LLP has an ongoing programme of search for sites that may be suitable for a wind farm development. Should a new site become available, a range of commercial, environmental, technical and policy factors are considered before a decision is made on whether to proceed with an environmental assessment and planning application.

2.5 In assessing a potential site the following criteria would usually be considered:

- Avoid locations within International environmental designations;
- Avoid locations within national landscape and environmental designations;
- As a preference, avoid locations in locally designated landscapes;
- As a preference, avoid areas which may be susceptible to radar impact;
- As a preference, locate potential developments close to trunk roads and the national grid, but do not discount other areas at this stage on account of access;
- As a preference, avoid areas where other infrastructure may impact on scheme feasibility e.g. pipelines or significant levels of telecommunications traffic, but do not discount areas because of such constraints;
- Locate in preferred areas of search for wind farms in policy documents where possible;
- Locate in areas where evidence of existing infrastructure defines or contributes to landscape character; and
- Avoid direct impacts to nationally designated heritage assets.

2.6 The Site fits with Force 9 Energy's broad site identification process. Further detail on each criterion for the Site is provided below and a plan showing potential environmental constraints on and near the Site is included as Figure 2.1.

Land Availability

2.7 The Site lies within the Blackwood estate, which is owned by a single landowner. The estate has a range of sources of income generation including farm, property and shooting tenancies, forestry, fishing, property development and agriculture. The estate is proactive in looking for opportunities for the diversification of income. Force 9 Energy was introduced to an opportunity to develop a wind farm on the estate in the first quarter of 2009 and applied its site selection criteria to the estate. Force 9 Energy determined that land on the eastern extremity of the estate, close to the existing Dalswinton wind farm would present an opportunity for wind farm development.

Designated Sites

2.8 Scottish Planning Policy states that development in nationally designated areas would only be permitted where it would not adversely affect the integrity of the area or the qualities for which it has been designated, or any adverse effects are clearly outweighed by social, environmental or economic benefits of national importance.

2.9 The Site is not located within a National Scenic Area (NSA) though there are two NSAs within a 35km radius of the Site with potential visibility of turbines. These are the Nith Estuary and the East Stewartry Coast, effects on which are considered in further detail in Chapter 8: Landscape and Visual Amenity. Parts of the access road to the Site are located within a locally designated landscape, although the turbines would not be located within the designated area.

2.10 There are no statutory ecological designations within the Site; the closest designation being the Black Loch Site of Special Scientific Interest (SSSI), located approximately 5.75km to the east of the Site. However, the Site does contain non-statutory ancient woodland, which was considered throughout the design process.

2.11 An initial review of statutorily protected sites, such as Listed Buildings, Scheduled Monuments and Historic Gardens and Designed Landscapes was undertaken, which showed that there were a number of potential heritage receptors in the vicinity of the Site that would require further assessment (refer to Chapter 9: Archaeology and Cultural Heritage). It is of note that archaeological features can usually be preserved through wind farm design or mitigated by an appropriate archaeological strategy for excavation.

2.12 The current Dumfries and Galloway Wind Energy Diagram shows that parts of the Site are within an area considered to have intermediate potential for wind farm development.

2.13 The Dumfries and Galloway Interim Planning Policy: Wind Energy Development (draft) shows the Site is not located in an 'area requiring significant protection' or a 'cumulative sensitivity zone'. However, the Site is located in a Higher Sensitivity Landscape Character Area (a designation that covers the majority of the DGC area) and outside

the Areas of Search for Medium and Large Scale Wind Energy Development. The document was issued after Force 9 Energy had applied its site search criteria to the Blackwood estate. A review of emerging environmental findings indicated that, whilst not within an area of search for Large Scale wind energy, the Development may meet the draft criteria based policy within the document subject to suitable design and mitigation.

Site Access

2.14 A number of the wind turbine components, notably the blades, tower sections and nacelles, exceed standard dimensions for transportation and are classified as 'abnormal loads'. The highway and site entrance need to be of a suitable size and gradient to accommodate such vehicles and for critical junctions on the proposed access route (identified by on-site inspection), an early 'swept-path' analysis may be conducted. For the Site an initial access study including swept path analysis was completed in October 2010. This showed access to the Site through the Blackwood Estate directly from the trunk road network was possible.

Proximity to a Grid Connection Point and Capacity

2.15 The electricity network connection equipment and associated infrastructure required are related to the connection voltage, the size of the wind farm and its distance to the nearest connection point. Furthermore, although the site may be close to an electricity sub-station or power line, there may be insufficient capacity in the infrastructure to accommodate the electricity from the wind farm. An initial study shows that there is capacity on the grid for a wind farm of the scale and nature of the Development at the Dunscore substation. Further details on the potential grid connection are presented in Chapter 3 Project Description.

Aviation

2.16 Wind turbines can affect aviation interests either through physical obstruction to aircraft flight movements or through the blade movements creating "clutter" on radar screens. Consultation with Ministry of Defence (MOD), Civil Aviation Authority and National Air Traffic Services is therefore undertaken early in the development process. The proposed turbines lie outside any consultation zone for safeguarded aerodromes and outside areas of concern for meteorological radars.

Conclusions

2.17 Whilst not located in the emerging DGC 'Area of Search for a Medium or Large Scale Wind Farm', the Site was located in an 'intermediate' area for windfarm development in previous policy documentation. As the emerging policy is yet to be finalised, the Site was concluded to be suitable for further consideration for a wind farm development. This was due to the technical suitability of the Site and the landowner agreement, the presence of the adjacent operational Dalswinton Wind Farm and the relatively limited number of environmental constraints.

Alternatives

2.18 The following section describes the evolution of the Development design and presents the alternative layouts considered and design workshop process. The number, output, height and location of turbines were all amended before the layout was finalised.

No Development Alternative

2.19 The 'No Development' alternative refers to the option of leaving the Site in its current state. This option would be likely to result in the following impacts:

- A missed opportunity to contribute to the national and local targets for renewable energy generation;
- No corresponding reduction in Greenhouse Gas emissions through renewable energy generation;
- No diversification of the estate activities;
- Landscape and visual impacts of the turbines and associated infrastructure would be avoided; and
- Habitats, species and recently planted forestry on-site would remain undisturbed.

2.20 Overall, it is considered that the potential benefits of the Development outweigh the potential adverse impacts that would arise, subject to suitable design and mitigation.

Layout A – Initial Considerations

2.21 The initial turbine layout, as shown in Figure 2.2, was developed for inclusion in the EIA Scoping Report, prior to the completion of all the detailed baseline studies. A wind farm of six turbines was proposed, with three turbines of height 150m to tip and three of height 120m to tip.

2.22 This initial design was based on the following principles;

- The site terrain and varying wind capacity across the Site;
- A layout that was appropriate in the context of the adjacent Dalswinton wind farm to the east, with similar turbine heights and separation distances to provide visual continuity;
- Appropriate separation distances between turbines to maximise energy capture, based on a 5.5 x blade diameter (440m) separation on the prevailing South West wind direction and a 3.5 x diameter (280m) separation perpendicular to the prevailing wind direction. These distances were not fixed and could be relaxed according to environmental constraints on the ground;
- Two different turbine heights to allow for local topography, so that visually the turbines all appeared to be a consistent height, especially in relation to the existing Dalswinton Windfarm;
- Set backs from residential properties within the Site to achieve compliance with ETSU noise limits;
- Minimising the amount of felling and avoid the areas of ancient woodland;
- Avoidance of power lines;
- Location of turbines and hardstanding areas to avoid watercourses; and

- Minimise introduction of turbine visibility into area of the Nith Valley that are not currently subject to turbine visibility.

Layout B – Five Turbine Layout

2.23 Layout B, also shown in Figure 2.2, evolved from the six turbine layout of Scheme A. This design was influenced by points raised during the scoping report process, a design workshop and a series of surveys and data gathering exercises, as well as technical information provided by turbine manufacturers.

2.24 For the design workshop, all the constraints identified during the baseline data gathering process were mapped, with appropriate buffers, and the turbines sited accordingly so they did not impinge on any of these constraints. Wireline testing was also carried out using computer software, to assess the design from a number of different viewpoints.

2.25 From this process it was evident that there were potential noise and cultural heritage impacts associated with the southernmost turbine present in Layout A. Therefore this turbine was removed to avoid potential impacts on the setting of a Scheduled Ancient Monument and ensure noise levels at nearest residences remained within the limits set out in the ETSU guidance[1]. Therefore, the outcome of the workshop was a layout based on five turbines, with three turbines of height 140m to tip and two turbines of height 120m to tip.

Layout C – Revised Five Turbine Layout

2.26 Following further on-site surveys, the location of Turbines 2 and 5 were modified in the light of ecological and archaeological constraints identified on the Site. Turbine 2 was sited slightly further to the south to reduce impact on potential ecological habitats (since the nearby woodland is red squirrel habitat) and Turbine 5 was moved to the northwest to avoid direct impacts on an archaeological feature, resulting in Layout C.

Access Track Options

2.27 Access to the Site is currently taken through an unnamed road that passes through Low Auldgirth. It was concluded that, due to physical constraints (and potential impacts to residential receptors), the access route to the turbines needed to avoid Low Auldgirth. A new section of access track was proposed, to route through the fields in the western area of the Site. The first version of the route extended into adjacent woodland and crossed a stream, but was subsequently amended to avoid potential associated hydrological and ecological impacts.

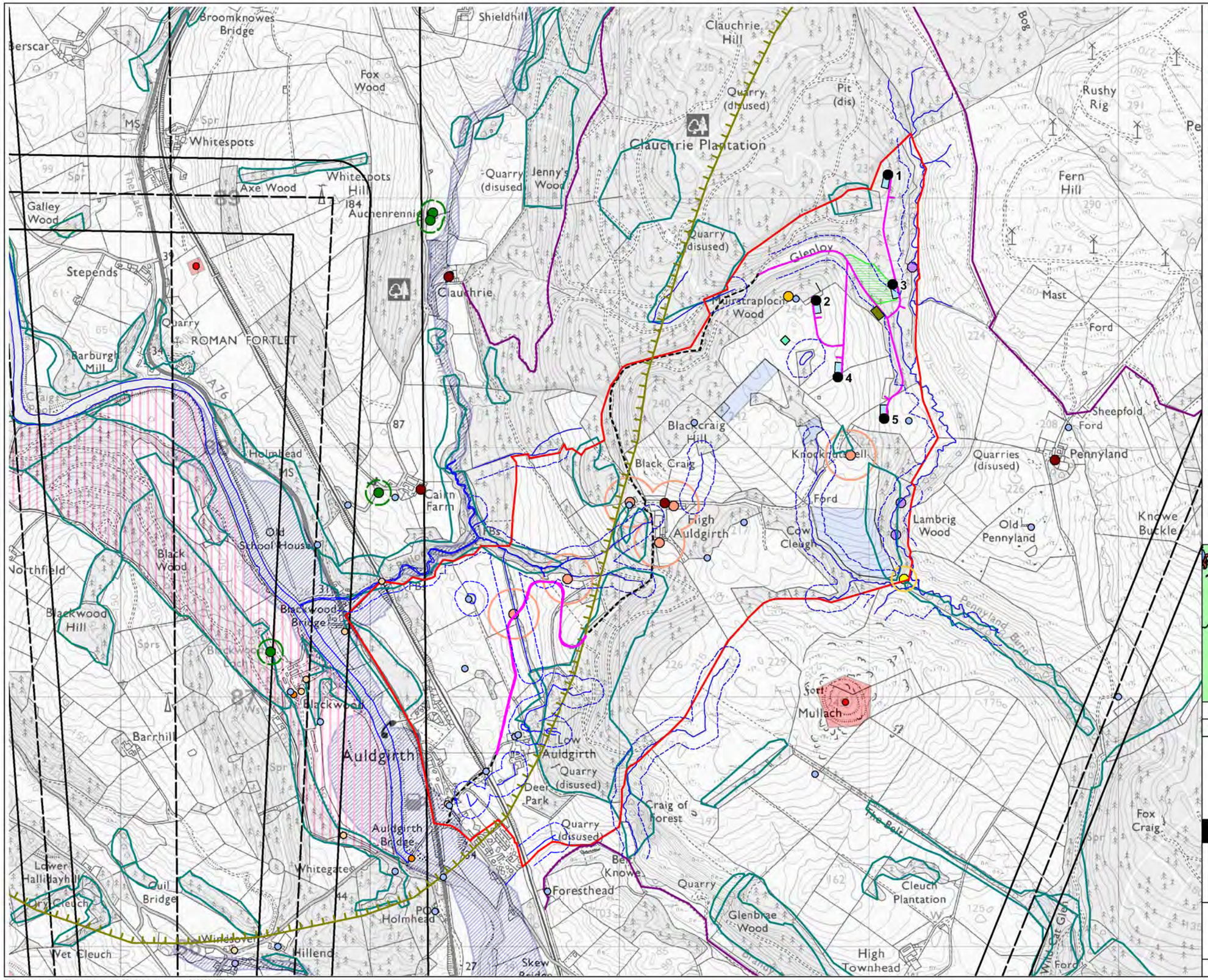
Conclusions

2.28 The Development to be submitted for planning has evolved as information has become available on physical and environmental constraints. The turbines in the finalised scheme have been reduced in number and height to reduce potential environmental impacts. A new proposed access track is also included to avoid potential impacts associated with engineering and environmental constraints around Low Auldgirth.

2.29 The final layout is included as Figure 3.2 and is described in detail in Chapter 3: Project Description.

Chapter 2 References

[1] Department of Trade and Industry, 1996, Energy Technology Support Unit (ETSU), R-97 'The Assessment and Rating of Noise from Wind Farms'



Rev	Date	Description	Drn	Chk	App
01	25.11.11	Layout	BF	MK	MK

FORCE 9 ENERGY

Blackwood Wind Farm

RSK

Figure 2.1 - Environmental Constraints Plan

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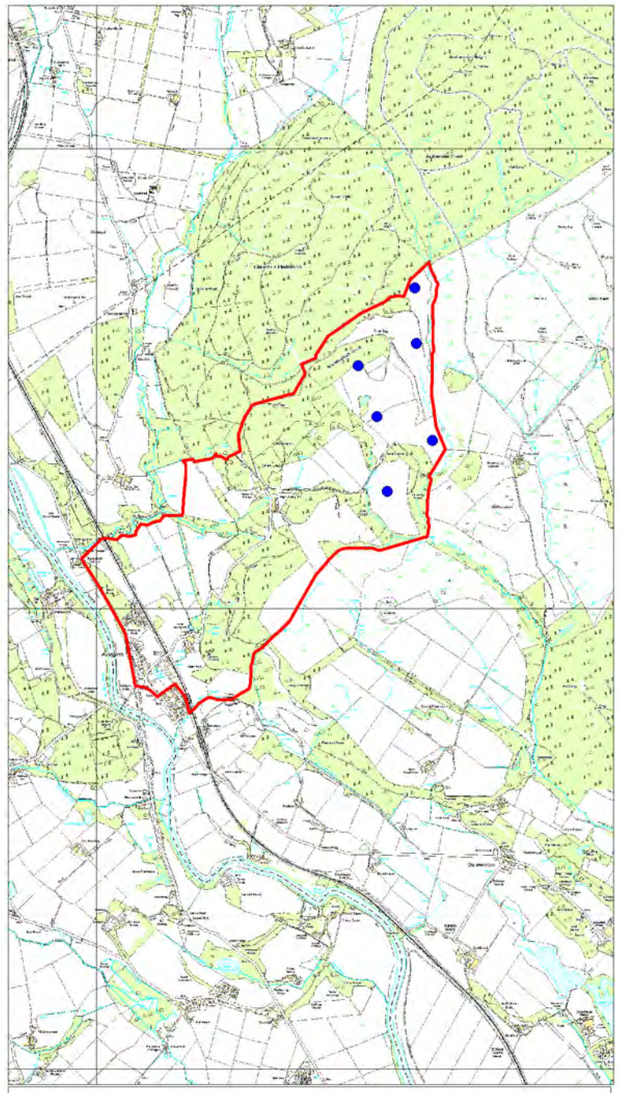
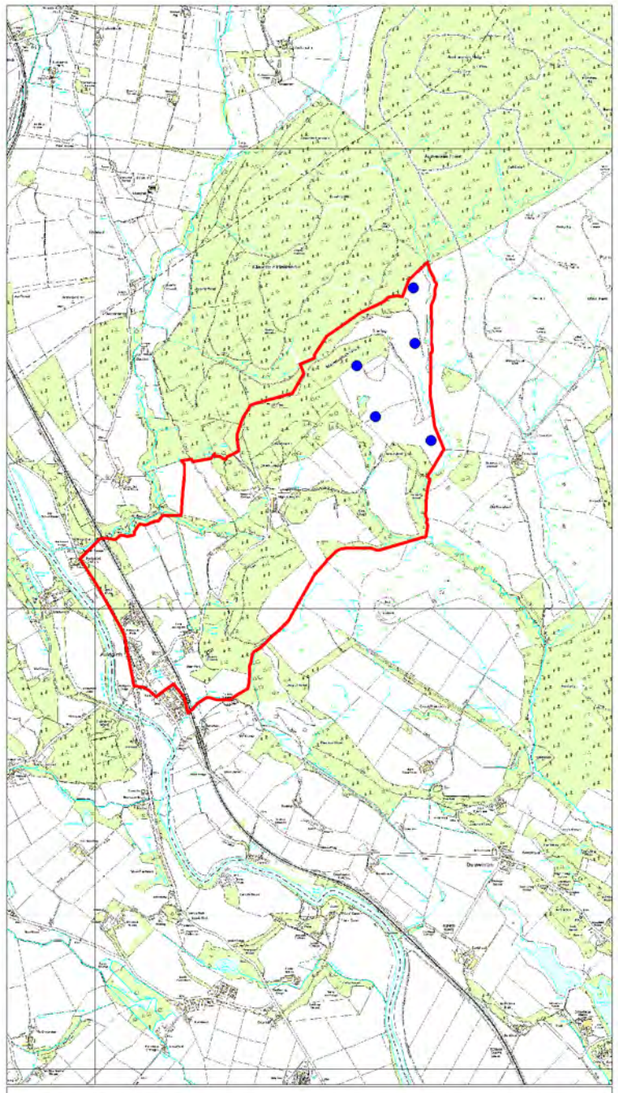


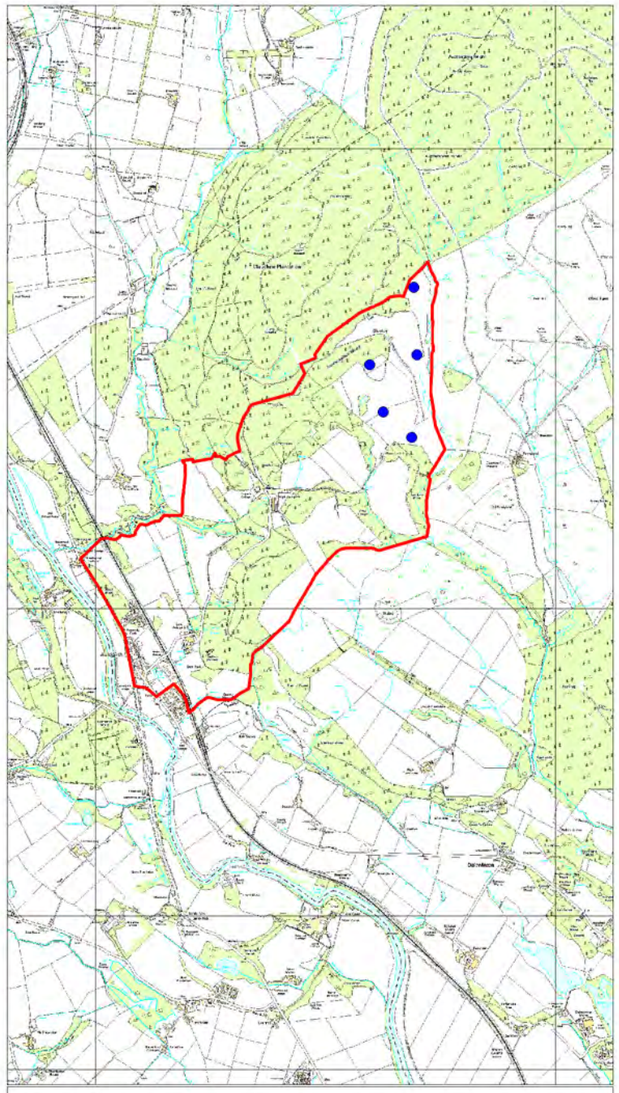
Option 1

Initially a six turbine layout was produced, based on wind capacity at the site and commercial considerations for the proposed development. More turbines could have been included further to the west, but this number was considered to be appropriate in the context of the adjacent dalswinton wind farm



Option 2

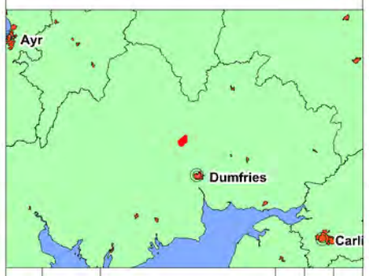
The southernmost turbine of Option 1 was removed, mainly due to potential noise impacts but also due to potential heritage impacts on a Scheduled Monument.
The layout was also amended in response to baseline environmental conditions, as discussed at a design workshop



Option 3

The locations of two of the turbines were altered slightly following further baseline (field) work.. The south eastern most turbine was altered to avoid potential archaeological impacts, and the north western most turbine was altered to be further from the woodland (red squirrel habitat).

Proposed Turbine
Site Boundary



Rev	Date	Description	Drn	Chk	App
00	12.01.11	Design Evolution	BF	MK	MK

FORCE 9 ENERGY

Blackwood Wind Farm

RSK

Figure 2.2: Design Evolution

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3 PROJECT DESCRIPTION

Introduction

3.1 This chapter provides details of the proposed Development, including a description of the Site and its surroundings, a description of the main components of the Development and the construction, commissioning, operational and decommissioning activities. An indicative project programme is also provided. This project description forms the basis of the assessment for the EIA.

Site Description

3.2 The Site is located in Nithsdale at High Auldgirth, Near Auldgirth, Dumfries and Galloway approximately 14km north of Dumfries, as shown on Figure 1.1. It is bounded to the north by Clauchrie Plantation, to the east by Fern Hill and to the south by Mullach Hill. The total Site area is 305 hectares (ha) though a far smaller area would be subject to permanent land take, as described below.

3.3 The Site is under single ownership and consists primarily of rough, semi-improved grassland and (predominantly) conifer plantation. A small stand of deciduous woodland is located in the north of the Site with a second adjacent to the north of Auldgirth village. The village is largely located within the south west corner of the Site, extending south across the Site boundary. A forestry plan is in operation for the Blackwood Estate, and a plan showing the approximate areas of planting and dates planted) is included as Figure 3.1.

3.4 In addition to Auldgirth a number of individual properties are located within the Site at Low Auldgirth and High Auldgirth, together with a keeper's cottage. Other features of note within the Site include a disused quarry located close to Low Auldgirth, the Burntkettle Shooting Ground at Glenloy and the Glasgow South Western railway line, which runs through the western section of the Site.

3.5 Topography of the Site varies significantly, the highest point being located in the northern area, close to Muirstraploch Wood, at approximately 244m Above Ordnance Datum (AOD), and the lowest point along the south western boundary, at approximately 35m AOD, at Auldgirth. Notable peaks include Blackcraig Hill (242m AOD) in the central northern area of the Site.

3.6 A network of small streams cross the Site, the majority of which drain in a generally southerly direction to Pennyland Burn and the remainder drain to Clauchrie Burn to the north or directly into the River Nith. This river flows in a generally southerly direction approximately 100m from the western Site boundary. The headwaters and issue points of several of the streams are located within the Site.

3.7 The A76 forms the western boundary of the Site, from which an unclassified road leads east through Low Auldgirth to High Auldgirth. A number of tracks lead from this road to provide access around Blackcraig Hill and to other areas of the Site.

3.8 There are no statutory designations such as Scheduled Monuments (SM) or Sites of Special Scientific Interest (SSSI) on or in the immediate vicinity of the Site.

Surrounding Land Use

3.9 The Site lies adjacent to the west of the existing Dalswinton Wind Farm, a 15 turbine 30MW wind farm situated on the Dalswinton Estate that has been operational since 2008. Other land use in the area predominantly comprises farmland and woodland plantations, including the Clauchrie Forest adjacent to the north and the Forest of Ae which extends several kms to the north east. The Clauchrie Forest is currently subject to a community buyout to turn it into a community woodland.

The Development

3.10 This section describes the key components of the proposed wind farm ('the Development').

Summary of Key Components

3.11 The main components of the Development are shown on Figure 3.2 and would comprise the following:

- Five wind turbines. For the purposes of this ES the candidate turbine is the REPower MM82 turbine which has an installed capacity of 2.05 MW, which would give the Site a total installed capacity of up to 10.25MW. The final installed capacity would be dependant on the final turbine selection based a competitive tendering process. Three of the turbines (turbines 1, 3 and 5) would have a maximum height to blade tip of 140m while turbines 2 and 4 would have a maximum height to blade tip of 120m;
- Crane hardstanding areas of approximate dimensions 30m x 50m adjacent to each turbine;
- A permanent anemometer mast, which would be of lattice tower construction and approximate height 80m located to the south west of Turbine 2 as shown on Figure 3.2;
- Re-use of existing access tracks and construction of new permanent access tracks to allow construction and maintenance of the turbines;
- A temporary construction compound located in the vicinity of Glenloy;
- Temporary borrow pits from which stone can be won for the construction and upgrading of tracks on site; and
- A substation and control building where electricity from each turbine is collected and discharged to the grid. Underground electrical cabling would link the turbines to the control building.

3.12 A separate application is to be made by the Distribution Network Operator (DNO), ScottishPower Power Systems, for a connection from the Development to the National

Grid. This would comprise an electricity transmission line (33kV) leading from the Site control building to the local electricity distribution network. Current studies show some capacity at the Dunscore substation and for the purposes of the planning application this is assumed to be the connection point. The Applicant's preference is for a below ground connection, with the grid connection cables to be located in trenches in roadside verges. However, the final decision about the nature and route of the connection would be made by the DNO.

Land Take and Forestry Clearance

3.13 The temporary and permanent land-take for the proposed Development is detailed in Table 3.1 below.

Table 3.1 Approximate Land Take

Component	Permanent (Ha)	Temporary (Ha)
Access Tracks	1.65	0
Temporary Construction Compound and laydown area	0	0.44
Turbine and anemometer foundations	0.12	0
Crane hard-standings	0.56	0
Control Building (including parking area)	0.04	0
Borrow pits	0	0.4
Total Area	2.37	0.84

3.14 Based on the forestry plan it is estimated that approximately 1.99 ha of planted areas would require clearance to allow construction of the Development. A buffer zone would be set around each turbine and the remaining saplings would be allowed to continue to grow until they reach a height of 20m. It is anticipated that the trees would not reach this height within the lifetime of the Development and therefore no further clearance would be required due to the Development. Compensatory planting for the saplings would be provided within the estate and the Site, with the specification and location of replacement planting to be agreed with the landowner. Further detail is provided in the 'embedded mitigation' section in this chapter.

Wind Turbines

Turbine Locations

3.15 The turbine locations are illustrated on Figure 3.2. The turbines and ancillary infrastructure would be subject to a maximum micrositing tolerance of 30m in any direction, except at Turbine 2 where micrositing to the north would be restricted to avoid the turbine being located within the woodland and to prevent the need for tree felling. Any movement of the turbines from the layout shown on Figure 3.2 would be agreed with Dumfries and Galloway Council (DGC) under the terms of an appropriate planning condition.

Wind Turbine Structure

3.16 The wind turbines would be of a typical modern design incorporating tubular towers and three blades (horizontal axis) attached to a nacelle housing the generator, gearbox and other operating equipment. The blades would be made from reinforced fibreglass composite materials such as Glass Reinforced Plastic (GRP) and the turbine towers would be made of steel. The proposed turbine dimensions are summarised in Table 3.2 below and a diagram of a typical turbine design is provided in Figure 3.3.

Table 3.2 Proposed Turbine Details

Turbine Number	Approximate Rotor Diameter (m)	Maximum Hub Height (m)	Maximum Height to Tip (m)
1,3,5	80	100	140
2,4	80	80	120

Colour and Finish

3.17 It is proposed that the wind turbines would all be a pale semi-matt off-white colour; this would be confirmed and agreed with DGC. The turbine structures would be free of external advertising and lettering, except for statutory notices and a turbine number on the tower door.

Rotational Speed

3.18 The rotors of the proposed turbines would turn in the same direction and would have sensors on the turbines to measure wind speed and direction. The measuring device provides data to operate a yaw mechanism, which turns the wind turbine nacelle to face the wind.

3.19 Generally wind turbines would operate during wind speeds between approximately 4 metres per second (m/s) and 25m/s. Modern turbine technology allows the rotational speed of the rotor to vary from the nominal rotational speed. This results in increased production in changing wind conditions. It also minimises undesired fluctuations in the electricity grid and increases annual energy production by around 5% in comparison with turbines without variable rotational speed, which are typically of a less modern design. This system also minimises strain on the gearbox, blades and tower and reduces the noise levels. It is anticipated that rotational speeds would range from around 10 revolutions per minute (rpm) to 18rpm.

Turbine Foundations

3.20 The detailed design specification for each foundation would depend on the ground conditions at each turbine location. However, it is anticipated that each turbine foundation would require an excavation of approximately 20m x 20m to a depth of approximately 3.5m. This excavation would allow for a reinforced concrete foundation of approximately 15.5m diameter with sufficient space to allow for shuttering access. Each foundation would require 350m^3 of concrete and 500m^3 of stone.

Transformers

3.21 Each turbine requires an electrical transformer. Depending on the final turbine design that is chosen, these would be housed either on the outside of the turbine towers close to the base, or within the turbine itself. The external housing allows easy access to the transformer for any maintenance or repair works required. If external housings were to be used each would not exceed 4m by 4.6m in footprint.

Crane Hardstanding

3.22 Each 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 two cranes necessary to lift the turbine components into place. An area of hardstanding approximately 25 x 45m would be constructed adjacent to each turbine, as shown on Figure 3.2.

3.23 The crane hardstanding would 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 wind farm. These could also be utilised during decommissioning at the end of the Development's life.

Permanent Anemometer Mast

3.24 A permanent anemometer mast would be installed as part of the Development, to provide accurate measurement of wind speeds and direction on the Site. The mast would be located at the position indicated in Figure 3.2 and would be a lattice tower construction to match the turbine hub height, i.e. a maximum 80m in height. The mast would require a concrete foundation measuring approximately 5.7m^2 and 2.2m depth. The lattice construction would help to reduce the visual impact of the structure and improve accessibility for maintenance. Access to the anemometer mast would be obtained via a 3m width (0.4m depth) track that would connect with the main network of access tracks. The temporary anemometer mast that is currently on site would be removed prior to construction commencing. A typical anemometer detail is provided as Figure 3.4.

Site Access and Internal Tracks

Delivery of material and wind farm components

3.25 The Site and Development would be accessed from the A76 trunk road at Auldgirth. For the adjacent Dalswinton Wind Farm, turbine components were transported to the Dalswinton Estate via a minor road leading from the A76 at Auldgirth i.e. the same junction as the entrance point to the Site. An access route therefore exists for the transport of turbine components from a suitable port facility to the Site. It is yet to be determined whether turbine components would arrive at Auldgirth from the north or south. Further detail is provided in Chapter 11 Traffic and Transport.

3.26 An Access Study completed by Grontmij[1] has confirmed that some improvement (road widening) works would be likely to be required to the A76 (T) at the entrance to the Site,

to allow delivery of the turbine components. The junction would be designed to meet the requirements of DGC and the Scottish Government (as trunk road authority).

Site Access Tracks

3.27 The following principles have been applied in the design of the on-site access tracks:

- Tracks make use of the existing access tracks and breaks in field boundaries as far as possible;
- Track length is kept to a minimum to reduce construction time, the requirement for road stone and land take;
- Tracks are routed as close to field boundaries as possible to minimise impact on agricultural management;
- Gradients are to be kept to less than 12% where possible to accommodate the requirements of delivery vehicles and also to allow construction plant to move safely around the Site; and
- Tracks are routed to avoid sensitive ecological, archaeological and hydrological features where necessary.

3.28 The length of track to be re-used and regraded is approximately 2.2km. Some stabilisation and widening works may be required, following supplementary detailed studies e.g. topographic survey and vertical swept path analysis.

3.29 The Access Study completed by Grontmij[1] concluded that the existing road from Low Auldgirth to High Auldgirth is highly constrained and unsuitable for turbine deliveries, and therefore a new section of access track is proposed to avoid these constraints, of approximate length 1.2km. The new section of track would rejoin the existing track to the south of High Auldgirth, as indicated on Figure 3.2. Additional new sections of track would be required to provide access to each turbine location. The total length of new access track would be 3.3km.

3.30 All new access tracks would be unpaved and, with the exception of the track to the anemometer, would generally be of 5m width. Once construction works were complete tracks would be dressed back to a width of approximately 3.5m. A turning head of sufficient size to accommodate a standard articulated vehicle would be provided at each turbine location.

3.31 Some widening would be necessary along the access track route to facilitate traffic movements, and allow for passing places / lay down areas. Track widening would typically be to approximately 10m, with a maximum of 13m on tight radius bends. Temporary passing places (15m x 15m) would be provided every 300m (or as required).

3.32 The access tracks are shown in Figure 3.2 and a typical track cross section is provided in Figure 3.5.

Burn Crossings

3.33 As part of the access track construction works eleven culverts would require upgrading and two new crossings would be required. All water crossings (and any works in the vicinity of watercourses on-site) would need to be authorised by Scottish Environment

Protection Agency (SEPA) as a controlled activity under the Water Environment (Controlled Activities)(Scotland) Regulations 2011 (CAR 2011).

3.34 The SEPA position statement on the culverting of watercourses[2] is to be updated to reflect CAR 2011 but SEPA's preference is for open watercourses to be retained and culverting to be discouraged. The position statement states: *"closed culverts used for river crossings would normally only be justified for single track roads over small watercrosses (<2m width)".* In this context culverts are proposed for the new watercourse crossings on the Site. Simple culvert type construction would be employed, using a cross sectional area that would not impede flow of water (minimum 400 mm culverts would be used). A typical culvert detail is shown in Figure 3.6 and the construction details are described below.

Construction Compound

3.35 A temporary construction compound and laydown area would be required for the duration of the construction works. The proposed compound would be located adjacent to the access track beyond the Burnkettle Shooting Ground at Glenloy, as shown on Figure 3.2 and would comprise:

- Temporary portacabins to be used for the site offices and welfare facilities for staff including toilets;
- Parking for construction staff, visitors and construction vehicles; and
- Storage areas for construction materials and components.

3.36 The construction compound would have dimensions of approximately 50m by 30m, which would encompass a laydown area of approximate dimensions 30 by 6m.

3.37 Temporary boarding or fencing would be erected around the compound boundary to minimise any potential adverse (temporary) noise and dust impacts to the operation of the Burntkettle Shooting Ground.

3.38 Any compound lighting required would be likely to be passive infra-red sensor activated security lighting (with manual override). The lighting would be directional in accordance with the ILE guidance[3] and mounted on the individual portacabins. An indicative site compound layout is provided as Figure 3.7.

3.39 The substation / control building would subsequently be constructed within the compound area, in order to minimise disturbance and excavations at the Site.

Borrow Pits

3.40 A total volume of approximately 26,000m^3 stone would be required for the new tracks, hardstanding areas and turbine foundations. This assumes that only 6F type material would be won on-site and an additional 4,200m^3 of Type 1 material would be imported for the top layer of the new sections of access track. The section of proposed new track (around Low Auldgirth) would also require approximately 4,300m^3 of 6F material to be imported. A further 1,500m^3 of Type 6N material (structural fill) would be imported for the turbine platforms.

3.41 The overall volume of material obtained from the borrow pits would therefore be approximately 16,000m³. Should stone of suitable quality be obtained on-Site as excavations are completed for the new lengths of access track and turbines, this would reduce the volume of imported material and/or volume of stone required from the borrow pits, and the number of vehicle movements associated with the construction works.

3.42 Two preferred locations for borrow pits have been identified and are shown on Figure 3.2. It is proposed that the area of borrow pit BA2 would subsequently be used as the location for the temporary construction compound thus minimising site excavations. Borrow pit BA1 would be an extension of an existing borrow area.

3.43 Prior to the commencement of construction works detailed ground investigation would be undertaken at each proposed borrow pit location, with sampling and grading of rock type to confirm the locations are suitable and the likely volume of stone that could be obtained. It is envisaged that the size and specification for each borrow pit including ground water management and restoration would be provided within the Construction Environmental Management Plan (CEMP) for the Development (refer to embedded mitigation below).

Cables and Operations Control Building

3.44 The electricity produced by the individual turbines would be at 690 kV and transformer to 33kV by each turbine's transformers. Electrical connections would be made between the wind turbines via underground cables to the 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 1000mm deep and up to 1200mm wide, in a substrate of coarse sand or other granular material. The trenches would then be backfilled with excavated soil and sub-soil that has been sieved and graded to remove stones. Figure 3.8 shows a typical cable trench detail.

3.45 Cables would be collected at the substation and control building, which would also incorporate switchgear and meters, telecommunications equipment, an office, store and welfare facilities for wind farm maintenance staff. The proposed location of the sub-station building is shown on Figure 3.2.

3.46 The control building compound would comprise a hard standing car parking area with maximum dimensions of approximately 15m x 15m and a single storey building approximately 19m x 8m in footprint. Figure 3.9 provides indicative elevations of the control building. The materials and colour palette to be used for the control building would be similar to that of local buildings, and would be agreed with Dumfries and Galloway Council.

3.47 A connection to a public water supply at the control building would not be commercially acceptable. It is therefore proposed to include a rain water harvesting system to supply water of a suitable quality for hand washing, showering and toilet facilities. Rainwater would be collected from the roof of the control building and stored in tanks within the

roof space. To treat the water to an acceptable level the water supply would then be directed thorough an ultraviolet treatment system followed by a 5µm filter.

3.48 Foul drainage from the welfare facilities would be directed to a septic tank located at a suitable distance from the building in order to meet Building Standard (Scotland) Regulations and SEPA's requirements. Foul water sludges within the tank would be regularly emptied by an appropriately licensed contractor. Effluents would be discharged to ground via a linear soakaway would be designed to meet SEPA requirements.

3.49 Any oils, hydraulic fluid and lubricants for maintenance of the wind turbines would be stored in the control building storeroom.

Construction Activities

3.50 This section outlines the main activities for the Development construction, including the programme, the construction process for each component and materials required.

Construction Programme

3.51 Construction of the Development would take approximately nine months from commencing work on-site. An indicative construction programme and key activities are set out in Table 3.4 below. Many of these construction activities would be carried out concurrently, although predominantly in the order set out in the table below.

Table 3.4 Indicative Construction Programme

Month	1	2	3	4	5	6	7	8	9
Site preparation including construction compound and site welfare facilities									
Upgrade site entrance and existing access track									
Excavate borrow pits and construct new access tracks and cable trenches									
Construct crane hard standings									
Construct turbine foundations and bases									
Install cabling									
Erection of wind turbines and anemometer mast									
Construct Substation / Control Building and install equipment									
Commissioning									
Site reinstatement									

Construction workforce and terms of working

3.52 A detailed construction workforce schedule i.e. employee numbers throughout the construction programme and likely shift patterns would not be known until the contract for building the wind farm has been granted, however the maximum number of staff likely to be on site at any one time would be 20.

3.53 Hours of construction would be from 7am to 7pm Monday to Friday and 7 am to 1pm on Saturdays unless otherwise agreed with DGC. Construction hours generally also apply to the delivery of materials. However, delivery of the nacelles and blades to site would require the use of abnormal-sized and slow-moving trucks. These vehicles would require a police escort and the timing of these deliveries may be dictated by the police. Such deliveries would be likely out of hours when the road network is at its quietest to reduce traffic disturbance.

Construction Compound

3.54 The compound and lay down area would be constructed by first stripping the topsoil which would be stored in a mound for subsequent reinstatement at the end of the construction period. A geotextile would then be placed on the sub-stratum, which would be overlain by a working surface of stone to approximately 600mm thickness.

3.55 Reinstatement would involve removing the stone and underlying geotextile before gently ripping the exposed substrate and replacing the topsoil. The ground surface would then be re-seeded using a seed mix approved by DGC in consultation with Scottish Natural Heritage (SNH).

Borrow Pits

3.56 At each borrow pit location, topsoil would first be stripped and set aside for reinstatement. The stone would be extracted using a combination of breakers and blasting.

3.57 Following extraction of all suitable stone, borrow pit BA1 would be reprofiled. Steep slopes would be graded to a safe angle and excess material from turbine foundation and excavations from road cuttings would be used to build up the pit floor, to create a landform that blends with the local topography. Topsoil would then be replaced and worked to create a tilth suitable for re-seeding, again using the mix agreed with DGC and SNH. As described previously, the area of borrow pit BA2 would be re-used as the location for the construction compound and subsequently the substation / control building, but local reprofiling and restoration would be undertaken as appropriate.

Access Tracks

3.58 In general terms, the construction method would see the topsoil being removed and stored adjacent to the construction area until required for reinstatement, leaving batters to each side of the track. Exacavations would then continue to expose a suitable sub-soil or bedrock horizon on which to construct the track. This would be levelled by a cut and fill operation or by benching of the rockhead as required.

3.59 The tracks would be constructed in layers, with a geo-textile overlain by a base layer of coarse stone, and subsequent layers of higher graded stone. Each layer of stone would be compacted and shaped to provide a profile and surface finish of a quality suitable for the turbine construction vehicles. The estimated depth of stone would be 600mm, though the final thickness used would be dependent on local ground conditions and load capacity.

3.60 The need for access track drainage would be established on-site during construction. The access tracks would have a suitable cross-fall to drain run-off and, where gradients are present, lateral drains would intercept any flow along the road. The dimensions of the lateral drains would be matched to the estimated water flow and outlets would be suitably located with erosion protection as required.

3.61 Where ground conditions are of a permeable nature, swales would be utilised alongside the access tracks to allow natural filtering of surface water into the ground. Where areas are less free draining, land drains or drainage ditches would be installed as topography and ground conditions dictate. Drainage filters would be installed at suitable locations to remove silts from the run-off.

3.62 Post-construction, the stripped topsoil would be re-laid along the edges of the access track and seeded. This would allow the edges of the access track to re-vegetate whilst maintaining a suitable track width of approximately 3.5m.

Burn Crossings

3.63 Existing watercourse crossings would be strengthened from above through placement of a geotextile above the crossing to provide reinforcement and use of additional stone. The decision on whether any structural upgrades would be required for each culvert would be taken on site.

3.64 The design of the two new culverts and any structural upgrades required for the existing culverts would draw on best practice guidance, for example:

- Forestry Commission: The Forests and Water Guidelines, 4th Edition;
- Scottish Executive (2000), *River Crossings and Migratory Fish*: Design Guidance a Consultation Paper;
- Scottish Government and SEPA (2010), Engineering in the Water Environment: Good Practice Guide, River Crossings; and
- CIRIA (2010), Culvert Design Guide C689.

3.65 Each culvert would be designed to accommodate water flows based on a 1 in 200 year return period.

3.66 Typically the culverts would be constructed using UPVC smooth wall pipes, with a small stone facing or headwall arrangement at each culvert upstream and downstream face. The stone work would be selected rock won from the Site borrow pits, with the culvert face being set back into the stone to minimise potential visual impact.

3.67 The culverts would be positioned such that the culvert pipe is located one quarter of the pipe diameter below the existing watercourse bed. River substrate would then be

placed within the culverts. Culverts would be oversized and positioned to have the same longitudinal profile as the existing watercourse.

Crane Hard Standing Areas

3.68 In order to construct the crane hardstanding areas surface vegetation and soil would be removed from the area of the crane pad and laid on the surrounding undisturbed vegetation until required for reinstatement. The area would be covered with a geo-textile overlain with compacted stone to approximately 600mm depth, dependent on ground conditions and load capacity. On completion of the turbine erection approximately a third of the hardstanding area would be dressed back with topsoil and landscaped into the surrounding area.

Turbine Construction

3.69 The wind turbines would be installed on foundations comprising stone and concrete; a typical turbine foundation is illustrated in Figure 3.10. The design specification for the foundations would depend on the ground conditions at each turbine location. A ground investigation would be undertaken prior to construction to determine these requirements.

3.70 Construction of the turbine foundations would first require clearance of any vegetation, followed by removal of topsoil and subsoil, which would be stored on the surrounding undisturbed vegetation until required for reinstatement.

3.71 It is anticipated that each turbine foundation would require an excavation of approximately 20m x 20m and the depth of the excavation would be approximately 3-4m, depending on the depth of the load bearing strata or bedrock. The sides of the excavation would be battered back to ensure that they remain stable during construction. The load bearing strata or bedrock would be levelled off and blinded prior to the in-situ casting of the steel-reinforced concrete slab that would be approximately 15.5m in diameter. Each foundation would require 350m^3 of concrete and 500m^3 of stone, with reinforcing steel.

3.72 A concrete up-stand would then be cast on top of the slab, to which the turbine tower would be bolted. The excavated area would be backfilled with compacted layers of graded material from the original excavation and capped with topsoil.

3.73 Turbine excavations may be open for 4 to 8 weeks during the construction programme. During this time, excavations would be kept free from water (rainwater and run-off). If local topography permits, the excavations would be free draining. If not, excavations would be mechanically pumped, with all dewatering works carried out in accordance with SEPA pollution prevention guidelines including discharges through either settling ponds, swales or mechanical silt traps.

3.74 The turbine components would be delivered to Site and stored in the temporary construction compound until weather conditions are appropriate for turbine erection. The bottom turbine tower sections would firstly be bolted onto the central columns of the foundations, followed by the upper turbine tower sections being crane lifted into place.

The cranes would then lift the nacelle into place on the top section of the turbine tower. Two of the blades would be fitted to the rotor hub on the ground and then lifted onto the nacelle. The third blade would then be lifted and fitted to the rotor hub. The transformer units would be housed either within the turbines or in specific units adjacent to the turbines.

Anemometer Mast

3.75 The anemometer mast would arrive on-site in sections, and one of the construction vehicle or cranes on-site would be used to raise the mast into place.

Control Building and Compound

3.76 The control building would be of typical masonry construction, with strip foundations and a pitched roof.

3.77 The external hardstanding to the control building would be constructed from site won, crushed and placed rock with a close bound granular topping to act as a running surface to delivery and support staff vehicles etc. The hardstanding would be graded to provide drainage falls. Surface water would run to the edge of the hardstanding where it would be intercepted by a linear soakaway, or a cut-off ditch which would convey any remaining flows to a soakaway.

Operational Activities

Turbine Monitoring and Control

3.78 Turbines have a proven track record for safety, although a very small number have been known to lose parts of the rotor assembly through accidental damage. All turbines would be controlled by a Supervisory Control and Data Acquisition (SCADA) system at a central remote location. The SCADA system would gather data from all the turbines via communications cables connecting to each turbine (the cables would be buried in the electrical cable trenches).

3.79 In the case of any fault, including over-speed of the blades, overpower production, or loss of grid connection, the turbines would shut down automatically through braking mechanisms. They are also fitted with vibration sensors so that, if, in the unlikely event a blade is damaged, the turbines would automatically shut down.

Meteorological Effects

3.80 Wind turbines are built to withstand very high wind speeds; the candidate turbine is normally certified against structural failure for wind speeds up to 50 m/s. The maximum wind speed for certification will vary according to the turbine installed and the site-specific conditions.

3.81 Turbines, as with any tall structure, can be susceptible to lightning strike and appropriate measures are included in their design to conduct lightning strike down to

earth, thus minimising the risk of damage to the structure. In the case of a lightning strike on a turbine or a blade, the turbine would automatically shut down.

3.82 In cold weather, ice can build up on turbine blade surfaces when operating. The turbines can continue to operate with a thin accumulation of snow or ice, but would shut down automatically when there is a sufficient build up to cause aerodynamic or physical imbalance of the rotor assembly.

3.83 As previously discussed local meteorological conditions would be monitored by a permanent, free standing anemometry mast, the location of which is shown in Figure 3.2.

Turbine Servicing and Repairs

3.84 Each turbine manufacturer has specific maintenance requirements, however, it is anticipated that routine servicing of the turbines would typically be undertaken twice a year, with a full annual service and a minor service every six months. In the first year, there is also likely to be an initial three-month service post-commissioning. The turbines are switched off whilst servicing is ongoing. Maintenance and servicing would include activities such as changing of gearbox oils and individual turbine components.

3.85 Blade inspections are likely to be required between every two and five years. This would be undertaken using a cherry picker or similar, but may also be performed with a 50T crane and a man-basket. Repairs to blades would utilise the same equipment. Light winds and warmer, dry conditions are required for any blade repairs, hence summer (June, July and August) would be the most appropriate period for this work.

3.86 Operational waste would generally be restricted to small volumes of waste generated from machinery repair and maintenance. The maintenance contractors would dispose of any such waste off-site, in line with Scottish waste management regulations and duty of care.

Track Maintenance

3.87 Once the Development is operational the volume of traffic using the access tracks would be low (although heavy plant is particularly wearing). Correspondingly, the need for any track maintenance works is anticipated to be low and infrequent. Any such works required would generally be undertaken during drier conditions in the summer months.

Environmental Management

3.88 EDF'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.

3.89 The Development would be managed by a team of specialist engineers, whose duties include compliance with statutory environmental and health and safety requirements. Where potential environmental or health and safety hazards are identified, a site-

specific risk assessment would be completed and control measures implemented to ensure that the risks are removed or minimised as far as possible.

Land Management

3.90 It is anticipated that long term land management practices on the Site i.e. agricultural and forestry practices, would continue unaffected by the Development.

Decommissioning

3.91 The operational life of the turbines is anticipated to be 25 years, after which the Development would be decommissioned and the turbines dismantled and removed. This is the proposed course of operations that is being applied for and any alternative to this action would require separate consent from DGC and so is not considered in this ES.

3.92 During decommissioning the bases would be broken out to below ground level. All cables would be cut off below ground level, de-energised and left in the ground. Access tracks would be left for use by the landowner. No stone would be removed from the Site. Decommissioning works are estimated to take six months. This approach is considered to be less environmentally damaging than seeking to remove foundations, cables and roads entirely.

3.93 On completion of decommissioning, forestry and estate activities could resume over the foundations of the turbines.

Mitigation

3.94 Within the Development, there are three levels of mitigation, the details of which are presented below.

- **Embedded design elements** – this level of mitigation encompasses all the environmental constraints and issues that were considered during the design process. These are discussed in Chapter 2: Alternatives and Design Evolution.
- **Embedded mitigation** - Along with the design, these mitigation elements comprise standard good practice for construction works and would be implemented by Force 9 and EDF for the Development, subject to agreement with DGC (refer to paragraph 3.96 for further detail); and
- **Project specific mitigation** - This mitigation is that above and beyond the two elements covered by the embedded mitigation levels above. It covers all project specific impacts and the associated mitigation, for example a specific archaeological scheme of investigation. Details on this level of mitigation can be found within the specific topic chapters.

3.95 Specific detail on the embedded mitigation for the Development is provided in the following section

Embedded Mitigation

3.96 This section describes the construction procedures and practices that are typically employed by Force 9 and EDF during construction of a wind farm. Should the Development be consented, these 'embedded' mitigation measures would be developed and agreed with DGC and put into practice throughout the Development, through a planning condition attached to any consent for the Development.

Best Practice Guidance

3.97 The following best practice guidance would be adhered to:

- Forestry Commission: The Forests and Water Guidelines, 4th Edition;
- CIRIA: Report C532 Control of Water Pollution from Construction Sites: Guidance for Consultants and Contractors;
- CIRIA Handbook C650 Environmental Good Practice on Site;
- Scottish Government and SEPA (2010), Engineering in the Water Environment: Good Practice Guide, River Crossings;
- Scottish Renewables, Scottish Natural Heritage (SNH), SEPA and Forestry Commission Scotland (FCS), Good Practice During Windfarm Construction, version 1, October 2010;
- SEPA Pollution Prevention Guidelines (PPG);
- CIRIA (2007), The SUDS Manual C69;
- SEPA (2000), Watercourses in the Community, a Guide to Sustainable Watercourse Management in the Urban Environment; and
- SEPA (2000), Ponds, Pools and Lochens, Guidance on Good Practice in the Management and Creation of Small Waterbodies in Scotland.

Pre Construction

3.98 In advance of the construction works, a targeted geotechnical ground investigation would be undertaken in the turbine and borrow pit locations to determine local ground conditions e.g. depth to rock head and quality of stone. A condition survey of the existing culverts would also be completed.

3.99 Further consultation and assessment as set out in Chapter 11: Traffic and Transport, to ensure safe access and transport of construction components and materials to the Site.

Management Plans

3.100 The following management plans would be prepared and applied for the duration of the construction and decommissioning works:

- Construction Environmental Management Plan (CEMP), which would encompass a Habitat Management Plan and Reinstatement and Restoration Plan;
- Site Waste Management Plan (SWMP); and
- Traffic Management Plan (TMP).

3.101 In line with Scottish Government policy in relation to tree felling[4], there would be no net loss of woodland habitats. The habitat management and restoration plans will include detail on the native tree planting, to be undertaken with species of local provenance within or adjacent to the Blackwood Estate. This would mitigate for the loss of woodland and shelterbelt habitats and would provide suitable shelter and foraging for faunal species including bats, red squirrel and reptiles.

3.102 Further detail on the CEMP, SWMP and TMP is provided below.

Construction Environmental Management Plan

3.103 Construction works can cause significant environmental impacts and disruption to neighbours if they are not properly managed. The appointed Principal Contractor(s) would be required to develop and implement a CEMP for both the construction and decommissioning works. The requirement to work in accordance with the CEMP would be included as part of the contract conditions for each element of the Development. As a minimum the CEMP would include the following requirements:

Watercourse Protection/Sediment control

- Use of Sustainable Drainage Systems where appropriate in the construction of the Development e.g. for the construction compound and access tracks;
- Sediment transport control measures (geotextiles/straw bales/brash) to be employed within the drainage network with an appropriate inspection scheme put in place to maintain these measures;
- Appropriate sediment control measures (silt traps, geotextile matting, settlement lagoons, etc) to be used in the vicinity of watercourses, issues or drains where natural features e.g. hollows do not provide adequate protection;
- Watercourses to be monitored throughout construction period for sedimentation;
- Where practicable, vegetation over the width of the cable trenches to be lifted as turfs, and replaced after trenching operations, to reduce disturbance;
- Access track drains to be kept clear of blockages;
- The movement of construction traffic to be controlled to minimise soil compaction and disturbance. Vehicle movements off the defined tracks and hardstanding areas to be avoided. Where tracks cross soils which are sensitive to erosion, or on steep gradients, the use of a protective surface layer to be considered;
- Refuelling of vehicles and plant to be confined to the construction compound, for mobile plant, and carefully controlled. Where it is not possible or practical to track vehicles back to the construction compound for refuelling, appropriate control measures shall be put in place for refuelling of the static and/or remote plant;
- Only emergency maintenance to construction plant would be carried out on-site, in a designated area and on an impermeable surface well away from any watercourse or drainage;
- Drip trays to be placed under standing machinery;
- The stripping of established surface vegetation to be kept to a minimum;
- The extent of all excavations to be kept to a minimum. During excavation works, cut-off drains would be used to control water levels, rather than pumping.

If dewatering of excavations is required, pumped discharges to be passed through silt traps or over land to capture sediments before release into receiving waters;

- Trenching or excavation activities in open land to be restricted during periods of intense rainfall and temporary bunding to be provided to reduce the risk of oil or chemical spills to the natural drainage system as required;
- Use of wet concrete in the vicinity of watercourses would be avoided; and
- Any wash water would be adequately treated to deal with suspended solids and high alkalinity before discharge into lined settlement ponds to prevent direct runoff into watercourses or ditches or infiltration to groundwater.

Chemicals

- Equipment, materials and chemicals not to be stored within or near watercourses;
- Equipment to contain and clean up any chemical spills would be provided, in order to minimise the risk of pollutants entering watercourses, lakes or flush areas; and
- All fuels, lubricants and chemicals storage would be contained within a bunded area with sufficient capacity to contain a spill in accordance with SEPA Pollution Prevention Guidelines (PPGs).

Air quality/Dust management

- Stored soils would be placed so as to minimise the potential for erosion and creation of dust;
- Temporary stockpiles would be covered and permanent storage would be re-instated with vegetation as soon as practicable;
- All vehicles would undergo wheel washing to prevent the transport of mud and debris on the surrounding roads. This would be monitored on a daily basis to ensure that it is effective;
- Site vehicles would not be over revved, or left with engines idling;
- All plant brought on to the site would be properly maintained and operated in accordance with manufacturers' recommendations; and
- Routine maintenance of vehicles to be carried out off site.

Noise control

- Implementation of a blasting noise and vibration management plan for all blasting activities at the borrow pits;
- All plant and machinery would be properly maintained and silenced in accordance with manufacturer's instructions;
- All on site vehicles would be subject to speed restrictions;
- Relevant local residents would be duly warned of noisy activities that could give rise to temporary nuisance e.g. blasting; and
- Hours of working would be restricted to between 7am-7pm Monday to Friday, 7am to 1pm on Saturdays, with no work on Sundays without prior notification to the DGC and local residents.

Effluent Wastes

- Sanitary facilities would be provided and methods of disposal of all waste would be approved by SEPA;
- All solid and liquid waste materials, including any contaminated soils, would be properly disposed of to controlled landfill sites away from the Site;
- A long term pollution prevention and emergency response plan would be established to address the potential significant long term impact of sediment and chemical pollution; and
- No unapproved discharge of foul or contaminated drainage from the site should go to either groundwater or any surface waters, whether direct or via soakaway.

Public Protection/Consultation

- Appropriate signage and fences would be put in place to inform and protect the public during the construction of the Development; and
- Communication would be maintained with the local community throughout the life of the Development.

Ecology

- An Ecological Clerk of Works (ECoW) would 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 requirements.

Waste Management

3.104 A site waste management plan (SWMP) would be implemented as part of the CEMP. The SWMP would include, as a minimum, the following requirements:

- Segregation of wastes in order to prevent co-storage of incompatible materials and the mixing of non-hazardous and hazardous wastes;
- Identification of the type of wastes likely to be generated during construction and decommissioning, to allow early planning of opportunities to re-use or recycle wastes; to gauge the expected quantities, and to allow monitoring;
- Storage of wastes in appropriately labelled containers suitable for the nature of the waste material, on an impermeable surface to minimise the potential for contamination;
- Disposal of any hazardous waste in accordance with the Hazardous Waste Regulations 2005;
- Prohibition of the burning of any waste;
- Covering of waste storage areas to prevent the generation of dust, the spreading of litter and the ingress of rain water;
- All waste carriers to be appropriately licensed; and
- Disposal of waste only at sites licensed to receive and dispose of such wastes in accordance with the relevant legislation.

Traffic Management Plan

3.105 The TMP would be prepared in accordance with guidance such as that found in the Scottish Natural Heritage document 'Good Practice During Windfarm Construction'[5] and would include details such as:

- Confirmation on any local public roads not to be used by construction vehicles;
- The agreed access route for abnormal loads;
- The permitted maximum number of abnormal loads per day;
- Permitted delivery hours;
- The vehicle speeds to be adhered to within the Site;
- Temporary traffic management procedures to be implemented for abnormal loads;
- The procedure to be followed to notify the local community, residents and the Burntkettle Shooting Ground well in advance of abnormal load deliveries;
- Potential constraints within the Site;
- Agreed parking areas;
- Agreed pedestrian crossing points and routes; and
- A commitment to undertaking a pavement condition survey prior to and on completion of the construction works. The survey would focus on the junction of the A76 with the U492n. Any deterioration resulting from the construction works would be rectified, with reinstatement to a standard to be agreed with Transport Scotland and DGC.

3.106 As noted in Chapter 5: Physical Environment, there is potential risk of local flooding from the River Nith, which could have an effect on A76, the main access route to the Site. The TMP would include details of an alternative access route from the existing minor road towards Dalswinton to the southeast.

Chapter 3 References

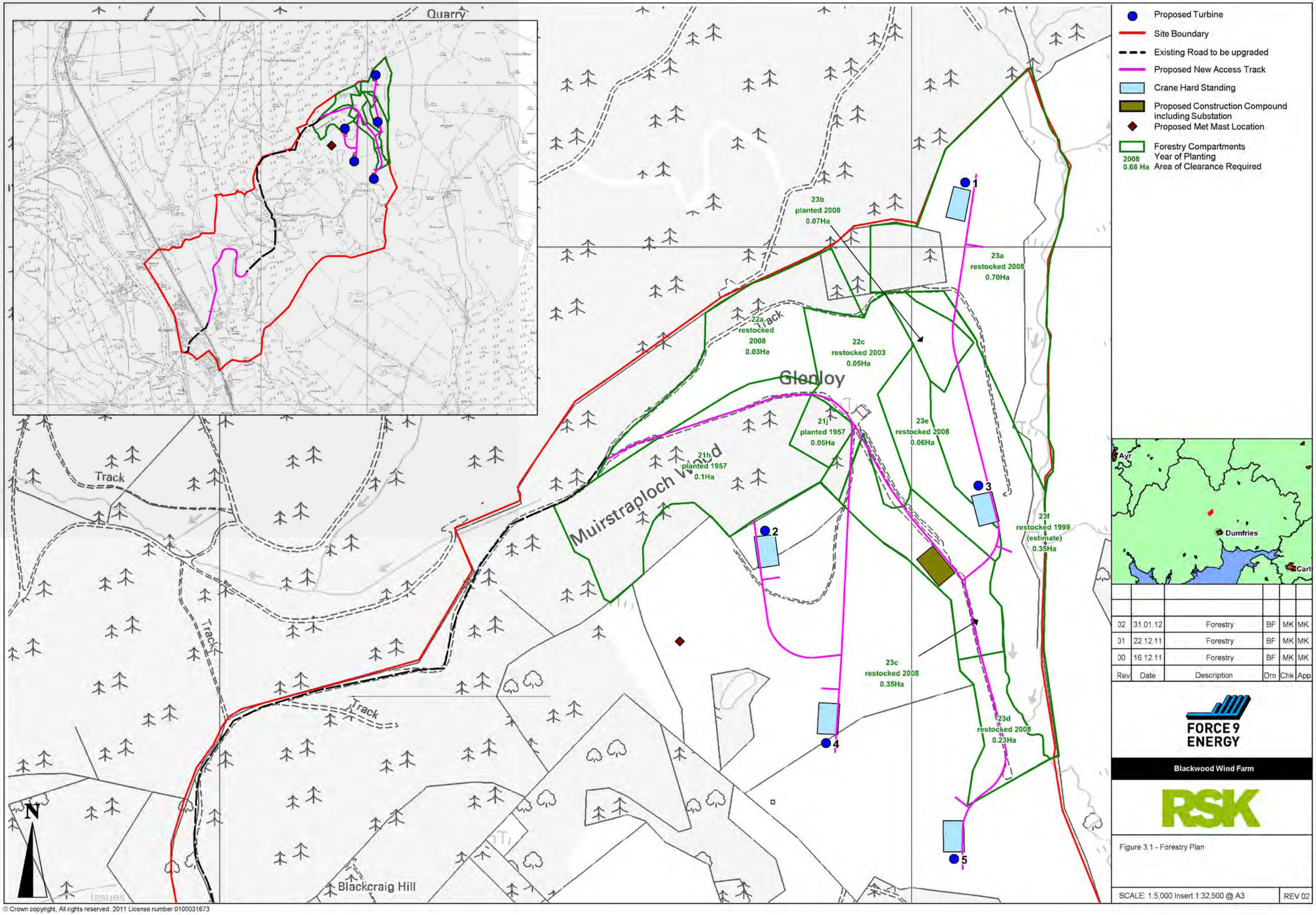
[1] Grontmij, 2010, Access Study, reference Appendix 11.1

[2] The Water Environment (Controlled Activities) (Scotland) Regulations 2011 No. 209,

[3] Institute of Lighting Engineers, 2005, Guidance Notes for the Reduction of Obtrusive Light.

[4] Scottish Government policy on control of woodland removal: http://www.forestry.gov.uk/pdf/fcfc125.pdf/$FILE/fcfc125.pdf. Accessed November 2011.

[5] http://www.snh.org.uk/pdfs/strategy/renewables/Good%20practice%20during%20windfarm%20construction.pdf



Rev	Date	Description	Drn	Chk	App
02	31.01.12	Forestry	BF	MK	MK
01	22.12.11	Forestry	BF	MK	MK
00	16.12.11	Forestry	BF	MK	MK

FORCE 9 ENERGY

Blackwood Wind Farm

RSK

Figure 3.1 - Forestry Plan

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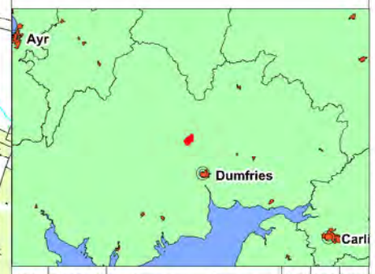
- Proposed Turbine
- Site Boundary
- Existing Road to be upgraded
- Potential Access Track
- Crane Hard Standing
- Proposed Borrow Pits
- Proposed Construction Compound including Substation
- Proposed Met Mast Location



Rev	Date	Description	Drn	Chk	App
04	22.12.11	Construction Compound	BF	MK	MK
03	15.11.11	Site Access Track	BF	MK	MK
02	03.11.11	Layout	BF	MK	MK
01	10.10.11	Layout	BF	MK	MK
00	15.09.11	Layout	BF	MK	MK

FORCE 9 ENERGY

Blackwood Wind Farm

RSK

Figure 3.2 - Wind Farm Layout

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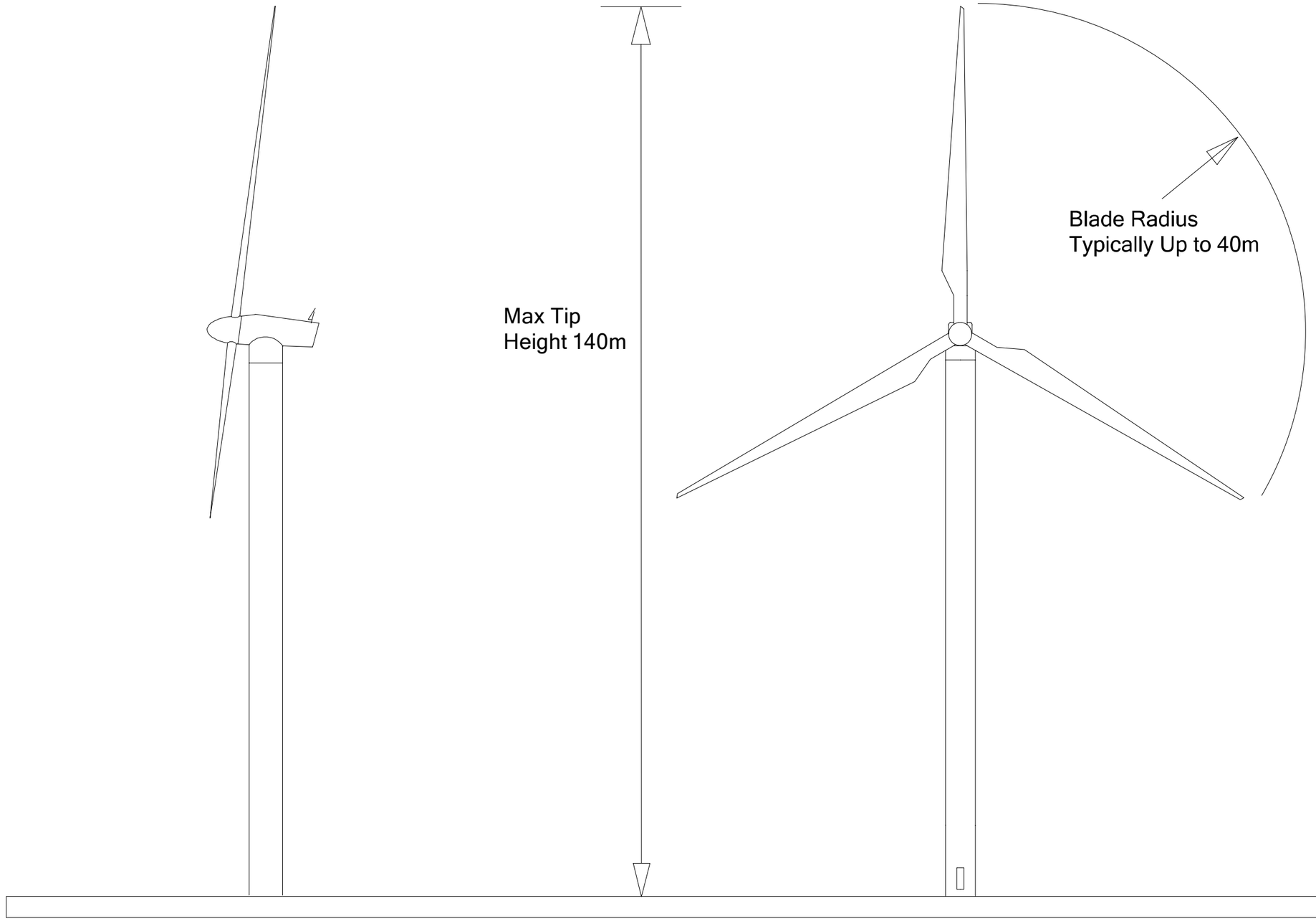

Figure Provided by Grontmij

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00	14.11.11	Indicative Turbine	BF	MK	MK

FORCE 9 ENERGY

Blackwood Wind Farm

RSK Grontmij

Figure 3.3: Indicative Turbine

Not to Scale

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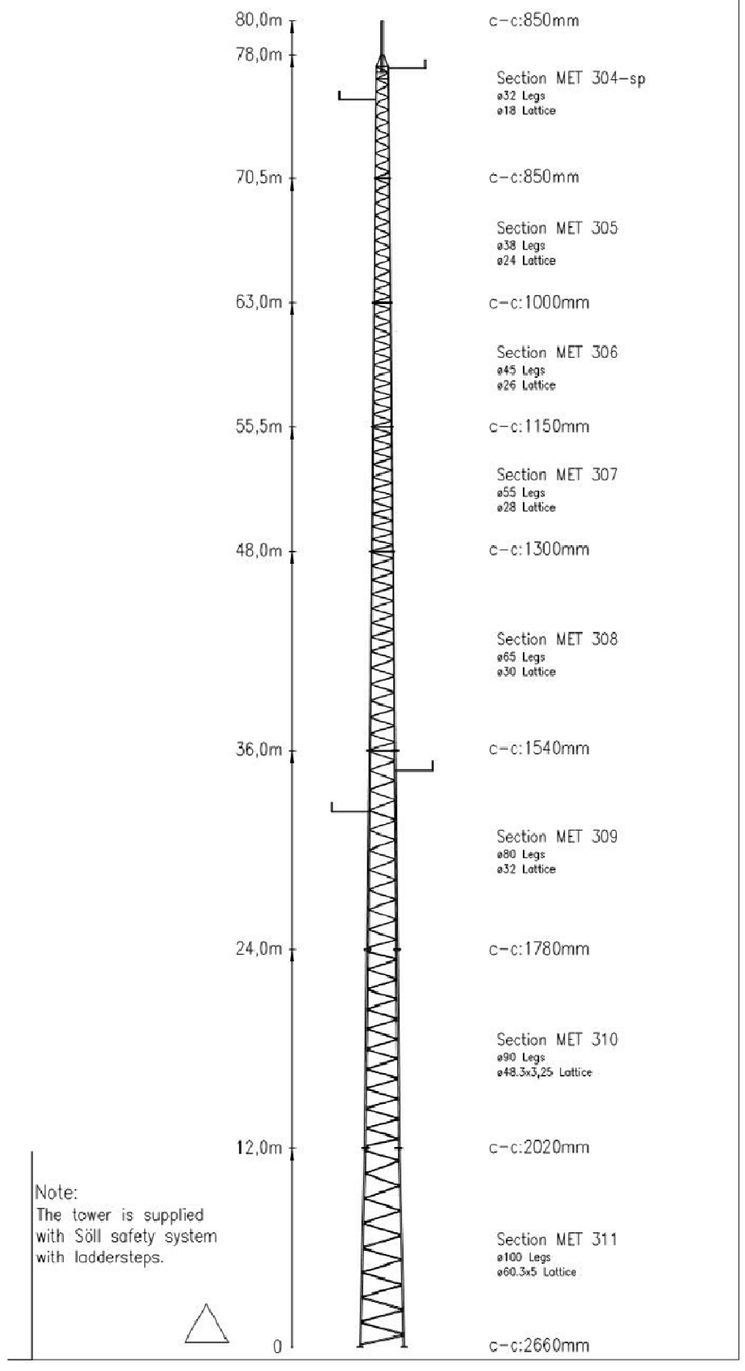

Figure Provided by Grontmij

Design

General:
Dimensioning and design according to British Standard:

DS 8100-1
BS 8100-3

Reference Wind: 25,0 m/s
Terrain category: I
Reliability Class: Normal

Deflection:
Maximum deflection at tower top is 1,91° at full characteristic wind including gust factor.

Rev	Date	Description	Drn	Chk	App
00	14.12.11	Met Mast	BF	MK	MK

FORCE 9 ENERGY

Blackwood Wind Farm

RSK Grontmij

Figure 3.4 Typical Anemometer Mast

As Shown

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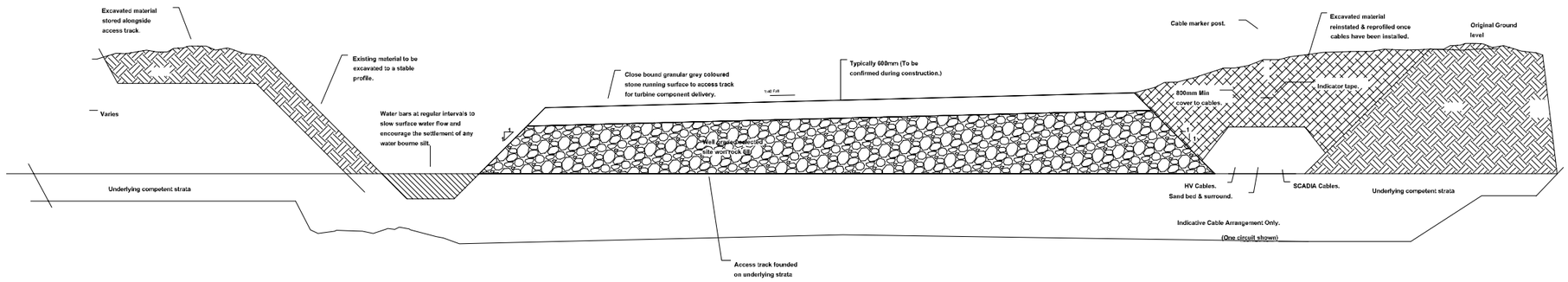
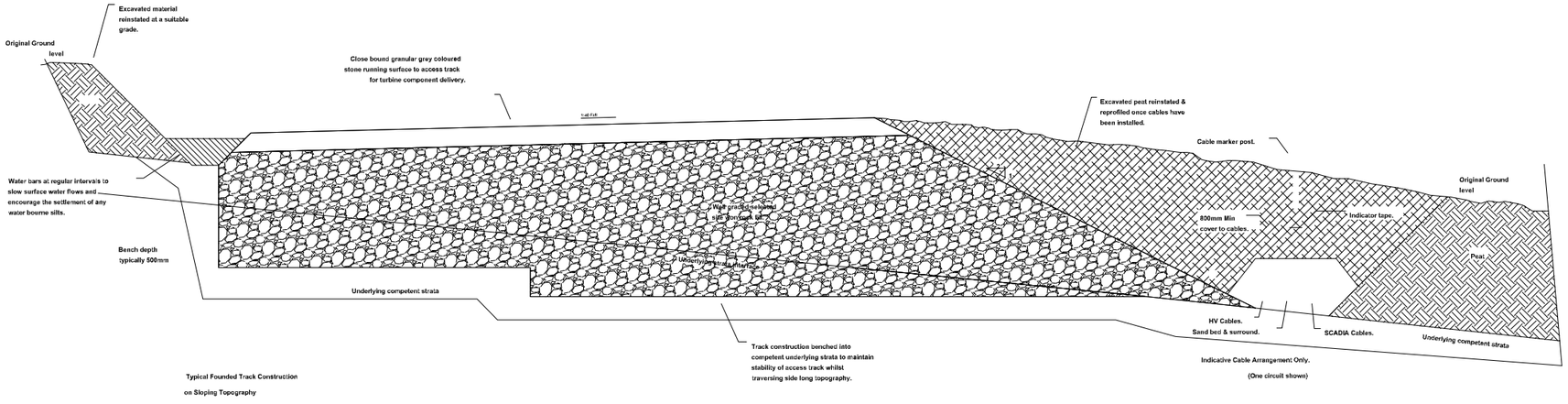


Typical Founded Track Construction.

Scale 1: 45



Typical Founded Track Construction on Sloping Topography

Scale 1: 45

Figure Provided by Grontmij

Rev	Date	Description	Drn	Chk	App
00	14.12.11	Site Compound	BF	MK	MK

FORCE 9 ENERGY

Blackwood Wind Farm

RSK Grontmij

Figure 3.5: Typical Access Track Cross-section

As shown

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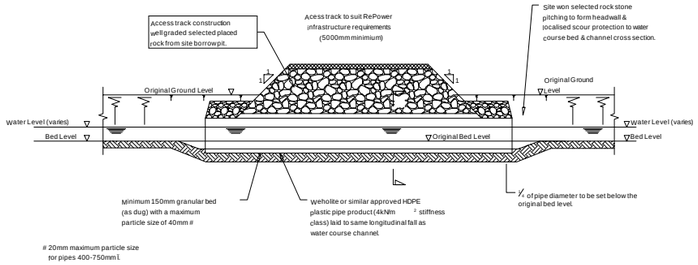
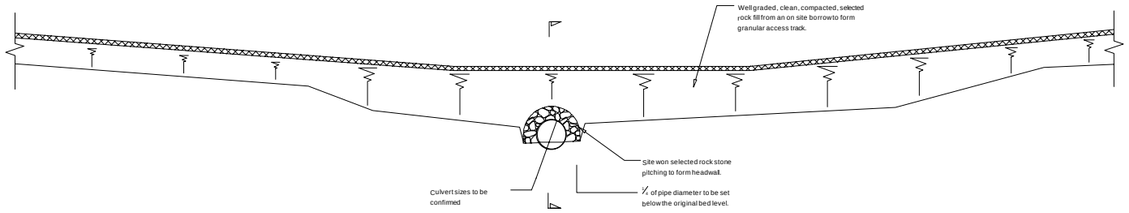


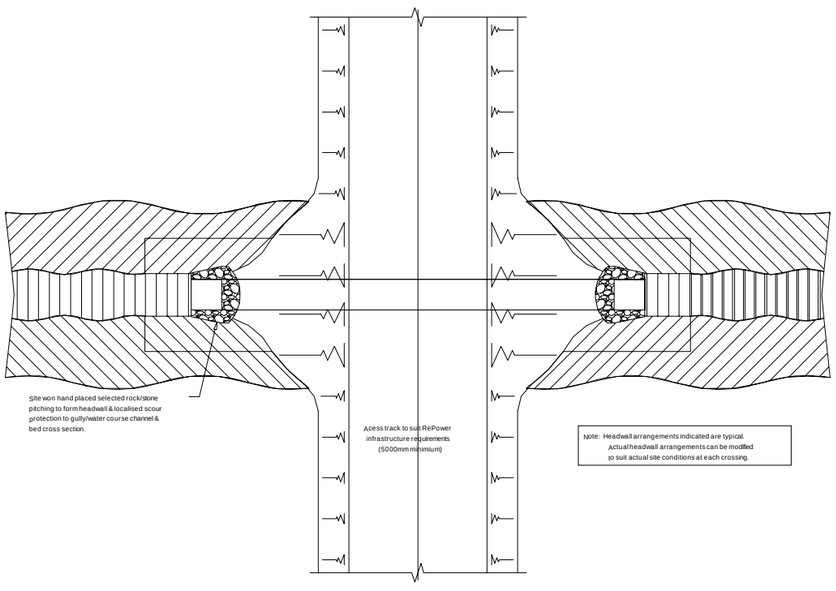
Cross-Sectional Elevation A-A

Scale 1: 200



Typical Elevation on Watercourse Crossing

Scale 1: 200



Typical Plan on Watercourse Crossing

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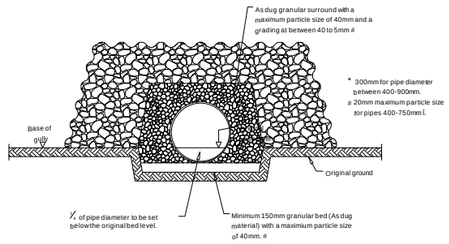

Section B-B

Typical Cross Section Through Watercourse

Showing Bedding & Surround Arrangement

Scale 1: 150

Figure Provided by Grontmij

Rev	Date	Description	Drn	Chk	App
00	14.12.11	Culvert Crossing	BF	MK	MK

FORCE 9 ENERGY

Deuchries Wind Farm

RSK Grontmij

Figure 3.6: Typical Culvert Crossing

As Shown

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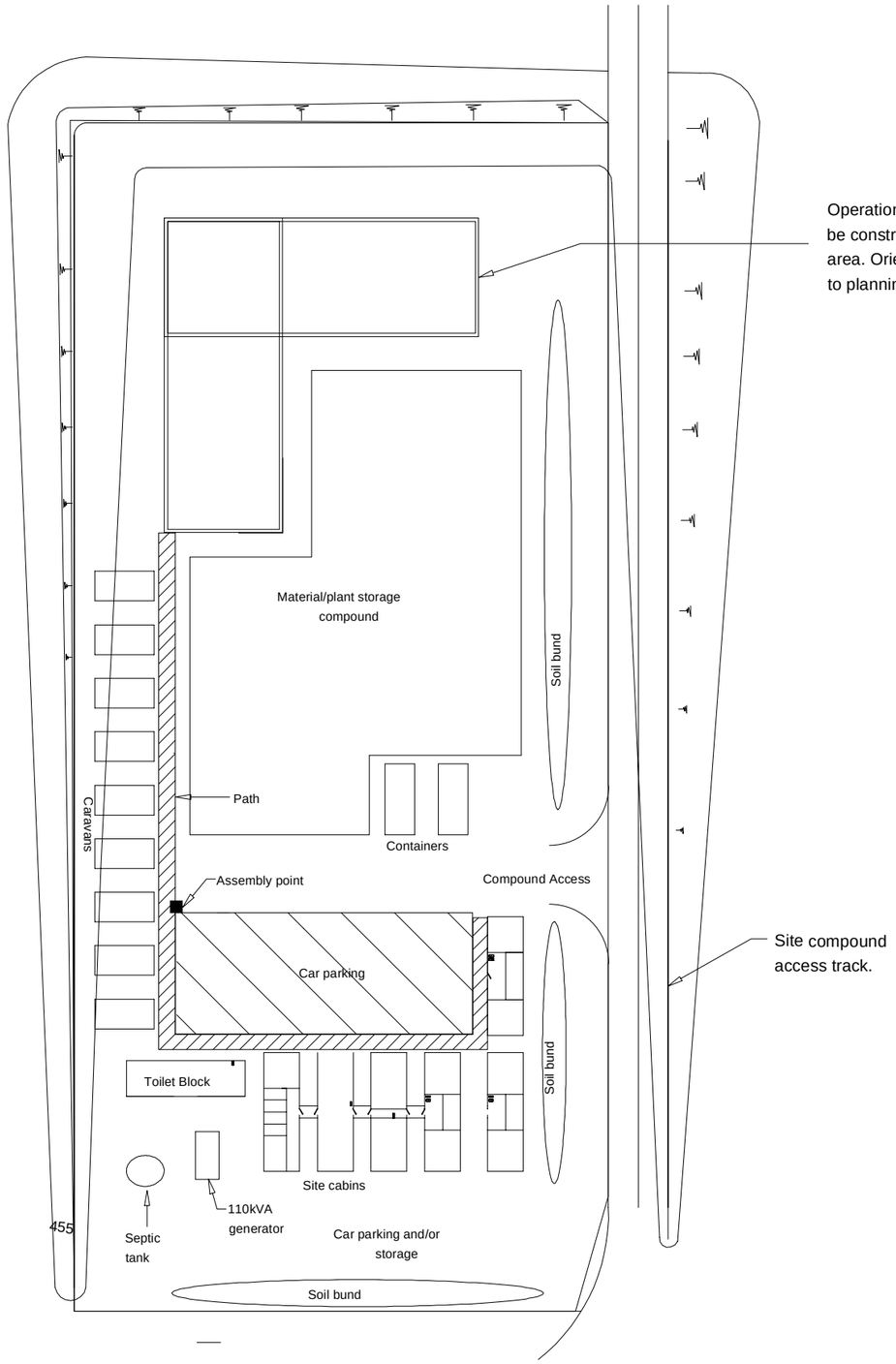

Extent of proposed site compound area.

Figure Provided by Grontmij

Rev	Date	Description	Drn	Chk
00	14.12.11	Site Compound	BF	MK

FORCE 9 ENERGY

Blackwood Wind Farm

RSK Grontmij

Figure 3.7: Typical Construction Compound

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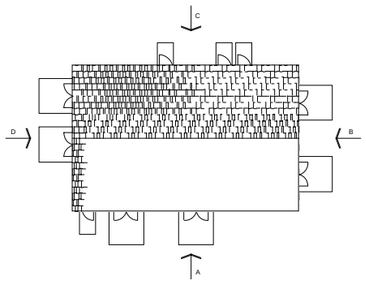
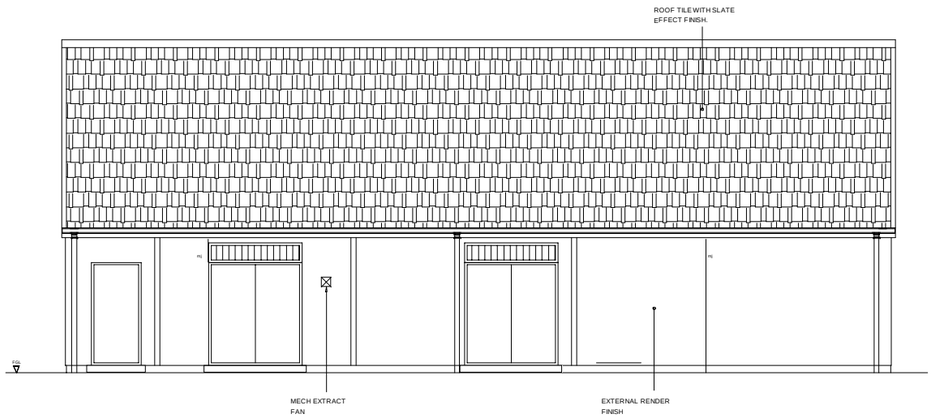


KEY PLAN



ELEVATION ON A

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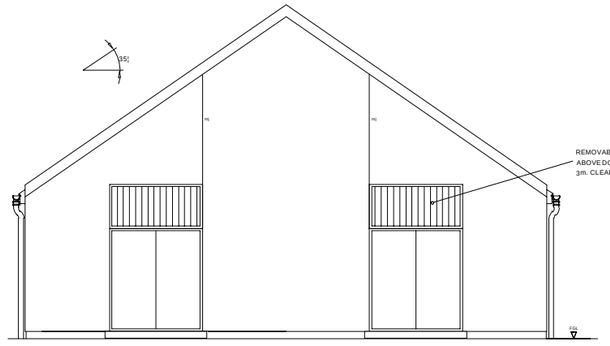

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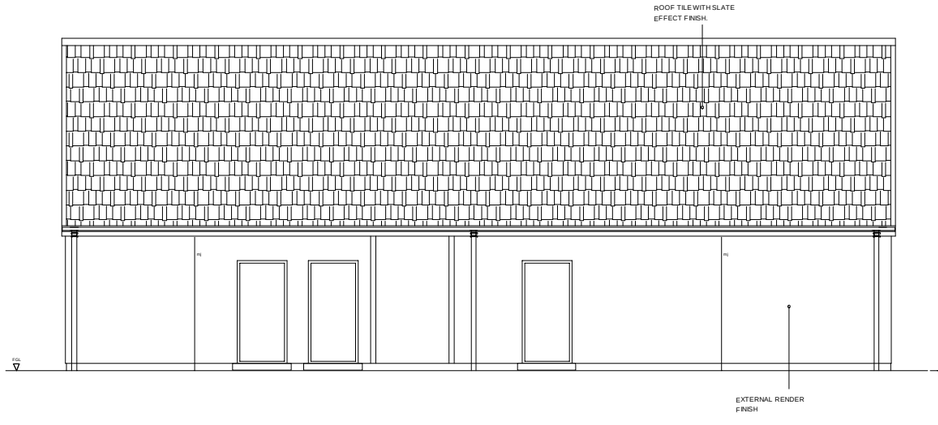

ELEVATION ON C

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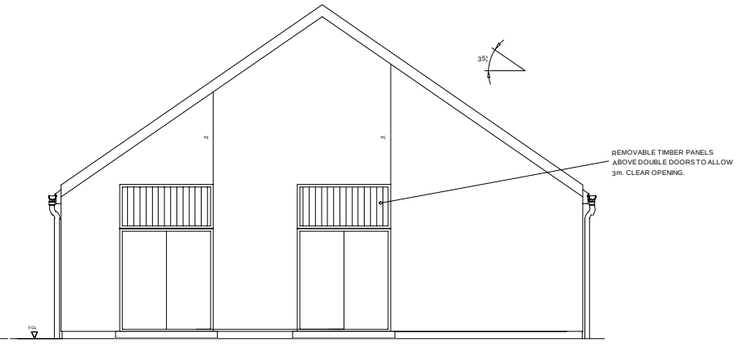

ELEVATION ON D

SCALE 1 : 1250.

Figure Provided by Grontmij

Rev	Date	Description	Drn	Chk	App
00	14.12.11	Control Building	BF	MK	MK

FORCE 9 ENERGY

Blackwood Wind Farm

RSK Grontmij

Figure 3.8: Typical Control Building

As shown

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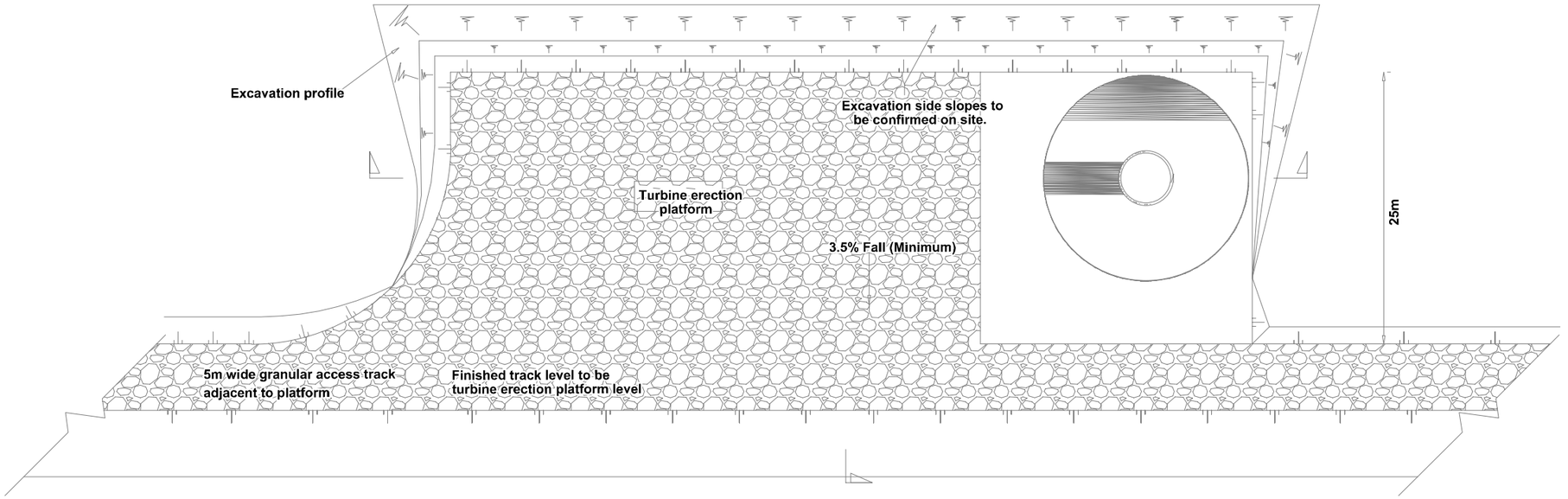
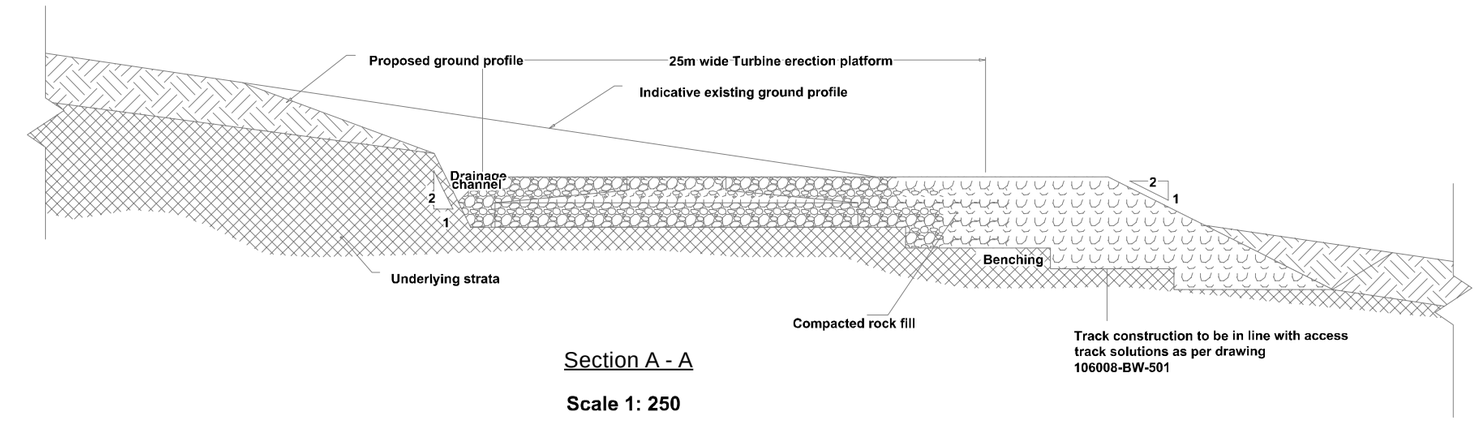


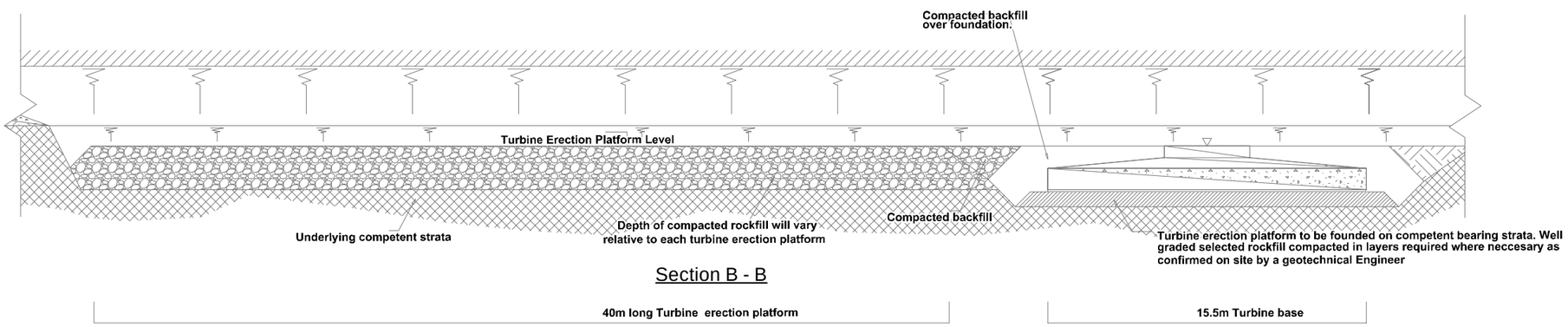
Plan: Typical Turbine Erection Platform Arrangement

Scale 1: 400



Section A - A

Scale 1: 250



Section B - B

Scale 1: 250

Figure Provided by Grontmij

Rev	Date	Description	Drn	Chk
00	14.12.11	Typical Foundation	BF	MK

FORCE 9 ENERGY

Blackwood Wind Farm

RSK Grontmij

Figure 3.9 Turbine Foundation

As Shown

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4 PLANNING

Introduction

4.1 This chapter details the national and local policy framework for the Development. It summarises the policy framework and details the policies which are considered relevant to the determination of the application.

4.2 There are three strands of applicable planning policy and guidance: UK energy policy, Scottish energy and planning policy, and local policies (both within the Development Plan and emerging policies). Each of these is examined below.

UK Context

4.3 As part of the Framework Convention on Climate Change (the Kyoto Protocol)[1], the United Kingdom is obliged to reduce greenhouse gas emissions by 12.5% from 1990 levels by 2008-2012.

4.4 Leading on from this the UK Government set out two long-term energy challenges:

"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".

4.5 In order to tackle these challenges, the 2007 White Paper: "Meeting the Energy Challenge[2]" sets out four key policy goals:

1. To put the UK on a path to cutting carbon dioxide (CO_2) emissions by some 60% by about 2050, with real progress by 2020;
2. To maintain the reliability of energy supplies;
3. To promote competitive markets in the UK and beyond;
4. To ensure that every home is adequately and affordably heated.

4.6 The UK Government's response to this has in part been through the assent of the Climate Change Act 2008 and Energy Act 2008. These set a legally binding commitment to reduce the UK's carbon emissions by 80% by 2050 and 34% by 2020 against a 1990 baseline. They also introduce a carbon budgeting system that requires that limits be set on the total amount of emissions in successive five year periods.

4.7 Latest estimates show that in 2009, net UK carbon dioxide (CO_2) emissions were 19.7% below 1990 levels, which were 9.8% lower than 2008[3]. In order to continue this trend, more action is required to further reduce CO_2 emissions.

4.8 The 2009 Renewable Energy Directive (2009/28/EC) calls for the UK to obtain 15% of its total energy consumption from renewable resources by 2020. In order to meet this legally-binding target, The UK Renewable Energy Strategy 2009 (RES)[4], part of the Government's Overall UK Low Carbon Transition Plan[5], sets out a range of measures and calls for UK emissions of CO_2 to reduce by over 750 million tonnes between 2009 and 2030.

4.9 Achieving the goal of 15% renewable energy by 2020 requires an increase from nearly 40 TWh of renewable energy in 2008, to just under 240 TWh in 2020. In achieving this target renewable electricity production is expected to rise to 30% of total generation, from about 5.5% in 2009. Around two thirds of this is anticipated to come from onshore and offshore wind. The Strategy calls for the planning system to encourage the deployment of renewable energy in appropriate places.

4.10 The UK National Renewable Energy Action Plan (NREAP) 2010[6] follows on from the RES, and details how the UK will reach its 2020 renewable electricity generation targets as a contribution toward legally binding emissions targets. It refines the targets set out in the RES and estimates by 2020 the total renewable capacity of the UK will be 38.21GW, 14.89GW of which will be from onshore wind, effectively increasing the targeted amount of renewable energy electricity generated from onshore and offshore wind by approximately 1GW.

4.11 The UK Renewable Energy Roadmap 2011[7] sets out the plan to accelerate the UK's deployment and use of renewable energy. Onshore wind is identified as one of the main technologies required to meet the 2020 target.

4.12 In summary, wind energy is one of the most significant renewable energy sources available to the UK given its substantial wind resource[8]. However, the present levels of consented and operational capacity are below what is required to meet targets. Substantial additional consents are required if wind energy is to play an important part in meeting the Government's short and medium term targets.

Scottish Context

4.13 While planning for wind energy in Scotland is governed by a number of overarching policy documents, Scottish Government policy demonstrates an increasingly strong commitment to exploitation of renewable energy resources including onshore wind.

Climate Change (Scotland) Act 2009

4.14 The Climate Change (Scotland) Act 2009 received Royal Assent on August 4, 2009. The Act shows the commitment of the Scottish Government to reduction of greenhouse gas emissions and a transition to a low carbon economy. It sets out a target of a 42% reduction in greenhouse gas emissions by 2020, with an 80% reduction by 2050. Annual targets will be set for interim years by Scottish Ministers.

National Planning Framework (NPF2) (2009)

4.15 The Scottish Government is fully committed to supporting the increased use of renewable energy sources. This is shown in NPF2[9] which set a high target of 50% of Scotland's electricity to be generated from renewable sources by 2020. Due to developments in the sector and changing expectations, this target has been raised to 100% (Scottish Government, 2011)[10]. NPF2 sets out a strategy which looks to maximise its renewable energy potential whilst safeguarding against negative impacts on the environment and communities. It encourages a mix of renewable energy technologies including growing contributions from onshore wind, wave and tidal energy. It notes the potentially important and valuable role small-scale renewable energy projects can make locally. It also notes that cumulatively they can make a significant contribution in developing a more decentralised pattern of energy generation.

Scottish Planning Policy (2010)

4.16 Scottish Planning Policy (SPP) sets out the Scottish Government's policy on nationally important land use planning matters. This reiterates the targets set out by the Climate Change (Scotland) Act and suggests planning has a key role in supporting achievement of sustainable development. It states that the use of energy efficient, micro-generating and decentralised renewable energy systems will be components in the move towards reducing emissions. Whilst the document sets a target for 50% of Scotland's electricity to be generated from renewable sources by 2020, this has been revised upwards to a 100% target (see paragraph 4.15).

4.17 Development Plans should support all scales of development associated with generation of energy and heat from renewable sources, accounting for economic, social, environmental and transport issues and maximising benefits. Development Plans should also support wider application of medium and smaller scale renewable technologies.

4.18 Planning authorities are required to develop a spatial framework for onshore windfarms, particularly those generating over 20 megawatts. Potential constraints to wind farm development may include: the historic environment; areas designated for regional and local landscape or natural heritage value; tourism and recreation interests; likely impacts on communities, including long term and significant impact on amenity; impact on aviation and defence interests, particularly airport and aerodrome operation, flight activity, tactical training areas, aviation and defence radar and seismological recording; and impact on broadcasting installations, particularly maintaining transmission links.

4.19 Planning authorities should not impose additional zones of protection around areas designated for their landscape or natural heritage value. Areas of search should have no significant constraints on development, including: other natural heritage interests; project viability, including wind speed, site access, ground suitability and other environmental factors; and grid capacity. Existing and approved grid capacity should be maximised wherever possibly, but grid constraints should not be used as a development constraint.

4.20 Development Plans are required to provide a clear indication for wind farms of all scales and set out criteria for deciding applications, which will include: landscape and visual impact; effects on natural heritage and the historic environment; the contribution of the development to renewable energy generation targets; effects on the local and national economy and tourism and recreation interests; benefits and disbenefits for communities; aviation and telecommunications; noise and shadow flicker; and cumulative impact. Wind farm developments need to reflect the scale and character of the landscape in their design and location. Landscape and visual impact needs to be minimised. Cumulative impacts will be considered, largely relating to the scale and proximity of further development.

4.21 The SPP suggests that it may be appropriate for developers to voluntarily provide a range of benefits to the communities affected by renewable energy developments.

Web-based renewable advice

4.22 In February 2011, PAN 45 Renewable Energy Technologies and Annex 2 Spatial Frameworks and Supplementary Planning Guidance for Wind Farms were replaced by a series of online supplementary guidance[11]. Relevant to this application is advice on 'Onshore Wind Turbines', and 'Process for preparing spatial frameworks for wind farms'.

4.23 Onshore Wind Turbines sets out advice for local authorities on how to formulate onshore wind turbine policy and determine planning applications. In determining applications the guidance asks local authorities to consider:

- *Landscape impact*: Local authorities need to determine whether a landscape can readily absorb a wind turbine development. The visibility of the development must also be assessed. Landscapes which are of rare or valued importance (e.g. National Scenic Areas and National Parks) are subject to greater scrutiny;
- *Landscape Assessment*: The guidance calls for applications to carry out in-depth analysis of landscape impact using such tools as a zone of theoretical visability maps. The guidance asks that any landscape assessment takes into account SNH's Landscape Character Assessment which identifies different landscape characteristics which are sensitive to wind farm development;
- *Impacts on Wildlife and Habitat, Ecosystems and Biodiversity*: The guidance calls for an in-depth analysis of the potential for positive and negative environmental impacts arising from wind farm developments. The guidance states that for any negative impact arising, there is scope for mitigation;
- *Buffer Zones*: No buffer zones are required to be established around areas designated for their natural heritage and proposals should be considered on their merits;

- *Impact on Communities*: The guidance asks for local authorities to assess the potential impact on communities, specifically looking at shadow flicker and noise. Developers are required to determine whether the phenomenon of shadow flicker is applicable to their applications. In the assessment of noise, the advice states that the framework for the measurement of wind noise used in The Report 'The Assessment and Rating of Noise from Wind Farms' (Final Report, Sept 1996, DTI) (ESTU-R-97) should be adhered to by developers[12]. The developer must also show that any wind farm development will not create any significant electro-magnetic interference to communications systems in the local area. Mitigation measures for potential ice throw must also be taken into account by developers;

- *Separation Distances:* As stated above, whilst an indicative 2km separation is suggested between wind farm developments and the edge of towns, cities and villages, this is only a general guide. Consideration of individual developments should take account of specific local circumstances and geography;

- *Aviation Matters:* Local authorities are asked to get developers to look into potential air safety and radar implications of wind farm developments;

- *Military Aviation and Other Defence Matters:* Again developers are asked to make due consideration of potential obstructions to MOD low flying operations and radar impact;

- *Road Traffic Impacts:* Full consideration of the potential road traffic impacts during construction, periodic maintenance and decommissioning phases must be assessed by local authorities;

- *Cumulative Impacts:* The advice calls on local authorities to be more aware of cumulative impacts occurring from wind farm developments;

- *Good Practice During Construction:* The advice asks that local authorities encourage developers to appoint Ecological Clerks of Works to make sure approved designs and construction techniques are adhered to; and

- *Decommissioning:* The guidance asks that an appropriate decommissioning strategy is in place once planning consent has expired at a wind farm development site.

4.24 Process for preparing spatial frameworks for wind farms notes that whilst local authorities need to set out a spatial framework in the development plan for onshore farms of over 20 MW generating capacity; as there has been a marked increase in developments below this threshold, it may be appropriate for local authorities to also

[1] Since the publication of ETSU-R-97, additional advice has been presented in the Institute of Acoustics Bulletin ('IOA Bulletin'), which clarifies preferred modelling parameters and an updated methodology for predicting windshear during noise monitoring.

[2] Additional guidance to assess noise during construction is set out in BS 5228-1:2009, "Code of practice for noise and vibration control on construction and open sites".

incorporate such schemes into their spatial framework. Local authorities are encouraged to bring forward wind turbines in suitable locations, within the development plan action programme. The goal of the spatial framework is not to create a sequential approach in determining applications. Therefore, wind farm developers with proposals outside an area of search are not required to show why there are no other suitable locations within it.

Scottish Renewables Action Plan (2009)

4.25 The key objectives of the Scottish Government's Renewables Action Plan (RAP) are: to establish Scotland as a UK and EU leader in the field, ensure maximum returns for domestic energy and to meet Scottish targets for energy from renewable and for emissions reductions to 2020 and beyond.

4.26 The vision for onshore wind is for a continued expansion of the portfolio of wind farms to help meet the renewable target, with a robust planning framework supporting timely processing of consents applications and ensuring wind farms are consented where they are environmentally acceptable. The headline ambitions are: to support the development of onshore wind farms in environmentally acceptable locations; and to maximise community engagement with wind projects and provide support for small and community-scale developments, including encouraging wind-to-heat projects in remote areas off gas grid.

4.27 This guidance was updated and extended through the publication of the 2020 Route Map for Renewables in Scotland in July 2011[12]. This guidance states the Scottish Government new target of meeting an equivalent of 100% demand for electricity from renewable energy by 2020. It reiterates the Scottish Government's goal of becoming Scotland the "*renewables powerhouse of Europe*". Therefore, the guidance is fully supportive of the use of renewable energy technologies in suitable locations.

4.28 Furthermore, specifically for onshore wind generation the guidance states:

"Our ambition is that by 2020, onshore wind developments ranging from small and community-scale to large power utility scale maximise engagement with communities; contribute electricity to renewables targets; and, through displacement of fossil fuel generation, help to reduce fossil fuel consumption".

4.29 The guidance calls on the planning system to find the right balance between protecting the environment and continuing to make progress on renewable targets.

Conclusions

4.30 It has been shown that there is a strategic policy necessity in the UK and Scotland to encourage the use of renewable technologies, and particularly onshore wind, to tackle climate change. The proposed Development would contribute to satisfying these requirements and make a contribution to achieving UK and Scotland renewable energy targets.

Local Planning Policy Context

4.31 Sections 25 and 37 (2) of the Town and Country Planning (Scotland) Act 1997 (as amended) require that planning decisions be made in accordance with the development plan, unless other material considerations indicate otherwise.

4.32 The Development Plan for the proposal at Blackwood consists of the Dumfries and Galloway Structure Plan (Approved 1999) and the adopted Nithsdale Local Plan (2006). The following sections highlight relevant policy which will be used to assess this application.

Dumfries and Galloway Structure Plan (Approved 1999)

4.33 **Policy 21 Renewable Energy** states that renewable energy projects will generally be considered positively if they do not have a significant adverse impact on:

- The built and natural heritage;
- Areas and routes important for tourism or recreational use in the countryside;
- Water and fishing interests;
- Air quality; and
- The amenity of the surrounding area.

4.34 The policy states that detailed information on infrastructure requirements, roads and grid connections, impact during construction and operational phases, visual impact, noise and odour issues and the decommissioning of the site must be provided.

4.35 In order to assess such impacts, the Council normally expects an Environmental Assessment to be carried out.

4.36 The primary policy on wind farms is **Policy S22 Wind Farm and Wind Turbine Developments**. This policy is supplemented by the Structure Plan Wind Energy Diagram (WED) and Technical Paper 5 – Preparation of Wind Energy Diagram. The WED categorises areas of high wind speed as either 'Potential', 'Intermediate' or 'Sensitive'. These categorisations are based on a two stage sieve process. Firstly, areas with high wind speeds which have sufficient grid capacity are identified. Then high wind speed areas are matched against a series of environmental and technical constraints (17 in total), with varying sensitivities to wind farms. A high wind speed area which contains a sensitive constraint is automatically classed as sensitive. Such areas are deemed to have the greatest degree of sensitivity to wind farms. Intermediate high wind speed areas are those with one or more intermediate constraint. These areas are sensitive to wind farms but have scope to accommodate them subject to good design and careful consideration of the scale and siting of the development. Those areas where the only constraint is identified as potential are classed as such and are most suitable for wind farm development.

4.37 **Policy S22** has a presumption against wind farm development in 'Sensitive' areas, but a favourable stance for those in 'Intermediate' or 'Potential' areas which accord with **Policy S21** and guidance in Technical Paper 5. The northeastern part of the Site

(including three of the proposed turbines) is within a high wind speed area classed as 'intermediate' for wind farm development. On the WED scoring system this area is classed as a low scoring intermediate. This means that that it has limited intermediate constraints within it. One constraint is that part of the areas Landscape Character (explained further in paragraph 4.30) is classed as Upland Fringe. The other is that the Site is within a settlement boundary. Technical Paper 5 stipulates that areas close to settlements are subject to more detailed assessments. As the proposed turbine locations are within 4km of the nearest village, Auldgirth, issues regarding noise, shadow flicker, proximity to roads and power lines are pertinent. Consideration of these constraints is discussed further in Chapters 8, 10 and 15 of this ES. Therefore, this area can be classed as a preferred area for wind farms in relation to the remaining 15 environmental and technical constraints. The remaining two turbines are located outside the designated search areas and are therefore considered in terms of **Policies S21** and **E3** (discussed below).

4.38 Landscape designations were identified in the Dumfries and Galloway Landscape Assessment (DGLA) published by SNH in 1998. The DGLA categorises the Site as straddling two Landscape Character Areas, Upland Fringe (3 turbines) and Foothills with Forest (2 turbines). Both character types are considered capable of accommodating wind farm development, subject to the principles of good design and siting. Upland Fringe is considered more sensitive than Foothills with Forest areas. Technical Paper 5 suggests that Upland Fringe areas are potentially more visible from more densely populated lowland and therefore sensitive to wind farm development. Where possible, wind farm development in these areas should be concentrated in enclosed plateaus, coils or minor valleys away from the main visual horizons of the adjacent lowlands. According to the DGLA, Foothills with Forest areas have more scope for less visual intrusion and are suited for medium-scale wind farm developments of 10 turbines or less. The Landscape and Visual Impact Assessment (LVIA) in Chapter 8 of this ES provides a detailed assessment of how the turbines of the Development would fit within the character of the area.

4.39 An updated Dumfries and Galloway Landscape Wind farm Capacity Study was prepared in 2010-11 to underpin the consultation draft Supplementary Planning Guidance (SPG) that has been produced for wind developments in Dumfries and Galloway. Consideration of the capacity study has been taken into account in ES Chapter 8.

4.40 There are also a number of other supplementary policies in the Structure Plan which should be taken into account.

4.41 **Policy D36 – Design of Development** asks proposals to take account of :

"1. siting, scale, form, massing and layout in relation to townscape and landscape setting;
2. local building styles; and
3. the access needs of all groups".

4.42 While this policy appears to be primarily directed at other forms of development rather than wind energy proposals, it is noted that the Council has referred to it as relevant policy in considering other wind turbine applications in Dumfries and Galloway. In terms of this policy, wind farm proposals need to show that they will have limited impact on the landscape setting of the area.

4.43 **Policy D38 – Environmental Assessment and Monitoring** states that *"Environmental Assessments will be required in accordance with Government Regulations".* The Environmental Impact Assessment (Scotland) Regulations 1999 (the 1999 regulations), as amended, require an Environmental Impact Assessment (EIA) to be undertaken if the relevant planning authority considers that the proposals have the potential to have a significant impact on the environment. Due to the scheme's scale and nature, Force 9 Energy has deemed that an EIA is needed to support the planning application.

4.44 **Policy E1 – National Scenic Areas** states that development within or which would have an impact on National Scenic Areas (NSAs) will only be permitted provided it will not affect the "*area's scenic and landscape character, and overall integrity"* or that social or economic benefits override any negative effects.

4.45 In a similar vein, **Policy E2 – Regional Scenic Areas** states that any development proposal within, or which would have significant impacts on Regional Scenic Areas (RSAs) will be allowed provided it can be shown that:

"1) The landscape character and scenic interest for which the area has been designated would not be adversely affected; or
2) There is a specific need for the development at that location which could not be located in a less sensitive area."

4.46 The proposed development is not within a designated NSA, although parts of the Site, including some of the proposed access track, are within the designated Thornhill Uplands RSA. As the turbines themselves would be located outside the RSA, the propensity for significant impact is reduced. The impacts on NSAs and RSAs are fully assessed in ES Chapter 8: Landscape and Visual Amenity.

4.47 While prepared primarily for the EIA, the LVIA will also help meet the criteria of **Policy E3 – Landscape Character** which states that *"when assessing development proposals likely to have a significant impact of the landscape the Council will take into account the guidance set out in the Landscape Assessment".*

4.48 **Policy E6: Conservation of Habitats and Species** requires that "*the impact on any habitats which is valued for its nature conservation interests is fully considered".* Surveys have been carried out to determine whether there are any parts of the Site that are covered by local, national or European designations. An ecological assessment is included within ES Chapter 6 and an ornithological assessment at ES Chapter 7.

4.49 **Policy E9 – Listed Buildings**, **Policy E11 – Historic Gardens and Designated Landscapes, Policy E12 – Development Affecting Archaeological Sites** and **Policy E13: Archaeologically Sensitive Areas** are all applicable to this Development, as

consideration of the impact on the setting of nearby listed buildings, historic gardens, designated landscapes, archaeological sites and areas will be required. Such an assessment is included as ES Chapter 9.

Nithsdale Local Plan (Adopted 2009)

4.50 The Nithsdale Local Plan is one of four Area Local Plans in Dumfries and Galloway. Whist the plan consists of policies specific to the Nithsdale area, there is a volume of Council wide policies which are contained in all the Local Plans. There are no specific Nithsdale policies related to the assessment of proposals for renewable energy development. However, there are a number of supplementary policies which are relevant.

4.51 **General Policy 1 – Development Principle** states that:

"there will be a general presumption against development which would give rise to a material degree of land use conflict, which would materially detract from and/or be incompatible with the character or amenity of the locality."

4.52 The proposed application should show that there would be no significant conflict with the other existing land uses on the Site.

4.53 **General Policy 2 – Development Considerations** notes that development proposals will have to show to the Planning Authority that there will be no significant impacts on the following criteria

"a) access, ground conditions and stability, contamination, foul and surface water drainage and water supply;

b) traffic generation onto the adjacent road network;

c) flooding;

d) Environmental Impact"

4.54 Criteria a) and c) are addressed in ES Chapter 5, criteria b) is addressed in ES Chapter 11 and the ES as a whole applies to criteria d).

4.55 Areas of **General Policy 7 – Siting and Design** relevant to wind farm proposals are that any proposed development:

- *"retain and, where appropriate, enhance important physical and landscape features which contribute to the quality of the local environment having regard to the Local Biodiversity Action Plan ;*
- *have no material adverse effect on the local landscape character, avoiding prominent ridge lines or other visually sensitive sites; and*
- *take into account the guidance and advice set out in the Landscape Assessment Study".*

4.56 This policy appears to be primarily aimed at urban development proposals rather than wind farms and the materiality of the statements above should be considered in this context. Areas of this policy are covered in ES Chapter 8.

4.57 **General Policy 12 – Potentially Polluting Development** states that:

"*Where a development has the potential to cause pollution of water, air, soil or pollution through noise, dust, odour, vibration, light and heat the Planning Authority will only consider granting planning permission where it has been established following consultation with the relevant regulatory organisations that: -*

- *the development would not result in an unacceptable level of nuisance, or unacceptable risk to human health; and*
- *the quality of the environment would not be materially damaged or put at risk."*

4.58 The most relevant factors to a windfarm development are potential noise impacts, and any disruption to soil and water courses during the construction phase. These are considered in Chapters 5 and 10 of this ES respectively.

4.59 **General Policy 13 - Safeguarding Land in Advance of Subject Local Plans** asks that Renewable Energy facilities *'be safeguarded from other forms of development which would inhibit their efficient operation'.* As the Site is located adjacent to the existing Dalswinton wind farm, this has been considered in ES Chapter 2: Alternatives and Design Evolution) and ES Chapter 14: EMI, Infrastructure, Aviation and Safety.

4.60 **General Policy 37 – Public Rights of way** says that development will not be granted permission if it results in a loss of a public right of way unless an appropriate alternative route or mitigation method is put in place. Any impacts on public rights of way are covered in ES Chapters 8 and 13.

4.61 **General Policy 38 – Access Routes** calls for the protection and where appropriate the creation of new access routes in the countryside. Appropriate mitigation methods, such as access agreements, will be required if an access route is adversely affected by a proposed development. ES Chapter 13 of this ES, looks into this in greater detail.

4.62 Both **General Policy 41 – National Scenic Areas** and **General Policy 42 – Regional Scenic Areas** refer to their respective Structure Plan Policies E1 and E2 for the criteria to assess development proposals. As mentioned previously the impacts on NSAs and RSAs are covered in Chapter 8 of this ES. However, it should be noted that these local plan policies, unlike their Structure Plan counterparts, restrict the potential for impact to development sites within these areas. Therefore, only **General Policy 42** is applicable for assessment of this application. However, as stated previously, only part of the Site is within the RSA. The turbines themselves are outside it. Therefore, the turbines themselves should not be assessed against this policy.

4.63 As with Structure Plan Policies **E9, E11, E12 & E13, General Policy 51 – Listed Buildings, General Policy 53a, Historic Gardens and Designated Landscapes, General Policy 54 – Known Archaeological Sites – Including Scheduled Ancient**

Monuments and **General Policy 55 – Archaeologically Sensitive Areas** are applicable as the Development may impact on the setting of such areas. A detailed consideration of these policies is found in Chapter 9 of this ES.

4.64 **General Policy 56 – Protecting the Quality of Groundwater** stated that development which could impact upon the status of a groundwater body will not generally be permitted unless appropriate mitigation methods are put in place.

4.65 **General Policy 57 – Sustainable Urban Drainage Systems (SuDS)** and **General Policy 60 – Water Sewerage & Drainage Provision** asks that appropriate measures are taken to dispose of surface water. The use of SuDS as an alternative to traditional hard engineering drainage methods is encouraged.

4.66 **General Policy 58 – Floor Risk and Development** cautions against development in areas susceptible to flooding or which may cause flooding in other areas.

4.67 All these hydrology related issued are examined in ES Chapter 5.

4.68 **General Policy 65 – Traffic Management & Road Safety** requires that developers need to provide measures for the '*control and management of heavy commercial traffic*'.

4.69 Whilst **General Policy 71 – Road Design** states that any new roads or alterations to existing roads need to meet the following criteria:

- *"The Council's Design Guidelines and Standards;*
- *Make positive provision for pedestrians, cyclists and public transport;*
- *Have regard to land either safeguarded, allocated or with planning permission for other development or land uses;*
- *Respect the character and appearance of the locality and minimise any material adverse effects; and*
- *Include where appropriate positive measures to safeguard biodiversity."*

4.70 These policy issues are covered in Chapter 11 of this ES.

Dumfries and Galloway, Draft Interim Planning Policy on Wind Energy Development

4.71 Draft Supplementary Planning Guidance (SPG) has been produced to meet the requirements set out under SPP and the online renewable guide. The document will eventually become a material consideration in determining wind energy applications. It will eventually replace the WED and Technical Report 5 and Policy 21 of the Structure Plan. A first draft of this guidance has undergone consultation, the results of which will be reflected in the Final Draft, which, it is understood, will be presented to the Council for considerationj in February 2012 (after this application is submitted).

4.72 The Draft SPG includes a spatial framework which details appropriate areas for wind energy development along with the wind energy policies which an application would be

considered against. It classes development as large, medium, small to medium or small. It also defines areas which require significant protection.

4.73 The Draft SPG specifies a series of development management criteria which proposals should take into account, including:

- Landscape and visual amenity;
- Cumulative impacts on landscape and visual amenity;
- Design of proposals in terms of turbine siting, layout, form and colour;
- Effects on local amenity and communities;
- Aviation and defence;
- The historic environment and cultural identity;
- Ecology, including biodiversity, protected species, ornithology and habitats;
- Forests and woodlands;
- Tourism and recreational interests;
- Broadcasting installations;
- Ancillary developments e.g. Access tracks, widening of existing roads and borrow pits;
- Physical site constraints; and
- Decommissioning and restoration.

4.74 The criteria are considered in various Chapters of this ES and will be given detailed consideration in the Planning Statement which accompanies this application.

4.75 The second criteria defines areas where legal agreements may have to be met before planning permission is granted. The third details supporting information required for applications which do not require a formal EIA and is therefore not applicable.

4.76 The SPG also states development should be compliant with guidance contained in the updated Dumfries and Galloway Wind Farm Landscape Capacity Study. This is examined in further detail at Chapter 8 of the ES.

4.77 While this ES covers most of the advice sought by the Draft SPG, as major changes are being made to the document, and these are not presently in the public domain, nor have they been approved by the Council, the draft guidance should be considered to have little material significance in assessing this application.

Conclusions

4.78 This overview of relevant planning policy and guidance has brought up a number of issues to be addressed in this ES. A summary of the key issues is provided below along with the relevant criteria which need to be met:

Table 4.1 Assessment Criteria

Issue	Criteria to meet	Where covered in this ES
Landscape and Visual impacts	Consideration of the visual impact Impact on the designated Landscape Characters. Impact on the landscape setting of the area. Impacts on the setting of NSA's, RSAs, listed buildings, historical gardens, designated landscapes or archaeological sites.	Chapter 8
Siting and Design	Design of the development is appropriate in terms of siting, layout, form and colour.	Chapters 2 and 3
Grid connection	Detailed information on grid connections.	Chapter 3
Impacts during construction, operational and decommissioning phases	Impacts during the construction, operational and decommissioning phases. Possible mitigation methods.	Chapter 3
Noise	Detailed information on noise issues.	Chapter 10
Impact on aviation , defence and transmitting or receiving systems	Impacts on radar performance, defence interests or other air safety considerations. Electromagnetic disturbance to be caused by the development	Chapter 14
Ecological and Ornithological impacts	Surveys to determine presence of any local, national and European designations.	Chapters 6 and 7
Impacts on Forests and Woodlands	Impacts on nearby forest and woodland	Chapter 6
Environmental Management	Environmental impact.	Chapters 3 and 16
Physical Environment / Impact on hydrology	Impacts on ground conditions and environment. Impact on water and fishing interests Impact resulting from contamination, soil disturbance, foul and water drainage and water supply. Flood impacts. Appropriate measures implemented to dispose of surface water.	Chapter 5
Climate Change	Impact on greenhouse gas emissions	Chapter 12
Impact on Archaeology and Cultural Heritage	Impact on the built and natural heritage	Chapter 9
Impact on nearby settlements	Impact on amenity on nearby settlements in terms of noise, shadow flicker, proximity to	Chapters 3, 10,11, 14 and

Issue	Criteria to meet	Where covered in this ES
	roads, air quality and power lines.	15
Impact on tourism	Impact on areas and routes important for tourism and recreational use in the countryside.	Chapter 13
Transport impacts	Detailed information on infrastructure requirements and roads required. Impact on traffic generation onto the adjacent road network. Appropriate measures are required for the control and management of heavy commercial traffic. Access issues with appropriate mitigation measures for changes to existing access routes.	Chapter 11
Impact on existing renewable energy facilities and neighbouring land users	Consideration of impact on the Dalswinton wind farm Impact on other existing land uses on the site.	Chapter 2
Cumulative Impacts	Consideration of wider cumulative impacts with other neighbouring renewable energy developments.	Chapter 8

Chapter 4 References

[1] Kyoto Protocol http://unfccc.int/resource/docs/convkp/kpeng.pdf

[2] Department of Trade and Industry, 2007, Meeting the Energy Challenge, a White Paper on Energy, TSO

[3] Department of Energy and Climate Change (DECC), 2009, Final UK Figures http://www.decc.gov.uk/assets/decc/Statistics/climate_change/1214-stat-rel-uk-ghg-emissions-2009-final.pdf

[4] HM Government, DECC, 2009, the UK Renewable Energy Strategy, TSO

[5] HM Government, DECC, 2009, the UK Low Carbon Transition Plan, National Strategy for Climate and Energy, TSO

[6] DECC, 2010, National Renewable Energy Action Plan for the United Kingdom (Article 4 of the Renewable Energy Directive 2009/28/EC)

[7] DECC, 2011, UK Renewable Energy Roadmap, DECC

[8] DECC website, About Wind section http://www.decc.gov.uk/en/content/cms/meeting_energy/wind/wind.aspx

[9] Scottish Government, 2009, National Planning Framework 2, http://www.scotland.gov.uk/Topics/Built-Environment/planning/National-Planning-Policy/npf

[10] Scottish Government website http://www.scotland.gov.uk/About/scotPerforms/indicators/electricity

[11] http://www.scotland.gov.uk/Topics/Built-Environment/planning/National-Planning-Policy/themes/renewables

[12] The Scottish Government, 2011, 2020 Route Map for Renewables in Scotland, http://www.scotland.gov.uk/Publications/2011/08/04110353/0

5 PHYSICAL ENVIRONMENT

Introduction

5.1 This chapter describes the existing geology, hydrogeology, hydrology, drainage and flood risk on and in the vicinity of the Site and provides an evaluation of potential impacts on these aspects resulting from the Development. The chapter also considers the methods for managing the quantity and quality of surface water runoff during construction, operation and decommission as described in Chapter 3.

Legislation and Policy

5.2 Relevant national, regional and local planning policy is discussed in Chapter 4: Planning. Local planning policy includes specific policies on the protection of groundwater, sustainable urban drainage systems and flood risk and development. The following summarises key legislation that is applicable to the physical environment.

Water Environment (Controlled Activities) (Scotland) Regulations 2011[1]

5.3 Under these regulations (CAR 2011) authorisation is required for activities that may impact the water environment. Three different types of authorisation allow for proportionate and risk-based regulation, these are:

- General Binding Rules. These apply to low risk activities that do not need to be notified to SEPA. There are a series of generic conditions contained in the CAR that must be complied with;
- Registrations. These notify SEPA of medium risk activities and enable SEPA to monitor cumulative impacts. A registration authorises the activity as described in the application and so would specify the scale of the activity and its location. SEPA may set additional conditions for such activities; and
- Licence (simple or complex). A licence is required for higher risk activities; this would contain site-specific conditions relating to that activity. A licence requires the identification of a responsible person who is responsible for ensuring compliance with the conditions of the licence.

5.4 When an application is being considered for authorisation, SEPA would assess the impact on ecology, on other water users and the extent to which the activities would affect flood risk.

Flood Risk Management (Scotland) Act 2009[2]

5.5 This act creates a statutory framework to deliver a sustainable and risk-based approach to flood management. This includes the preparation of assessments of the likelihood and impacts of flooding, and catchment focused plans to address these impacts. By 2015, flood risk management plans will be in place across Scotland, which should then be taken into account when development plans are prepared.

5.6 The Act also amends the Town and Country Planning (Development Management Procedure) Regulations (Scotland) 2008, requiring all applicants to provide a flood risk assessment for development that may increase the number of buildings at risk of being damaged by flooding.

Water Environment and Water Services (Scotland) Act 2003[3]

5.7 The Act provides regulatory controls over a wide range of activities in order to protect and improve Scotland's water environment. These include preventing further deterioration of, and protecting and enhancing, the status of aquatic ecosystems and promoting sustainable water use. Thus contributing to mitigating of the effects of floods and droughts.

The Private Water Supplies (Scotland) Regulations 2006[4]

5.8 The overriding objective of the regulations is to ensure the provision of clean and wholesome drinking water and deliver significant health benefits to those using private (non-mains) water supplies. The regulations incorporate the latest advances to improve drinking water quality including the use of risk assessments from 'source to tap' as part of an effective drinking water surveillance programme.

Water Framework Directive, 2000.[5]

5.9 The Water Framework Directive (WFD) came in to force in December 2000. The purpose of the Directive is to establish a framework for the protection of inland surface waters (rivers, lakes and lochs), transitional waters (estuaries), coastal waters and groundwater. It aims to ensure that all aquatic ecosystems and, with regard to their water needs, terrestrial ecosystems and wetlands meet 'good status' by 2015.

The River Basin Management Plan for the Solway Tweed

5.10 The Site falls within the River Basin Management Plan (RBMP) for the Solway Tweed[6]. The RBMP sets the framework for protecting and enhancing the water environment for the catchment for the period 2009 to 2015, although some commitments made in the plan may extend to 2021 or 2027. Specific overarching objectives of the RBMP are to:

- Prevent deterioration and enhance the condition (status) of aquatic ecosystems, including wetlands and groundwater;
- Promote sustainable water use;
- Reduce pollution; and
- Contribute to the mitigation of floods and droughts.

Method of Assessment

General Methodology

5.11 The assessment of impacts on the physical environment has been carried out in accordance with the methodology outlined in the EIA scoping report submitted to SEPA (dated April 2011) and in accordance with the scoping responses received as described below. As such, the assessment considers the three key areas of flood risk, drainage and hydrology and water quality (surface and groundwater).

5.12 Baseline conditions were determined through desk study and site walkover investigations. This included consultations with SEPA, review of relevant data and published material relating to the local and wider hydrological environment, such as the Strategic Flood Risk Appraisal[7], Flood Estimation Handbook CD ROM v3[8] and other relevant studies as listed above.

5.13 The assessment has considered all impacts associated with the Development as described in Chapter 3. The route and nature of the grid connection does not form part of the planning application and is yet to be finalised so has not been assessed here. The applicant's preference is for the grid connection cables to be located in trenches in roadside verges; it is not anticipated there would be any significant environmental impacts associated with this option. However, the line would be considered in more detail and subject to environmental assessment by the Distribution Network Operator (DNO) prior to a formal application for this element of infrastructure. The scope of any such assessment would be agreed with DGC.

Consultation and Scoping

Flooding and Hydrology

5.14 The scoping consultation response from DGC (dated 1 July 2011, reference 11/E/3/0011) identified a number of aspects relating to hydrology and drainage as follows:

- The area proposed for development lies outwith the 1 in 200 fluvial floodplain;
- There is no record of flooding in this area; and
- DGC have no objection to the application if a condition is placed on the applicant to take into account pluvial flows from the site so that the flood risk is not increased elsewhere.

5.15 Consultation with SEPA made a number of points relating to hydrology and flood risk in their response (dated 14th June 2011, reference PCS 113887). These included:

- It is appropriate to include flood risk within the proposed Environmental Impact Assessment (EIA), due to the tributaries of Pennyland Burn within the Site, the proximity of the Site to the River Nith and parts of the lower end of the Site being located within the 1 in 200 year (0.5% annual probability) floodplain of the Nith;

- Flood risk within the Site should also be considered with regards to the proposed access tracks, anemometer mast, grid connection building and site office with associated car park.
- Should the potential for disturbance and modification of watercourses, existing drainage patterns and groundwater recharge and flows be confirmed during the course of the EIA then the impacts on flood risk should be identified.

Water Quality

5.16 In addition, the SEPA response contained comments on pollution prevention and effects on groundwater including:

- The EIA should consider potential pollution risks associated with the proposals and identify the principles of preventative measures and mitigation;
- In order to meet the objectives of the Water Framework Directive of preventing any deterioration and improving the water environment, developments should be designed to avoid engineering activities in the water environment wherever possible. It should be demonstrated that every effort has been made to leave the water environment in its natural state; and
- Groundwater abstractions sources within a radius of (i)100 m from roads, tracks and trenches and (ii) 250 m from borrow pits and foundations should be considered in order to assess potential impacts to groundwater flow and abstractions.

Flood Risk Assessment

5.17 A Flood Risk Assessment (FRA) has been prepared in accordance with SPP and CAR. This establishes the flood risk associated with the Development and to consider if suitable mitigation measures are required, to reduce the risk to a more acceptable level. The results of which have been used in the development of the scheme design and in informing this assessment. The FRA is contained as Appendix 5.1.

5.18 The FRA has considered the following aspects:

- The characteristics of the Site;
- The use and design of the Development;
- The size of the area likely to flood;
- Depth of water, likely flow rate and path, rate of rise and duration;
- Existing flood prevention measures – extent, standard and maintenance regime;
- The allowance for freeboard;
- Cumulative impacts of development e.g. the loss of flood storage capacity;
- Potential cross boundary impacts and the need for consultation with adjacent authorities;
- Effects of a flood on access including by emergency services; and
- The extent to which the development, its materials and construction are designed to be water resistant.

Peat Assessment

5.19 A site walkover was completed by a Grontmij engineer on the 23rd November 2011, to assess the potential presence of peat zones and hazards. Several probes were also completed during the walkover to investigate further the soils and strata present.

5.20 Whilst softer wetter soils were identified in some locations, the only peat deposits identified on-site were to the west of the Burntkettle Shooting Ground to a thickness greater than 900mm (the length of the probe). However, this area would not be disturbed during the construction or operation of the Development. Furthermore the access track has been designed and turbines located to avoid wetter areas of the Site where there is a higher potential for peat. No peat slide risk assessment or further assessment of peat was therefore deemed to be required.

Drainage and Water Quality

5.21 Water pollution prevention and mitigation measures have been developed based on guidance from the following:

- Sustainable Urban Drainage Systems (SUDS) Manual[9];
- SEPA publications 'Watercourses in the Community'[10];
- SEPA publication 'Ponds, Pools and Lochans'[11];
- SEPA publication 'Technical Flood Risk Guidance for Stakeholders'[12];
- SEPA publication 'Development at Risk of Flooding, Advice and Consultation – a SEPA Planning Authority Protocol'[13]; and
- Scottish Government publication, River Crossings and Migratory Fish[14].

Impact Assessment Criteria

5.22 Impact significance has been assessed based on the sensitivity of the identified water receptors, which are explained below (including Tables 5.1 to 5.3), and the magnitude of the predicted impacts. The criteria used to assess sensitivity and magnitude are defined in Tables 5.4 and 5.5. Impact significance has been defined as described in Table 5.6.

Flood Risk

5.23 Scottish Planning Policy (SPP)[15] paragraph 204 outlines the application of the flood risk framework for any development site. It provides a basis for planning decision-making relating to flood risk. The framework divides flood risk into three categories and outlines an appropriate planning response. The calculated probability of a flood occurring should be regarded as a best estimate and not a precise forecast. The annual probabilities referred to in the framework below relate to the land at the time a planning application is made or a development plan is prepared.

Table 5.1: Flood Risk Framework

Little or No Risk
Definition: Annual probability of watercourse, tidal or coastal flooding is less than 0.1% (1:1000)
Appropriate uses: No constraints due to watercourse, tidal or coastal flooding.
Low to Medium Risk Area
Definition: Annual probability of watercourse, tidal or coastal flooding in the range 0.1% - 0.5% (1:1000 – 1:200)
Appropriate uses: These areas will be suitable for most development. A flood risk assessment may be required at the supper end of the probability range (i.e. close to 0.5%) or where the nature of the development or local circumstances indicate heightened risk. Water resistant materials and construction may be required depending on the flood risk assessment. Subject to operational requirements, including response times, these areas are generally not suitable for essential civil infrastructure such as hospitals, fire stations, emergency depots etc. where such infrastructure must be located in these areas or is being substantially extended it should be capable of remaining operational and accessible during extreme flooding events.
Medium to High Risk
Definition: Annual probability of watercourse, tidal or coastal flooding greater than 0.5% (1:200)
Appropriate uses: • Generally not suitable for essential civil infrastructure such as hospitals, fire stations, emergency depots etc., schools, care homes, ground-based electrical and telecommunications equipment unless subject to an appropriate long term flood risk management strategy. The policy for development on functional flood plains applies. Land raising may be acceptable; • If built development is permitted, appropriate measures to manage flood risk will be required and the loss of flood storage capacity mitigated to produce a neutral or better outcome; • Within built up areas, medium to high risk areas may be suitable for residential, institutional, commercial and industrial development provided flood prevention measures to the appropriate standard already exist, are under construction or are planned as part of a long term development strategy. In allocating sites, preference should be given to those areas already defended to required standards. Water resistant materials and construction should be used where appropriate; and • In undeveloped and sparsely developed areas, medium to high risk areas are generally not suitable for additional development. Exceptions may arise if a location is essential for operational reasons, e.g. for navigation and water based recreation uses, agriculture, transport or some utilities infrastructure and an alternative lower risk location is not achievable. Such infrastructure should be designed and constructed to remain operational during floods. These areas may also be suitable for some recreation, sport, amenity and nature conservation uses provided adequate evacuation procedures are in place. Job-related accommodation (e.g. caretakers and operational staff) may be acceptable. New caravan and camping sites should not be located in these areas. If built development is permitted, measures to manage flood risk are likely to be required and the loss of flood storage capacity minimised. Water resistant materials and construction should be used where appropriate.

Surface Water Quality Criteria

5.24 Controlled waters are defined in law and are essentially all waters, either above or below ground, which are neither in the drinking water supply pipe or the sewerage network. In consideration of SEPA and RBMP requirements mentioned above, the assessment includes consideration of the impact of the Development on water quality.

5.25 SEPA's Water Quality Classification is defined in SEPA's publication entitled 'National Water Quality Classification 2006[16]. It is based on a five point scale and includes all rivers with a catchment area of 10km^2 or more and specific smaller rivers where known pollution problems exist. This is called the "classification network". The classification network is divided into river stretches based on confluences and pollution pressures. Every stretch is assigned a monitoring point where chemical and/ecological surveys are taken and the aesthetic appearance recorded. The quality or "class" of a length of river is calculated from the monitoring point results. SEPA's River Water Quality Classification Categories are presented in Table 5.2.

Table 5.2: The River Water Quality Classification Categories

Class	Description
A1	Excellent
A2	Good
B	Fair
C	Poor
D	Seriously Polluted
U	Unclassified

Groundwater

5.26 Groundwater vulnerability can be defined as the tendency and likelihood for general contaminants to reach the water table after introduction at the ground surface.

5.27 SEPA's groundwater vulnerability is defined in the SNIFFER publication entitled 'Development of a Groundwater Vulnerability Screening Methodology for the Water Framework Directive[17]'. It is based on five vulnerability classifications. The five classes denote general and relative degrees of vulnerability. In the most vulnerable areas, groundwater is vulnerable to most types of pollutant and contamination is rapid. In the least vulnerable areas, groundwater is only vulnerable to conservative pollutants (such as chloride and nitrate) when they have been continually introduced to the subsurface by a persistent activity. Table 5.3 summarises the transport characteristics of common pollutants and those in particular that are susceptible to absorption or degradation.

Table 5.3: Vulnerability Definitions for Potentially Polluting Surface Activities

Vulnerability category	Description	Frequency of activity	Travel Time
5	Vulnerable to most water pollutants with rapid impact in many scenarios	Vulnerable to individual events	Rapid
4	Vulnerable to those pollutants not readily adsorbed or transformed		
3	Vulnerable to some pollutants with many significantly attenuated		
2	Vulnerable to some pollutants, but only when continuously discharged/leached		
1	Only vulnerable to conservative pollutants in the long-term when continuously and widely discarded and leached	Vulnerable only to persistent activity	Very slow

Table 5.4: Receptor Sensitivity

Sensitivity	Definition
Very High	Sites with Special Protection, Special Area of Conservation (SAC), Ramsar Site, EC designated freshwater fisheries. All nature conservation sites of national importance designated by statute including: Sites of Special Scientific Interest (SSSI) and National Nature Reserves. Very highly productive bedrock or superficial aquifers Potable groundwater abstractions. Drinking Water Protection Zone Groundwater vulnerability (defined as the tendency and likelihood for general contaminants to reach the water table after introduction at the ground surface.) Category 4 and 5** as shown in Table 5.3. Flood Risk: Areas with a 0.5% (1 in 200 year) or greater probability of being flooded in any given year from either rivers or the sea* Excellent and Good surface water quality with pristine or near pristine water quality corresponding to Classes A1*** Surface water flood flow patterns and pathways outside the site area that directly affect peat deposits. Water supply to significant numbers of residential properties (estates, urban settlements etc) and heavy industrial development

Sensitivity	Definition
High	Areas of internationally or nationally important habitats which are degraded but are considered readily restored Highly productive bedrock or superficial aquifers Potable groundwater abstractions for local use, i.e. farm buildings Drinking Water Protection Zone Groundwater vulnerability (defined as the tendency and likelihood for general contaminants to reach the water table after introduction at the ground surface.) Category 3** as shown in Table 5.3 Flood Risk: Areas with a 0.5% (1 in 200 year) or greater probability of being flooded in any given year from either rivers or the sea* Good surface water quality with pristine or near pristine water quality corresponding to Classes A2*** Surface water flood flow patterns and pathways within and outside the site area that affect directly peat deposits. Water supply to residential properties (small estates, villages etc) and meadium to heavy industrial development Flood flow capacity of Local watercourses (where additional runoff from the site could lead directly to flooding)
Medium	A site designated as a non-statutory designated site e.g. Local Wildlife site, Scottish Wildlife Trust Reserve/Wildlife Site, or a site listed on the Ancient Woodland Inventory (AWI) or Semi-natural Ancient Woodland Inventory (SNAWI); Moderately productive bedrock or superficial aquifers Areas where no abstractions are recorded but may be viable within a Drinking Water Protection Zone Groundwater vulnerability (defined as the tendency and likelihood for general contaminants to reach the water table after introduction at the ground surface.) Category 2** as shown in Table 5.3 Flood Risk: Low to Medium risk area (0.1% to 0.5% (1 in 1000 – 1 in 200)) suitable for most development but not essential civil infrastructure* Biological and chemical water quality within rivers and streams, Fair water quality corresponding to Class B*** Surface water flood flow patterns and pathways within and outside the site area that affect indirectly peat deposits. Flood flow capacity of Local watercourses (where additional runoff from the site would be unlikely lead to flooding) Water supply (mains or private) to individual properties, offices and commercial developments
Low	Low productive bedrock or superficial aquifers Areas where no abstractions are recorded but may be possible within a Drinking Water Protection Zone Groundwater vulnerability (defined as the tendency and likelihood for general contaminants to reach the water table after introduction at the ground surface.) Category 1** as shown in Table 5.3 Flood Risk: Little or no risk area (less than 0.1% (1 in 1000) – no general constraints* Poor surface water quality corresponding to Classes C*** Surface water flood flow patterns and pathways within and outside the site area that are unlikely to affect peat deposits. Local watercourses (where additional runoff would not lead to flooding)

Sensitivity	Definition
Negligible	Flood Risk: Little or no risk area (less than 0.1% (1 in 1000) – no constraints* Non-aquifers Water supply to properties used infrequently or discontinued. Seriously Polluted water quality corresponding to Classes D*** Areas outside the Drinking Water Protection Zone
* Flood Risk definitions quoted from SPP ** Based on SEPA's groundwater vulnerability categories *** Based on SEPA's water quality classifications	

Table 5.5: Criteria to Assess Impact Magnitude

Magnitude	Definition
High	Substantial change in terms of flooding, surface water drainage, hydrology or hydrogeology, which may result in greater impact on the environment and require a longer period to recover (>10 years). Substantial change in baseline water quality either by a relatively high amount for a long-term period or by a very high amount for an episode such that watercourse quality is greatly changed. Equivalent to downgrading from Class A to B or C, or from B to D, that will require >10 years to recover.
Medium	Changes to flooding, surface water drainage, hydrology or hydrogeology, which cause inconvenience, which would recover over a medium period of time (5-10 years). Noticeable change in baseline water quality that may be long-term or temporary. Results in a change in the quality of the watercourse, equivalent to downgrading one class, for example from B to C, that will require between 5-10 years to recover.
Low	Slight change where the proposals could occasionally cause a minor flooding, surface water drainage, hydrology or hydrogeology change in the short term. (1-5 yrs). Minor change in water quality baseline conditions with a minor temporary nature such that watercourse quality is slightly affected, equivalent to minor but measurable change within a class. Results in a change in the quality of the watercourse, equivalent to downgrading one class, for example from C to D but would recover within 1-2 years.
Negligible	No impact detectable or a change within the bounds of natural variation. Very slight change in water quality baseline conditions such that there is no detectable impact upon the watercourse's quality, no change in classification.

Table 5.6: Impact Significance

Magnitude	Sensitivity				
	Very High	High	Medium	Low	Negligible
High	Substantial	Substantial	Major	Moderate	Low
Medium	Substantial	Major	Moderate	Low	Negligible
Low	Major	Moderate	Low	Negligible	Negligible
Negligible	Moderate	Low	Negligible	Negligible	Negligible
Key			Significant Impact		
			Not Significant Impact		

Baseline Environment

5.28 The total area of the Site is approximately 305ha, of which a relatively small area in the northeast would be used to locate the turbines. Approximately 177ha of the Site generally falls southwest toward the River Nith. The remaining area of approximately 129ha falls toward the northwest, east and southeast.

Geology

Soils

5.29 Typically a shallow (often wet and clayey) topsoil is present across the Site. One area of peat (of thickness greater than 900mm) was recorded, in the relatively flat and lower lying area adjacent to the west of the Burntkettle Shooting Ground.

Superficial Deposits

5.30 The publicly available geological information does not indicate the presence of any man made deposits, however, it is considered that localised made ground would be present in the western and central areas of the Site around the residential properties and the railway line. Additionally, two quarries are indicated to the south of Low Auldgirth, which may be backfilled with man made deposits.

5.31 The map information indicates the presence of alluvium (clay, silt and sand) associated with the River Nith (to the west), which may encroach onto the western Site area. Some localised alluvial soils may be present in association with the streams that flow through the Site.

5.32 Glacial sand and gravel soils are indicated to be present beneath the south-west area of the Site, extending from the A76 to the approximate location of the Low Auldgirth properties. The quarries in this area may have worked sand and gravel deposits historically.

5.33 An area of glacial till is indicated in the central northern-western area of the Site, to the west of Keepers Cottage. Within the majority of the central Site area and across the eastern and north-eastern areas the map information indicates the presence of shallow bedrock.

Solid Strata

5.34 The map information indicates the underlying bedrock to be wacke rocks of the Silurian aged Gala Group. These comprise predominantly fine to very coarse sandstones, with subordinate siltstones and mudstones.

Hydrogeology

5.35 The majority of the Highlands and Borders areas (2004 SNIFFER maps) are classed in terms of groundwater as either Vulnerability Class 4 or 5, owing to the widespread occurrence of fractured rock with a generally thin cover of superficial deposits with Nithsdale bedrock and localised sand and gravel aquifers.

5.36 According to SEPA's aquifer maps, the Site lies within an area classified as F, L (Fracture Flow with Low productivity) for bedrock and I, L (intergranular flow with low productivity) for superficial deposits.

5.37 The Site falls within Drinking Water Protection Zone (DWPZ) classified with Pass status.

5.38 SEPA has classified the groundwater in this area as having an overall status of Good with High confidence in 2008. The quality of the groundwater has been classified as Good with High confidence and the quantity of groundwater has been classified as Good with High confidence in 2008. There is no trend for pollutants for the groundwater in this area.

5.39 SEPA has set the overall environmental objectives for the first, second and third RBMP cycles as shown in Table 5.7.

Table 5.7: Groundwater RBMP Cycles

Year	2008	2015	2021	2027
Overall Status	Good	-	-	-
Chemistry Status	Good	Good	Good	Good
Quantitative Status	Good	Good	Good	Good

5.40 The current status of the water body (groundwater) meets the requirements of the WFD, thus SEPA must ensure that no deterioration from Good status occurs, unless caused by a new activity providing significant specified benefits to society or the wider environment.

5.41 SEPA stated (in their response to scoping, dated August 8th, 2011) that there are no records of water supply abstractions within the boundary of the Site, The nearest abstraction point is located within the village of Auldgirth, though outside the Site boundary.

Hydrology

5.42 The annual average rainfall for the area is approximately 1,260mm.

5.43 Topographic gradients influence the direction, rate and velocity of surface runoff and groundwater movement. At the Site the steep topography dictates the gradient of the watercourses, which influences the velocity of flow and speed of flooding, which can occur downstream.

5.44 The proposed turbines are located within the catchment of the Pennyland Burn which is located adjacent to the south east of the Site. The burn is a significant tributary of the River Nith, joining the river at Carnshalloch, approximately 11km to the south of the Site. A second tributary of the Nith, the Clauchrie Burn, is located adjacent to the north west of the Site. The confluence of this burn with the Nith is close to the north western corner of the Site.

5.45 Surface water run-off from the Site drains into a number of small field ditches, which flow into the minor watercourses within the Site as follows:

- The north-eastern area of the Site drains into an unnamed tributary of the Pennyland Burn (approximate total catchment area of this tributary is 3.4km^2);
- The south-eastern area drains into a larger unnamed tributary of the Pennyland Burn (approximate total catchment area of this tributary is 0.64km^2);
- The southern area of the Site drains into several small minor watercourses which converge to drain directly into the River Nith to the west of the Site;
- The north and north-western area of the Site drains into an unnamed tributary of the Clauchrie Burn (approximate total catchment area of this tributary is 0.73 km^2); and
- The remainder of the Site is within the catchment of Clauchrie Burn to its confluence with the River Nith: (approximate total catchment area of which is 0.98km^2).

5.46 A pond is located within the Site boundary, close to the proposed locations of the wind turbines and is approximately centred at NGR 292753E, 588336N.

5.47 There are no designated sites of hydrological interest e.g. Sites of Special Scientific Interest (SSSI) on or in the vicinity of the Site.

Current Water Quality

5.48 Information on SEPA's website classifies the area's major watercourses as follows:

- The River Nith water has an overall status of Good with High confidence in 2008 with ecological status of Good and chemical status of Pass;
- The Pennyland Burn has an overall status of Moderate with Medium confidence in 2008, with ecological status of Moderate and chemical status of Pass; and
- The Clauchrie Burn has an overall status of Good with High confidence in 2008 with ecological status of Good and chemical status of Pass.

5.49 SEPA has set environmental objectives for the three watercourses over future river basin planning cycles. These are set in order that sustainable improvements to watercourse status can be made over time, or alternatively to ensure that no deterioration in status occurs, unless caused by a new activity providing significant specified benefits to society or the wider environment. Overall environmental objectives for the first, second and third RBMP cycles for the watercourses of interest are summarised in Table 5.8.

Table 5.8: RBMP cycles and Environmental Objectives for Local Rivers

Watercourse / Year	2008	2015	2021	2027
River Nith	Good	Good	Good	Good
Pennyland Burn	Moderate	Good	Good	Good
Clauchrie Burn	Good	Good	Good	Good

5.50 The current status of the River Nith and the Clauchrie Burn meets the requirements of the Water Framework Directive (WFD).

Existing Tracks and Culverts

5.51 The existing sections of access tracks proposed for upgrading within the Site cross 11 watercourses, in culverts with diameters varying between 150mm and 450mm.

5.52 The existing tracks do not incorporate any positive (piped) drainage systems or significant ditches associated with the control of surface water. Although the track surface is not tarmacked, the surface is compacted, hence, rain falling onto the track will result in runoff onto the adjacent soft areas during the more extreme events with some rainfall infiltrating into the track.

Flood Risk

SEPA Flood Zones

5.53 The SEPA indicative flood map indicates that the area of the proposed turbines does not fall within predicted flood zones of the major rivers in the area.

5.54 The SEPA indicative flood map shows that the existing Site access from the A76(T) falls within the 200-year flood outline of the River Nith. However, the village of Auldgirth is above the 200-year predicted flood outline and largely free from flood risk. The existing access track (U492n) from Auldgirth village appears to be located above the indicative 200-year flood outline. The SEPA indicative flood outline is shown in Figure 5.1.

Historic Flooding

5.55 According to SEPA the lower portion of the Site i.e. Auldgirth village was subject to flooding from the River Nith during the November 1997 flood. There have also been reports of flooding in Auldgirth village during the November 2009 flood. Precise locations of flooding are not known. However, the SEPA indicative flood map shows three properties along the approaching local road from the south east within the 200-year flood outline which appears to confirm the predicted flood outline for the village.

5.56 The information obtained for the FRA (included as Technical Appendix 5.1) confirms that neither SEPA nor Dumfries and Galloway Council have any records of flooding for the majority of the Site. The FRA concludes that the Site is at low risk of flooding. However, the access from the A76 is located within the SEPA identified Floodplain and may be impassible during the more extreme flood events.

Water Supplies

5.57 Scottish Water has confirmed that they have no sewer systems assets passing through the area of the proposed turbines.

5.58 The Burntkettle Shooting Ground building may have its own private water supply and localised drainage arrangements such as a borehole or well, rainwater harvesting or storage tanks (bowsers). The underlying geology would suggest that a private well is unlikely. Drainage is likely to be localised and may include a septic tank or other containment vessel for foul flows, with surface discharged to the local land.

5.59 Scottish Water records shows water supply distribution pipe to the farmhouse and building at Low Auldgirth and the farm and existing properties at High Auldgirth.

Project Characteristics

5.60 The key components of the Development are detailed in Chapter 3: Project Description and include not only the physical characteristics of the Development (turbines, access tracks etc) but also embedded mitigation, further detail on which is provided below.

5.61 The greatest potential for impacts to the physical environment would occur during the construction phase (and decommissioning works to a lesser extent). Specific construction activities that could cause environmental impact include excavations for the following:

- Turbine and anemometer foundations (each turbine requiring an excavation of approximately 20m x 20m). Each turbine foundation excavation would be likely to be kept open for four to eight weeks during the construction programme, and would be dewatered during this time;
- Crane hard standing areas;
- Access tracks;
- Cable and service trenches;
- Borrow pits (two preferred locations have been identified as shown on Figure 3.2, other potential locations shown would only be considered if the preferred locations do not generate sufficient stone of suitable quality); and
- Construction compound / substation building

5.62 In addition, the following construction activities may also impact the physical environment:

- General site clearance - e.g. from stripping the working area of vegetation and topsoil leaving ground surface exposed to erosion by the elements;
- Stockpiling (of topsoil and excavated material);
- Storage of construction materials, fuels and oils etc on-site at the construction compound;
- Concrete pour for the turbine foundations;
- Construction vehicle traffic within the Site;
- Construction of two new culverts and upgrading of 11 existing culverts in accordance with best practice guidance e.g. CIRIA Culvert Design Guide C689, 2010[18] as required; and
- Borrow pit restoration (to be completed at the end of the construction works).

Embedded Mitigation

Construction

5.63 As set out in Chapter 3: Project Description the Development includes a level of embedded mitigation. This mitigation includes adherence to best practice guidance including SEPA Pollution Prevention Guidelines (PPGS and implementation of a Construction Environmental Management Plan (CEMP) for the duration of the

construction and decommissioning phases of the Development. The CEMP includes minimum requirements for pollution control and drainage design.

Operation

5.64 As stated in the embedded mitigation for the Development, the drainage design for the hard standing areas of the Development would include Sustainable Drainage Systems (SuDS), to provide treatment of surface run-off, protect receiving water quality and control run-off rates.

5.65 SuDS would be in the form of filter trenches, swales and/or infiltration/attenuation basins. Should attenuation basins be included these would be designed to cater for a 1 in 200 year flood event with an appropriate freeboard designed to accommodate a 1 in 200 year plus climate change flood event. The discharge from any attenuation basins would be limited to 1 in 2 year 'greenfield' runoff rates. Overland flow routes would be provided for more extreme events allowing safe discharge of the runoff towards the nearest watercourse. Location and size of the attenuation basins would be determined prior to commencement of construction and subject to agreement with the relevant statutory authorities. It is not anticipated that the basins would be significant in size.

5.66 Track edge drainage in the form of lateral filter drains or swales would be used to control runoff from the running face to lower water levels in the sub-grade, to control surface water and groundwater from adjacent higher ground and carry the flow to the outfall points. Drainage would be designed and constructed in accordance with the guidance given in the SUDS Manual[9] and the joint publication by Scottish Renewables, Scottish Natural Heritage (SNH), SEPA and Forestry Commission Scotland (FCS)[19].

5.67 As discussed in Chapter 3: Project Description construction activities potentially affecting the minor watercourses within the Site i.e. the culvert construction would be subject to authorisation under the CAR 2011 regulations. The CAR application should demonstrate that the works would not cause adverse morphological impact on the minor local watercourses and would not present a risk to the water environment in terms of habitat loss, river geomorphology and impact on fish. CAR 2011 requirements are summarised in Table 5.9 below.

Table 5.9: CAR Requirements

Details	Watercourse/Ditch Crossing		
	Tributary Pennyland Burn	Removal of Existing Culvert and Construction of new Culvert	Removal of Existing Culverts and Construction of New Culverts
Watercourse crossing	New crossing required for access track leading to Turbine No.1 and 3.	New crossing required for access track to the wind farm	In total, 11 existing culverts require to be upgraded

Details	Watercourse/Ditch Crossing		
	Tributary Pennyland Burn	Removal of Existing Culvert and Construction of new Culvert	Removal of Existing Culverts and Construction of New Culverts
Grid reference	Approx: E293128, N588424	Approx: E291582, N587285	At points along the proposed access track. Approximate locations are shown on constraints plan.
New/existing	New crossing is located approximately on the middle reach of the unnamed tributary of Pennyland Burn, with low vegetation on banks. Small watercourse is, with top width less than 2m.	Removal of existing culvert at the existing field access and construction of a new culvert over a small stream, which drains into the unnamed tributary of Clauchrie Burn with low vegetation on banks. Small stream, with top width less than 2m	Removal of existing culverts, and construction of new culverts with low and high vegetation. Very small streams, with top width less than 2m.
Type of crossing required	See Note*	See Note*	Pipe culverts
The level of CAR2011 authorisation required	Registration	Registration	Registration
Note: * SEPA Position Statement to support the implementation of CAR indicates that closed culverts used for river crossings would normally only be justified for single track roads over small watercourses (<2m in width). For all other crossings, the use of span bridges and bottomless arch structures should be pursued, where practicable.			

Predicted Impacts

Construction Impacts

Untreated large stockpiles of topsoil on site could slough off into the ditches and then watercourses during heavy intense rainfall events

Hydrology

5.68 During the construction phase, the greatest risk to watercourses in terms of both flooding and contamination would be due to intense rainfall events which could mobilise materials from exposed ground, topsoil stockpiles etc., held within the Site and, if not controlled, these would be conveyed to the tributary of the Pennyland Burn which then transported into the Pennyland Burn. Construction management practices as set out in the CEMP would, however, reduce this risk. Based on the sensitivity of the Pennyland Burn, which is considered to be 'Medium' (in terms of water quality) with the 'Negligible' magnitude of silts and other materials reaching the watercourse, the significance of impact on water quality would be **Negligible** as defined by Table 5.5.

5.69 To a lesser extent, there would be an impact on Clauchrie Burn. Based on its sensitivity, which is considered to be 'High' (in terms of water quality) and again with a 'Negligible' magnitude of material/silt passing the protection measures and considering the small extent of the track upgrade, the significant of impact would be **Low (not significant).**

5.70 There is also the potential risk of accidental spillages, leakage of liquids (such as fuels and oils from tanks and refuelling areas) and other pollution incidents. If leached into the watercourses, these would potentially have detrimental impacts by drawing oxygen from the water and altering the pH of the water. Adequate storage, careful management and a pollution incident plan as detailed in the CEMP would minimise the risk of such an incident into the 'Medium' water quality of the receiving waters (Pennyland Burn) and 'High' water quality sensitivity of Clauchrie Burn. With a 'Low' magnitude of any event, the overall significance of impact on water quality would be **Low (not significant)**.

5.71 The uncontrolled discharge of surface runoff from the construction works areas into the local minor watercourses and ditches during storm events have the potential to cause localised flooding and increase the risk of flooding downstream. These changes and concentration of overland flood flow pathways could result in a temporary increase in water levels within the watercourses locally. By early establishment of temporary drainage facilities as well as implementation of SUDS methodology, the magnitude of any flood event downstream during construction would be considered to be 'Negligible'. With the 'Medium' sensitivity of the receptor (Pennyland Burn) to surface water runoff due to its rural environment the overall significance of impact would be **Negligible (not significant).**

5.72 Existing access tracks would be upgraded within the Site. Six of the existing culverts are to be upgraded with the culvert design and construction works to be undertaken in accordance with best practice guidance, SEPA PPG and CAR 2011 as set out in Chapter 3 embedded mitigation. These fall within the catchment of Clauchrie Burn. With the receptor (local ditch flood flow capacity) sensitivity considered to be 'Low' in respect of changes to the flow regime within the watercourse, and with a long term magnitude of the impact of changes to the existing culverts considered to be 'Low', the overall significance of impact and potential to cause flooding would be **Negligible (not significant)**.

5.73 The rest of the existing access track upgrade falls within the catchment of Pennyland Burn. Three existing culverts would be upgraded as part of these works. With the receptor (local ditch flood flow capacity) sensitivity in respect of changes to the flow regime within the watercourse considered to be 'Low', and with a long term magnitude of the impact of changes to flooding related to the existing culverts considered to be 'Low', the overall significance in relation to flooding would be **Negligible (not significant).**

5.74 There would be one new minor watercourse crossing (the unnamed tributary of the Pennyland Burn) which would be crossed by the new section of the access track to turbines 1 and 3. This crossing would also be undertaken with the culvert design and

construction works to be in accordance with best practice guidance, SEPA PPG and CAR 2011 as set out in Chapter 3 embedded mitigation. The receptor (unnamed tributary) sensitivity in respect of changes to the flow regime within the watercourse considered to be 'Medium' (i.e. change in flood risk potential). The long term magnitude of any change in flow characteristics is considered to be 'negligible' i.e. providing bottomless arched culvert or large culvert with natural bed that maintain existing flow characteristics, the overall significance of impact of the construction of the new culvert would be **Negligible (not significant).**

5.75 There would be one new minor watercourse crossing (a small steam discharging into the unnamed tributary of the Clauchrie Burn) which would be crossed by the access track to the Development. The receptor (smaller streams) sensitivity in respect of changes to the watercourse flow is considered to be 'High' but there would be a long-term 'negligible' magnitude of any change in flow characteristics i.e. by providing a bottomless arched culvert or large culvert with natural bed that maintain existing flow characteristics. The overall impact significance of the new culvert construction on water flow would be **Low (not significant).**

5.76 During construction of the access tracks, there is a risk of interrupting the water supply to the existing shooting ground building. With the receptor (the shooting range operators and customers) sensitivity considered 'Low' (the compound is not used on a daily basis), and with a short-term magnitude of impact also considered 'Low' (timescale to effect repairs), the overall significance of impact would be **Negligible (not significant)**.

5.77 There is also a risk of interrupting the water supply to the existing properties and farm building at Low Auldgirth and High Auldgirth. With the receptor sensitivity considered 'Medium' (small number of residential properties) with a short-term magnitude of impact (any interruption would be repaired quickly) considered to be 'Low', the overall significance of impact would be **Low (not significant).**

5.78 During construction, the turbine foundation excavations would be dewatered. The discharge would be a point discharge into the ditches and unnamed watercourse. This has the potential to increase the water levels and change water temperature locally in the tributary of the Pennyland Burn. The CEMP will include measures and methodologies for dewatering that will minimise the concentration of pumped waters. Based on 'Low' sensitivity of receptor to changes in flow and temperature and 'Low' magnitude of impact (volumes and rates of flow), the overall significance of impact would be **Negligible (not significant)**.

5.79 During construction, there is potential risk of flooding of the River Nith affecting A76, the main access route to the site disrupting access to and from the site. There is an available alternative dry access from the existing minor road towards Dalswinton to the southeast. Based on 'Low' sensitivity of receptor (construction work - as work practices could be tailored to suit conditions) and the 'Low' magnitude of impact (Construction staff - although delivery of larger wind farm components may be disrupted to a greater extent but the duration of the disruption is unlikely to significantly impact the

construction works), the overall significance of impact would be **Negligible (not significant)**.

Hydrogeology

5.80 There is a potential risk of pollution to groundwater from fuel and chemical spills during construction. The receptor sensitivity (groundwater, water quality) is considered to be 'High' due to its Pass status in terms of Drinking Water Protection Zone. Implementation of hazardous materials controls within the CEMP would minimise potential risk. Hence, with a 'Negligible' magnitude of the impact, the overall significance of impact would be **Low (not significant)**.

Operational Impacts

5.81 Once the Development is operational, there would be occasional vehicles visiting the Site for maintenance and servicing of the turbines, and there would be a permanent change in the impermeable surface area within the Site due to the new length of access track (which is currently made of compacted soil and gravel) crane hard standing and turbine foundations. This would create a total area of new hard standing of 2.37ha, compared with the total area of the Site i.e. 305ha, it equates to 0.78% of the Site area.

5.82 The impacts of the Development on physical environment would be minimal during operation. However, the following hydrological and hydrogeological impacts have been considered:

- Risk associated with increase runoff and flooding downstream due to new impermeable areas; and
- Potential risk associated with spillage of fuels, oils and lubricants by vehicles using the access tracks through the wind farm.

Hydrology

5.83 The uncontrolled discharge of surface runoff from the Site areas into the local minor watercourses and ditches during storm events has the potential to cause localised flooding and increase the risk of flooding downstream. These changes and concentration of overland flood flow pathways due to the slight increase in impermeable area and the layout of the access tracks could result in increase in water level locally. The implementation of SUDS methodology to control discharges would eliminate the risk of flooding downstream by limiting peak flows and retaining the volumes on-site until such time as the runoff is released. The 'Medium' sensitivity of the receptor (Pennyland Burn) to runoff increases and the magnitude of changes to the flooding patterns downstream as a result of the inclusion of the SuDS scheme would be considered to be 'Negligible'. Hence, the overall significance of impact would be **Negligible (not significant)**.

5.84 Accidental spillage of fuels, oils and lubricants by maintenance vehicles has the potential to cause pollution of the watercourses. Operational activities are unlikely to involve large quantities of potentially contaminative materials. With the SuDS elements in place no direct route to a watercourses is possible for pollutants. The water quality

receptor sensitivity to pollution is considered to be 'medium' for the Pennyland Burn and 'Low' for Clauchrie Burn and the short-term magnitude of impact considered to be 'Negligible'. Hence, the overall significance of impact would be **Negligible (not significant)**.

Hydrogeology

5.85 The increase of impermeable land cover (access tracks and turbine bases) has a small potential to reduce the surface recharge of the groundwater regime by preventing rainfall infiltrating in to the underlying soils. Although the access tracks are stone surfaced, there would be runoff particularly during more extreme rainfall events. However, the implementation of SuDS in controlling the volume and rate of runoff from these areas would minimise the magnitude of change. With the receptor sensitivity (groundwater levels) considered to be 'Low' and a 'Negligible' magnitude of impact, the overall significance of impact would be **Negligible (not significant)**.

Decommissioning

5.86 The impacts during decommissioning phase would be similar to those during construction phase, though there would be no geological impacts as there would be no further excavations.

Hydrology

5.87 The only impacts considered in terms of the Development during its decommissioning relate to the potential contamination of soils, surface water or groundwater e.g. from spillages of hazardous materials used during decommissioning and demolition, such as fuels and lubricants.

5.88 Similar to the construction phase, the greatest risk of flooding generated from the site causing changes to water quality would be due to intense rainfall events, which can mobilise materials (excavations, stockpiles, recovered road stone etc). The sensitivity of the watercourses to these changes are considered to be 'Medium' for Pennyland Burn and 'High' for Clauchrie Burn.With the SuDS measures in place and the application of the CEMP, a 'Negligible' magnitude of change would result and the significance of any impact on the water quality of the watercourses would be **Negligible (not significant).**

5.89 Similar to the construction phase, there is the potential risk of accidental spillages, leakage of liquids (such as fuels and oils from tanks and refuelling areas) and other pollution incidents. If leached into the tributary of Pennyland Burn and then Pennyland Burn, these would potentially have detrimental impacts by drawing oxygen from the water and altering the pH of the water due to the introduction of alkaline chemicals. By implementation of spillage of hazardous materials controls as described in the CEMP and the presence of the SuDS features, this would reduce the risk and based on the 'Medium' sensitivity (water quality of the receiving waters-Pennyland Burn) and a 'Low' magnitude of any event, the overall the significance of impact would be **Low (not significant)**.

5.90 To a comparatively lesser extent, this potential risk of accidental spillages could impact Clauchrie Burn. Again, by the implementation of the CEMP and the presence of the SuDS features, based on its 'High' sensitivity to pollution and with a 'Negligible' magnitude of any event because of small extent of the track involved, the significance of impact would be **Low (not significant).**

Hydrogeology

5.91 There is a potential risk of pollution to groundwater from fuel and chemical spills during the decommissioning works. The implementation of the CEMP to reduce sources of contamination and control spillages and the presence of the SuDS features that would be design to incorporate water quality improvement elements (to allow filtering and settlement of pollutants within the SuDS components) will result in a 'Negligible' magnitude of impact. The receptor sensitivity to pollution (groundwater) is considered to be 'High' due to its Pass status, and thus results in a **Low (not significant)** overall significance of impact.

Mitigation Measures

5.92 The Development would include embedded mitigation, as described in Chapter 3, including good working practices during the construction and decommissioning works, the implementation of the CEMP and SWMP and the inclusion of sustainable drainage measures. No further mitigation measures are proposed for any phase of the Development.

Residual Impacts

5.93 Providing the embedded mitigation is implemented for the Development, residual impacts to the physical environment from the construction, operation and decommissioning of the Development would be not significant.

Cumulative Impacts

5.94 Cumulative impacts are those, which result from incremental changes caused by other consented but not constructed or reasonably foreseeable future actions together with the Development.

5.95 Current planning policy, government and SEPA guidance would impose similar environmental constraints on all other developments in terms of attenuation, flood protection levels and discharge quality that are applicable to this Site. Hence, in hydrological and flood risk terms, there would not be any significant cumulative impacts from this Development.

Chapter 5 References

[1] The Water Environment (Controlled Activities), Scotland) Regulations, 2011

[2] *Flood Risk Management (Scotland) Act 2009*

[3] *Water Environment and Water Services (Scotland) Act 2003*

[4] *The Private Water Supplies (Scotland) Regulations (2006)*

[5] *Water Framework Directive (2000)*

[6] The Environment Agency/SEPA (2009), *The River Basin Management Plan for the Solway Tweed River Basin District* 2009–2015 Strategic Environmental Assessment statement

[7] Dumfries and Galloway Council (2007), *Strategic Flood Risk Assessment*

[8] Institute of Hydrology (1999), *Flood Estimation Handbook, CD ROM,* Wallingford

[9] CIRIA (2007), *The SUDS Manual C697*

[10] SEPA (2000), *Watercourses in the Community*, a Guide to Sustainable Watercourse Management in the Urban Environment

[11] SEPA (2000), *Ponds, Pools and Lochens, Guidance on Good Practice in the Management and Creation of Small Waterbodies in Scotland*.

[12] SEPA (2010), *Technical Flood Risk Guidance for Stakeholders*

[13] SEPA (2000), *Development at Risk of Flooding, Advice and Consultation – a SEPA Planning Authority Protocol*

[14] Scottish Executive (2000), *River Crossings and Migratory Fish*: Design Guidance a Consultation Paper

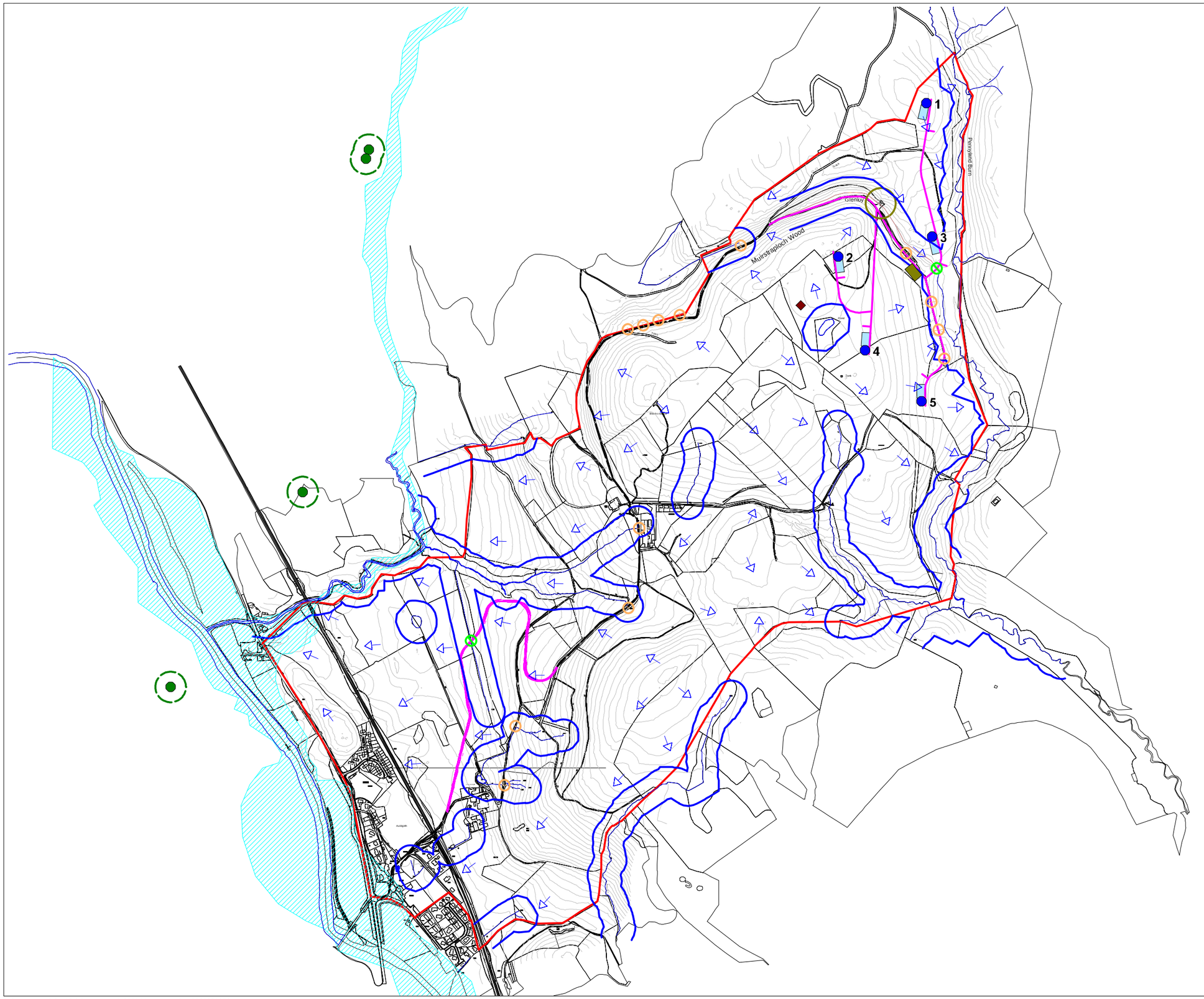
[15] Scottish Government, 2010, Scottish Planning Policy, A Statement of the Scottish Government's Policy on Nationally Important Land Use Planning Matters

[16] (2006) National Water Quality Classification

[17] SNIFFER (2004), *Development of a Groundwater Vulnerability Screening Methodology for the Water Framework Directive*

[18] CIRIA (2010), *Culvert Design Guide C689*

[19] Scottish Renewables, Scottish Natural Heritage, Scottish Environment Protection Agency, Forestry Commission Scotland, 2010, Good Practice During Wind Farm Construction http://www.snh.org.uk/pdfs/strategy/renewables/Good%20practice%20during%20windfarm%20construction.pdf



Proposed Turbine
Site Boundary
Existing Road to be upgraded
Potential Access Track
Crane Hard Standing
Proposed Construction Compound including Substation
Proposed Met Mast Location
50m easement from any water features
50m easement from Burntkettle Shooting Ground
Existing Overland Flow Directions
SEPA abstraction and discharge points and 50m buffer
Approximate location of existing culvert crossing
Proposed new watercourse crossing
SEPA flood extent (area at flood risk only)

Rev	Date	Description	Drn	Chk	App
00	07.12.11	Layout	BF	MK	MK

FORCE 9 ENERGY

Blackwood Wind Farm

RSK

Figure 5.1 - Hydrological Constraint Plan

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6 ECOLOGY

Introduction

6.1 This chapter sets out the methods and findings of ecological surveys, evaluates the current nature conservation interest and assesses the likely impacts on terrestrial ecology (except birds) during the construction, operation and decommissioning of the Development. In addition this chapter presents the mitigation measures incorporated into the Development design (embedded mitigation) and additional measures required to mitigate impacts on habitats and species. Finally, the chapter assesses the predicted residual impacts of the Development. By its nature ecology is closely interlinked with a number of environmental topics which are more fully addressed in other chapters, in particular ES Chapter 5: Physical Environment, and ES Chapter 7: Ornithology.

6.2 The planning application boundary (the Site) consists primarily of agricultural land and rough, semi-improved grassland which contains grazing livestock. Areas of woodland are present within the Site and include some of ancient origin. Pennyland Burn is the principal watercourse present within the Site; all watercourses within the Site boundary are within the catchment of the River Nith which flows adjacent to the western edge of the Site (see Chapter 3 – Project Description).

6.3 The area considered for assessment in this chapter is referred to as the Site and is defined by the area shown in Appendix 6.1, Figures 1.1 and 1.2, along with specific survey areas which were determined during the scoping process. The Site boundary runs along the A76 road at Auldgirth at its western extent, follows Ballochan Linn Burn, Clauchrie Plantation and Muirstraploch Wood along its northern boundary and is bordered to the east by Pennyland Burn along much of its length. The southern boundary of the Site passes alongside woodland and through farmland.

6.4 There are a small number of buildings including occupied dwellings and farm buildings within the Site boundary.

Legislation and Policy

6.5 The general methodology of the Environmental Impact Assessment (EIA) takes account of the Scottish Planning Circular 3: The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2011. The 2011 Regulations consolidate, update and replace Part II of the Environmental Impact Assessment (Scotland) Regulations 1999. Details of the UK, Scottish and Local planning policies which apply to this chapter are discussed in detail in Chapter 4 – Planning.

6.6 This chapter pays regard to the requirements of, and advice given in:

- The EC Habitats Directive (Directive 92/43/EEC) as translated into UK law by the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended in Scotland);
- Surface Waters (Fishlife) (Classification) (Scotland) Regulations 1997 (as amended);
- Wildlife and Countryside Act 1981, as amended (WCA);
- The Protection of Badgers Act 1992;
- Nature Conservation (Scotland) Act 2004;
- The EC Water Framework Directive (Directive 2000/60/EC) with regard to groundwater-dependent terrestrial ecosystems;
- The Wildlife and Natural Environment (Scotland) Act 2011);
- Consolidated Scottish Planning Policy (SPP) (February 2010);
- Planning Advice Note (PAN) 60: Planning for Natural Heritage;
- Nature Conservation: Implementation in Scotland of the Habitats and Birds Directives: Scottish Executive Circular 6/1995 as amended (June 2000);
- Scottish Executive Guidance on Protected Species (SE, 2001[1]);
- Dumfries and Galloway Council's Draft Interim Planning Policy on Wind Energy Development[2];
- Nithsdale Local Plan General Policies 1 (development principles); 2 (development considerations); 7 (siting and design) and 12 (potentially polluting development);
- The UK Biodiversity Action Plan (UK BAP);
- The Scottish Biodiversity List (SBL);
- The Dumfries and Galloway Local Biodiversity Action Plan (LBAP)[3];
- Land Use Planning System - SEPA Guidance Note 4: Planning Guidance on Wind farm Developments[4]; and
- Good Practice during Wind farm Construction[5]

6.7 Baseline surveys follow nationally recognised guidelines and the ecological impact assessment takes into account the recognised Institute of Ecology and Environmental Management guidelines[6] (the "IEEM Guidelines").

Method of Assessment

The scoping process

6.8 The initial scope of this assessment was derived from a general knowledge of wind farm/ecology interactions and the potential for nature conservation receptors to be significantly affected, combined with a desk study and consultation exercise.

6.9 The proposed scope of the ecology surveys was initially detailed in a Scoping Request which was submitted to Dumfries and Galloway Council (DGC) on 19 May 2011[7]. Scoping opinions which are relevant to the Ecology chapter were received from

Scottish Natural Heritage (SNH) and the Scottish Environmental Protection Agency (SEPA).

6.10 SNH indicated in their response that the scope of survey work should include:

- Desk study and subsequent field survey work at an appropriate time of year for otter, great crested newt, bats, water vole, badger and red squirrel in order to assess whether these protected species are likely to be affected by the proposals.
- Phase 1 habitat survey of the proposed development site at a suitable time of year, and a further survey using the National Vegetation Classification (NVC) system where the Phase 1 survey identifies habitats and/or species of note, such as those included on Annex 1 of the Habitats Directive or the Dumfries and Galloway LBAP.

6.11 SEPA noted in their response that a Phase 1 habitat survey should be carried out for the whole site and NVC should be carried out for any wetlands identified, with the results of these findings included in the ES along with appropriate maps and location of infrastructure.

6.12 The DGC ecologist did not provide any comment in the Scoping Opinion.

Desk study

6.13 Baseline data on the nature conservation interest of the Site and its surroundings, including information on statutory and non-statutory designated nature conservation sites, protected and notable species - defined in Box 1 - were sought from the following sources:

- Joint Nature Conservation Committee (JNCC) website8;
- SNH Site Link website9;
- The National Biodiversity Network website10 (NBN Gateway);
- Dumfries and Galloway Environmental Resources Centre (DGERC) provided information regarding broad habitats, notable and protected species and local non-statutory designations;
- SNH provided information regarding statutory designations within 20km of the site boundary in their Scoping Response, dated 28 June; and
- Large-scale 1:10,000 Ordnance Survey (OS) maps in conjunction with colour 1:25,000 OS map (to determine the presence of ponds and other features of nature conservation interest).

6.14 A 2km search area from the consultation boundary (shown in Appendix 6.1, Figures 3.1 and 3.2; and in Appendix 6.2, Figures 3.1 and 3.2) was specified when requesting baseline data, which was increased to 12km with regard to bats from DGERC (this concurs with accepted guidance[11]). These distances were considered adequate in terms of mobility of species outside the Site boundary which could be affected by the Development.

6.15 Further information relevant to the scoping process, the evaluation of the nature conservation features that could be affected by the development and the assessment of its impacts upon them, was obtained through searches of internet sources (e.g. UKBAPs, LBAP) and relevant published literature (i.e. relevant guidance documents and scientific papers).

Box 1 Sites of nature conservation value and protected & notable species

Statutory nature conservation sites

SNH notifies sites that are of national importance for nature conservation as Sites of Special Scientific Interest (SSSIs), although some sites that are of national importance for certain species have not been so designated. Internationally important sites may also be designated as Special Areas of Conservation (SAC), Special Protection Areas (SPA) or Ramsar sites (it should be noted that SSSI designations also apply to most internationally designated sites).

Non-statutory nature conservation sites

In Dumfries and Galloway non statutory wildlife sites are entitled as Local Wildlife Sites or Local Biodiversity Sites. A site may qualify as a Local Wildlife Site due to the presence of a notable species or an important habitat. These designations broadly constitute the most important wildlife and geological sites that do not reach the criteria required for SSSI designation, and include Scottish Wildlife Trust (SWT) Reserves, SWT Sites and woodlands listed on the Ancient Woodland Inventory (AWI).

Protected species

Many species of animal and plant receive some degree of legal protection. For the purposes of this study, legal protection refers to:

Species included on Schedules 1, 5 and 8 of the Wildlife and Countryside Act 1981 (as amended), excluding species that are only protected in relation to their sale (see Section 9[5] and 13[2]), reflecting the fact that the Development does not include any proposals relating to the sale of species;

Species included on Schedules 2 and 5 of The Conservation (Natural Habitats, &c) Regulations 1994 as amended in Scotland; and

Badgers, which are protected under the Protection of Badgers Act 1992 (as amended by the Nature Conservation (Scotland) Act 2004).

Notable Species

Species which are listed on UK and/or Local BAPs or those which are of some other conservation interest based on their status nationally, regionally and locally.

Results of the scoping process

6.16 The net result of the consultations and collation of baseline data was a scope that encompassed the following:

- Consideration of how the development may affect the ecological interest features of nearby statutory and non-statutory designated sites of nature conservation importance;
- A Phase 1 habitat survey (including a desk study) which was extended to include an assessment of habitat suitability for legally protected species. This identified the potential for a range of protected species that may be present at the Site and was used to inform the scope and extent of surveys carried out for badger, bats, great crested newt, otter, red squirrel and water vole. The desk study identified the presence of reptiles in the surrounding area and the extended Phase 1 recorded some habitats within the site that may support these species. However, it was not considered necessary to carry out a

specific reptile survey due to the limited level of protection that they receive in the UK12. Mitigation measures have, however, been included to ensure that there is minimal risk to reptiles posed by the development (see paragraph 6.125);

- Similarly, targeted surveys were not undertaken for fish and freshwater habitats, given that the Development includes only minor watercourse crossings, which were considered unsuitable for supporting spawning salmonids.
- An assessment of the impacts of construction, operation and decommissioning of the wind farm upon protected species and sensitive habitats (such as watercourses, wetlands, woodlands) and design of appropriate mitigation if impacts are predicted to occur;
- Consideration of how the development would affect habitats and species identified in the UK BAP and LBAP, together with Dumfries and Galloway species and habitats of conservation concern, as identified by the outcome of the desk study;
- Incorporation of habitat management / enhancement objectives; and
- Identification of the need for any ecological survey / monitoring prior to or during construction and / or operation.

Field survey methods

6.17 Full details of the ecological surveys undertaken are provided in **Appendix 6.1** (Baseline Ecology Report) and **Appendix 6.2** (Bat Survey Report). Survey dates and standard guidance documents referred to are provided in Table 6.1. The survey area covered an appropriate area within the Site boundary, depending upon the ecological feature being surveyed as described in the table.

Table 6.1 – Ecological Surveys Undertaken and survey Dates.

Ecological Survey	Date (s)	Surveyor(s) and Methodology
Phase 1 Habitat Survey and Extended Phase 1 Habitat Survey Surveys were completed within the extended Phase 1 habitat survey area including along the proposed new access track – see Appendix 6.1 and Figure 2.1)	04-05 May 2011 01-03 June 2011 Proposed access track: 03-04 August 2011	AMEC Consultant Ecologist Jenny Sneddon BSc (Hons) MSc MIEEM AMEC Consultant Ecologist Rachel Finan BSc (Hons) MSc AMEC Senior Consultant Ecologist Claire Hopkins BSc (Hons), MSc MIEEM. Phase 1 and extended Phase 1 habitat surveys followed standard guidance[13,14, 15]
Badger Surveys Surveys were undertaken in all suitable habitats within the protected species survey area including along the route of the new access track - see Confidential Appendix 6.1 Figure 3.5 (NB sensitive information regarding	04-05 May 2011, 04 August 2011 and 15 September 2011	AMEC Consultant Ecologist Jenny Sneddon BSc (Hons) MSc MIEEM AMEC Consultant Ecologist Rachel Finan BSc (Hons) MSc AMEC Senior Consultant Ecologist Claire Hopkins BSc (Hons), MSc MIEEM. The survey followed accepted

Ecological Survey	Date (s)	Surveyor(s) and Methodology
the location of badger setts is excluded on welfare grounds – this has been provided in a confidential annex to DGC and SNH).		standard practice[16].
Bat Surveys Bat roost suitability surveys within the bat survey area including along the proposed access track. Bat activity transect and static Anabat surveys within the core bat survey area – see Appendix 6.2 Figures 3.4 and 3.11).	Bat roost suitability survey: 23-24 August Bat activity transect surveys: 11 May (dusk) 14 June (dusk) 13 July (dawn) 08 August (dusk) 05 September (dusk) 18 October (dusk) Manual emergence/re-entry survey: 08-09 September 21-22 September 28-29 September Static Anabat surveys: 14-17 June 27-31 July 03-08 August 28 September-02 October	Bat roost suitability surveys: AMEC Senior Consultant Ecologist Claire Hopkins BSc (Hons), MSc MIEEM (SNH licence no 12067) AMEC Consultant Ecologist Rachel Finan BSc (Hons) MSc (trainee licensed bat worker and agent under Claire Hopkins' licence) Bat activity transect and manual emergence/re-entry surveys: Echoes Ecology Ltd (bat survey specialists). Static Anabat surveys: AMEC Consultant Ecologist Rachel Finan BSc (Hons) MSc and AMEC Consultant Ecologist Jenny Sneddon BSc (Hons) MSc MIEEM. Surveys followed standard guidelines[12,]
Great Crested Newt Survey Survey area included one pond within the protected species survey area – see Appendix 6.1 Figure 3.4.	Habitat suitability survey 12 April 2011 Subsequent survey visits: Visit one: 4-5 May Visit two: 11-12 May Visit three: 1-2 May Visit four: 2-3 June	HSI assessment by AMEC Principal Ecologist Anita Hogan BSc (Hons), MSc, CEnv and MIEEM Subsequent surveys by AMEC Consultant Ecologist Jenny Sneddon BSc (Hons) MSc MIEEM and AMEC Consultant Ecologist Rachel Finan BSc (Hons) MSc under SNH Licence No. 11394. A Habitat Suitability Index (HSI) was calculated in accordance with standard guidance[17]. The subsequent survey followed standard guidance[18 19].
Otter survey Targeted surveys were completed along all waterbodies, streams, drainage ditches and foraging habitat within the protected species	04-05 May 2011 04 August 2011 15 September 2011	AMEC Consultant Ecologist Jenny Sneddon BSc (Hons) MSc MIEEM AMEC Consultant Ecologist Rachel Finan BSc (Hons) MSc

Ecological Survey	Date (s)	Surveyor(s) and Methodology
survey area, where accessible. The survey included the 250m around proposed turbine locations and within 100m of access roads. See Appendix 6.1, Figure 3.4)		AMEC Senior Consultant Ecologist Claire Hopkins BSc (Hons), MSc MIEEM. Standard survey methodology was followed during the surveys[20].
Red squirrel survey Survey for suitability of red squirrel carried out within protected species survey area; targeted surveys undertaken in Muirstraploch Wood (see Appendix 6.1, Figure 3.4).	03-04 August 2011 15 September 2011	AMEC Consultant Ecologist Rachel Finan BSc (Hons) MSc AMEC Senior Consultant Ecologist Claire Hopkins BSc (Hons), MSc MIEEM. Survey was undertaken following standard survey methodology[21]
Water vole survey Targeted surveys were completed along all waterbodies, streams, drainage ditches and foraging habitat within the protected species survey area, where accessible. The survey included the 250m around proposed turbine locations and within 100m of access roads. See Appendix 6.1, Figure 3.4)	04-05 May 2011 04 August 2011 15 September 2011	AMEC Consultant Ecologist Rachel Finan BSc (Hons) MSc AMEC Senior Consultant Ecologist Claire Hopkins BSc (Hons), MSc MIEEM. Standard survey methodology was followed during the surveys[22].

Other species

6.18 Incidental sightings of other species were recorded during the surveys.

Assessment methodology for identifying significance of impacts

Assessment Methodology

6.19 The assessment of the significance of predicted impacts on ecological receptors is based on both the 'value' of a receptor and the nature and magnitude of the impact that the Development would have on it. Impacts on biodiversity may be direct e.g. the loss of species or habitats, or indirect e.g. impacts due to noise, dust or disturbance, on receptors located within or outside the application area.

Valuation of Receptors

6.20 This evaluation methodology has been adapted from the IEEM Guidelines[vii]. A key consideration in assessing the impacts 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 Site.

6.21 In identifying these receptors, it is important to recognise that a development can affect flora and fauna directly e.g. the land-take required, and/or indirectly, by affecting land beyond the development site e.g. through noise generation or hydrological impacts.

6.22 Since it is impractical for an assessment of the ecological impacts of a development to consider every species and habitat that may be affected, it should focus on valued ecological receptors. The approach that has been undertaken throughout this EIA process is therefore to identify 'valued ecological receptors', which are species and habitats that are both valued in some way and could be affected by the development.

6.23 The value of species populations and habitats is assessed with reference to:

- Their importance in terms of '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 that they provide.

6.24 Where there is no potential for valued ecological receptors to be affected significantly, it is generally not necessary for them to be considered. However, it should be noted that ecological receptors may benefit from legal protection and these are considered separately.

6.25 Both species' populations and habitats have been valued using the following scale: International; National (UK); Regional; District/County Level; Local; Less than Local. The approach taken in this assessment is that a species population that is considered to be of District or greater importance in biodiversity conservation terms is considered to be a valued ecological receptor. Therefore, if a species population is considered to be of local value or less, the Development would not have a significant impact on the receptor in question. Exceptions are if the species population has been identified as having a high social or economic value or if the species is legally protected.

6.26 A similar approach is adopted for habitats i.e. if a habitat is considered to be of local value or less, the Development would not have a significant impact on the receptor in question. The exceptions to this would be if;

- The habitat has economic or social value (e.g. an open space that is used extensively for informal recreation by local people, where the area's wildlife is an important contribution to this value); or
- The habitat is identified as a GWDTE.

6.27 Species' populations and habitats have been valued using the scale set out in Table 6.2, with examples provided of criteria used when defining the level of value.

Table 6.2 Nature conservation valuations together with examples of the criteria used to define the value of ecological receptors

Level of Value	Examples of Criteria
International	An internationally important site e.g. Special Protection Area (SPA), Special Area of Conservation (SAC), Ramsar (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).
National (UK)	A nationally designated site e.g. Site of Special Scientific Interest (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 5 & 8 of the Wildlife and Countryside Act 1981 (as amended); A feature identified as a priority species/habitat in the UK BAP.
Regional (Scotland)	Areas of internationally or nationally important habitats which are degraded but are considered readily restored; A regularly occurring, locally significant population of a species listed as being nationally scarce.
District (Dumfries and Galloway)	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 as a whole; A site designated as a non-statutory designated site e.g. Local Wildlife site, Scottish Wildlife Trust Reserve/Wildlife Site, or a site listed on the Ancient Woodland Inventory (AWI) or Semi-natural Ancient Woodland Inventory (SNAWI); A regularly occurring, substantial population of a nationally scarce species, including species listed on the UK and Local BAPs e.g. common frog (a UK BAP species).
Local (site and its vicinity, including areas of habitats contiguous with or linked to those on site)	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 national or local 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 widespread species.

6.28 It should be noted that the approach of this assessment is to consider the value of the site for the species under consideration, rather than the nature conservation importance of the species itself. To illustrate this rationale with reference to Table 6.2, while otter as a species could be considered to be of international value by virtue of being listed on Annex IV of the Habitats Directive, the value of a site with a small and shallow water course which was only used very occasionally by a single otter would be limited[23]. Therefore, in this case, nature conservation importance of that site would be assessed as being of 'Local' value for otter.

6.29 Therefore, while the importance of the species present is taken into account, in order to assess nature conservation importance, the number of individuals of that species using the site, and the nature and level of this use, is also taken into account. An assessment is then made of the value of the site to that species, based upon professional judgement.

Legal Protection of Species

6.30 Notwithstanding what has been said above, there is also a need to identify all legally protected species that could be affected by the 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 impacts within the context of species' legal protection – measures to avoid or reduce impacts on such species are legally required to avoid contravention of the law, otherwise the development cannot be taken forward.

6.31 In certain situations, however, adherence to measures that are designed to ensure that the law is not contravened may not prevent a significant impact relating to a species' biodiversity conservation, social or economic value (i.e. in the context of the species being a 'valued ecological receptor' – see above).

6.32 Even where a protected species is not considered to be a valued ecological receptor, for example badgers which are protected on animal welfare grounds rather than nature conservation value, the measures that would be taken to ensure compliance with the legislation are documented within this chapter.

Nature and Magnitude of Impact

6.33 Impacts can be permanent or temporary; direct or indirect; adverse or beneficial, and can be cumulative. These factors are brought together to assess the magnitude of the impact on the 'conservation status' of the particular valued ecological receptors, and on the 'integrity' of the habitats that support them:

- Integrity is the coherence of the ecological structure and functions of a site or habitat 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 distribution and/or extent/size.

6.34 Conservation status is therefore largely determined by the extent to which integrity is maintained. It follows that habitats may or may not be valued ecological receptors in their own right.

6.35 Wherever possible, the magnitude of the impact is quantified. Professional judgement is then used to assign the impacts on the receptors to one of four classes of magnitude, defined in Table 6.3.

Table 6.3 Definition of Magnitude Table

Magnitude	Definition
High	A permanent or long-term impact on the integrity of a site or conservation status of a habitat, species assemblage/community, population or group. If adverse, this is likely to threaten its sustainability; if beneficial, this is likely to enhance its conservation status.
Medium	A permanent or long-term impact on the integrity of a site or conservation status of a habitat, species assemblage/community, population or group. If adverse, this is unlikely to threaten its sustainability; if beneficial; this is likely to be sustainable but is unlikely to enhance its conservation status.
Low	A short-term but reversible impact on the integrity of a site or conservation status of a habitat, species assemblage/community, population or group that is within the range of variation normally experienced between years.
Negligible	A short-term but reversible impact on the integrity of a site or conservation status of a habitat, species assemblage/community, population or group that is within the normal range of annual variation.

Significance of Impacts

6.36 The significance of an impact is largely a product of the value of the ecological receptor and the magnitude of the impact on it, moderated by professional judgement. Table 6.4 illustrates a matrix based on these two parameters which is used for guidance in the assessment of significance. It should be noted that in terms of the EIA Regulations, it is only impacts that are likely to have significant impacts that require detailed assessment. Those impacts which are shaded in Table 6.4 equate to those considered significant under the EIA Regulations with the others constituting an insignificant impact. The category of 'minor' is used in acknowledgement that there are instances whereby there may be an impact, albeit that this is not likely to be significant. It is also used to facilitate assessment of cumulative impacts e.g. where cumulatively several minor impacts could be significant.

Table 6.4 Significance of Impacts Matrix

Value of Receptor	Magnitude of Impact			
	High	Medium	Low	Negligible
International	Major	Major	Minor	Negligible
National	Major	Major	Minor	Negligible
Regional	Major	Major	Minor	Negligible
District	Major	Minor	Minor	Negligible
Local	Minor	Minor	Negligible	Negligible
Less than Local	Negligible	Negligible	Negligible	Negligible
Key			Significant Impact	
			Not Significant Impact	

Baseline Environment

6.37 The location of statutory and non-statutory sites of nature conservation interest within 2km of the consultation boundary are shown in Appendix 6.1 Figure 3.1. The results of ecological field surveys are shown in Figure 6.1 (Phase 1 habitat survey results); Appendix 6.2 Figures 3.3-3.11 (bat survey results) and Appendix 6.1 Figure 3.4 (protected species survey results).

Desk Study Results

Nature Conservation Designations

6.38 There are no statutory designated sites within 2km of the consultation boundary. The closest statutory designated site, Black Loch SSSI, is located approximately 6km east of the consultation boundary and is considered to be a sufficient distance from the Site for the notified habitats and species not to be adversely affected by the Development (see Table 6.5).

6.39 There are no non-statutory sites within 2km of the Site boundary.

6.40 There are a number of areas within the Site boundary which are listed on the Ancient Woodland Index (AWI). The locations of these are shown in Appendix 6.1 Figure 3.1.

6.41 The Site is located within Zone 1 (lowest sensitivity) on the boundary with Zone 2 (medium sensitivity) of SNH's Zones of Natural Heritage Sensitivity in relation to designated sites and biodiversity interests[24].

6.42 Table 6.5 details the designated and non-designated sites potentially affected by the development.

Table 6.5 Statutory and Non-Statutory Nature Conservation Sites potentially connected to the Site

Site Name	Description	Possible impacts resulting from the Development
Black Loch SSSI	This site is 37.56ha in size and is the best example of a basin fen within the Nithsdale District. The fen occupies the site of a drained loch and is notified for its fen-moorland transitional habitats which include fen, willow carr and grassland habitats.	Located 6km east of the Site near Ae. There is no hydrological connectivity with this SSSI and therefore no pathway for impacts on the interest features of this site. Site scoped out of further assessment.
Woodland to the west of T1 – listed on the AWI	No further information provided.	Located within the Site boundary. Forms part of the Clauchrie Plantation and connects areas of woodland around the Site. Impacts possible, included for further

Site Name	Description	Possible impacts resulting from the Development
		assessment.
Knocknutshell Wood – listed on the AWI	No further information provided.	Located within the Site boundary. Forms part of the Clauchrie Plantation and connects areas of woodland around the Site. Impacts possible, included for further assessment.
Lambrig Wood – listed on the AWI	No further information provided.	Located within the Site boundary. Forms part of the Clauchrie Plantation and connects areas of woodland around the Site, and with Dalswinton Wood via Pennyland Burn. Impacts possible, included for further assessment.
Unnamed woodland areas around High Auldgirth and Low Auldgirth - listed on the AWI	No further information provided.	Located within the Site. Forms part of the Clauchrie Plantation and connects areas of woodland around the Site. Impacts possible, included for further assessment.
Unnamed woodland areas along Ballochan Linn and Clauchrie Burn - listed on the AWI	No further information provided.	Located within the Site. Forms part of the Clauchrie Plantation and connects areas of woodland around the Site. Impacts possible, included for further assessment.
Blocks of woodland to the east of the Site (including Glenbrae Wood, Cleuch Plantation, The Belt and Low Townhead) – listed on the AWI	No further information provided.	Located outwith the Site but within 2km. Small woodland blocks which form discontinuous connections with areas of woodland within the Site. No pathway for impacts on this woodland area. Site scoped out of further assessment.
Dalswinton Wood – listed on the AWI and listed as a red squirrel priority woodland	No further information provided.	Located outwith the Site but within 2km. Large woodland which is indirectly connected with Lambrig Wood via Pennyland Burn. No pathway for impacts on this woodland area. Site scoped out of further assessment.
Clauchrie Plantation – several blocks listed on the AWI and partly included in the red squirrel priority woodlands	No further information provided.	Located outwith the Site but contiguous with woodland areas within the Site. Impacts possible, included for further assessment.
Blocks of	No further information	Located outwith the Site but within 2km.

Site Name	Description	Possible impacts resulting from the Development
woodland to the east of the Site (including Glenbrae Wood, Cleuch Plantation, The Belt and Low Townhead) – listed on the AWI	provided.	Small woodland blocks which form discontinuous connections with areas of woodland within the Site. No pathway for impacts on this woodland area. Site scoped out of further assessment.
Black Wood – listed on the AWI	No further information provided.	Located within 2km of the Site on the opposite side of the River Nith. No pathway for impacts on this woodland area. Site scoped out of further assessment.

Protected and notable species

6.43 No protected or notable species were returned for the Site. Species recorded outside but within 2km of the consultation boundary (12km for bats) which were provided by the DGERC are shown in Appendix 6.1 Figure 3.2 and Appendix 6.2 Figure 3.1 and are listed below:

- Reptile: Adder;
- Mammal: Red squirrel, otter, badger, bandit pipistrelle, soprano pipistrelle, unidentified Pipistrelle species, Daubenton's bat, Natterer's bat, brown long-eared bat and noctule along with unidentified bat species records and Chiroptera records.
- Flowering plant: Ling heather, marsh thistle, pedunculate oak, spear thistle, scarlet pimpernel; and
- Insect – butterfly: Pearl-bordered fritillary, small heath, small pearl-bordered fritillary.

6.44 A large area of red squirrel priority woodland (Ae Forest) exists within 2km to the east of the Site (see Appendix 6.1, Figure 3.1).

6.45 A search on NBN Gateway indicated records of the presence of otter, red squirrel, adder and many invertebrate species within 2km of the consultation boundary and badger, slow worm (*Anguis fragilis*) and bat species records (all of the above species plus whiskered bat *M. mystacinus*) in the wider area.

6.46 These records identify the Site as being situated within an area where 7 of the 9 Scottish bat species are known to be present and roosting.

6.47 In addition SNH detailed the presence of the following species in their Scoping Response:

- Otter – the River Nith and its tributaries are known to host a population of otter. Small streams are commonly used for feeding and as connection routes between water catchments;

- The Site is within Nithsdale which is known to host great crested newt (GCN) where suitable habitat exists;
- Several species of bat are common along Nithsdale;
- Red squirrel has been noted on Site; and
- Atlantic salmon (*Salmo salar*), brown trout (*Salmo trutta* Morph.), lamprey (*Petromyzon* sp.) and sea trout (*Salmo trutta trutta*) are present within the River Nith catchment.

6.48 Therefore, based on this desk assessment and the nature of the habitats present on Site it was considered that the initially proposed scope of surveys i.e. Phase 1 / extended Phase 1 Habitat survey, badger, bats, great crested newt, otter, red squirrel and water vole along with observations of other notable species such as brown hare (*Lepus europaeus*) would be sufficient to form the basis of the ecological impact assessment and no other detailed surveys were considered necessary.

Local Biodiversity Action Plan

6.49 The Dumfries and Galloway LBAP sets out 41 Habitat Action Plans for the local priority habitats[25]. A number of these habitats are present within (or directly adjacent to) the Site and the assessment takes these into account e.g. lowland burns and ditches, ponds, farm woods and shelterbelts. In addition the LBAP lists a number of floral and faunal species as being of conservation concern, and species statements[26] identify the priority actions for these species.

Field Survey Results

6.50 The results of the Phase 1/extended Phase 1 habitat surveys are combined for clarity hereafter. The results of these and the protected species (other than bats) survey results are provided in a Baseline Ecology Report within Appendix 6.1. Badger survey results are shown in a confidential appendix to Appendix 6.1 which has been provided to DGC and SNH. Figure 6.1 shows the Phase 1 habitats present within the survey area; Figure 3.4 in Appendix 6.1 shows the protected species survey results and confidential Figure 3.5 shows the badger survey results. The Bat Survey Report is included as Appendix 6.2 together with all bat survey figures.

Phase 1 habitat survey results

6.51 A summary of the habitats identified within and adjacent to the extended Phase 1 survey area is provided in Table 6.6. The scientific names of species recorded are provided in Appendix 6.1 and are only included in the table below where no recognised English versions exist.

6.52 No reptiles were recorded during surveys, however suitable reptile habitat is present throughout the extended Phase 1 survey area in the form of scrub, stone wall boundaries, tufts of grass and vegetation and rocky outcrops, especially in areas of new plantation woodland where clear-felling has taken place along Pennyland Burn and in the west of the survey area.

6.53 Along the route of the proposed access track around Low Auldgirth the following habitat types were recorded:

- Broad-leaved plantation woodland (a small area of felled and recently replanted woodland);
- Conifer plantation woodland (the dominant woodland type);
- Mixed plantation woodland with a high proportion of broadleaved species;
- Scattered broad-leaved trees at the edges of conifer plantation woodland areas and along the railway embankment, and forming part of a shelterbelt which bisects the proposed access track. Mature trees include those with potential for bats;
- Semi-improved neutral grassland areas which have been fenced off and are relatively free from grazing pressure;
- Improved grassland habitats form the dominant habitat type and are grazed by livestock;
- Tall ruderal habitats associated with areas of felled woodland;
- Standing water (a pond) adjacent to Low Auldgirth;
- Amenity grassland with low inherent biodiversity value associated with Low Auldgirth; and
- An unnamed ditch which was dry at the time of the survey.

6.54 No notable species were recorded along the proposed access track.

Table 6.6 Summary of Extended Phase 1 Habitat Survey Results

Habitat	Description[27]
Broadleaved semi-natural woodland	Pennyland Burn borders the eastern edge of the Site boundary where small areas of grey willow are associated with the watercourse, forming small pockets of naturalised woodland along its edge.
Broadleaved plantation woodland	Broadleaved plantation woodland is restricted to a number of small blocks. Knocknutshell wood on the crest of the hill near the centre of the survey area consists mainly of mature beech stands and is recorded on the AWI. The wooded area is enclosed on all but the north western boundary by a stone wall. The mature trees offer high bat roost potential. The ground flora is not very species diverse due to heavy grazing and trampling by livestock. A small area of poplar with some beech exists along a dry ditch running parallel to one of the main access tracks. Larger areas of plantation woodland are found along the watercourses where tree species such as willow, birch and alder are found. A small area of woodland dominated by alder with a small drain running through the woodland also exists. The ground flora is grass dominated with abundant rough meadow grass in addition to creeping buttercup and common nettle. Younger areas of broadleaved plantation estimated to be less than 10 years old are also present near Blackcraig Hill in the centre of the survey area. Species present include rowan, ash, birch and oak.
Coniferous plantation	Coniferous plantation woodland is the dominant woodland habitat type within the survey area and it is found in both extensive blocks (around Blackcraig Hill,

Habitat	Description[27]
woodland	Muirstraploch Wood and High Auldgirth) and smaller woodland areas (adjacent to the pond and Cow Cleuch) throughout the survey area. Much of the coniferous plantation is newly planted with stumps remaining from previously felled stands. Many of these areas of previously felled plantation offer good habitat potential for reptiles. Many of the more mature coniferous plantations are dominated by one species e.g. Douglas fir or Sitka spruce with ground flora being typically species poor. These woodland areas form part of the larger Clauchrie Plantation and provide excellent red squirrel habitat.
Mixed plantation woodland	Five areas of mixed plantation woodland are found within the survey area. Lambrig Wood is located on the south eastern boundary of the survey area; the species composition of the woodland gradually changes with proximity to the watercourse e.g. the southern area of the woodland contains more birch woodland. Tree stands within the area are ~10 years old and a wide variety of species are present including Douglas fir, rowan, birch, willow species and birch. A woodland area along Pennyland Burn on the eastern edge of the survey area has similarities with parts of Lambrig Wood in that the dominant species is birch but this woodland runs along the burn and is adjacent to a larger area of broadleaved plantation. Cow Cleugh is also classed as mixed woodland with more mature trees of 10-20 years old. The western side of the plantation is dominated by coniferous species such as Sitka spruce with broadleaved species becoming more dominant towards the east. These habitats provide ideal badger setting habitat and suitable habitat for red squirrel.
Dense/ continuous scrub	Scrub forms only a small part of the survey area and is largely concentrated on stretches of the Pennyland Burn on the north eastern edge of the survey area. This area is heavily overgrown with gorse.
Scattered broadleaved trees	Scattered broadleaved trees were recorded at four locations within the survey area and are associated with conifer plantation woodlands on the northern boundary of the survey area at Muirstraploch Wood, around the cottages at High Auldgirth and on the woodland edge at the southern extent of the survey area.
Semi-improved neutral grassland	Semi-improved neutral grassland are present within the survey area boundary. This habitat is present in isolated areas alongside improved grassland and woodland areas and has arisen due to less intensive grazing and management. Species present include cock's foot, common vetch, germander speedwell, smooth meadow grass, Yorkshire fog and sweet vernal grass.
Improved grassland	Improved grassland habitats are found throughout the survey area and constitute most of the main grassland areas. These are meadows and pastures which have been heavily grazed by sheep and cattle. Low species diversity was recorded with only a few common grass species present. Improved grassland is of limited habitat value for protected species, however, may offer potential for ground nesting birds and foraging badger.
Marshy grassland	Three small areas of marshy grassland (1ha in total) occur within the survey area. Two of these areas of marshy grassland are located at the base of slopes which means that water accumulates in these areas creating conditions which favour marshy vegetation. These include an area along the bottom of Glenloy, adjacent to Muirstraploch Wood. An additional area of marshy grassland is associated with the pond in the middle of the survey area. Species present include soft rush, marsh marigold and meadowsweet. A National Vegetation Classification (NVC) survey was not undertaken within the survey area as the heavily modified nature of the habitats on site did not merit such a detailed habitat assessment. A Phase 1 habitat survey does not

Habitat	Description[27]
	collect the same level of species detail as would be collected for an NVC survey and the phase 1 habitats are not always easily interchangeable with NVC plant communities. However, using species lists and information gathered during the phase 1 habitat survey these marshy habitats are thought to have some affiliation with M23 *Juncus effusus/acutiflorus – Galium palustre* rush-pasture due to the presence of rush and herb species. This habitat is listed as a community dependent on GWDTE within Land Use Planning System SEPA Guidance Note 4, however, the habitats present are not considered to be (GWDTEs) in accordance with SNIFFER classifications, but rather are determined by their position within the local topography and are rain-fed. In accordance with Chapter 5 – Physical Environment the survey area is generally rocky with steep to moderate gradients and topsoils are generally shallow (less than 1m deep) therefore marshy areas are likely to be fed by surface water rather than groundwater.
Scattered bracken	This habitat makes up only a small proportion of the survey area and is restricted to a mixed plantation woodland boundary in the centre of the survey area between Knocknutshell Wood and the pond.
Tall ruderal	Isolated areas of tall ruderal habitat occur throughout the survey area in small patches, mainly in conjunction with semi-improved neutral grassland and marshy grassland.
Standing water	A pond 0.1ha in area is located towards the centre of the survey area. It is fenced off from improved grazing land surrounding it and is densely vegetated with marshy grassland along the edges with rush, tufted hair grass, meadowsweet and rosebay willow-herb also present.
Running water	Two burns and a ditch traverse the survey area with water ultimately flowing into the River Nith via Pennyland Burn. The River Nith flows south to Dumfries approximately 14km downstream of the Site, and ultimately to the Solway Firth. Pennyland Burn rises in Clauchrie Plantation and flows south along the easternmost boundary of the survey area. The burn runs downstream within a narrow glen, through agricultural land and then Lambrig Wood before leaving the survey area along the south eastern survey area boundary. The burn is shallow, less than 10cm deep, approximately 1m wide with a stony substrate and heavily vegetated in places. There are numerous obstructions e.g. small waterfalls along the watercourse which are likely to act as barriers to many fish movements. The water is fast flowing and poaching is frequently evident. Otter signs were found along this burn during the protected species surveys. An unnamed ditch which was dry at the time of the survey runs parallel to the main track past High Auldgirth. It is heavily vegetated with perennial rye-grass, Yorkshire fog, pignut creeping buttercup, raspberry and rosebay willow-herb. An unnamed burn runs from a drain along a farm access track through the survey area and to the south through Cow Cleugh Wood. The burn meets Pennyland Burn a short distance outside the survey area boundary. This watercourse is very heavily vegetated for the majority of its length and was deemed unsuitable for water vole due to the high level of shading and number of obstructions along its course. The burn does not provide good foraging habitat for otter but is likely to act as a corridor along which otter may commute to foraging areas which may include the pond, and laying up areas.
Amenity grassland	There is an area of amenity grassland associated with a clay pigeon shooting range. This habitat has, by definition, low species diversity and poor suitability for supporting species such as reptiles and amphibians.

Badger survey results

6.55 The results of the badger survey are provided in a confidential annex to Appendix 6.1 and shown in Confidential Figure 3.5, which has been provided only to SNH and the DGC due to the sensitive nature of the information they contain on welfare grounds.

6.56 There is an abundance of suitable foraging and setting habitat for badger within the protected species survey area. Three setts were recorded within the survey area:

- Sett 1 - One-hole outlier;
- Sett 2 – One-hole outlier; and
- Sett 3 – Main sett with 18 entrances showing varying levels of use.

6.57 None of the setts identified are located within the footprint of the Development and all recorded badger activity was over 500m from the area proposed for development.

Bat survey results

6.58 Full details of bat survey results are provided in the Bat Survey Report in Appendix 6.2 and in Appendix 6.2, Figures 3.3-3.11, with only a summary provided in the following section.

6.59 The bat survey area offers numerous opportunities for roosting bats in localised areas, including mature woodland (e.g. Knocknutshell Wood) and buildings. Roosts were confirmed at 1 - 4 High Auldgirth Cottages (bandit and soprano pipistrelle), Keepers Cottage and outbuildings (bandit and soprano pipistrelle and *Myotis* species) and outbuildings next to High Auldgirth (soprano and bandit pipistrelle and probably brown long-eared). Although low numbers of bats (maximum 3) were recorded at each roost entrance observations made during emergence and re-entry surveys included three commuting *Nyctalus* bat passes and observations of pipistrelles foraging, commuting and social calling. No roosts were identified at Knocknutshell Wood. The locations of these features are shown in Appendix 6.2, Figure 3.3.

6.60 The bat survey area has a mosaic of habitat types offering productive foraging habitat including different types and age stands of woodland, semi-improved grassland, a pond and running water. Habitats are closely interlinked with potential commuting routes connecting the different parts of the bat survey area along woodland edges and field boundaries.

6.61 Overall low - moderate levels of bat activity were recorded during manual bat activity transects with activity concentrated along woodland edges and treelines and in particular along Pennyland Burn where sheltered foraging and commuting habitat exists. *Myotis* calls around the burn. No *Nyctalus* passes were recorded during manual bat activity transect surveys. The highest activity levels were recorded in June with another peak in September and no bat passes were recorded at all in October. No bats could be tracked to roosts despite first sightings being made within 30 minutes of sunset on three out of the six transect surveys.

6.62 Bandit pipistrelle was the most commonly recorded species in the Anabat surveys and, combined with soprano and unidentified pipistrelle recordings, account for over 95% of overall bat activity. *Myotis* species, *Nyctalus* species and brown long-eared were also recorded. The highest activity levels were recorded in June with another peak in September, consistent with trends observed in manual activity transects. Of the four locations surveyed Location 1 (Pennyland Burn) recorded the highest *Myotis* and *Nyctalus* activity levels; Location 2 (pond) had the highest total number of bat passes and the highest brown long-eared activity; Location 3 (conifer plantation) included early records of *Nyctalus* but lowest levels of bat activity; and Location 4 (woodland edge and boundary) included consistently early records of pipistrelle bats.

6.63 In respect of their status as a high risk species a summary of the data pertaining to *Nyctalus* species is provided below.

6.64 Five records (field sightings) of noctule bat were returned from DGERC, namely two field sightings at Thornhill (approximately 10km north west of the Site) and three at Locharbriggs (approximately 8-10km south east of the Site) which indicates the presence of this species along Nithsdale of which the Site forms part. No further records of noctule were returned from NBN and no Leisler's bat records were returned from the desk study.

6.65 *Nyctalus* species was recorded in low – moderate numbers during the static Anabat surveys: Location 1 (Pennyland Burn) had the highest volume of *Nyctalus* calls (39) of which 38 were in July. Location 2 (the pond) returned 18 *Nyctalus* passes, 12 of which were in June, and which included a small number of passes within the first 30 minutes after sunset and soon before dawn on 29 July. Location 3 (woodland edge on the south of the core bat survey area) had the lowest number of calls (9) but included an early recording on 27 July. Location 4 (woodland edge on the north of the core bat survey area) had 27 *Nyctalus* passes, 17 of which were in August. The early sightings in July may indicate that there is a *Nyctalus* roost in the vicinity of the core bat survey area, although the location is not known as both noctule and Leisler's bats can travel fast and over long distances (around 13km in Leisler's bats[28] and more for noctule) to get from roosts to foraging areas.

Great crested newt survey results

6.66 The Habitat Suitability Index (HSI) score for the unnamed pond within the extended Phase 1 habitat survey boundary classified the pond as having poor suitability for great crested newt[29].

6.67 The survey found no records of this species. Taking into account the HSI score and the results of surveys it is considered that this species is currently absent from the extended Phase 1 habitat survey boundary.

6.68 Both palmate newt (*Lissotriton helveticus*) and smooth newt (*L. vulgaris*) were recorded during survey.

Otter survey results

6.69 The results of the otter survey are provided in Appendix 6.1 and shown in Appendix 6.1, Figure 3.4. Four signs of otter (spraints) were recorded within Pennyland Burn to the east of the protected species survey area; two in the north of the survey area and two where the burn flows through Lambrig Wood. Suitable habitat for foraging and lying up was identified on most of the watercourses surveyed although no confirmed otter resting sites were identified.

Red squirrel survey results

6.70 Targeted red squirrel surveys were undertaken in woodland areas within the protected species survey area and revealed signs of red squirrel presence including feeding remains (chewed pine cones), dreys and sightings of red squirrel. No grey squirrels were observed during surveys. A large woodland plantation in the south and east of the study area was considered to have low potential for red squirrel due to the immaturity of tree stands.

6.71 The landowner receives a grant to trap grey squirrel and only one has been caught to date in 2011 (pers. comm. Andrew Smith, Force 9 Energy).

Water vole survey results

6.72 No water voles or signs of water voles were recorded during surveys and habitat suitability was considered low given the rocky and fast-flowing nature of Pennyland Burn and other watercourses present and high degree of channel shading. American mink (*Neovison vison*) is also known to be present in the area.

Valuation of receptors in the baseline condition

Evaluation of Habitat for Protected Species

6.73 No signs of the presence of water voles were recorded and the potential for colonisation by this species is considered low given the poor suitability of habitats present within the protected species survey area for burrowing. This species is therefore not considered further in this assessment.

6.74 Based on the lack of records of great crested newts from the desk study, the negative survey result for this species, the low suitability of the pond for breeding and the distance of these from site infrastructure, great crested newts are not considered further in this assessment.

6.75 No incidental observations of reptile species were recorded during surveys. However adder and slow worm are known to be present within the locality. These species, together with common lizard (*Zootoca vivipara*) and grass snake (*Natrix natrix*) are protected under the Wildlife and Countryside Act 1981 (as amended) against intentional and reckless killing and injuring. Grass snake is generally believed to be absent from

Scotland although recent evidence indicates that it is now present in southern Scotland[30] including within the same district as the site.

6.76 All of the Scottish reptile species are included within the Widespread Reptiles Species Action Plan (SAP), developed by the Amphibian and Reptile Conservation Trust[31]. The site offers some good examples of reptile habitat within felled and newly planted areas of woodland which are commonly occurring habitats in the Nithsdale district. Although no formal survey was undertaken the value of the site or parts of the site for these species the habitats present are considered to be of not greater than Local importance to reptile species.

6.77 The desk study identified no potential fisheries interest within the extended Phase 1 survey area, the scoping response did not raise any concerns about potential impacts upon fish and the Extended Phase 1 Habitat Survey did not identify any particularly suitable habitat that could be used by lamprey or migratory fish (such as salmon and trout) for spawning. For these reasons, fish are not considered any further in this assessment.

6.78 The route of the proposed access track crosses largely improved fields which have low nature conservation value and which are common in the area. The shelterbelt and woodland edge habitats it would bisect form a fraction of the total habitat resource and, whilst notable for their potential to support faunal species (such as roosting bats) they do not significantly enhance the woodland resource. Semi-improved neutral grassland habitats are LBAP habitats but again these are small and whilst they may support reptile species they are not considered to enhance the habitat resource at greater than Local level. No detailed surveys were undertaken at the remaining habitats but due to their size and commonness in the area they are not likely to be of greater than Local value.

6.79 This section evaluates the nature conservation interest of the survey area for its habitats and for the species it supports in terms of its relative importance in a geographical context. As noted VERs are defined as those which have a value of at least District level (noted in **bold**). All other ecological receptors are henceforth not considered further in this ES, apart from where legal considerations need to be taken into account.

Table 6.7 – Evaluation of Nature Conservation Interest

Ecological Receptor	Evaluation Rationale	Site Value
Designated Sites for Nature Conservation		
Ancient Woodland of Semi-Natural Origin (listed on the AWI) Woodland to the west of WT1 Knocknutshell Wood Lambrig Wood Unnamed woodland areas around High Auldgirth and Low Auldgirth Unnamed woodland areas along Ballochan Linn and Clauchrie Burn - listed on the AWI Clauchrie Plantation – several blocks	These are sites where woodland has been present on old maps and they therefore have nature conservation value due to the potential for supporting an old woodland seed bank as well as the trees that they may currently support. Whilst some areas have clearly been significantly modified, for example through the establishment of commercial forest, the sites are considered to be of up to District value for ancient woodland sites listed on the AWI. Ancient woodlands that are located within the site are assessed with their Phase 1 habitat categories below.	**District**
Habitats		
Broadleaved semi-natural woodland	There is one section of broadleaved semi-natural woodland within the survey area within the riparian corridor of the Pennyland Burn. The UK BAP (Lowland Mixed Deciduous Woodland) and LBAP (Native Woods) list this habitat type as a priority habitat. There is estimated to be around 5000ha of semi-natural broadleaved woodland in Dumfries and Galloway[32] and the habitat present on the survey area (1ha) represents a small fraction of this total. It extends alongside the Pennyland Burn for approximately 500m and is bordered on either side by woodland plantation. It offers a relatively diverse habitat niche on the perimeter of an extensive block of woodland and the survey area is therefore considered to be of District value for broadleaved woodland.	**District**
Broadleaved plantation woodland	Broadleaved plantation woodland comprises 4.9ha (around 3%) of the land area within the survey area. Broadleaved, mixed and yew woodland is a UK broad habitat type with some affiliation with the UK BAP (Lowland Mixed Deciduous Woodland) and Local Habitat (Broadleaved and Mixed Plantations) priority habitats. Broadleaved plantation woodland blocks present within the survey area include Knocknutshell Wood which is listed on the AWI. The plantation woodlands are generally immature and are currently of limited ecological interest. However they are relatively diverse compared to the neighbouring commercial coniferous plantation, their ecological interest would be expected to increase over time and they link into the extensive block of woodland . As such, the survey area is considered to be of District value for broadleaved plantation woodland.	**District**

Ecological Receptor	Evaluation Rationale	Site Value
Coniferous plantation woodland	Coniferous plantation woodland makes up 62ha (around 40%) of the area within the survey area and includes one small area to the west of WT1 which is listed in the AWI. Dumfries and Galloway is estimated to have around 145,000ha of coniferous plantation woodland, to which the survey area contributes less than 0.05%. Although affiliated with the UK BAP habitat (Lowland Mixed Deciduous Woodland) and local priority habitat (Conifer Plantations and Farm Woods and Shelterbelts) this habitat is of limited ecological interest or potential. The survey area is therefore considered to be of Local importance for coniferous plantation woodland.	Local
Mixed plantation woodland	The five areas of mixed plantation found within the survey area make up 14.6ha (around 9.5%) of the area within the survey area and include Lambrig Wood which is listed in the AWI and has recently been re-planted. Affiliated with the UK BAP priority habitat (Lowland Mixed Deciduous Woodland) and local priority habitats (Farm Woods and Shelterbelts and Broadleaved and Mixed Plantations), the different areas of plantation woodland provide varied habitats and support a number of locally important floral and faunal species. As such this habitat is considered to be of District value for mixed plantation woodland.	**District**
Dense/ continuous scrub	Scrub forms a small part of the survey area (1.7ha or1% of the total area) and is not affiliated with UK BAP or LBAP priority habitats although it does provide shelter and food sources for a number of species such as breeding birds and invertebrates. This habitat type is common in the locality and is considered to be of less than local importance to nature conservation.	Less than Local
Scattered broadleaved trees	Affiliated with the UK BAP priority habitat (Lowland Mixed Deciduous Woodland) and local priority habitats (Farm Woods and Shelterbelts) scattered broadleaved trees are closely associated with other woodland habitats and may provide roosting opportunities for bats. This habitat type makes up around 1ha (0.6%) of the survey area. The survey area is considered to be of District value for scattered broadleaved trees.	**District**
Semi-improved neutral grassland	Semi-improved neutral grassland makes up 2.8ha or 1.8% of the survey area. Neutral grasslands are a LBAP priority habitat and there is some affiliation with UK BAP habitats (Lowland Meadows). There are less than 100ha of neutral grassland estimated to be present in Dumfries and Galloway[33] but the habitats present within the survey area are semi-improved and therefore of limited ecological value. This habitat type is nevertheless important for breeding birds, invertebrates and reptiles and contributes to the diversity of habitats and species present within the survey area. As such, the survey area is considered to be of Local value for semi-improved neutral grassland.	Local
Improved grassland	Improved grassland is a UK Broad Habitat Type. Improved grassland forms 62.2ha (around 40%) of the survey area and is very common both locally and nationally and the representation of the habitat within the survey area is considered to warrant evaluation of Less than Local value	Less than Local

Ecological Receptor	Evaluation Rationale	Site Value
	for improved grassland.	
Marshy grassland	Marshy grassland has a greater botanical diversity compared with other grassland habitats within the survey area (e.g. amenity grassland and improved grassland) and can provide important habitat for invertebrates. The marshy grassland habitats within the survey area are small (totalling 1ha) and isolated within improved grassland habitats and heavily modified habitat (coniferous plantation woodland) . Although including plant species which are sometimes associated with GWDTEs the marshy grassland habitats within the survey area are considered to be rain-fed systems due to their position at the base of slopes where water accumulates creating conditions which favour marshy vegetation. The habitat has limited overlap with UK priority habitats. Given the small area of marshy grassland within the survey area (totalling 1ha or less than 0.6% of the area) and its isolated position within the survey area marshy grassland is considered to be of no more than Local value.	Local
Scattered bracken	Bracken habitats are not notable in biodiversity terms and do not have any direct affiliation with BAP priority habitats. Bracken habitats make up a small proportion of the survey area (0.2ha or 0.1% of the area) and have restricted distribution. The survey area is therefore considered to be of Less than Local value for scattered bracken.	Less than Local
Tall ruderal	The tall ruderal habitats within the survey area are not notable in biodiversity terms and do not have any direct affiliation with BAP priority habitats. This habitat makes up approximately 0.9ha (0.6%) of the survey area and the survey area is therefore considered to be of Less than Local value for tall ruderal.	Less than Local
Standing water	Although there are thought to be around 150,000 ponds up to 2ha in area in Scotland[34] the number and extent of ponds within Dumfries and Galloway is not known. Ponds are a priority habitat in the LBAP and in the UK BAP. The pond within the survey area represents the only example of this habitat type in the vicinity and supports locally important populations of amphibians and invertebrates. However, due to its isolation and small size it is not considered to be of greater than Local value.	Local
Running water	Watercourses are listed as a UK BAP Priority habitat and an LBAP priority habitat (River Headwaters/Lowland Burns and Ditches)[35]. Pennyland Burn which traverses the eastern boundary of the survey area supports a number of important species (e.g. otters and bats) although it is heavily poached in places. An unnamed tributary of Pennyland Burn traverses the survey area and may represent a conduit by which species such as otter access resources within the survey area. There is one ditch present within the survey area which is generally heavily vegetated and is likely to support running water on a seasonal basis only. The survey area is therefore considered to be of no more	Local

Ecological Receptor	Evaluation Rationale	Site Value
	than Local value for running water.	
Amenity grassland	Amenity grassland makes up around 1.5ha (less than 1% of the survey area) and the habitat has low species diversity and poor suitability for supporting faunal species. The habitat is very common locally and nationally. As such the survey area is considered to be of less than local value for amenity grassland.	Less than local
Fauna		
Badger	In the UK, badgers are a relatively common species and there are a reported 25,000 individuals in Scotland[37]. They are listed on the SBL. Moderate levels of badger activity were recorded during surveys in a localised area of the protected species survey area. In the context of the legal protection afforded to badgers (albeit in respect of persecution) and the fact that the survey area is located within an active territory, the survey area is considered to be of Local value for this species.	Local*
Bats	Soprano and common pipistrelles, Daubenton's, whiskered, Natterer's, brown long-eared and noctule bats are listed on the Scottish Biodiversity List (SBL) as being of principal importance for biodiversity conservation in Scotland. Soprano pipistrelle, noctule and brown long-eared bats are listed as priority species in the UK BAP. All 8 species of bat found in Dumfries and Galloway are listed as local priority species in the LBAP. All species of bat in the UK receive full legal protection via inclusion on Schedule 2 of the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended). Maybe have this first in the table as it is the most important statement Current population estimates[36] are: Common pipistrelle: Native, common across the UK. Population estimate: UK 2,430,000; GB 1,280,000 – breakdowns not available. Soprano pipistrelle: Native, common across the UK. Population estimate: UK 1,300,000; GB 720,000 – breakdowns not available. Natterer's bats: Native, common across the UK. Population estimate: UK 148,000; Scotland 17,500. Daubenton's bat: Native, common throughout much of the UK. Population estimate: UK 560,000; Scotland 40,000. Whiskered bat: Native, locally distributed. Population estimate: UK 64,000; Scotland 1500. Brandt's bat: Native, common in western and northern England, rare/absent elsewhere. Population estimate: UK 30,000, Scotland 500. Noctule bat: Native, generally uncommon but more numerous in well wooded areas. Population estimate: UK 50,000; Scotland 250 (likely to be an underestimate due to lack of reliable survey data). Leisler's bat: Native, widespread, scarce in GB. Population estimate: UK 28,000; Scotland 250 (Ireland is a stronghold	Local* (Pipistrelle species, *Myotis* species and brown long-eared bat) **District*** (*Nyctalus* species)

Ecological Receptor	Evaluation Rationale	Site Value
	for this species). Brown long-eared bat: Native, common. Population estimate: UK 245,000; Scotland 27,500. Based on the population estimates above, combined with the level of the risk associated with individual bat populations from wind farms and the survey results collected at Blackwood, Pipistrelle bats, *Myotis* species and brown long-eared bats have been evaluated as being low risk with regards to the Development. While pipistrelle presence within the bat survey area was considered high and the *Myotis* and brown long-eared representation is low, it should be noted that brown long-eared bats are difficult to detect in the field due to their quiet calls. Disproportionately high numbers of calls can be recorded during foraging where individual bats pass multiple times. The survey area is otherwise considered to be representative of a typical site in Dumfries and Galloway in respect of these species. The moderate number of *Nyctalus* records is noteworthy in view of the high risk that wind farms potentially pose to these species. Although no *Nyctalus* roosts were recorded within the survey area boundary it cannot be ruled out that there may be roosts nearby, due to early first sightings on more than one occasion. This, in combination with the comparable numbers of *Myotis* and *Nyctalus* species recorded within the survey area emphasises the overall importance of the survey area given the distribution and population status of both of these species groups. While *Nyctalus*' presence within the survey area was low in relation to the total level of activity within the survey area, it can be considered to be of district level importance due to the limited range of *Nyctalus* within Scotland and the evidently suitable habitat the survey area offers. The survey area is thought to be representative of a typical habitat in Dumfries and Galloway and is therefore considered to be of Local value for pipistrelle, *Myotis* and brown long-eared bats and of District value for *Nyctalus* species because of the variety of features within it which are used and have potential for use for roosting, foraging and commuting.	
Otter	Otters are listed on the SBL as being of principal importance for biodiversity conservation in Scotland and are also listed as a priority species on the Dumfries and Galloway LBAP. They are a UK BAP priority species and are the subject of a national Species Action Plan (SAP). Otters receive full legal protection via inclusion on Schedule 2 of the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended). Scotland is considered a principal British stronghold for the species with an estimated 90% of the total British population resident here[37]. Otter populations in Dumfries and Galloway have not shown significant positive or negative trends in recent years and the population is thought to be stable and probably at carrying capacity[38].	Local*

Ecological Receptor	Evaluation Rationale	Site Value
	Signs of otter (spraints) were recorded on Pennyland Burn. There are no significant water features within the protected species survey area although foraging and potentially lying up habitat exists. The survey area is considered to be of Local value for otter.	
Red squirrel	Red squirrel is listed in Schedule 5 of the Wildlife and Countryside Act 1981 (as amended) which makes it an offence to kill, injure, take or possess a red squirrel; damage, destroy or obstruct access to dreys or disturb a red squirrel when it is using a drey. Red squirrel is listed on the SBL as being important to the Scottish Public, and also has an SAP in the UK BAP. It is also a priority species in the LBAP. Red squirrel was recorded in Muirstraploch Wood and is likely to use other suitable habitats which are present within the survey area, provided they are mature enough to provide the shelter and food that squirrels require. The Site is adjacent to an area of woodland (Clauchrie Plantation) that is listed as red squirrel priority habitat and, as such, the habitats which are present within the survey area are not scarce in the locality. Although grey squirrels are present, red squirrel is still the dominant species in South West Scotland. As the survey area is not thought to support a "substantial population" of these species, based on its exclusion from the non-statutory priority area, the survey area is considered to be of Local value to red squirrel.	Local*
Other Fauna	Although no great crested newts were recorded during the survey for this species, smooth and palmate newts were identified in small numbers in the pond surveyed. There is no SAP for amphibian species (other than GCN) and these species are common and widespread. The survey area offers good habitat for deer, in particular roe deer (*Capreolus capreolus*), which were frequently seen during surveys. Deer numbers are unknown but numbers could be expected to range between 10 and 15 animals per square kilometre (pers comm. Jim Reilly, Scottish Agricultural College, Aberdeen). The survey area is also likely to support low numbers of other common mammals such as fox (*Vulpes vulpes*) and brown hare. Brown hare is a UK BAP species although it is common nationally. The survey area is considered to be of Less than Local value for other fauna.	Less than Local

Trends in the Absence of Development

6.80 The forest areas in the Site are managed for commercial forestry in accordance with the Blackwood Estate Forest Plan[39]. Embedded within this are plans to clearfell and restock several areas of woodland including Muirstraploch Wood and to section fell trees within Knocknutshell Wood. There are proposals to restock areas which would be felled. A plan of the forestry areas is included as Figure 3.1. In the absence of development therefore, the Site is likely to remain as predominantly forestry and agricultural (stock grazing) land.

6.81 The range of faunal species present at the Site would probably vary through time in response to the changing forest habitat. The badger population is likely to continue to use the Site for foraging and may colonise the Site further. Bats, in particular, may make more use of the Site as younger woodland areas mature, but may need to adapt as trees are felled and re-planted. Otters may increase their use of the Site as they expand in number throughout the region and red squirrel populations would remain stable or deplete with changes in forestry management and if affected by squirrel pox virus or competition from non-native invasive grey squirrel (*Sciurrus carolinensis*). It is possible that water vole could colonise the area in the future although low habitat suitability and the presence of mink are likely to reduce the likelihood of this happening.

6.82 The land owner receives grants for dry stone dyking and trapping grey squirrels, only small numbers of which are thought to be present in the area at present (pers. Comm. Andrew Smith, Force 9 Energy).

6.83 In summary, in the absence of development, it is considered that there is unlikely to be any substantial change in the ecological value of the Site over the next 25 years.

Information Gaps

6.84 At the time of surveys the layout of the proposed access track had not been finalised therefore detailed and targeted surveys for potential bat roosts in trees that would be affected by the road, and detailed reptile surveys have not been undertaken. Pre-construction surveys outlined in the Mitigation section below would ensure that these species' needs are taken into account and, as detailed in the residual impacts section, with the inclusion of such measures, no significant residual impacts would be predicted.

6.85 No other information gaps affecting the assessment of the potential impacts of the Development have been identified.

Project Characteristics

6.86 The key components of the Development are detailed in Chapter 3: Project Description. As a fundamental part of the assessment of potential impacts of the Development on VERs the following elements of the construction, operation and decommissioning of the Development have been considered during the scope of the investigation, following the establishment of baseline conditions:

- Temporary and permanent habitat loss associated with access tracks, borrow pits, wind turbine and crane hardstanding locations, anemometer mast, the construction compound, control building and electrical substation and other associated infrastructure;
- Habitat damage of areas surrounding construction sites through changes in the hydrological regime and pollution with dust, silt or chemical contaminants;
- Tree felling and the resultant impacts on habitats and their associated fauna;

- Disturbance and/or damage to watercourses and potential injury, death or disturbance of their associated fauna e.g. otter, through the construction of infrastructure with close proximity to the bank side;
- The damage/destruction and /or disturbance of active badger setts and red squirrel dreys; and
- The potential to injure or kill or injure reptiles during vegetation clearance.

6.87 As detailed in Chapter 3: Project Description there are a number of embedded design elements which would be developed and agreed with DGC and implemented throughout the development. In relation to Ecology the following measures are inherent within the design:

- The layout minimises the number of watercourse crossings resulting in there being a possible eleven upgraded culverts and two new watercourse crossings:
- These are located away from where otter spraints have been found;
- Watercourse crossings would be designed according to best practice[40]. The exact designs for upgraded/new culvert structures required would be agreed with SEPA prior to construction. Watercourses would be protected during construction through the adoption of a range of mitigation measures e.g. sediment control and pollution prevention measures; see Chapter 3: Project Description and Chapter 5: Physical Environment;
- Existing access tracks would be upgraded and existing field accesses would be used where possible to minimise habitat loss;
- A project Construction Environmental Management Plan (CEMP) would be developed and implemented to ensure measures would be taken to avoid, reduce and mitigate environmental impacts;
- In order to minimise the impacts of construction (e.g. disturbance from works), all activity would be limited to clearly defined working areas, and the storage of surplus materials would be confined to areas of hardstanding. Vegetation clearance would be kept to a minimum and, where practicable, vegetation would be lifted as turfs and replaced after trenching operations. An Ecological Clerk of Works (ECoW) would 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 requirements;
- Habitats which would be subject to temporary loss e.g. temporary construction compound and laydown area would be re-vegetated and reinstated as soon as possible after construction, to replicate habitats which are temporarily lost; and
- In line with Scottish Government policy in relation to tree felling[41], there would be no net loss of woodland habitats. Tree planting of native species of local provenance would be undertaken within or adjacent to the Blackwood Estate to mitigate for the loss of woodland (including saplings around the proposed turbines 1 and 3) and shelterbelt habitats and the management of these habitats would be undertaken in accordance with long-term objectives for the estate.

6.88 The assessment has considered all impacts associated with the Development as described in Chapter 3. The route and nature of the grid connection does not form part

of the planning application and is yet to be finalised so has not been assessed here. The applicant's preference is for the grid connection cables to be located in trenches in roadside verges; it is not anticipated there would be any significant environmental impacts associated with this option. However, the line would be considered in more detail and subject to environmental assessment by the Distribution Network Operator (DNO) prior to a formal application for this element of infrastructure. The scope of any such assessment would be agreed with DGC.

Predicted Impacts

Construction Impacts

Habitats

6.89 Permanent habitat loss of mixed plantation woodland (District value) would result from the siting of the proposed construction compound (part of which would be re-used as the location of the substation and control building towards the later stages of the construction works) adjacent to Glenloy, and to enable the construction of access roads and hard standing for the substation.

6.90 Permanent habitat loss of conifer plantation woodland (Local value) would also result from the upgrading of existing tracks, creation of new access tracks and creation of areas of hard standing for wind turbine construction. Habitats which would be affected by the Development include areas of recently planted woodland (sitka spruce, hybrid larch and broadleaves) around WT1 and WT3 (keyholing) and along the proposed access track to WT1, 3 and 5. The extent to which these woodland habitats would be removed or fragmented is detailed in Chapter 3: Project Description and amount to a maximum of 1.99ha of woodland habitat. Of this total approximately 0.22ha is mature conifer plantation woodland (at Muirstraploch Wood). There would not, however, be any direct impacts on woodland areas listed in the AWI.

6.91 The loss of mixed plantation and conifer plantation woodland would be considered to be of Low magnitude and Negligible-Minor significance in terms of the value of these habitats given their District and Local value within the Site. Potential impacts on protected species as a result of clearance for construction are discussed below. There is potential for impacts on the water environment if pollution events occur during construction or if there is sedimentation caused by silt run-off. The loss of semi-improved (Local value) and improved (Less than Local value) grassland habitats for construction of the above elements and the anemometer mast would be assessed as Low magnitude and Negligible significance (Not Significant in EIA terms).

Protected species

6.92 There is at least one group of badgers present within the survey area, which is used for setting and foraging, but no badger setts were identified within 500m of a turbine or any

other development on the Site[42]. However it is possible that a new sett(s) could be constructed prior to works commencing and badgers may be affected by the construction of the development as a result of the loss of foraging habitat, disturbance, death or injury as a result of entrapment, and sett loss. Such impacts would be predicted to result in impacts of up to Medium magnitude (long-term impact on the integrity of the badger group which is unlikely to threaten its presence in the area) and Minor significance to Local badger populations, notwithstanding their protected status,

6.93 SNH generally advises that where activities are proposed which can cause indirect disturbance through noise and/or vibration e.g. blasting, such activities are avoided within ~100m of the closest sett entrance[43]. Work that disturbs a badger sett is illegal without a licence from SNH. A badger sett is defined in the Protection of Badgers Act (1992) as "any structure or place, which displays signs indicating current use by a badger" and SNH's guidelines indicate that "current use" does not simply mean "current occupation" and for licensing purposes it is defined by 'any sett within an occupied territory regardless of when it may have last been used'. A sett therefore, in an occupied territory, is classified as in current use even if it is only used seasonally or occasionally by badgers and is afforded the same protection in law. The guidance also indicates the types of activities which may result in disturbance and advises that any such work within 30m of a sett may require a licence. With the exception of the potential to cause harm to badgers, construction impacts are likely to be temporary and reversible during the construction period with severance of territories unlikely to result in displacement.

6.94 There would be some loss of potential foraging habitat during clearance of woodland and grassland habitats for construction and for permanent (operational) structures associated with the Development, as detailed in paragraphs 6.88 and 6.89, however, there is abundant alternative foraging habitat present within the Blackwood estate as a whole and this loss of foraging habitat would be unlikely to significantly affect badgers' resource availability. The magnitude of impacts is therefore considered to be Negligible and significance Negligible (i.e. Not Significant) in terms of badger.

6.95 Bat roosts have been identified at the Keeper's Cottage (approximately 45 from the proposed access road), High Auldgirth outbuildings (within 15m of the road) and Auldgirth Cottages 1 – 4 (around 75m from the proposed access road) and may, therefore, be subject to indirect disturbance (for example as a result of lighting during track construction/upgrading works). In addition, although no bat roosts were recorded in trees within the survey area during surveys (which included assessments of roost potential taken from the ground – see Table 6.1), there are several mature trees which offer potential roosting habitat within the bat survey area and along the proposed access track. A number of these trees may need to be felled or pruned during the construction of access tracks and site infrastructure therefore any bats which use them for roosting may be subject to disturbance. Actions which would result in harm to bats or disturbance, damage or obstruction to roosts, regardless of whether they are occupied, would constitute an offence under the above legislation and carry the risk of

prosecution. The magnitude and significance of such actions would be proportionate to the value of the feature/bats being impacted in the absence of mitigation, and would be predicted to range between Low magnitude for small roosts of common species such as soprano pipistrelle, and High magnitude if a significant roost (summer maternity or winter hibernation roost or roost for rarer species such as *Nyctalus*) were to be impacted, resulting in impacts of Negligible/Minor to Major significance.

6.96 Habitat loss of mature and recently planted woodland habitats as detailed above and in Chapter 3 - Scheme Description would result in the temporary, reversible (for temporary components) and permanent (for access tracks, hardstandings and wind turbines) loss of small areas of potential bat foraging habitat, however the survey area contains abundant alternative foraging habitat and it is considered unlikely that this would result in impacts of greater than Low magnitude, resulting in significance of Negligible to Minor on the Local (pipistrelle, Myotis and brown long-eared bat) and District (*Nyctalus* species) value bat populations i.e. Not Significant.

6.97 No otter lying up sites were recorded during the surveys however there is potential for new lying-up sites to be constructed prior to works commencing and otters may also be affected indirectly as a result of habitat loss due to sedimentation or polluted runoff during construction, disturbance as a result of the use of lighting and heavy machinery, and death or injury as a result of entrapment. As European Protected Species (EPS), otters and the places which they use for shelter and protection are afforded full protection in UK legislation therefore it is an offence to harm an otter or damage, disturb or obstruct a lying up site; actions which may result in prosecution.

6.98 The magnitude and significance of such actions would be proportionate to the value of the feature/otters being impacted and would be predicted to range from Low magnitude for small temporary lying up sites including couches, to High magnitude for extensive natal or breeding holts, resulting in impacts of Negligible to Minor significance in the absence of mitigation for the Local value population of otters present on the Blackwood Site.

6.99 The risk of significant breeding holts being present within the Site is considered to be low given that much of the Site is subject to occasional disturbance from grazing livestock and human disturbance (e.g. pasture farming and shooting) which are factors which otters tend to avoid when selecting such sites.

6.100 The construction of crossing points along watercourses during the construction and upgrading of access roads would result in temporary severance of otter habitats and construction works in and near watercourses have the potential to result in pollution or sedimentation of watercourses which could lead to reduced suitability of the watercourses to support otter prey. However otter home ranges cover many kilometres of watercourse and the watercourses present within the Site are small and are unlikely to represent important foraging or commuting habitat resources in comparison with features such as the River Nith; their temporary loss as a result of barrier effects during

construction would not be considered to result in an impact of greater than Low magnitude and Negligible significance on the local otter population i.e. Not Significant.

6.101 The layout avoids direct impacts on viable areas of red squirrel habitat however small areas (approximately 0.22ha in total) of mixed conifer plantation woodland are proposed to be felled at Muirstraploch Wood to accommodate the Development and, as such, it is possible that red squirrel could be directly impacted by the proposed works. It is an offence under the Wildlife and Countryside Act 1981 (as amended) *inter alia* to kill or injure a red squirrel or to damage, destroy or obstruct access to dreys or disturb a red squirrel when it is using a drey. Muirstraploch Wood supports a locally significant population of red squirrel and their dreys and, as such, it is likely that felling operations would result in disturbance of red squirrel, in the absence of mitigation. Given that only a small proportion of woodland would be lost the magnitude of impacts would be expected to be Low with Negligible significance on the local red squirrel population i.e. Not Significant.

6.102 The survey area supports suitable reptile habitats and there is potential for temporary and permanent loss of these habitats as a result of clearance for construction. In particular the loss of semi-improved grassland and conifer plantation woodland edges and the clearance and removal of brash, logs and piles of rubble has the potential to cause harm to reptiles. Impacts would be temporary, direct and adverse and would be unlikely to threaten the sustainability of the site to support reptile populations therefore the magnitude of impact is considered to be Low. Based on the evaluation provided in paragraph 6.76 this would result in impacts of Negligible significance to reptile populations which are evaluated as being of Local value.

Operational Impacts

6.103 During the operation of the Development, the potential for chance pollution incidents during routine maintenance activities would be minimised by implementing SEPA pollution prevention guidance (further details are included in Chapter 3: Project Description).

Habitats

6.104 The impacts of permanent and irreversible loss of habitats for access tracks and hardstandings which would be predicted to occur if the Development were consented are addressed in the construction phase (see Section 6.89) and would be Not Significant.

Species

6.105 There would be permanent loss of small areas of potential foraging habitat for badgers as a result of site infrastructure and hard standing for wind turbines as detailed in paragraph 6.93 and would be predicted to be Not Significant. Similarly, operational impacts on otter and reptile are considered to be Negligible resulting in no significant

impact on these receptors. Red squirrel may be affected by loss of foraging and drey habitat during routine forestry operations on the site but would not be anticipated to be further affected by the operation of the Development; loss of foraging and drey habitat is assessed in the Construction phase above (see Section 6.101).

6.106 Bats are potentially at risk from collisions with wind turbines with fatalities recorded in several European countries, occasionally in very high numbers[44]. The majority of fatalities take place in the late summer and autumn and are particularly notable in migratory species[45],[46]) although resident species are also affected. A number of hypotheses have been posed to explain why bats are killed by wind turbines, including random collision, acoustic attraction and swarming of insect prey around the nacelle which attracts foraging bats (reviewed in University of Bristol/BCT, 2009[47]). Bats may be at even higher risk of mortality because they can be affected by barotrauma, whereby rapid or excessive changes in pressure resulting from the vortices created by moving turbine blades result in tissue damage in the lungs[48];[49]). This condition is unique to bats as birds have a different respiratory system. Indirect impacts which could potentially result from the presence of operating wind turbines may include the displacement or exclusion of bats from their foraging areas by the introduction of physical barriers (moving turbine blades) which could interfere with migration, commuting routes or access to roosts.

6.107 Whatever the reasons for mortality, the impacts on bat populations are compounded by their low fecundity, the implications of which are that it can take a long time for populations to recover from comparatively small losses and can therefore affect species' conservation status.

6.108 There has been no systematic approach to monitoring bat fatalities or activity patterns at wind farm sites post-construction in the UK and a lack of understanding on migratory behaviour in British bats means that the flight paths and flying altitudes for British species are not known. However, current understanding of migration patterns in Europe from ringing returns[50] and understanding of bat behaviour, flight patterns, foraging strategies and echolocation calls[29] have enabled an assessment of relative collision risk to individuals of each species from wind turbines[51]. This also estimates likely risk to bat populations, based on level of risk to individuals and species population size. The guidance places bat individuals into one of three risk categories: low, medium and high.

6.109 Soprano pipistrelle is the only confirmed species with recorded fatalities in Britain[45]. Both soprano and common pipistrelle are classed as being at medium risk of collision with turbines at a species/individual level, whilst their populations are assessed as being at low risk. According to large-scale studies in Germany[43], the majority of pipistrelle collisions occur where turbines are located within forests. The risk is likely to be comparatively high in proximity to woodland edges (i.e. WT1, 2 and 5) and near the pond (i.e. WT4); features at which bat activity was found to be concentrated during

manual activity and Anabat surveys, and which are considered important to foraging pipistrelles in comparison with open areas of the bat survey area.

6.110 Wind turbines 1 and 3 are located within an area of newly planted woodland which, in the absence of felling or clearance, would mature over the lifespan of the project, which would result in increased risks to foraging bats by forcing them to fly higher in relation to the turbine blades. WT2 is located 20m south of Muirstraploch Wood and WT5 is located 50m north of the woodland plantation to the east of Knocknutshell Wood resulting in a stand-off between turbine blades and tree height of less than the 50m recommended by guidelines[52] which may also result in higher risk of collisions. Taking into account the proposed locations of the turbines, the magnitude of impact is considered to be low in terms of common and soprano pipistrelle populations, for which the bat survey area is assessed as being of Local value, resulting in no significant impact on this species.

6.111 *Myotis* bats are classed as being at low risk of collision at both the individual and population level and Rydell *et al*[45] report that they are generally not at risk as they fly below rotor height. *Myotis* activity was generally low within the survey area and was concentrated along Pennyland Burn and, in view of the low levels of activity detected within the survey area, it is considered unlikely that any *Myotis* populations would be adversely affected by the Development. In recognition of the low risk of collision categorisation of these species, it is therefore considered that the impact magnitude would be Negligible in terms of *Myotis* bats resulting in no significant impacts on these species.

6.112 Conclusions drawn from bat survey results are that there is a notable population of *Nyctalus* bats using the bat survey area, which given the rarity of these species throughout much of Scotland indicates the relative importance to this species group in comparison with other bat species. There was no evidence from survey results i.e. *Nyctalus* social calls or large numbers of calls peaking in autumn, to indicate that there is a peak in activity during the mating season (August-September) when these species are thought to be particularly vulnerable to collisions. Noctules and Leisler's bats are wide-ranging species that will forage and commute across woodland, parkland and wetlands as well as open landscapes at comparatively high altitudes (including within the height range of the rotor swept path of the proposed turbines, i.e. 60-140m for WT1, 3 and 5; 40-120m for WT2 and 4). Nithsdale may act as a commuting route between different areas of bat habitat and the bat survey area represents good foraging and potentially roosting habitat[53] in an area of Dumfries and Galloway where noctule is regularly encountered[54] and Leisler's rarely so.

6.113 In recognition of the high collision risk of *Nyctalus* species with wind turbines but in line with the notable indices of activity recorded within the bat survey area, it is considered that the impact magnitude would be Low-Medium in terms of *Nyctalus* bats resulting in impacts of Minor significance to these species.

Decommissioning

6.114 During the eventual decommissioning of the Development, potential impacts on nature conservation would be expected to be similar to those during the construction phase and thus similar mitigation measures are likely to be required. Any new legislation or guidelines published prior to decommissioning would be adhered to and incorporated into mitigation design prior to decommissioning taking place.

Mitigation

6.115 No significant impacts have been recorded which require mitigation, however in recognition of the sensitivity of some of the species concerned and in the interest of ensuring best working practice and compliance with relevant legislation a number of mitigation measures are set out below. The provisions of these mitigation measures would be included in the CEMP or agreed with stakeholders as detailed below.

6.116 Potential impacts on badgers would be mitigated through adoption of the following measures in addition to those outlined above:

- Pre-construction badger survey of areas that would be directly affected by construction, together with a 100m buffer around wind farm infrastructure, would be carried out no more than six months prior to the start of construction. This survey would aim to identify any new badger setts that have been established and, if necessary, a badger protection plan detailing mitigation proposals (such as the provision of artificial setts) would be prepared and the requirement for licensing would be determined through consultation with SNH. SNH is the licensing authority for badgers in Scotland;
- All contractors would be briefed regarding the badgers at the Site and the locations of any setts to avoid any accidental damage or disturbance; and
- A suitable means of escape (e.g. a long wooden or metal plank) from any exposed trenches and other excavations would be provided. Deeper excavations would be fenced off to prevent wildlife access.

6.117 Potential impacts on bats would be mitigated through adoption of the following measures:

- In advance of any tree works, an appraisal of the potential to support bat roosts would be undertaken up to a minimum of 50m from the Development to provide detailed, up-to-date information on the presence of bat roosts or suitability to support roosts in order to inform further survey effort (which may include the need for targeted emergence/re-entry surveys, or climb-and-inspect surveys by a licensed bat worker);
- Only when this survey has been carried out on moderate-high potential trees would the felling works proceed (no longer than 48 hours after the tree check has been carried out). Tree felling/pruning work would be undertaken at suitable times of year to reduce the potential for adverse impacts upon bats;
- A bat protection plan would be prepared which identifies measures to protect bat roosts which would not be directly affected by construction works in order to prevent an offence from being committed. This may include declaring an area

within 30m of a bat roost out of bounds to site users and sensitive use of lighting near roosts in accordance with Institute of Lighting Engineers (ILE) guidelines[55];

- If bat roosts which have the potential to be affected by the Development become established on the Site during construction works, all contractors would be briefed regarding their locations to avoid any accidental damage, disturbance or obstruction to roosts;
- Wind turbines may be subject to micrositing of up to 30m deviation from the locations shown in Figure 3.2, however they would not be microsited any closer to woodland edges than is currently shown. This would result in a distance of greater than 50m (recommended by guidance[56]) between the rotor-swept area of WT5 and the nearest woodland edge thereby minimising the collision risk to bats. This recognises the fact that bats including pipistrelle, *Myotis* and long-eared species generally forage and commute in close proximity to habitat features (the same is not generally true of *Nyctalus* species which often forage over open ground);
- Trees in proximity to operating turbines would be managed in such a way that the 50m standoff is maintained. This would be established by agreement of felling/pruning around turbine locations;
- New bat roost habitat would be provided for any bat roosts which would be disturbed, lost, damaged or obstructed, in proportion to the roost type, size and species of bat using the feature to be affected, in accordance with the bat mitigation guidelines[57]. Such habitat may include bat boxes installed on trees or buildings to be retained; and
- In addition to the above mitigation for the disturbance, obstruction, damage or loss of bat roosts during the construction of the scheme, additional bat roosting opportunities (bat boxes) would be created within the Site to compensate for the loss of potential roosts and reduced suitability of potential roosting features as a result of the development. It is considered that mature trees adjacent to High Auldgirth and in Lambrig Wood on the south eastern boundary of the site would provide excellent receptors for such features, where there is no risk of disturbance or collision with turbine blades.

6.118 In the context of their European Protected Species (EPS) status, works that can be expected to cause disturbance to bats or which may damage, obstruct or destroy their places of shelter (irrespective of when the roost has last been used), should only proceed after an appropriate licence has been issued by SNH. In this context, should a bat roost be confirmed within any tree that requires removal, all possible alternatives would be considered prior to the decision to go ahead with tree-felling. Should the felling be progressed, SNH would be consulted, a Method Statement agreed and an appropriate licence sought. SNH is the licensing authority for bats in Scotland.

6.119 Recent research has been undertaken into the impacts of wind turbine installation on bat activity and, as a result, it is recommended that post-construction monitoring be undertaken in order to assess changes in bat activity patterns and provide additional information on any mitigation schemes[11].

6.120 In conjunction with woodland management and offset planting elsewhere within the Blackwood estate, and in light of the potential risk to bats of wind turbine collisions it is proposed that post-construction monitoring of potential bat collisions with wind turbines would be undertaken. These surveys would monitor the rate of collision mortality and the impacts of this on local bat populations, if any. Post-construction monitoring is not a mandatory requirement however it is recommended in best practice guidelines. There is an opportunity to utilise the proposed anemometer mast to monitor bat activity through the operation of the Development, with microphones installed at the height of the rotor-swept path. Collectively, these data would be used to monitor the rate of collision mortality and the impacts of this on local bat populations, if any, and to inform the requirement for additional mitigation measures, which would be discussed with SNH if required.

6.121 Potential impacts on otters would be mitigated through adoption of the following measures:

- In order to ensure that otters have not established holts, shelters or resting places along the burns during the intervening period before construction, a pre-construction otter survey would be carried out within 6 months prior to works beginning. These surveys would include a search of all suitable habitats up to a minimum of 250m from turbine locations and infrastructure and up to a minimum of 100m of all indicative site access tracks in accordance with standard guidance[38]. In particular this would include the drainage channels which would be crossed during the construction and upgrading of the access track, and around the proposed infrastructure and turbines at WT1, WT3 and WT5 which are proposed for construction adjacent to the Pennyland Burn. If a place of shelter for otter is identified then SNH would be consulted and an otter protection plan and licence application (if required) would be prepared. SNH is the licensing authority for otter in Scotland; and
- SNH guidance suggests that, while SNH should be consulted to determine whether any proposed measures incorporated into a scheme are sufficient to avoid the need for a licence, disturbance during development works can be minimised by declaring an area within at least 30m of an otter shelter, out of bounds to all site users at all times.

6.122 Even if works would not disturb an otter holt or resting place, there is potential for otters to be harmed during the construction period if they are present at that time. To minimise the potential risk of harm, the following measures would also be employed:

- Artificial lighting, where used during construction, would be directed away from watercourses, so that it does not disturb otter activity during the hours of darkness;
- Should evidence of otters be found on site during construction, a suitable means of escape from any exposed trenches and other excavations would be provided (such as a long wooden or metal plank). Deeper excavations would be fenced off to prevent wildlife access; and
- If holts/rest areas become established in the future, all contractors would be briefed regarding their locations to avoid any accidental damage or disturbance.

6.123 Potential impacts on red squirrel during construction would be mitigated through adoption of the following measures:

- A pre-construction survey would be undertaken of woodland areas up to 50m around proposed site infrastructure (including borrow pits, turbine locations and access tracks) to identify active red squirrel dreys; and
- If dreys become established in the future, all contractors would be briefed regarding their locations to avoid any accidental damage or disturbance.

6.124 For red squirrels, the Wildlife and Natural Environment (Scotland) Act 2011 has added a new licensing purpose to the Wildlife and Countryside Act 1981 (as amended)[58]. Works (including excavation) which could otherwise constitute an offence may require a licence. SNH is the licensing authority for red squirrels in Scotland.

6.125 Potential impacts on reptiles would be mitigated through adoption of the following measures:

- Targeted pre-construction surveys for reptile would be undertaken to identify habitats which are of particular value to reptiles;
- Common lizards, adder, grass snake and slow worm are active during the warmer months and hibernate in winter, often in rock crevices, dry stone dykes, grass tussocks, rubble and rotting tree stumps and roots (the latter of which are abundant in recently felled woodland areas along the route of the proposed access tracks) where sheltered crevices exist. Site preparation work requiring the clearance of such habitats should ideally avoid the winter period (generally November to March, although this is dependent upon the weather conditions in any one year) when there is a risk of torpid[59] reptiles being killed or injured and any movement of their hibernacula[60] may have a negative impact on their survival;
- Removal of any existing piles of spoil (brash, logs or rocks) should take place prior to hibernation (i.e. before the end of October) or following hibernation in the latter weeks of March (weather dependent) onwards;
- Areas of suitable reptile habitat within the development footprint (particularly tufted grasses) should be mown short outwith the winter period under the supervision of a suitably qualified ecologist and thereafter maintained at a short sward in order to discourage reptiles from these areas for the duration of the construction period. Rotting tree stumps and roots in areas of recently felled woodland should also be cleared outside the winter period and brash and logs stored in such a way that once placed they would not have to be removed again;
- Any scrub clearance should be undertaken outside of the breeding bird season (March to August inclusive) and the scrub must only be cut low to the ground during this period, not removed by the roots as this has the potential to impact upon hibernating reptiles; and
- For the duration of any earthworks, any trenches or excavations which are left open overnight should be inspected for lizards prior to in-filling, if dug during the lizards' active period (generally accepted as being late March until the end of October). Any reptiles found during works should be removed and placed in suitable reptile habitat away from the construction works.

Enhancement

6.126 There are opportunities within the Site where existing habitats could be improved, subject to landowner agreement, for the benefit of local faunal populations. For example, the forestry management plan could be adapted to include specific management for red squirrels (which may include increasing the proportion of conifer species other than sitka spruce and enhancing the connectivity of woodland areas); inclusion of broadleaved edges to enhance the foraging and eventual roosting opportunities for bats; and establishment of rough grassland strips along the boundaries of pasture land (as per ES Chapter 7: Ornithology) to enhance reptile habitats. It is proposed to incorporate such measures into the development should it be consented.

Residual Impacts

6.127 No residual impacts that would be judged to be significant in terms of the EIA process have been identified i.e. Major significance as defined by the matrix presented in Table 6.4.

6.128 The adoption of best practice during the construction and operation of the Development and the provision of mitigation and enhancement measures outlined above would minimise the potential for adverse impacts on protected species.

6.129 The potential death or injury of bats due to collision with wind turbines would result in the permanent loss of these individuals from the population. However, the risk of such losses is predicted to be small and is unlikely to result in any detectable change in the current level of background bat mortality. In the case of pipistrelle, *Myotis* and long-eared species (local value) the risk of collision would be managed by the siting of turbines away from woodland edges and management of woodland to maintain this buffer. This is because bat activity declines significantly away from such features. In the case of *Nyctalus* species (District value) which typically forage in more open areas the siting of turbines in relation to woodland areas may have less of an effect on the collision risk. Although bat behaviour may change to accommodate the barrier effects associated with the presence of turbines, there remains a low residual risk of small numbers of bats being killed which would be Not Significant in EIA terms. It is anticipated that with monitoring as outlined above additional mitigation may be designed to reduce this risk.

Table 6.8 – Summary of Residual Impacts

Receptor and summary of predicted impacts	Type of impact	Valuation	Magnitude	Significance	Summary rationale
Construction					
Loss of mixed and conifer plantation woodland habitats	-ve	Local/District	Negligible	Negligible	Woodland planting so no net loss of woodland habitat.
Disturbance of badgers	-ve	Local	Negligible	Negligible	Pre-construction surveys and implementation of badger protection plan.
Loss of bat roosts	-ve	Local/District	Negligible	Negligible	Pre-construction surveys and implementation of bat protection plan.
Loss of bat foraging habitat	-ve	Local/District	Negligible	Negligible	No net loss of woodland foraging habitat.
Disturbance of otters	-ve	Local	Negligible	Negligible	Pre-construction surveys and otter protection plan.
Loss of otter foraging habitat and pollution of watercourses	-ve	Local	Negligible	Negligible	Watercourse protection and pollution prevention measures; sensitive lighting, maintain open corridors along watercourses.
Loss of red squirrel foraging and drey habitat	-ve	Local	Negligible	Negligible	Pre-construction surveys; no net loss of woodland habitats.
Disturbance of reptiles	-ve	Local	Negligible	Negligible	Pre-construction surveys; translocation of reptiles and no net loss of habitats.
Operation					
Turbine collisions by bats	-ve	Local/District	Negligible/ Low	Negligible/ Minor	Offset between turbines and woodland edges, and post-construction monitoring.
Decommissioning					
No residual impacts predicted					

Cumulative Impacts

6.130 The impact of the Development on the ecological value of the Site is not anticipated to extend beyond the Site boundary. Of the species recorded during the surveys, bats are the most likely species to be affected by an additional wind farm development in the area because of the cumulative risks to bat populations as a result of collision with wind turbines.

6.131 Several species of UK bats are known to be migratory in parts of their range on the continent however little is known about migration in the UK. Short-distance migration (between summer roosts and mating sites/ winter roosts) occurs annually in several bat species, but for many species these migrations take place at relatively low altitude (e.g. *Myotis* species and brown long-eared bats) therefore the risks of colliding with wind turbines are considered low and these species will not be considered further. As discussed above the risks to pipistrelle and *Nyctalus* species are relatively high because they tend to fly at heights comparable with the rotor swept path of wind turbines. Direct cumulative impacts of wind farm schemes on individuals of the same *local* population would only be predicted to occur where these schemes are situated on commuting or migratory routes or near important foraging habitats, roosts or hibernacula. Of the features which have been considered in the cumulative impact assessment for landscape purposes (see Chapter 8: Landscape and Visual Amenity and Figure 8.27) most are situated at distances from the Site which exceed the maximum typical commuting distances. Table 6.8 identifies the possible cumulative impacts on bats of wind farm schemes within 20km of the Site[61]. Outwith this distances cumulative impacts are likely to be limited to the impacts of demographic changes, i.e. changes in the number or distribution of bats which are of sufficient scale to affect their range or their ability to reproduce.

6.132 In the absence of available data on the existing impacts (in terms of bat mortality) of the operational wind farms in the vicinity of the Site, and without an understanding of the extent to which bats have been able to adapt their behaviour to avoid wind turbines the cumulative impacts on local bat populations is therefore unknown.

Table 6.9 – Possible Cumulative Impacts on Local Bat Populations

Wind farm - status	Distance/direction from the Site	Number of turbines	Potential impact
Dalswinton - operational	Directly adjacent to the Site	15	Cumulative impacts possible due to proximity to the Site and location within Nithsdale.
Auchencairn – in planning	1km north east	16	Cumulative impacts possible if Auchencairn scheme is realised due to proximity to the Site and location within Nithsdale.
Harestanes – under construction	6km north east	71	Cumulative impacts possible due to contiguous woodland habitat area between Harestanes and

Wind farm - status	Distance/direction from the Site	Number of turbines	Potential impact
			Blackwood.
Minnygap Resubmission – in planning	11km north east	10	Cumulative impacts possible if Minnygap scheme is realised due to contiguous woodland habitat area between Harestanes and Blackwood.
Barnbackle – in planning	15km south west	2	Cumulative impacts unlikely if the Barnbackle scheme is realised due to absence of obvious linear route between the sites and distances involved.

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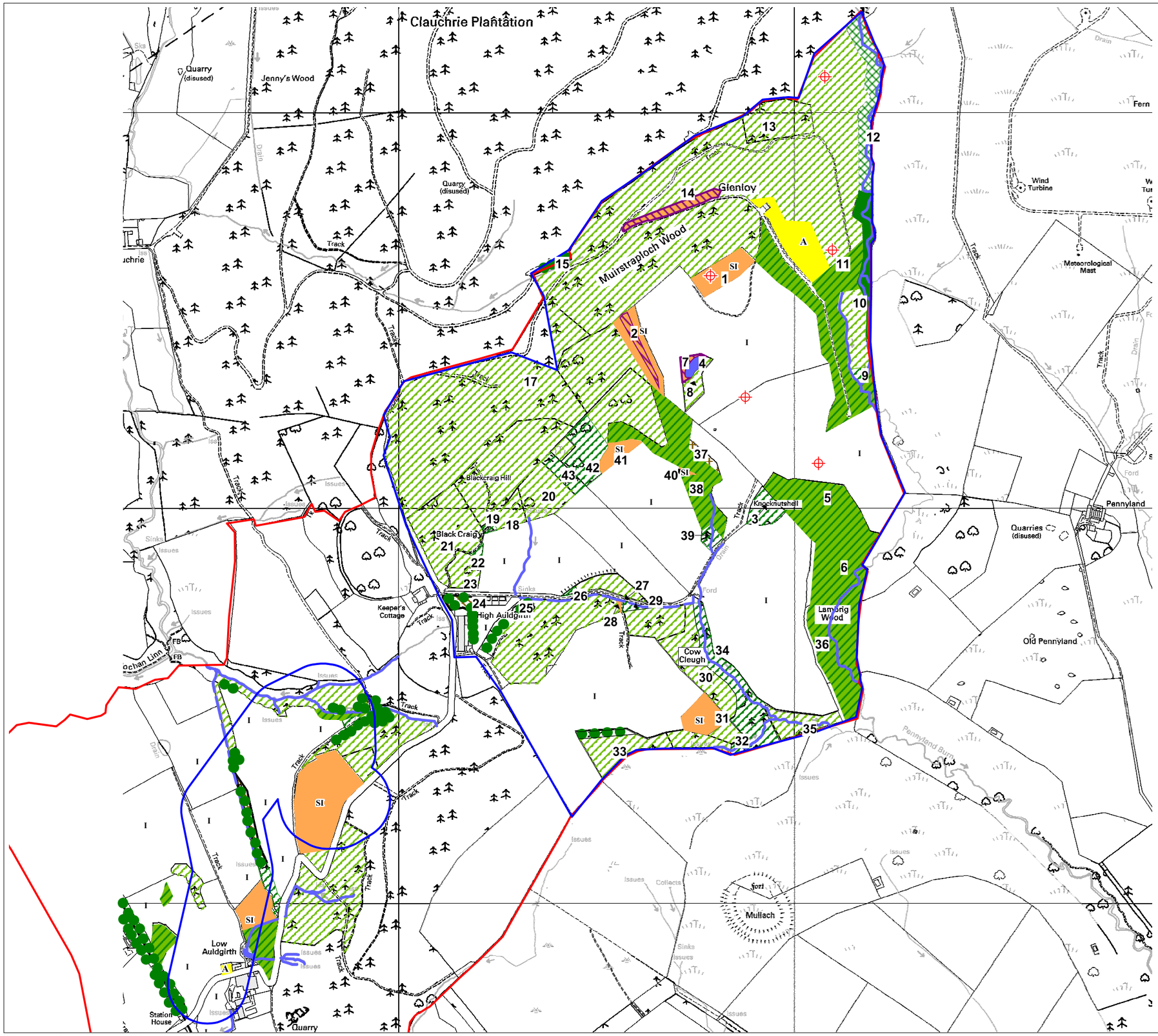
[60] Hibernacula are places where species which hibernate (i.e. bats or reptiles) will spend the winter.

[61] Noctules – the widest ranging of the bat species potentially recorded at Blackwood - have been recorded flying up to 26km from roosts to foraging areas but most hunting flights extend to areas up to 2.5km from the roost and often there are no well-defined hunting grounds with the animals roaming relatively freely (as referenced in Dietz, c., von Helversen, O. and Nill, D. (2007). Bats of Britain, Europe and Northwest Africa. Stuttgart.).



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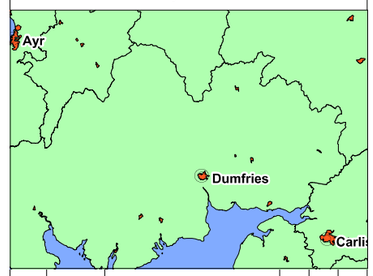
- Site Boundary
- Phase 1 Survey Area Boundary
- Proposed Wind Turbine
- 1 Target Note
- A1.1.1 Broad-leaved semi-natural woodland
- A1.1.2 Broad-leaved plantation woodland
- A1.2.2 Coniferous plantation woodland
- A1.3.2 Mixed plantation woodland
- A2.1 Dense / continuous scrub
- A3.1Scattered broad-leaved tree
- SI B2.2 Semi-improved neutral grassland
- I B4 Improved grassland
- B5 Marsh / marshy grassland
- C1.2 Scattered bracken
- C3.1 Tall ruderal
- G1 Standing water
- G2 Running water
- A J1.2 Amenity grassland
- J2.6 Dry ditch



Rev	Date	Description	Drn	Chk	App
00	19.12.11	Phase 1 Habitat Survey	SF		

FORCE 9 ENERGY

Blackwood Wind Farm

RSK

Figure 6.1: Phase 1 Habitat Survey

SCALE: 1:10,000 @ A3

FILE NAME: T:\T190000 - RSK Scotland Glasgow\T190283 Deuchries Wind Farm\01 GIS\Figure 2 - Environmental Designations.Wor

7 ORNITHOLOGY

Introduction

7.1 This chapter describes and evaluates the current ornithological interest of the Site and its surrounds and assesses the predicted impacts of The Development on this interest. The key issues when considering the interaction of birds with wind farms are as follows:

- The impacts of direct habitat loss due to land take by wind turbine bases, tracks and ancillary structures;
- The impacts of indirect habitat loss, i.e. the displacement of birds from the proximity of wind 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 impacts of collision with rotating turbine blades, power cables, guy lines and fencing (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.

7.2 In order to assess the potential impacts of a wind farm, both the value of the Site itself and of the zone of potential influence around the development to birds should be determined. Scottish Natural Heritage (SNH) guidance, *Survey methods for use in assessment of the impact of proposed onshore wind farms on bird communities* (SNH 2005[1]), recommends that assessment should concentrate on 'target' species, for example those specially protected or those which occur at a development in regionally or nationally important numbers. Species that qualify as target species under SNH guidance are detailed below.

7.3 The following sections of this chapter set out details of the methodological approach to the surveys and assessment, describe the baseline conditions and fully assess the potential impact of The Development on birds.

Legislation and Policy

7.4 The ornithological assessment has taken account of the requirements of, and/or advice given in:

- 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);
- Wildlife and Countryside Act 1981 (as amended);
- The Nature Conservation Scotland Act (2004);

- Scottish Planning Policy (SPP) Guidance[i];
- Planning Advice Note (PAN) 60: Planning for Natural Heritage;
- Survey methods for use in assessment of the impact of proposed onshore wind farms on bird communities (SNH 2005);
- 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);
- The UK Biodiversity Action Plan (UKBAP);
- The Scottish Biodiversity List; and
- The Dumfries & Galloway Local Biodiversity Action Plan (LBAP).

7.5 Detailed planning policy is outlined in ES Chapter 4: Planning.

Method of Assessment

Terminology

7.6 With regards to the terminology used in this assessment, the 'Site' refers to the land within the planning application boundary, while 'survey area' refers to areas covered by different bird surveys e.g. the survey area for vantage point watches extends up to 2km from the observation point. The 'turbine envelope' is defined by a line drawn around the outer turbines with the addition of a 46.5m perimeter to account for the sweep of the blades.

Scope

7.7 Given the low levels of recorded collisions and the limited disturbance to the majority of bird species from wind farm developments to date, SNH guidance (2005[1] & 2006[2]) on the assessment of the impacts of wind farms on ornithological interests suggests that assessment should concentrate on species within the following categories that are likely to be affected by disturbance or collision:

- Species listed in Annex 1 of the Birds Directive[ii];
- Species protected under Schedule 1[iii] of the Wildlife & Countryside Act 1981 (as amended);
- Regularly occurring migratory species; and
- Red-listed Birds of Conservation Concern (BoCC)[iv].

[i] This includes Scottish Government guidance on how government policies for the conservation and enhancement of Scotland's landscape and natural heritage should be reflected in land use planning.

[ii] Certain endangered, rare, or vulnerable bird species, which warrant special protection, are included on Annex 1 of the Birds Directive.

[iii] All species of wild birds are afforded some degree of protection under the Wildlife and Countryside Act 1981, though some species that are considered to be rare or vulnerable are listed on Schedule 1 of the Act and are afforded additional protection to deter disturbance when nesting.

[iv] The background to the establishment of a 'traffic light system' of conservation concern for UK birds is discussed in Gregory *et al* (2002). 'Red-listed' species include those that are globally threatened have suffered an historical population decline (between 1800 and 1994) or which are perceived to have experienced rapid declines in their UK breeding population or contractions in their UK range of more than 50% over the past twenty-five years.

7.8 In addition, special consideration should be given to migratory species that are either rare or vulnerable, or warrant special consideration due to the proximity of the proposed wind farm to their migration routes, or breeding, moulting, wintering or staging areas. The same consideration should be given to species occurring at the Site in regionally or nationally important numbers[v] and species identified locally as of conservation concern within Local Biodiversity Action Plans and any other species for which the Site hosts a particular concentration (SNH, 2005[1]). In Scotland, consideration should also be given to species listed on the Scottish Biodiversity List[vi]. These species are defined as target species for the purposes of this assessment.

7.9 Preliminary work carried out to define the scope of the assessment encompassed the following:

- A description of the bird community associated with the Site, based upon desk study and field surveys;
- An assessment of the presence, numbers and distribution of target species and other species of conservation concern (e.g. UK BAP species, Scottish Biodiversity List species); and
- An assessment of how birds would be affected by the proposed development, with particular reference to potential displacement from the Site and collision risk to species of high nature conservation value.

7.10 The initial desk study and baseline bird surveys indicated that the Site is a typical example of lowland improved pasture farmland bordered or interspersed with blocks of coniferous plantation and likely to support an unexceptional range of common and widespread farmland and woodland birds. The habitats present on the Site and in the surrounding area, in addition to initial desk study data indicated that goshawk was likely to be the main bird of note. Based on the habitats on the Site and in the surrounding area, it was considered that generic bird surveys during the breeding season and winter would be appropriate. Although additional goshawk vantage point surveys were undertaken early in the breeding season, specific goshawk walkover surveys were not undertaken given the limited access within woodland surrounding the Site. Nevertheless, sufficient data were available from the Dumfries and Galloway Raptor Study Group of breeding site locations within this area. The need for additional species-specific surveys, such as ground-nesting raptors and black grouse, was scoped out due to the habitats present.

Amber listed species may have suffered moderate declines or range contractions, have an unfavourable conservation status in Europe (and are therefore of European concern), breed in very low numbers (five year mean of 1-30 pairs breeding annually), breed at a limited number of sites, or occur in relatively high numbers in UK in comparison with other parts of Europe. Other species have 'green' status, as they do not fulfil these criteria. This implies that the population of a species is either stable or increasing (or that too little is known about the population to allow the species to be included on the red or amber list).

[v] When considering bird populations, importance is taken as meaning that a site supports at least 1% of the population under consideration, i.e. a nationally important site would support at least 1% of the national breeding population.

[vi] The Scottish Biodiversity List is a list of flora, fauna and habitats considered by the Scottish Ministers to be of principal importance for biodiversity conservation and satisfies the requirements of Section 2(4) of The Nature Conservation (Scotland) Act 2004.

7.11 A scoping request was sent to Dumfries and Galloway Council (DGC), SNH and the Royal Society for the Protection of Birds (RSPB), who were asked to provide opinions on the proposal and the ornithological appraisal required at the Site. The response from SNH noted that the Site is located within an area without a RSPB sensitivity rating. It was recommended however, that the study should include any local knowledge from bird recorders, landowners, Raptor study groups, the Wildfowl and Wetlands Trust and the RSPB. The RSPB stated that the Site has potential for foraging peregrine, merlin, hen harrier and all Annex 1 species in the EU Birds Directive throughout the year. In addition, breeding waders and goshawk were noted in the area. Year round vantage surveys and breeding bird surveys following latest SNH guidance were recommended. In their response, DGC made no reference to ornithology.

7.12 The scope of the bird surveys and the proposed approach to the impact assessment was therefore considered to be satisfactory.

Sources of Data and Surveys Undertaken

Nature Conservation Sites

7.13 It is necessary to ascertain the proximity of sites of conservation importance for birds in relation to a proposed development. There are no established criteria with regard to the distance from a proposed site that should be considered. A search area extending 20km from the development area was considered to be an appropriate distance given the potential presence of wildfowl (particularly geese) in the wider area. This distance was considered appropriate based on published information on maximum distances travelled by wildfowl between roost sites and foraging areas (e.g. Giroux & Patterson 1995[3]).

7.14 The presence of Special Protection Areas (SPAs) and Sites of Special Scientific Interest (SSSIs) within 20km of the Site boundary for which birds were a principal reason for notification or designation was determined by accessing the SNH and Joint Nature Conservation Committee (JNCC) websites and through use of the GIS tool MAGIC (http://www.magic.gov.uk).

Bird Records

7.15 Information from Dumfries & Galloway Environmental Resources Centre, and Dumfries & Galloway Raptor Study Group was requested as part of the desk-study to determine whether they possessed ornithological data for the Site and the surrounding area (extending to 5km from the development boundary), particularly relating to birds of high nature conservation value. Additional primary sources of contextual data were:

- Dumfries and Galloway Bird Report (No. 20) 2009 (Irving *et al*. 2010[4]); and
- The Birds of Scotland (Forrester *et al* 2007[5]).

Bird Surveys

7.16 Bird surveys comprised vantage point (VP) surveys, winter walkover surveys, point counts and a breeding bird territory mapping survey, details of which are presented in the following sections.

Vantage point watches

7.17 VP watches, based upon the method statement prepared by Mike Madders for SNH, and appended to SNH (2005[1]) were undertaken over a 12 month period, thus covering the winter and breeding season, as well as much of the autumn migratory period. This method focuses on identifying flight-paths of target species such as geese and allows any regularly used flight lines to be identified, allowing turbine locations to be altered where necessary to reduce collision risk to birds. The data generated can also be used to estimate the theoretical risk of collision with turbines by incorporation into a suitable model.

7.18 During VP watches priority is given to recording the flight activity of target species (as defined by SNH guidance). However, under the Madders methodology, non-target species activity is also recorded during each five minute interval within the standard three hour VP watch. Additional data is therefore collected on all species using the Site during VP watches, which was used to assist in the characterisation of the bird community at the site.

7.19 The Madders methodology guidance is that VPs should be chosen parsimoniously to achieve maximum site visibility from the minimum number of locations such that all parts of the survey area are within 2km of a vantage point. On this basis a single VP was chosen to cover the area where turbines would be located. During the initiation of vantage-point surveys, access outside the Site was not granted; as a result, the VP was situated immediately within the turbine envelope. However, the observer was positioned discretely within the tree-line such that no bird flight lines would have been affected. The location is shown on Figure 7.1, and was as follows: VP1 NX 93037 89084.

7.20 Bird flights were recorded in six height bands: less than 10m, 10-20m, 20-30m, 30-40m, 40-130m and greater than 130m. SNH guidance on survey methods for the appraisal of bird communities at proposed onshore wind farms (SNH 2005[1]) states that survey effort should be matched to conservation sensitivity.

7.21 Breeding season VP surveys were conducted between 21 April and 21 August 2010. A total of 36 hours of survey was undertaken at the VP (see Appendix 7.1 for details). Winter VP surveys were carried out between 24 September 2010 and 28 March 2011. A total of 42 hours of survey was undertaken at the VP, which was considered appropriate given the nature of the site. In addition, VP surveys specifically to look for displaying goshawk were undertaken in Spring 2011, over-looking the woodland to the north of the site (from NX 93850 89450): 15 hours were undertaken between 10 and 22 April 2011. Dates and times of the winter VP surveys are given in Appendix 7.1.

Species-specific goshawk vantage-point watches

7.22 Five additional vantage-point surveys were undertaken between 10 April and 22 April in order to determine the presence of displaying goshawk within or around the Site. Vantage point watches were carried out from a separate vantage-point (VP2 – 'GI Vantage-point', Figure 7.1) on Rushy Rig to the north east of the Site: NX93850 89450.

Breeding Season 2010 Territory Mapping Survey

7.23 Breeding bird territory mapping surveys were undertaken within the Site boundary (due to access restrictions outside this area) only but given the turbine layout this includes a substantial buffer around turbine locations (up to c.1km) and does not represent an information gap. As recommended in SNH guidance, survey methodology was based on the British Trust for Ornithology (BTO) Common Bird Census (CBC) methodology (Marchant, 1983[6]; Gilbert *et al* 1998[7]) and comprised three visits during the breeding season (21 April, 17 May and 22 June 2010) between 06:00 and 12:00. All birds seen and heard were recorded onto maps, noting behaviour to allow an assessment of breeding status. The maps from the three visits were then analysed to produce an estimated number of territories for each species in the survey area.

7.24 Each visit was conducted in suitable weather conditions i.e. good visibility and avoiding strong winds (greater than Beaufort force 5) or persistent rain and all birds were mapped using standard BTO notation.

Point Counts

7.25 SNH guidance recommends that point counts should be conducted in conifer plantations to ascertain bird species present. Point counts were carried out from six locations within and along edges of the plantation. The grid references of the point-count locations for 2010 and 2011 survey seasons are included in Appendix 7.1 and presented on Figure 7.1.

7.26 Five counts were conducted over the course of the breeding season in 2010 (April 21st, May 17th, May 26th, June 22nd and June 27th). Each point count was carried out over a five minute period.

Winter 2010/11 Walkover Surveys

7.27 SNH guidance recommends winter walkover surveys and these were undertaken on a monthly basis during the winter period (September to March inclusive). These surveys were carried out within the Site and extending out to c.1km from the Site boundary (access permitting) where suitable habitat for wildfowl and waders was present. Figure 7.1 shows the survey area. Where access was not possible, observations were made from publicly accessible roads and tracks. Foraging and loafing/roosting birds (especially wildfowl and waders) were recorded in order to help put the Site in context and increase the confidence in prediction of impacts. Dates and times of the winter walkover surveys are provided in Appendix 7.1.

Incidental Records

7.28 Birds seen outside formal, timed surveys were also recorded (i.e. those seen during walks within the Site and surrounding area and during other breaks in survey work). Notes of the activity of highly protected species (i.e. birds afforded a greater level of protection under Annex 1 of the EU Birds Directive or birds and animals with an enhanced protection level under the Wildlife and Countryside Act) were made and / or flights mapped.

Significance Evaluation Methodology

Prediction of Impacts

7.29 There are an enormous number of variables that affect the responses of individual living organisms, populations, communities and ecosystems to changes in their environment. These are only partially understood or studied, and it is therefore rarely possible to make predictions about the ornithological impacts of any form of development with absolute confidence.

7.30 Prediction relies on a synthesis of the information gathered during the baseline surveys and studies of the Site, together with the body of contextual information and knowledge available from written sources (both published and unpublished). Input is also required from those individuals and organisations with expertise in, or local knowledge of, relevant aspects of ornithology.

7.31 Early investigations into the potential for terrestrial wind farms in the UK to cause significant displacement, or mortality, of birds concluded that this was most unlikely in any but the most exceptional circumstances (see early reviews of the topic by e.g. Percival (2000)[8] and Gill *et al* (1996)[9]). Although various post-construction ornithological monitoring studies are being undertaken in the UK, the results of few of these have been made publicly 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 impacts 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 Impacts

7.32 Four criteria have been used in evaluating the ornithological impacts of the proposed development:

- The type of impact, i.e. whether it is positive, negative, neutral or uncertain;
- The probability of the impact 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) (Percival *et al* 1999[10]) and expanded on in SNH (2006[2]) and Percival (2007)[11] which are set out in Table 7.1; and

- The magnitude of the impact in relation to the resource which has been evaluated based on Percival *et al* 1999[10] and Percival, 2007[11] which are set out in Table 7.2.

7.33 A matrix showing how nature conservation importance and impact magnitude are used to derive an assessment of the significance of impacts is presented in Table 7.3.

7.34 The guidelines (Percival *et al* 1999[10], Percival 2007[11]) 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 that it supports, and their conservation status (for example Schedule 1/Annex 1 and UK BAP species) are used along with other factors to assess the nature conservation importance of a site. These terms only set out to evaluate the importance of species however; the importance of the habitat is not evaluated. Thus the nature conservation importance of a bird occurring in optimal, and hence possibly more productive habitat, is considered equal to that of a bird in a sub-optimal area.

7.35 It should be noted that the approach of this assessment is to also consider the value of the Site 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 would be considered to be a species of medium conservation importance using the criteria in Table 7.1 by virtue of being a UKBAP Priority species, the value of a site which was only used very occasionally by a single bullfinch would be extremely limited. Therefore, in this case, nature conservation importance would be assessed as being 'Low'.

7.36 Therefore, while the importance of the species is taken into account, in order to assess the nature conservation importance of the site, the number of individuals of that species using it and the nature and level of this use is also taken into account. An assessment is then made of the importance of the proposed Site to that species.

Table 7.1 Definitions of Terms Relating to Nature Conservation Importance of Species

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 and/or Schedule 1 of the Wildlife and Countryside Act 1981. Regularly occurring relevant migratory species that 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 wind farm.
MEDIUM	Species covered above which are present infrequently. Species present in regionally important numbers (>1% of regional population).

Importance	Definition
	Species occurring within SPAs and SSSIs, but not crucial to the integrity of the site. Species listed as priority species in UK Biodiversity Action Plan subject to special conservation measures.
LOW	Species covered above which are present very 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 7.2 Definitions of Terms Relating to the Magnitude of Impacts on a Site

Magnitude	Definition
VERY HIGH	Total loss or very major alteration to key elements/features of the baseline conditions such that the post development character/composition/attributes will be fundamentally changed and may be lost from the site altogether.
HIGH	Major loss or major alteration to key elements/features of the baseline (pre-development) conditions such that post development character/composition/attributes 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/attributes of baseline will be partially changed.
LOW	Minor shift away from baseline conditions. Change arising from the loss/alteration will be discernible but underlying character/composition/attributes of baseline condition will be similar to pre-development circumstances/patterns.
NEGLIGIBLE	Very slight change from baseline condition. Change barely distinguishable, approximating to the "no change" situation.

7.37 It should be noted that in terms of the EIA Regulations, it is only impacts that are likely to have significant impacts that require detailed assessment. Those impacts which are shaded in Table 7.3 equate to those considered significant under the EIA Regulations with the others constituting an insignificant impact. The use of the category of 'minor' is used in acknowledgement that there are instances whereby there may be an impact, albeit that this is not likely to be significant. It is also used to facilitate assessment of cumulative impacts e.g. where cumulatively several minor impacts could be significant.

Table 7.3 Evaluation of Impacts Matrix

Magnitude	Importance				
	Very High	High	Medium	Low	Negligible
Very High	Major	Major	Major	Minor	Negligible
High	Major	Major	Minor	Minor	Negligible
Medium	Major	Major	Minor	Minor	Negligible
Low	Minor	Minor	Minor	Negligible	Negligible
Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Key		Significant Impact			
		Not Significant			

Baseline Environment

Designated sites

7.38 There are two Special Protection Areas (SPAs) within 20km of the Site: Castle Loch, Lochmaben SPA 14.5km south east of the Site and Upper Solway Flats and Marshes SPA, 15.6km south of the Site.

7.39 Castle Loch is a winter roost for large numbers of the Iceland/Greenland population of Pink-footed Goose *Anser brachyrhynchus*. The site qualifies under Article 4.1 of the Directive (79/409/EEC) by supporting populations of European importance of the following migratory species:

- Pink-footed Goose (*Anser brachyrhynchus)*, (5,450 individuals representing at least 2.4% of the wintering Eastern Greenland/Iceland/UK population [5 year peak mean 1991/2 - 1995/6])

7.40 Upper Solway Flats and Marshes is of importance for wintering wildfowl (ducks, geese and swans) and waders, and is a vital link in a chain of west coast UK estuaries used by migrating waterbirds. The SPA supports virtually all of the Svalbard population of Barnacle Goose (*Branta leucopsis*) over the winter. The site qualifies under Article 4.1 of the Directive (79/409/EEC) by supporting populations of European importance of the following species listed on Annex 1 of the Directive:

Over winter

- Bar-tailed Godwit (*Limosa lapponica*), 2,367 individuals representing at least 4.5% of the wintering population in Great Britain (5 year peak mean 1991/2 - 1995/6);
- Barnacle Goose (*Branta leucopsis*), 13,595 individuals representing at least 13.3% of the wintering population in Great Britain (5 year peak mean 1991/2 - 1995/6);
- Golden Plover (*Pluvialis apricaria*), 6,121 individuals representing at least 2.4% of the wintering population in Great Britain (5 year peak mean 1991/2 - 1995/6); and
- Whooper Swan (*Cygnus Cygnus*), 117 individuals representing at least 2.1% of the wintering population in Great Britain (5 year peak mean 1991/2 - 1995/6)

7.41 Upper Solway Flats and Marshes SPA qualifies under Article 4.2 of the Birds Directive by regularly supporting at least 20,000 waterfowl. Over winter, the area regularly supports 133,222 individual waterfowl (5 year peak mean 1991/2 - 1995/6).

7.42 No SSSIs for which birds are a citation interest were recorded within 20km of the Site.

Bird Records

7.43 Records of protected raptor species within 5km of the Site held by the Dumfries & Galloway Raptor Study Group (RSG) included one known goshawk site approximately 900m from the site boundary and two known sites within 5km. The nest site to the north of the Site has been checked every year between 2004 and 2011. Over eight

years, the goshawk pair(s) was found to change breeding site location on four occasions. No sign of presence was found in 2010 however, and in 2011 the breeding site was found to have relocated approximately 1500m further away from the site boundary (approximately 2,400m from the Site).

Bird Surveys

Breeding Season 2010 Vantage Point Watches

7.44 No target species flight lines were recorded during the breeding season vantage point watches. Thirty six flights of two secondary species were recorded: twenty five flights of single curlews and seven flights of between two to eight birds; and two flights of single lapwing and two flights of nine and 34 birds. A peak count of 15 curlews was recorded on 31 May, 13 birds were recorded loafing and two displaying within the Site. A peak count of 34 lapwing was recorded on 22 June, over rough pasture to the south of the VP, outside the Site boundary.

7.45 No non-target species were recorded in large flocks; generally most species were recorded in very low numbers. Buzzard and kestrel were the most commonly observed species; there were also occasional sightings of black-headed gull, lesser black-backed gull, raven and crossbill. Other species that were recorded less regularly included the following red and amber-listed birds: mallard, snipe, starling, linnet, willow warbler, tree pipit and song thrush.

7.46 Snipe was recorded during the VP surveys on three occasions, one of which was heard drumming east north east of VP1. Snipe can be difficult to detect, but this behaviour (recorded on 31 May 2010) indicates at least one breeding attempt by this species close to the Site boundary.

Winter 2010/11 Vantage Point Watches

7.47 Six flights of target species were recorded during the winter vantage point watches: two flights of greylag geese (4 and 7 birds), three flights of pink-footed geese (99 - 190 birds) and one goshawk flight. Two of the flights included periods at collision risk height (CRH), including a flock of 190 pink footed geese and a flock of seven greylag geese.

7.48 Details of all flights are provided in Table 7.4 (flights with periods at collision risk height (CRH) are shown in bold) and flight lines are presented in Figure 7.2.

Table 7.4 Details of Target Species Flights Winter 2010/11

						Seconds at Height Band					
Flight No.	Date	Time	VP	Species	No. of Birds	<10m	10-20m	20-30m	30-40m	40-130m	>130m
1	30/10/2009	0816	1	Greylag goose	4						165
2	27/11/2009	1107	1	Pink-footed goose	99						120
3	14/01/2010	1415	1	Goshawk	1			15			

						Seconds at Height Band					
Flight No.	Date	Time	VP	Species	No. of Birds	<10m	10-20m	20-30m	30-40m	40-130m	>130m
4	25/01/2010	0805	1	Greylag goose	7				30		
5	**25/01/2010**	**0901**	**1**	**Pink-footed goose**	**190**					**30**	135
6	18/04/2010	1110	1	Pink-footed goose	112						210

7.49 Many of the flight paths of target and secondary species were recorded either above collision risk height, or outside the Site boundary. No flocks or individual species were recorded regularly utilising areas within the Site boundary. A single whooper swan was also recorded; however, the bird was heard calling beyond the east of the Site and not seen, hence no flight line mapping for this species.

7.50 Greylag goose flights were recorded on two occasions, only one of which was recorded at CRH. Pink footed goose flights were recorded on two occasions, both of which were recorded above CRH. Goshawk was recorded once, flying below CRH.

7.51 Three flights of secondary species (curlew and lapwing) were recorded, although none of the three flights actually passed within 400m of the proposed turbine locations.

7.52 In addition to these target and secondary species, eight raven flights (of 1-2 birds) and two grey heron flights (involving a single bird) were recorded.

7.53 Non-target species regularly recorded during winter VP watches included flocks of fieldfare (45-150 birds), crossbill (1-9 birds), in addition to flocks of carrion crow; buzzard was also recorded regularly, but generally in low numbers.

7.54 Other species observed occasionally, generally in low numbers, included the following red and amber-listed species: mallard, kestrel, herring gull, mistle thrush and redwing. Brambling and waxwing were both recorded by sound within the vicinity of the VP.

Breeding Season 2010 Territory Mapping Survey

7.55 Breeding birds recorded during the territory mapping surveys were concentrated in the woodland blocks, most of which border the Site and were dominated by passerines typically associated with this type of habitat such as willow warbler, goldcrest, siskin, lesser redpoll, crossbill, blue tit, coal tit and chaffinch. Species associated with rough pasture and open farmland, such as woodpigeon, skylark, meadow pipit, linnet and red-legged partridge were also present in small numbers. Four tree pipit territories and two grasshopper warbler territories were recorded within the site boundary. Waders were represented by curlew, lapwing, oystercatcher and woodcock. A curlew pair was recorded holding territory on pasture fields to the south east of Knocknutshell plantation (NX927878); breeding behaviour was not exhibited by other waders within the site boundary. Buzzard was recorded displaying over the Site and adults were observed flying over plantation woodland with two juvenile birds; although likely to breed within the Site vicinity, it was not thought that buzzard was actually breeding within the Site.

Kestrel and sparrowhawk were both recorded within the site boundary, although no breeding behaviour was recorded; no Schedule 1 raptor species were observed.

7.56 Wheatear, common redstart and woodcock were recorded on 21 April; these species were not recorded during May and June and are considered to be birds on passage. Other species that were recorded less regularly included the following red and amber-listed birds: spotted flycatcher, reed bunting, bullfinch and dipper.

7.57 Table 7.5 lists number of estimated territories of species recorded during the breeding bird territory mapping survey (species for which there was no evidence of breeding are not included in the table). The indicative territory locations[vii] are presented in Figure 7.3.

Table 7.5 Breeding Bird Territories

Species	BTO Code	No of Territories[viii]
Blackbird	B.	3
Blackcap	BC	3
Blue tit	BT	2
Bullfinch	BF	1
Buzzard	BZ	-
Chaffinch	CH	9
Chiffchaff	CC	2
Coal tit	CT	1
Curlew	CU	1
Dunnock	D.	3
Goldcrest	GC	2
Goldfinch	GO	1
Grasshopper warbler	GW	2
Great spotted woodpecker	GS	1
Great tit	GT	3
Greenfinch	GR	2
Jackdaw	JD	-
Jay	J.	1
Lesser redpoll	LR	-

[vii] The maps from the three visits were analysed and combined to produce the final territory location map, as per the CBC methodology. Therefore, territory locations do not represent specific nest locations (this is not the aim of this survey method which was designed to estimate population sizes).

[viii] Where species are likely to breed within the Site but breeding behaviour was not recorded, a dash (-) is marked.

Species	BTO Code	No of Territories[viii]
Linnet	LI	3
Long-tailed tit	LT	-
Meadow pipit	MP	3
Mistle thrush	M.	1
Moorhen	MH	1
Pheasant	PH	1
Pied wagtail	PW	2
Robin	R.	6
Siskin	SK	3
Skylark	S.	2
Song thrush	ST	2
Spotted flycatcher	SF	1
Swallow	SL	1
Tree pipit	TP	4
Whitethroat	WH	7
Willow warbler	WW	18
Woodpigeon	WP	1
Wren	WR	4

Point Count Surveys

7.58 Twenty nine species were recorded during point counts. With reference to Appendix 7.1 it can be seen that most of the birds detected were common species associated with either coniferous woodland such as goldcrest, coal tit, lesser redpoll and siskin; on successive or regenerative scrubby ground such as willow warbler, linnet and wren; as well as ubiquitous species with a range of habitat preferences including wood pigeon, song thrush, greenfinch and chaffinch. Other species that were recorded less regularly included the following red and amber-listed birds: tree pipit, grasshopper warbler, bullfinch and meadow pipit.

Winter 20010/11 Walkover Surveys

7.59 During the walkover surveys, peregrine falcon, goshawk, greylag goose and curlew were occasionally recorded flying across the Site:

- 22/10/10 one peregrine falcon circling to the south of Whitespots Hill, approximately 1km to the west of the Site boundary;

- 08/02/11 one peregrine (adult female) carrying prey, flying south west outside the Site boundary;
- 08/02/11 one flock of 8 domestic greylag geese within the small pond on-Site;
- 08/02/11 one goshawk (adult female) flying through centre of the site in a south easterly direction at a height of 30-40m; and
- 28/03/11 one curlew was recorded displaying over rough pasture outside the turbine envelope between 20-30m in height.

7.60 Two curlews were recorded loafing and feeding within pasture fields within the Site on 14/01/11; four birds were recorded on rough pasture feeding and loafing within the Site.

7.61 Another notable record during the walkover surveys was barn owl, which was recorded indirectly through fresh pellets and splashing, which were recorded within the southern most barns/sheds at High Auldgirth (NX921876). It was also noted however, that no suitable nesting platforms were identified within this building.

7.62 Several passerine species were occasionally recorded in moderate to small flocks, including redwing (100 birds), chaffinch (100 birds), fieldfare (60 birds), starling (35 birds), skylark (up to 12 birds) and crossbill (up to 5 birds). In addition, small to moderate flocks of gulls (herring, common and greater black-backed) (individuals and up to 30 birds) were occasionally recorded between September and November, while large flocks of woodpigeons and corvids were frequently recorded throughout the survey period.

7.63 With the exception of these moderate to small flocks, relatively low numbers of birds were observed during the winter surveys. Additional to lapwing and curlew, small numbers of woodcock, were the only wader species recorded. Small numbers of several red and amber-listed/Schedule 1 passerine species, such as song thrush, brambling (up to 20 birds), bullfinch and reed bunting (up to 10 birds), were also recorded during the walkover surveys.

Information Gaps

7.64 The information presented in this chapter represents an ornithological picture of the Site over the time the surveys were undertaken. In conjunction with desk-based information, it is considered that these surveys have allowed a representative description of the bird community at the proposed Blackwood Wind Farm.

Evaluation of Resources

7.65 This section evaluates the ornithological importance of the proposed Blackwood Wind Farm site, in its regional, national and international context, with regard to birds recorded during the breeding and wintering surveys. When considering bird populations, importance is taken as meaning that a site supports at least 1% of the population under consideration, i.e. regional, national or international[ix]. In most cases,

[ix] There is no fundamental biological reason to take 1% of a population as the threshold for establishing the relative 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 to the Ramsar Convention. Thereafter, the 1% level of

estimates of regional population size are unavailable, therefore, professional judgement, based on experience, consultation with knowledgeable local consultees and extrapolation from national population estimates and breeding range, is used to determine whether species present are likely to occur in regionally important numbers.

7.66 It should be noted that the definition of what constitutes a 'region' also varies for those species where numbers are known. Hence the Development can be considered to be within Dumfries and Galloway or the wider area of south-west Scotland. Birds do not respect regional boundaries and may range across wide areas in order to forage, hence assessment of importance should take this into account. For the purposes of this report, Dumfries and Galloway is considered to be an appropriate area for the region as reasonably contemporary figures for regional populations of important bird species are available.

Blackwood Bird Community

7.67 The conservation status of the bird species using the survey area is summarised in Table 7.6.

Table 7.6 Conservation Status of the Birds Recorded at Blackwood

Species	BTO Code	Season Recorded	Conservation Status[†]	BWEA/SNH
Goshawk	GI	W	Ann 1, Sch 1	High
Peregrine	PE	B	Ann 1, Sch 1, SBL	High
Kestrel	K.	B/W	LBAP, SBL, A	Low
Barn owl	BO	W	Sch 1, SBL, LBAP, A	High
Whooper swan	WS	W	Ann 1, SBL, A	High
Pink-footed goose	PG	W	A	High
Greylag goose	GJ	B/W	A	High
Lapwing	L.	B/W	UKBAP, SBL, LBAP, R	Medium
Curlew	CU	B/W	UKBAP, SBL, A	Medium
Black-headed gull	BH	B/W	SBL, A	Low
Herring gull	HG	B/W	UKBAP, SBL, R	Medium
Skylark	S.	B/W	UKBAP, SBL, R	Medium
Tree pipit	TP	B	R	Low
Song thrush	ST	B/W	UKBAP, SBL, R	Medium
Grasshopper warbler	GW	B	UKBAP, SBL, R	Medium

national species totals has been taken as the basis of assessment in various countries, including Britain (Stroud, Mudge & Pienkowski, 1990).

Species	BTO Code	Season Recorded	Conservation Status†	BWEA/SNH
Spotted flycatcher	SF	B	UKBAP, SBL, R	Medium
Starling	SG	B/W	UKBAP, R	Medium
House sparrow	HS	W	UKBAP, SBL, R	Medium
Linnet	LI	B/W	UKBAP, SBL, R	Medium
Lesser redpoll	LR	B	UKBAP, R	Medium
Crossbill	CR	B/W	Sch 1	High
Bullfinch	BF	B/W	UKBAP, SBL, R	Medium
Reed bunting	RB	B/W	UKBAP, SBL, A	Medium
Key: B = Breeding Season, W = Winter and passage periods, Ax1 = Annex 1 of Birds Directive, Sch1 = Schedule 1 of the WCA, UKBAP = UKBAP Priority Species, SBL = Scottish Biodiversity List, LBAP = Local BAP Priority Species, R / A = Red/Amber listed on BoCC				

7.68 The species that have a BWEA/SNH conservation importance of medium or high have been discussed in more detail below. Low importance species are not considered, as in EIA terms, no impacts on them can be significant when they do not occur in numbers of regional importance or above.

Raptors and owls

7.69 Peregrine numbers have increased in recent years in much of the UK including southern Scotland. The Scotland wide population is estimated at 600 pairs (Forrester *et al* 2007[5]). In Dumfries & Galloway, peregrine is classified as a common resident, which breeds on coastal cliffs, quarry faces and on hillside rock faces. According to Irving (2010)[12], in 2009, of 112 known peregrine sites checked, 52 were occupied by a pair. There are widespread records of peregrine in the Dumfries & Galloway area outwith the breeding season, mostly between September and March. Peregrine was recorded on two occasions during walkover surveys; firstly, in October a bird was recorded circling over woodland above Clauchrie (approximately 1km to the west of the site boundary), and on the second occasion an adult female was recorded carrying prey whilst flying a south westerly direction, also approximately 1km from the site boundary. Such a low level of flight activity suggests that the Site is of negligible importance for peregrine.

7.70 Barn owl is amber listed is due to its unfavourable conservation status in Europe rather than any concerns about the UK population. Indeed, the Scottish barn owl population appears to have been steadily growing since the 1980s and the population is estimated at 500–1,000 pairs (Forrester *et al* 2007[5]). Within Dumfries & Galloway, barn owl is described as a scarce breeding resident. According to Irving (2010)[12], the majority of records are from coastal plains and river valleys but this species is also found in hill country. No barn owl flights were observed during surveys; however, fresh pellets and splashing were recorded in the southern most shed at High Auldgirth (NX921876) within the Site boundary during a walkover survey on 25 January, suggesting the southern

part of the Site (i.e. outwith the turbine envelope) is used on occasion by this species for foraging and roosting. The Site is therefore of medium importance for barn owl.

7.71 Goshawk is not of particular conservation concern within the UK, but is listed on Schedule 1 of the Wildlife and Countryside Act 1981, and is particularly prone to persecution. According to the latest Scottish Raptor Study Group report, the main centres of population within the Scotland are the Scottish Borders, Dumfries & Galloway and Aberdeenshire (Etheridge *et al*. 2011[13]). Within Scotland, the breeding population is estimated at least 130 pairs, and wintering birds at approximately 350-450 birds (Forrester *et al* 2007[5]). Within Dumfries & Galloway, goshawk is described as a rare breeding resident. According to Irving (2010[12]), during 2009, nineteen occupied breeding sites were found. The extensive plantings of the Forestry Commission across Dumfries & Galloway have provided extensive suitable habitat for the goshawk as the trees have matured.

7.72 Two flights of single birds were recorded within the site during 12 months of surveys; however, no evidence of breeding birds was recorded. Records provided by the DGRSG suggest that a breeding site, which was previously recorded approximately 900m from the Site, had been abandoned and that birds had relocated to approximately 2,400m from the Site boundary. The forestry blocks within the Site (contiguous with the wider Clauchrie Plantation) represent habitat of optimal value for breeding goshawk, with the provision of large areas of mature coniferous woodland with numerous windblown gaps and rides for nesting and hunting. Such open areas also offer good flight access and suitable habitat for rearing young and developing the aerial skills of juvenile birds (Petty, 1989[14]). The Site is of low importance for goshawk but the woodland to the north is of medium importance for this species due to the fact that it supports more than 1% of the regional population.

Wildfowl

7.73 Whooper swan is amber-listed due to its small UK breeding population and localisation in winter. It is also listed on Annex I of the Birds Directive. The species is a common winter visitor in Scotland, where the winter population is estimated at 4,142 birds, but locally, in Dumfries & Galloway, whooper swan is described as a scarce winter visitor (Irving 2010[12]), and the majority of birds are generally based in the east of the region on the Inner North Solway around Caerlaverock and the mouth of the River Nith. Peak monthly counts at Caerlaverock during winter 2009 ranged from 168 – 455 birds. A single bird was heard overflying the edge of the Site during a vantage point watch in October was the only record of this species during the winter/migratory survey period, suggesting that the Site is of negligible importance for whooper swan.

7.74 Scotland is a key wintering area for the Iceland and Greenland pink-footed goose population, with large feeding and roosting flocks in eastern and western areas, especially in autumn and early winter. Numbers peak in October when the population is estimated to be 200,000 birds, with fewer birds (100,000-150,000) in winter/spring (Forrester *et al* 2007[5]). The species is described as an common winter visitor on coasts and a scarce winter visitor to farmland and inland waters in Dumfries & Galloway (Irving, 2010[12]) with important roosts at Baldoon Merse (6,500 birds) as well as West

Freugh (maximum 16,000 birds), both of which are approximately 30km and 50km from the site and unlikely to be connected by any regular flight paths. Three flights of pink-footed geese (flocks of 99, 112 and 190 birds) were recorded overflying the site (one flight within CRH) during winter vantage point watches and walkover surveys, and no birds were recorded foraging or loafing on or surrounding the site, suggesting that the Site is of negligible importance for pink-footed goose.

7.75 Greylag goose is a common resident in Scotland with a native breeding population in the north and west (estimated at 20,000 birds post-breeding) and a naturalised, probably re-established population in the south and east (estimated at 5,000 birds post-breeding, with at least 700 pairs). After the breeding season these birds are joined by 85,000+ immigrants from Iceland that winter in lowland areas (Forrester *et al* 2007[5]). Locally in Dumfries & Galloway greylag geese are common winter visitors on coasts and inland waters and scarce residents on inland waters (Irving, 2010[12]). Two flights of greylag geese (flocks of 4 and 7 birds) were recorded during winter vantage point watches and a flock of 8 birds were recorded within the small pond on one occasion during winter walkover surveys. These birds were likely to be domestic geese thus the Site is of negligible importance for greylag goose.

Waders

7.76 Curlew is a UKBAP priority species and is amber-listed due to a widespread decline that is primarily attributed to agricultural change and afforestation. Curlew is a widespread resident in Scotland, with an estimated 58,800 pairs breeding on farmland and uplands. It is also a common passage migrant and winter visitor to coasts and nearby fields (Forrester *et al* 2007[5]). Local population estimates for curlew within Dumfries & Galloway are unavailable, but according to BBS trends (Risely *et al* 2010[15]), the curlew population in Scotland declined by 53% between 1995 and 2008. Locally, however, curlew is described as common breeding species (Irving 2010[12]). A peak count of 15 curlews was observed during vantage point surveys on May 31, including occasionally displaying birds but only one pair are considered to have bred in the survey area. A single pair of breeding curlew is likely to fall well below the threshold of 1% of the regional population, and as such, the Site is considered to be of low importance for curlew.

7.77 Lapwing is a UKBAP priority species and was recently red-listed due to a long-term decline in the UK breeding population, and because at least 20% of the European non-breeding population occurs in the UK. Lapwing is a common and widespread resident in Scotland. In winter, some Scottish breeding birds move to lower ground and estuaries, where they are joined by migrants from Fennoscandia. Other Scottish breeding birds overwinter in Ireland and the continent. The Scottish breeding population is estimated at 71,500-105,600 pairs and the winter population at 65,000-69,000 birds (Forrester *et al* 2007[5]). Locally, in Dumfries & Galloway, lapwing is described as a common resident on coast, farmland and inland waters with key breeding concentrations at Mersehead (35 pairs), Caerlaverock (25 pairs) and Kirkbean (17 pairs).

7.78 Lapwing did not breed within the survey area. This species was recorded within the site on three occasions during the breeding season; a single bird was recorded on two

occasions during surveys in April and a post-breeding flock of nine was recorded in August. Another larger post-breeding flock of 34 was recorded beyond the eastern edge of the site in June. During winter surveys, two flocks of 21 and 2 birds were recorded. There is no published regional population estimate; however, the level of use of the site by this species during both breeding and wintering seasons is unexceptional and it is considered that the Site is of low importance for lapwing.

Passerines

7.79 Evaluations of passerine species are summarised in Table 7.7.

Table 7.7 Evaluation of the Conservation Importance of Development Area for Passerine Species Recorded

Species	Number of breeding territories in survey area	Regional status (Dumfries & Galloway Bird Report 2010)	Scottish breeding population	Importance
Tree pipit	4	Scarce summer visitor (breeds)	43,000 pairs	Low
Grasshopper warbler	2	Summer visitor (breeds)	900 – 3,700 pairs	Medium
Common crossbill	Not identified	Resident	5,000 – 50,000 pairs	Low
Skylark	2	Common resident (breeds)	290,000 – 557,000 pairs	Low
Song thrush	2	Resident	250,000 – 260,000 pairs	Low
Spotted flycatcher	1	Scarce summer visitor (breeds)	10,000 – 20,000 pairs	Low
Starling	Not identified	Common resident	170,000 – 300,000 pairs	Low
Linnet	1	Common resident	70,000 – 90,000 pairs	Low
Bullfinch	1	Common resident	50,000 – 90,000 pairs	Low
Reed bunting	1	Common resident	15,000 – 30,000 pairs	Low
House sparrow	Not identified	Common resident	600,000 – 900,000 pairs	Low
Linnet	2	Common resident	70,000 - 90,000 pairs	Low
Lesser redpoll	3	Scarce resident (breeds)	7,500 – 15,000 pairs	Low

7.80 All other species are present in numbers likely to be less than 1% of the regional population and therefore the Site is of low importance for these species.

Predicted Trends in the Absence of Development

7.81 The Site is predominantly improved pasture farmland, with extensive bordering coniferous plantation woodland blocks. Thus, the type of habitat at the Site is largely dictated by agricultural and forestry practices. No change from the current farming and

forestry practices carried out at the Site is anticipated in the short term and consequently for the most part the bird community within these habitats is likely to remain broadly similar.

7.82 Notwithstanding the short-term predictions, because of future changes in the agricultural support regime, it is possible that management of this area could change over the medium to long term. It is difficult to predict what this would mean for the Site, but any change in the pattern of agricultural land use could have direct impacts on the sizes and distribution of bird populations, although these will be complex and to a certain extent species-specific.

7.83 Matters may be further complicated by the impacts of climatic change on bird productivity, survival rates and breeding ranges. Recent collaborative work by Durham University, the BTO and RSPB predict substantial changes in species ranges during the coming decades with an average shift north of 4km per year and contraction of range and species richness (Huntley *et al* 2007[16]). Survey work represents a snapshot of the bird community at the time of the survey and cannot be extrapolated to predict future population trends in the wake of agricultural change or climate disruption.

Project Characteristics

7.84 The key components of the Development are detailed in Chapter 3: Project Description. As a fundamental part of the assessment of potential impacts of the Development on birds the following elements of the construction and operation of the Development have been considered:

- Direct loss of habitat from construction of turbine bases, access tracks and other structures. This could also result in destruction or damage to nests and or eggs/chicks;
- Displacement from habitat either by construction activities or presence of operational turbines (and associated maintenance activities); and
- Collision in flight with turbines, overhead wires, met mast and other structures.

7.85 The route and nature of the grid connection does not form part of the planning application and is yet to be finalised so has not been assessed here. The applicant's preference is for the grid connection cables to be located in trenches in roadside verges; it is not anticipated there would be any significant environmental impacts associated with this option. However, the line would be considered in more detail and subject to environmental assessment by the Distribution Network Operator (DNO) prior to a formal application for this element of infrastructure. The scope of any such assessment would be agreed with DGC

Predicted Impacts

Impacts on Designated Sites

7.86 Castle Loch, Lochmaben SPA, which is designated for its populations of roosting pink-footed geese is unlikely to be affected by the Development because use of the Site by pink-footed geese was negligible, with just two flights recorded (during winter vantage

point watches and walkover surveys). Upper Solway Flats and Marshes SPA, which is designated for its populations of roosting barnacle goose would be unlikely to be affected by the Development because barnacle geese were not recorded during winter vantage point watches and walkover surveys.

Construction Impacts

Disturbance

7.87 Construction activities may temporarily displace some birds using the 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 birds.

7.88 Disturbance impacts on birds due to wind farm construction 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 where sensitive species are present; and
- It is generally accepted that the more potentially significant impacts 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 concentrate on these issues.

7.89 It is likely that construction impacts would be greatest on species that are intolerant of noise and other sources of disturbance. Current evidence suggests that impacts on many common species would be relatively low because they are able to habituate to disturbance close to otherwise favourable habitats. For example at Hare Hill Wind Farm (Ayrshire) several species, including curlew, snipe and skylark, continued to breed on-site during construction (Shepherd, 2002[17], 2003[18]) and this was also observed to be the case for species such as oystercatcher, lapwing, snipe, curlew, skylark, meadow pipit and reed bunting at Minsca Wind Farm in Dumfries and Galloway (Entec 2010[19]).

7.90 While there is evidence to suggest that passerines and some wader species are tolerant of relatively high levels of disturbance, it is possible that some breeding pairs may be disturbed by construction activities at the Site. A worst case scenario is that disturbance would result in a reduction in productivity i.e. more nest failures/fewer young fledged, of some breeding pairs during the one or possibly two breeding seasons during which construction would be taking place. However, given the temporary nature of this disturbance, it is unlikely that any long-term change in breeding bird populations would occur at the Site and impact magnitude is considered to be negligible.

7.91 With regard to goshawk disturbance distances, according to Petty (1989[14]), a 400m radius (50ha) disturbance free zone is recommended around occupied nests during February – July inclusive. Given that the distance to the nearest goshawk breeding site

(breeding season 2009) is approximately 900m and the distance to the most recent breeding site (breeding season 2011) is approximately 2,400m, the impact magnitude of construction disturbance is likely to be negligible.

Operational Impacts

Land-Take

7.92 The total land-take by access tracks, turbine bases, hard standings and ancillary structures would result in the permanent loss of approximately 2.37ha of vegetation. Therefore the permanent loss of nesting and foraging habitat for birds would be very small and it is predicted that this would have little, if any, impact on bird populations. It should be noted that a small section of access track was not covered within the CBC surveys undertaken in 2010; however, given the similarity between the habitats present and the surrounding habitats which were surveyed, the species composition is likely to be the same. As such, the nature conservation value of species is also low and therefore the magnitude of impact is therefore considered to be low.

Displacement

7.93 Published information (e.g. Vauk 1990[20], Phillips 1994[21], Percival 2000[8] & 2005[22], Devereux *et al* 2008[23], Douglas *et al* 2011[24]) and reviews of impacts (e.g. Crockford 1992[25], Benner *et al* 1993[26], Winkelmann 1994[27], Langston and Pullan 2003[28], Hötker *et al* 2006[29]) suggest that most birds are affected only slightly by the presence of operational wind farms.

7.94 Early studies have shown that breeding birds are not affected at distances greater than 300m from a turbine (Gill *et al* 1996[9]; Percival, 1998[30] & 2005[22]) and a synthesis of European work (Hötker *et al* 2006[29]) discovered no statistically significant negative impact on any bird species population (including wader and passerine species found at The Development such as lapwing, skylark and meadow pipit) during the breeding season. During a study of breeding birds at ten wind farms in England and Wales, no significant disturbance impacts on passerines were observed (Thomas 1999[31]). Similarly, Shepherd (2002[17], 2003[18]) reported little or no change in numbers of breeding skylark and stonechat between 2000 and 2003 at Harehill Wind Farm in Ayrshire following its construction in 2000. This study also found no significant difference between years in distances of skylark territories to the nearest wind turbine. Other studies from Spain have shown that passerine numbers are not negatively affected following wind farm construction (De Lucas *et al* 2005[32]) and further evidence comes from a recent study of winter farmland birds at two wind farm sites in East Anglia (Devereux *et al* 2008[23]) where authors found no evidence to suggest that the distribution of wintering farmland birds (with the single exception of pheasant) was affected by wind turbines. Given the above evidence the magnitude of displacement impacts on passerines is predicted to be low.

7.95 Recently published work by the RSPB (Pearce-Higgins *et al* 2009[33]) provides evidence of lower frequencies of occurrence of some species within the vicinity of wind turbines during the breeding season. The authors studied bird distribution at 12 existing wind

farm sites in upland areas of the UK. It was reported that a significant reduction in frequency of occurrence was found for 7 of the 12 species studied: buzzard; hen harrier; golden plover; curlew; snipe; meadow pipit; and wheatear. Of these wader and raptor species, within the Site, only curlew was recorded as breeding (a single pair). In addition to which, meadow pipit was also recorded breeding in moderate numbers. Species for which a significant impact was not found comprised: kestrel; lapwing; skylark; and stonechat.

7.96 Recent work looking at distributions of waders at wind farm sites have found evidence that the declines in abundance predicted by Pearce-Higgins may not necessarily be realised. Whitfield *et al* (2010)[34] studied the abundance and distribution of curlew at five wind farm sites and two reference sites in the UK, before and after construction. They found no evidence of immediate or gradual displacement even at 200m proximity and assert that curlews are not sensitive to displacement by wind turbines. Given this evidence it is likely that curlew would be able to continue to breed at the site at a similar density (one breeding pair) to the current situation and impact magnitude is predicted to be negligible.

7.97 Goshawk presence was recorded on two occasions within the site boundary. Although the site and wider vicinity present large areas of suitable mature coniferous woodland habitat for this species, no breeding birds were recorded over the breeding season in 2010 or displaying birds during the spring of 2011. DGRSG records indicated that the nearest breeding sites were 900m from the Site in 2009 and approximately 2,400m from the Site in 2011. As such, given the limited goshawk presence during both survey seasons and the fact that display flights are likely to be concentrated to the north of the Clauchrie Wood plantation (i.e. within the vicinity of these two breeding sites), displacement during operation of the wind farm would be minimal. Goshawk in the UK mainly forage in woodland and mainly below canopy height (Petty, 1996[35]); as such, even were soaring or displaying goshawk (which will often fly high above the main woodland) be displaced, in some cases from the woodland as a result of the avoidance of turbine blades, this impact is likely to be minimal, given the similarity of much of the habitat (forestry particularly) in the wider area. The impact magnitude in terms of displacement of goshawk is likely to be negligible.

7.98 Barn owl presence was recorded within the survey area (pellets and splashing were recorded within the barn buildings at High Auldgirth); however, this location is outside the turbine envelope (approximately 1.4km to the south west) and therefore no displacement impacts are predicted for this species.

7.99 For all other species use of the Site was very limited and therefore impact magnitude in terms of displacement of birds breeding and wintering at the Site is likely to be no more than low.

Collision with Turbines

7.100 The level of collision would 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.

7.101 The indications from studies published to date (reviewed Crockford 1992[25], Benner *et al* 1993[26], Winkelman 1994[27], Hötker *et al* 2006[29]) are that collisions are rare events and occur mainly at sites where there are unusual 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 "wind wall" turbine layouts.

7.102 The passerines and waders nesting within the wind farm would be expected to be regularly flying between turbines and could therefore be expected to be most at risk of collision. However, the evidence suggests that these birds collide with turbines only infrequently, and most of the species concerned are of low or negligible nature conservation importance. 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 (SNH 2002[36]). At the proposed Blackwood Wind Farm species considered were whooper swan, pink-footed and greylag geese and goshawk.

7.103 Hötker *et al* (2006)[29] produced a summary of all known European collision victims based on the work of Tobias Dürr and others. A summary of recorded collisions in target species recorded during VP watches at the proposed Development is presented in Table 7.8.

Table 7.8 Collisions of Species found at the Site, as Recorded in European Studies (from Hötker *et al* 2006[29] and Dürr 2011[37])

Species	Collisions (individuals)	Country in which Collision occurred	European population
Whooper Swan	2	Germany, Norway	16,000 – 21,000 (breeding pairs) >65,000 individuals (wintering pop.)
Pink-footed goose	0	-	310,000 individuals (wintering pop.)
Greylag goose	10	Belgium (4), Germany (3), Norway (3)	120,000 – 190,000 (breeding pairs), >390,000 individuals (wintering pop.)
Goshawk	3	Germany (3)	500,000 individuals (wintering population)

7.104 With reference to the table above, it can be seen that while most of the target species recorded in flight in the survey area have been found to collide with turbines, the numbers of individuals involved are insignificant compared to their European populations (especially when one considers that these numbers are cumulative, with records going back over ten and in some cases 20 years; the number of recorded collisions in any one year will be significantly less) and thus no population level impact will have occurred as a result. While no pink-footed goose collisions have occurred, other geese in the *Anser* genus have been recorded (in addition to the greylag geese in the table): two white-fronted geese, three bean geese and three bean or white-fronted geese (all in Germany).

7.105 SNH and NE guidance generally recommends that possible bird collisions at proposed wind farms are calculated using the model developed by W. Band (Band *et al*. 2007[38]). However, if very few flights are observed, or very little time is spent at collision risk

height by a species, it is generally accepted that the results of the model become increasingly questionable and irrelevant as the flights recorded are likely to be chance use of the survey area or untypical behaviour rather than representing regular use of the site. On this basis, all target species were recorded too infrequently at collision risk height over the Site for collision risk modelling to be carried out i.e. only one flight of pink-footed goose, comprising 190 birds and two flights of greylag comprising four and seven birds were recorded at collision risk height in the turbine area during the full 12 months of observation.

7.106 Whooper swan, pink-footed goose and greylag goose flights across the Site were very limited; and peregrine was not recorded overflying the Site, therefore the risk of collision for these species and predicted impact would be negligible.

Goshawk

7.107 Goshawk is not generally regarded as being susceptible to collision with wind turbines. Of the 127 studies reviewed by Hotker *et al* (2006)[29] and updated by Durr to 2011 (Durr 2011)[37] (see Table 7.8 above), only three fatalities have been recorded at wind farms across Europe. Over twelve months, two flights were recorded at the Site, neither of which were within collision risk height. Goshawk are ambush predators and much of the time is spent on a perch within woodland before chasing prey within the forest itself. Given the limited flights recorded at collision risk height, in addition to the lack of evidence that they are prone to collision, suggests that the impact magnitude in terms of collision would be negligible.

Collision with Electric Cables

7.108 The assessment has considered all impacts associated with the Development, as described in Chapter 3. The route and nature of the grid connection does not form part of the planning application and is yet to be finalised so has not been assessed here. The applicant's preference is for the grid connection cables to be located in trenches in roadside verges thus minimising the risk of bird collisions. Therefore, there would be no additional risk of collision with overhead lines associated with the proposed Development. However, the line would be considered in more detail and subject to environmental assessment by the Distribution Network Operator (DNO) prior to a formal application for this element of infrastructure. The scope of any such assessment would be agreed with DGC.

Decommissioning Impacts

7.109 Turbine removal may cause disturbance to birds breeding and foraging within the Site. The level of impact would depend on the bird species present at the time of decommissioning and cannot be reliably predicted at this stage. However, it is likely that impact would be temporary, affecting one breeding season at most and, if necessary, similar mitigation measures to those described for the construction period would be employed. In view of this, the impacts are predicted to be low. Survey work should be commissioned prior to decommissioning of the Development to identify any bird impacts that might be considered.

Mitigation

7.110 Mitigation measures to be taken in order to avoid contravention of the legislation affecting birds comprise the following:

- Nest damage or destruction would be avoided by removing or making unsuitable by other means, potential nest sites within the working area. Sensitive areas (where sensitive species are present) would be avoided or construction would be undertaken outwith the breeding season (April to July inclusive) or after an inspection by an independent ecologist had confirmed no breeding birds were present; and
- Pre-construction breeding bird surveys would be undertaken and should any Schedule 1 species be found to be breeding appropriate mitigation measures would be agreed with SNH to avoid disturbance during the construction phase e.g. agreeing a suitable stand-off between working area and nest site.

7.111 As stated above, the route and nature of the grid connection does not form part of the planning application and is yet to be finalised. The applicant's preference is for the grid connection cables to be located in trenches in roadside verges thus minimising the risk of bird collisions. In addition, the permanent anemometry mast would be of lattice design rather than a guyed structure, reducing the risk of collision.

Enhancement

7.112 With regards to enhancement measures, there are opportunities within the Site where existing habitats could be improved, subject to landowner agreement, for the benefit of local bird populations, for example, the establishment of rough grassland strips along boundaries of improved pasture fields. Such strips could be fenced off from stock in order to develop longer sward structure, thus helping to provide habitat for invertebrates, small mammals and nesting and foraging bird species, such as skylark, meadow pipit and reed bunting. These habitat features would also help to benefit nesting and roosting waders (such as snipe, lapwing and curlew) through the provision of suitable cover, and also consequently increase the prey availability on site for barn owl. In addition to which, the provision of barn owl nest boxes at suitable locations within the Site would also help to support the local population. It is therefore proposed to incorporate such measures into the development should it be consented.

Residual Impacts

7.113 Table 7.9 summarises the ornithological impacts of the Development and assesses their significance on the basis if the criteria set out in Section 7.3.

Table 7.9 Impacts and Evaluation of Significance

Impact	Type of Impact	Probability of Impact Occurring	Nature Conservation Importance of Site	Magnitude of Impact	Significance	
					Level	Rationale
Construction						
Changes to breeding bird populations as a result of disturbance	Negative	Unlikely	Low	Negligible to Low	Not Significant	Evidence suggests that most species are tolerant of construction type disturbance plus any disturbance impacts would be short lived and would have no measurable impact on populations in the long term.
Destruction of nests	Negative	Unlikely	Low	Negligible to Low	Not Significant	Vegetation clearance to take place outwith the breeding season where it is necessary for access and other infrastructure. Where this is not possible, checks would be made by an independent ecologist to ensure no nests are destroyed.
Operation						
Loss of nesting habitat as a result of infrastructure land-take	Negative	Certain	Low	Low	Not Significant	Approximately 0.8% of the Site would be lost as a result of wind farm infrastructure.
Displacement of foraging or nesting raptors (including goshawk)	Negative	Unlikely	Low	Low	Not Significant	The nearest record of a goshawk breeding site was 900m from the site in 2009. This distance is great enough such that displacement impacts are likely to be minimal. In addition to which, the weight of available evidence suggests raptors can continue to nest and forage in close proximity to wind farms.
Displacement of breeding waders	Negative	Unlikely	Low	Negligible to Low	Not Significant	Recent evidence suggests waders are not displaced from wind farms and it is therefore likely that similar numbers would be able to breed post construction.
Displacement of breeding passerines	Negative	Unlikely	Low	Negligible to Low	Not Significant	There is a growing body of evidence that most passerine species are not affected by the presence of wind turbines and it is therefore likely that similar numbers of birds would continue to breed at the Site both during construction and operation.
Displacement of non-breeding	Negative	Unlikely	Negligible to Low	Negligible to Low	Not Significant	Some species would continue to use the Site. Others were either present very infrequently or are likely to be able to find alternative foraging habitat nearby.

Impact	Type of Impact	Probability of Impact Occurring	Nature Conservation Importance of Site	Magnitude of Impact	Significance	
					Level	Rationale
birds						
Collision with turbines by target species	Negative	Unlikely	Low	Negligible to Low	Not Significant	Flights of target species over the Site were limited and reported collision rates throughout Europe for target species recorded are low. Therefore collision risk is predicted to be low or negligible.
Collision with turbines of breeding waders and passerines	Negative	Unlikely	Low	Negligible to Low	Not Significant	Reported collision rates of waders recorded at the proposed Blackwood Wind Farm are low, while Passerines have very high reproductive rates and also a high level of baseline mortality. As such, the result of the death of one bird is likely to leave a vacant territory for another or temporarily reduce competition, meaning that there would be no long term population impact even at site level.
Collision of birds with overhead cables	Negative	Zero	Negligible to Low	Zero	Not Significant	All electric cables linking the Site with the local network would be underground.
Cumulative Impacts	Negative	Unlikely	Low	Likely to be Low	Not Significant	The proposed Blackwood Wind Farm is predicted to have no significant impacts on the bird community, and with similar assessments for other schemes, it is very unlikely that there would be a significant cumulative impact on any target species.
Decommissioning						
Destruction of nests or disturbance during Decommissioning	Negative	Likely	Likely to be Negligible to Low	Likely to be Low	Not Significant	Although the impacts of decommissioning cannot be accurately predicted at this stage it is considered that any impacts would be temporary in nature and with suitable mitigation in place are likely to be of low magnitude.

Cumulative Impacts

7.114 It is possible that a series of wind farms (see below) could lead to an increased risk of collision as individual birds range across the area occupied by them. Alternatively, a number of individual birds could be displaced from several areas as a result of multiple wind farms.

7.115 General guidance on when cumulative assessment should be carried out and the general principle to follow has been published by SNH (SNH 2005b[39]) however there is no published detailed guidance on how to carry out a cumulative assessment for birds and wind farms (SNH are currently in the process of drawing up guidance) and any such assessment is fraught with difficulties, for example:

- Within what distance from the Development should other sites be considered;
- Should developments other than wind farms be considered; and
- Should all schemes in the planning system be considered or only those consented or built.
- Differing survey periods and methodologies, especially for sites that have been in existence for many years and for which contemporary data may not be available. Data presented in the ES chapters for such schemes may no longer be representative of current bird activity, particularly if schemes have involved substantial habitat management for mitigation or enhancement purposes.
- Inherently precautionary predictions in ESs. Displacement distances assumed in earlier ESs may be too great as further research in this area is published (for example Douglas *et al* 2011[24], Whitfield *et al* 2010[40], Fielding & Haworth, 2010[41]). Furthermore the avoidance rates used in CRM are considered to produce precautionary estimates of collision mortality (SNH 2010[42]) and therefore adding the predicted collisions across several schemes included in a cumulative assessment would quickly compound this 'error' and produce unrealistic results

7.116 Notwithstanding these problems, an attempt has been made to assess the cumulative impacts of the Development with other wind farm schemes in the area.

7.117 The only species of note that was recorded at the Site for which cumulative impacts may occur due to their presence within the wider area was goshawk. Level of use of the site by whooper swan, pink-footed goose and greylag goose was such that negligible impacts are predicted at the Development and therefore there would be no contribution to cumulative impacts with other wind farms.

7.118 In order to keep the assessment manageable, only those wind farms that are operational or with submitted planning applications and are located within a radius of 20km of the Development have been considered further.

7.119 One operational wind farm is located within this radius; Dalswinton Wind Farm is a 16 turbine scheme located approximately 400m to the east of the Development. The landscape surrounding Dalswinton Wind Farm is very similar to the area surrounding

the Development yet is characterised by habitats of more upland nature, with rougher grazing, patchy heather moorland and woodland blocks. Contemporary information was available from Dalswinton (Dalswinton ES, 2003[43]); however, no target species recorded at the Site were recorded at Dalswinton. Nevertheless, DGRSG records supplied for the Development suggest those goshawks are nesting to the south and north west of the Dalswinton site. Although birds are likely to nest within the wider area, survey data show that they are unlikely to regularly use the Dalswinton site. As such, there is unlikely to be a cumulative impact on goshawk as a result of this scheme.

7.120 One other consented wind farm and three with submitted planning applications are located within 20km:

- Harestanes, a 71 turbine scheme under construction 6km north east.
- Auchencairn, a 16 turbine scheme in planning 1km north east
- Minnygap, a 10 turbine scheme in planning 11km north east
- Barnbackle, a 2 turbine scheme in planning 15km south west

7.121 Although more heavily forested than the Development area, Harestanes wind farm site contains a similar suite of species to that found within the forestry surrounding the Site. At Harestanes wind farm, disturbance due to operation of the proposed wind farm is predicted to have long-term but not significant impacts on goshawk, whilst the risk of collision with rotating rotor blades is predicted to have long-term but not significant impacts (Harestanes ES, 2006 and SEI, 2006[44]).

7.122 Auchencairn is also a forested site and the main ornithological interest is goshawk. Impacts on goshawk have been mitigated at this scheme by re-locating turbines away from the nest sites and therefore impacts in terms of displacement and collision are predicted to be negligible (Auchencairn ES 2011[45]).

7.123 Detailed information was not available for Minnygap, however the site is not forested and use by goshawk is likely to be limited. The Non-Technical Summary for the scheme concluded no significant impacts on birds (Minnygap NTS 2009[46]).

7.124 Detailed information was also not available for Barnbackle but this is a lowland farmland site with limited woodland in the surrounding area and unlikely therefore to be used by goshawk (Barnbackle NTS 2006[47]).

7.125 As such, given the low magnitude of impact for both disturbance and collision impacts for goshawk at all these sites, there would be no likelihood of a significant cumulative impact.

7.126 In addition it should be noted that the small number of turbines (5) proposed at the Development would not add significantly (4% increase) to the total of turbines (115) in an area of 1257km^2 (a 20km radius of the Site). Furthermore, the species recorded that breed or forage within the Site are in general typical of such farmland and coniferous woodland habitats and it is not anticipated that significant impacts in terms of displacement would occur. As a result it is considered very unlikely that there would be any significant cumulative impact on any of the target species recorded.

No significant impacts on birds are therefore predicted as a result of constructing and operating the Development either alone or in combination with other nearby built or consented schemes.

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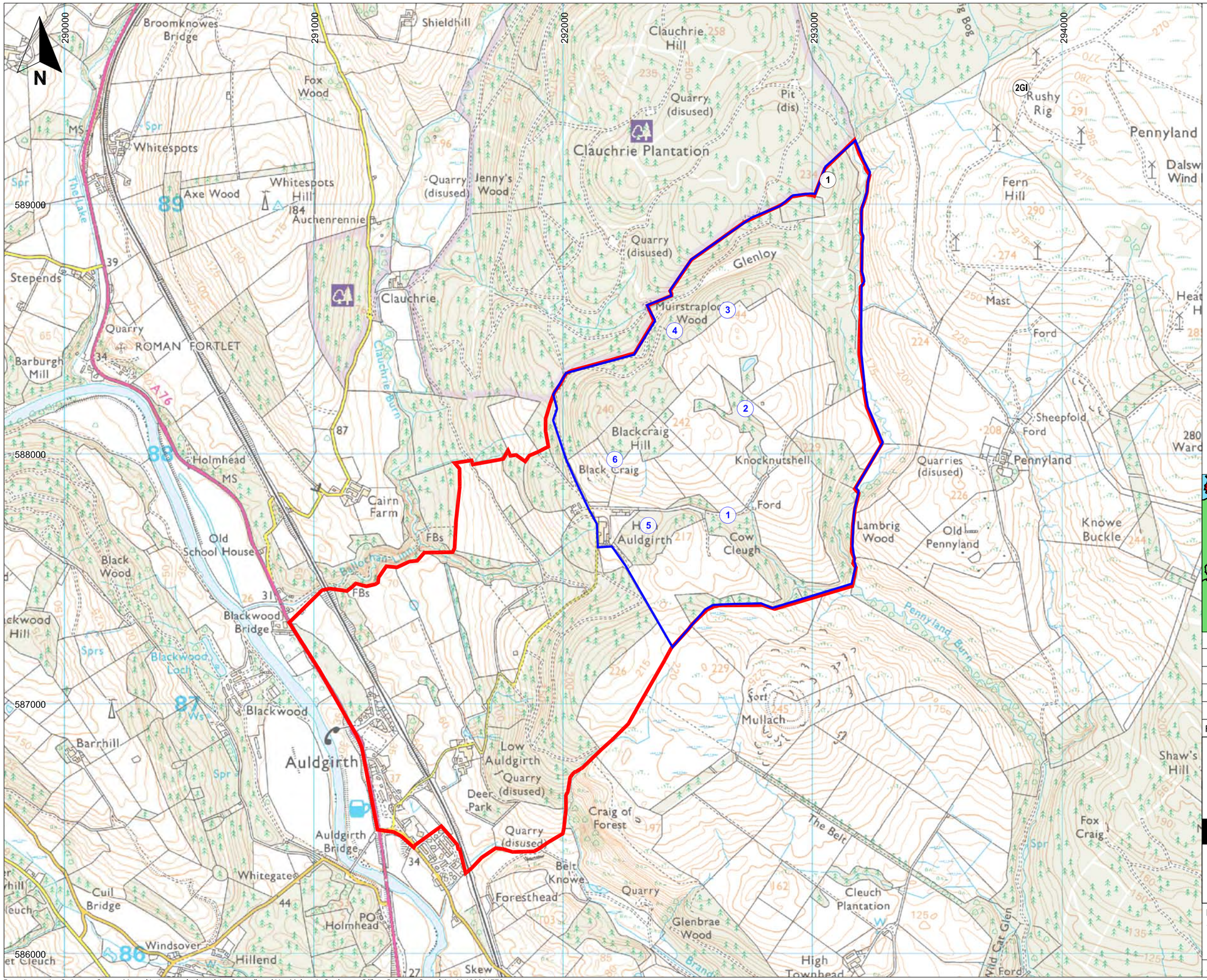

Rev	Date	Description	Drn	Chk	App

FORCE 9 ENERGY

Blackwood Wind Farm

RSK

Figure 7.1
Site Boundary Map and Survey Areas

SCALE 1:15,000 @ A3

November 2011 27846-R05a.dwg panng

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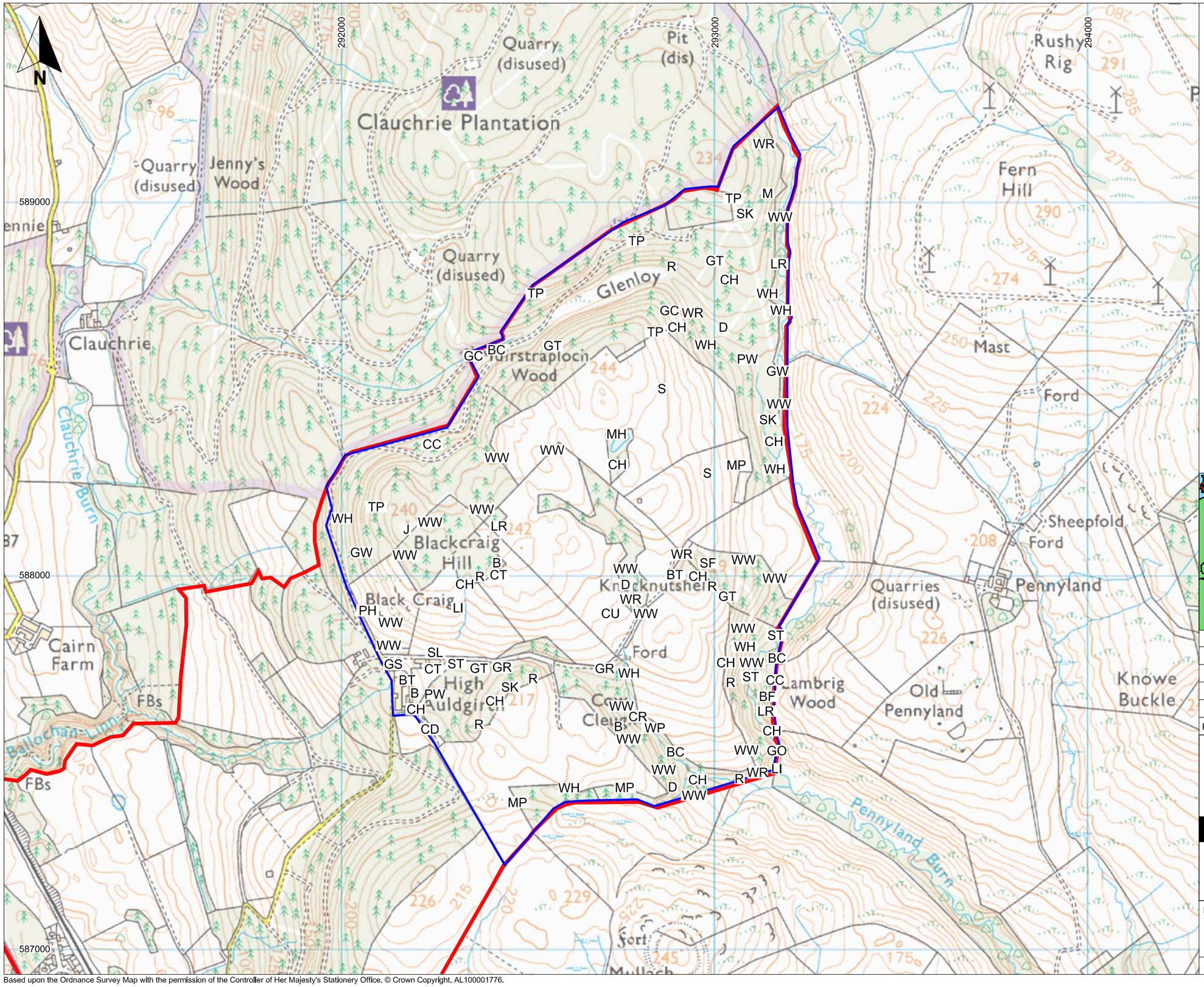

Key

- Site boundary
- CBC Survey area

Rev	Date	Description	Drn	Chk	App

FORCE 9 ENERGY

Blackwood Wind Farm

RSK

Figure 7.3
Territory Map

SCALE 1:10,000 @ A3

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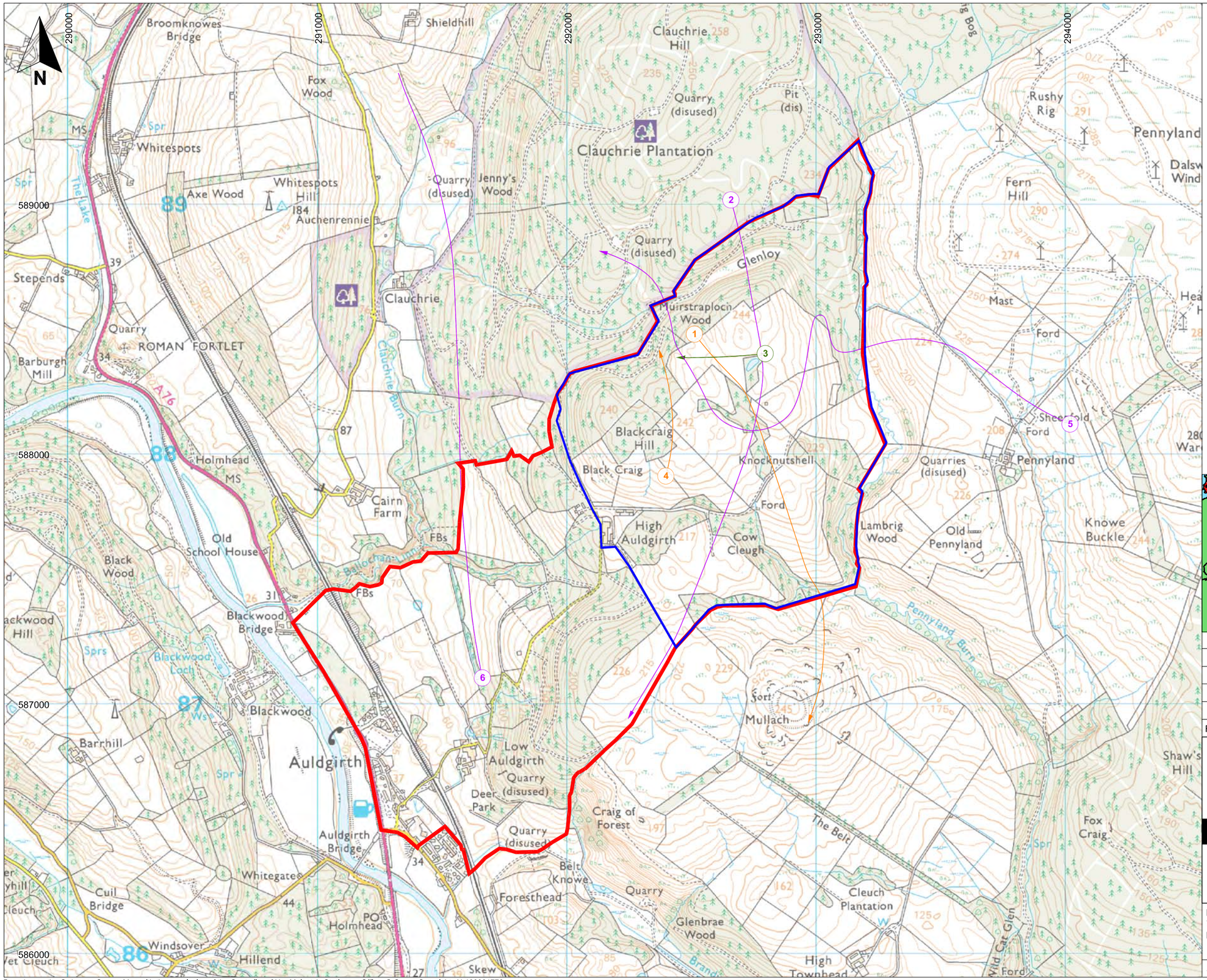

Key

- Site boundary
- Survey area
- Greylag goose flight line and reference
- Pinkfooted goose flight line and reference
- Goshawk flight line and reference

Rev	Date	Description	Drn	Chk	App

FORCE 9 ENERGY

Blackwood Wind Farm

RSK

Figure 7.2
Wintering Bird Surveys Target Species
Flight Lines

SCALE 1:15,000 @ A3

November 2011 27846-R08a.dwg panning

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8 LANDSCAPE AND VISUAL ASSESSMENT

Introduction

8.1 This chapter describes the findings of a landscape and visual impact assessment (LVIA) and cumulative landscape and visual impact assessment (CLVIA) undertaken for the Development.

8.2 Within this chapter, the landscape and visual baseline environment of the Site and its surroundings is described along with the project components. Following this the sensitivity of the landscape and visual receptors is determined along with the anticipated magnitude of change associated with introducing the Development. An evaluation of the significance of the impacts is provided, mitigation measures are identified and then the residual impacts are assessed.

8.3 Figures to accompany the LVIA and CLVIA are contained in Volume 2 of this ES. The chapter is also supported by Technical Appendix 8.1: Additional Indicative Wirelines and Appendix 8.2: Landscape Character Assessment, contained in ES Volume 3.

Summary of Key Components

8.4 The main components of the Development, which have been considered within the LVIA are shown on Figure 3.2 and comprise the following:

- Five wind turbines - three of the turbines (turbines 1, 3 and 5) would have a maximum height to blade tip of 140m while turbines 2 and 4 would have a maximum height to blade tip of 120m;
- Crane hardstanding areas of approximate dimensions 30m x 50m adjacent to each turbine;
- A permanent anemometer mast, which would be of lattice tower construction and approximate height 80m located to the south west of Turbine 2;
- Re-use of existing access tracks and construction of new permanent access tracks to allow construction and maintenance of the turbines;
- Underground electrical cabling linking the turbines to an electrical substation and site office / control building located at Glenloy;
- A temporary construction compound located in the vicinity of Glenloy;
- Temporary borrow pits from which stone can be won for the construction and upgrading of tracks on site; and
- A control building where electricity from each turbine is collected and discharged to the grid.

8.5 The assessment has considered all impacts associated with the Development as described in Chapter 3. As outlined in Chapter 3, the proposed turbine locations and ancillary infrastructure would be subject to a maximum micrositing tolerance of 30m in any direction. This could marginally increase or reduce the overlapping between turbines depending on the viewing location. However, given the limited scope for

movement it is unlikely that this will effect the assessed magnitude of change in views of the Development.

8.6 The route and nature of the grid connection does not form part of the planning application and is yet to be finalised so has not been assessed here. The applicant's preference is for the grid connection cables to be located in trenches in roadside verges; it is not anticipated there would be any significant environmental impacts associated with this option. However, the line would be considered in more detail and subject to environmental assessment by the Distribution Network Operator (DNO) prior to a formal application for this element of infrastructure. The scope of any such assessment would be agreed with DGC.

Legislation and Policy

Planning Policy Guidance / Planning Policy Statements

8.7 Scottish Planning Policy (SPP), Planning Advice Notes (PAN) and Circulars together provide statements of Government policy and good practice on nationally important land use and other planning matters. Planning guidance relevant to the assessment is listed under Chapter 4.

8.8 As a Government advisory body, Scottish Natural Heritage (SNH) also has a series of policy guidance used to advise Government and other public bodies on natural heritage matters. Policy Statements of specific relevance to the assessment of landscape and visual impacts comprise the following:

- Policy Statement No. 01/02 - Renewable Energy Policy;
- Policy Statement No. 02/02 - Strategic Locational Guidance For Onshore Wind Farms in Respect of the Natural Heritage; and
- Policy Statement No. 02/03 - Wildness in Scotland's Countryside.

8.9 SNH Policy Statement No. 02/02 *Strategic Locational Guidance for Onshore Wind Farms in Respect of the Natural Heritage* (updated March 2009)[1] sets out a number of principles to guide the location of onshore wind farm projects to minimise impacts on the natural heritage. This guidance provides a broad overview of where there is likely to be greatest scope for wind farm development, and where there are the most significant constraints, in natural heritage terms.

8.10 The Site falls within an area identified as Zone 1. Zone 1 areas are described as areas *"with least sensitivity to wind farms, with the greatest opportunity for development, within which overall a large number of developments could be acceptable in natural heritage terms, so long as they are undertaken sensitively and with due regard to cumulative impact".*

Regional and Local Planning and Policy Guidance

8.11 The key designations within the study area are National Scenic Areas (NSA), Regional Scenic Areas (RSA) and Historic Gardens and Designed Landscapes (HGDL) as shown on Figure 8.3 (ES Volume 2). The following provides a brief overview of the policies in

relation to these landscape designations. Further details on these designations with regard to their character, distance from the Development and potential visibility of the proposed scheme are provided below.

8.12 Dumfries and Galloway Structure Plan (approved in 1999)[2] includes policies that seek to protect NSA, RSAs and HGDLs. Concerning NSAs the structure plan states *"the siting and design of a development should respect the special nature of the area. Development within, or which would have a significant impact of NSAs will only be permitted where it can be demonstrated that either:*

- *The proposed development will not compromise the area's scenic and landscape character, and overall integrity; or*
- *Any significant adverse effects on the scenic interest and integrity of the area are clearly outweighed by social or economic benefits of national importance."*

8.13 Concerning RSAs the structure plan states "*the siting and design of development should respect the special nature of the area. Development within, or which would have a significant impact on RSAs, may be permitted where it can demonstrate that:*

- *The landscape character and scenic interest for which the area has been designated would not be adversely affected; or*
- *There is a specific need for the development at that location which could not be located in a less sensitive area."*

8.14 Concerning HGDLs the structure plan states "*development in or affecting the setting of a site listed in the Inventory of Gardens and Designed Landscapes or mentioned in the list of Non-Inventory Sites will require an evaluation of the proposal's impact on the site and its setting. There will be a presumption against development which would adversely affect the landscape features, character and setting of these sites and the approaches and environs of Inventory Sites*."

8.15 As part of the Local Development Plan implementation process landscape policies are under review and are intended to be replaced in May 2013. All relevant plans and guidance have been reviewed in order to inform the assessment process during the EIA and are identified in Chapter 4: Planning.

Method of Assessment

Approach

8.16 Landscape and visual assessments are two separate, but interlinked, procedures. The baseline landscape, its analysis, and the assessment of character contribute to the baseline for the visual assessment. Assessments are undertaken in parallel and are informed by a combination of desk and site based appraisal techniques and professional judgements.

8.17 There are six key stages to the overall assessment process:

- Analysis and recording of the existing landscape character and visual context of the study area through desk and field based appraisal;
- Appreciation of the nature, forms and features of the Development;

- Assessment of the sensitivity of the existing landscape and identified visual receptors to change and the magnitude of change likely to result from implementation of the Development;
- Evaluation of the significance of the changes identified;
- Identification of mitigation measures appropriate to the Development and the receiving landscape; and
- Assessment of the residual impacts on landscape character and visual amenity.

8.18 In establishing the baseline conditions, the assessment takes account of the presence of operational wind energy developments.

8.19 The assessment process is iterative, in which the analysis of baseline conditions and the evaluation of potential impacts resulting from the Development can inform the evolution of the design, layout and configuration of turbines and the development and incorporation of mitigation measures.

8.20 The assessments are based on relevant and accepted guidance as set out below, and draw on information provided by statutory consultees, current landscape planning policies and other relevant documentation, computer based visibility analysis and fieldwork observations.

Guidance

8.21 This assessment has been undertaken in accordance with the methods outlined in the following best practice guidance:

- Guidelines for Landscape and Visual Impact Assessment (Second Edition), published by the Landscape Institute and the IEMA (2002). (GLVIA);
- Landscape Character Assessment: Guidance for England and Scotland, published by Scottish Natural Heritage and the Countryside Agency (2002);
- Guidelines on the Environmental Impacts of Wind Farms and Small Scale Hydroelectric Schemes, published by Scottish Natural Heritage (2001);
- Guidance: Cumulative Effect of Wind Farms Draft Version 3, published by Scottish Natural Heritage November 2009;
- Visual Representation of Wind Farms: Good Practice Guidance, published by Horner and Maclennan and Envision (2006);
- LI Advice Note 01/2011: Photography and photomontage in landscape and visual assessment; and
- Scottish Natural Heritage, 2009, Siting and Designing Wind Farms in the Landscape Version 1.

Computer Based Visibility Analysis

Zone of Theoretical Visibility

8.22 In order to identify landscape and visual resources within the study area that may be theoretically affected by the proposed development, a series of Zone of Theoretical Visibility (ZTV) plans have been produced to illustrate the maximum theoretical area of visibility (refer to Figures 8.7a to 8.7d in ES Volume 2). The term ZTV is used to describe the area over which it may be possible to see some part of the Development.

However, ZTVs do not take into account any low level screening which may result from buildings, vegetation or localised variations in topography. Therefore, ZTVs present the maximum theoretical visibility.

8.23 There are two turbine sizes within the Development and the ZTVs have been modelled on a typical turbine hub height of 100m and 80m with a rotor diameter of 80m, giving an overall height to blade tip of 140m and 120m. The modelling was based on a digital terrain model (DTM) prepared using Ordnance Survey (OS) data at 1:50,000 scale with contours at 10m intervals to create a 50m cell size DTM and took account of the curvature of the earth.

8.24 Whilst ZTVs indicate theoretical visibility of the Development the actual visual impact of the Development is assessed through a more detailed analysis of specific viewpoints via field survey observations and the production and analysis of wireline and photomontage visualisations.

Visualisations

8.25 The assessment of potential visibility from selected viewpoints is typically aided by the use of visually representative material. To this end, a series of computer generated wireline images and photomontages were produced for agreed viewpoint locations within the study area.

8.26 A comprehensive photographic study was then undertaken with 360-degree high-resolution digital photography taken at each viewpoint. Viewpoint locations were visited and photographed using a Canon EOS 350D digital SLR camera with a 30mm lens to achieve the same view as that of a 50mm lens on standard 35mm film SLR camera. Photography was then merged using Panorama Factory stitching software.

8.27 3D visualisations (models) of the proposed turbines were then generated, superimposed correctly and to scale onto landform wirelines (constructed using Windfarm software) and/ or digital photography. Within the visualisations the turbines have been modelled to face the viewing direction and the rotors appear in a random synchronisation.

8.28 The photomontage illustrations provide photo-realistic, rendered representations of how the Development may look in the context of the existing landscape. The wireline illustrations together with ZTVs, field surveys are used to assist professional judgement in the robust assessment of the potential impacts and significance of the impacts on the landscape and visual resource.

Study Area

8.29 In accordance with best practice the LVIA considers a study area of a 35km radius from the outermost turbines of the Development, in order to establish the spatial parameters of the assessment, and identify potential landscape and visual impacts. The extent of the LVIA study area is illustrated on Figure 8.1.

8.30 The CLVIA considers a study area of a 60km radius from the outermost turbines of the Development. The extent of the cumulative study area is illustrated on Figure 8.26 which depicts the locations of wind farm projects that are either operational, consented, at planning application stage, or within scoping.

8.31 Not all of the wind farms within the 60km study area have been taken forward within the cumulative assessment. Rather those developments that are deemed to have key interactions with the Development, and which could potentially result in significant landscape and visual impacts are the focus of attention.

8.32 Both defined study areas follow current best practice guidance, and have been agreed with both Dumfries and Galloway Council and Scottish Natural Heritage (SNH) as appropriate to this assessment.

Landscape Assessment

8.33 Landscape assessment is based on an evaluation of the sensitivity of the existing landscape, and the magnitude of change associated with the introduction of the Development.

Baseline Landscape Character

8.34 Landscape character is a composite of physical and cultural elements. Aspects such as landform, hydrology, vegetation, land cover, land use, landscape pattern and cultural features/ associations combine to create a common 'sense of place' and identity which can be used to categorise the landscape into definable, homogenous units known as character areas or types. The level of detail and size of a landscape character area or type can be varied to reflect the scale of definition required, and can be applied at a national, regional or localised level. For the purposes of this assessment, the SNH national landscape character areas have been utilised. A more localised landscape character assessment of the Site has been undertaken as part of the assessment and is described later in this chapter.

Landscape Sensitivity Criteria

8.35 Having established the baseline landscape character areas/ types, the sensitivity of the landscape has then been assessed. The sensitivity of the landscape to change is defined as Very High, High, Medium or Low and is based on professional interpretation of the key landscape characteristics and following factors:

- Landscape quality and condition of landscape elements;
- Scale of the landscape/ sense of distance;
- Simplicity/ complexity of the landscape and existing focal points;
- Special landscape interests and existing land-use;
- The nature of skylines/ horizons;
- Visual interruption;
- The nature of views and distribution of visual receptors; and
- Landscape value as reflected through landscape designations.

8.36 A brief description outlining the key reasons for ascribing the level of landscape sensitivity criteria to each landscape character type/ area is provided within the Landscape Assessment in Table 8.9.

Visual Assessment

8.37 Visual impact assessment considers the sensitivity to change of visual receptors within the study area, and the magnitude of change associated with the introduction of the Development into the existing visual context. Sensitive receptors may include the public or community at large, residents, visitors and other groups of viewers, as well as the visual amenity of people affected.

8.38 The assessment commenced with the preparation of ZTVs to identify theoretical visibility of the Development, leading to identification of representative visual receptors, description of the existing visual context, and evaluation of the visual implications of implementation of the Development.

8.39 The assessment of visual impact from any one location, takes account of the following:

- Sensitivity of the views and viewers (visual receptor) affected;
- Nature, scale and duration of the change;
- Extent of the proposed development that would be visible;
- Degree of visual intrusion or obstruction that would occur;
- Distance of the view; and
- Change in character or quality of the view compared to the existing.

Visual Receptors

8.40 A series of ZTVs (see Figures 8.2 and 8.7a to 8.7d) together with site visits and consultation with Dumfries and Galloway Council and SNH, have been used to identify and agree potential sensitive visual receptors and to inform the selection of representative viewpoints.

8.41 Visual receptors were initially identified through desk-based review of existing landscape character distribution and the pattern of settlement, land use, access, and transportation within the Development ZTV. Furthermore, a range of fixed viewpoints was initially considered, with emphasis placed on identification and selection of locations with a clear relationship to the Development where potential visual implications were deemed to be greatest.

8.42 The key visual receptors include statutory and non-statutory designated or protected areas, cultural heritage resources, residential properties and farmsteads, recreational/ tourist resources, sequential routes, panoramic hilltop views, focused or directed views along glens, coastal and sea views, and cumulative views. Viewpoints have been selected to represent a range of visual receptor types and sensitivities, viewing distances, directions and elevations (refer to Table 8.10).

8.43 Representative viewpoints were then validated by way of field survey, resulting in some preliminary viewpoints either being repositioned to locations offering improved visibility of the Development or being discounted from the assessment due to no actual visibility.

8.44 A series of computer generated 3D wireline images and photomontages were then generated to illustrate how the Development may appear in the context of the existing landscape, and to assist in the assessment of the potential impacts on the landscape and visual resource. In addition, representative viewpoints were also used during the design process to determine the appearance of the Development.

8.45 From the viewpoints selected, there were no direct views (within 10km) into the Site so borrows pits and tracks have not been modelled in the visualisations. Furthermore, any lighting on the turbines which may be required by the Ministry of Defence would be infra-red, so a night time assessment has not been undertaken.

Visual Sensitivity Criteria

8.46 Visual sensitivity considers the location and existing visual context of the receptor or viewpoint, the expectations and occupation or activity of the receptor, and the importance of the view. Visual receptor sensitivity has been rated on a four-point scale (see Table 8.1 below).

Table 8.1 Visual Receptor Sensitivity

Visual Receptor Sensitivity	Typical Receptors
Very High	Visual receptors with an overriding interest in their surroundings or with continuous viewing opportunities (e.g. public, expansive views from designated vistas and viewpoints, Munroe's, hill forts, castles and beacons).
High	Visual receptors with a principal interest in their surroundings or prolonged viewing opportunities (e.g. views from residential properties, nationally recognised cycle ways, important landscape features, vistas, and historic viewpoints).
Medium	Visual receptors with a general interest in their surroundings or tourists /visitors using transient viewing opportunities (e.g. views from strategic and local roads, public transportation corridors, public open spaces, and navigable waterways).
Low	Visual receptors with a limited or passing interest in their surroundings (e.g. views from places of employment, indoor facilities, commercial and industrial buildings, and commuters).

Magnitude of Change

8.47 The magnitude of change on identified landscape and visual receptors has been evaluated using the criteria summarised in Table 8.2.

Table 8.2 Definition of Magnitude of Change

Magnitude	Landscape	Visual
Very Large	The development would form a dominant new landscape element, resulting in a total loss of or major alteration to the balance or relationship of the key landscape characteristics.	The development would form a dominant element and focal point of the view, resulting in a dramatic change in the quality and character of the view. Commanding, controlling the view.
Large	The development would form a prominent new landscape element, resulting in a substantial loss of or alteration to the balance or relationship of the key landscape characteristics.	The development would form a prominent element within the view, resulting in a prominent change in the quality and character of the view. Standing out, striking, sharp, unmistakeable, easily seen.
Medium	The development would form a conspicuous new landscape element, resulting in a partial loss of or alteration to the balance or relationship of the key landscape characteristics.	The development would form a conspicuous element within the view, resulting in a conspicuous change in the quality and character of the view. Standing out, striking, sharp, unmistakeable, easily seen. Noticeable, distinct, catching the eye or attention, clearly visible, well defined.
Small	The development would form an apparent, small new landscape element, resulting in a minor loss of or alteration to the balance or relationship of the key landscape characteristics.	The development would form an apparent small element within the view, without affecting the overall quality and/or character of the view. Evident, obvious
Very Small	The development would form an inconspicuous minor new landscape element, resulting in a very minor loss of or alteration to the balance or relationship of the key landscape characteristics.	The development would form an inconspicuous minor element within the view, without affecting the overall quality and/or character of the view. Lacking sharpness of definition, not obvious, indistinct, not clear, obscure, blurred, indefinite.
Negligible	The development would be a barely perceptible landscape element, and would not change the balance or relationship of the key landscape characteristics. Would cause a 'no change' situation to the existing landscape.	The development would result in a barely perceptible change in the view, or would cause a 'no change' situation to the existing view. Weak, not legible, near limit of acuity of human eye.

Cumulative Landscape and Visual Impacts

8.48 Cumulative landscape impacts occur when a combination of two or more wind farm developments begin to influence the perception of landscape character. Cumulative visual impacts occur in several ways, either arising when wind farm developments are visible either in combination or succession from a particular viewpoint, or appearing sequentially as multiple developments when moving through the landscape. Cumulative impacts can also develop through a gradual change in perception over time.

8.49 In consultation with Dumfries and Galloway Council and SNH, wind farm developments which have been considered for inclusion within the CLVIA are shown on Figure 8.26. Whilst this figure illustrates the locations of wind farms that are at scoping stage, these

have not been assessed in detail within the CLVIA in accordance with accepted practice. This is due to the level of uncertainty surrounding the availability of project details and whether such projects will progress to valid planning applications at a future date.

8.50 Assessment of the comparative impacts of different wind farm combinations (i.e. those at different stages of the development process) has been considered to provide for a better understanding of the likely cumulative impacts of the proposed development on the receiving landscape and visual context. Where appropriate operational wind farm developments within the 35 km study area are considered in the LVIA baseline. The CLVIA therefore considers the following scenarios:

- Scenario 1 involves the assessment of the addition of the Development to the existing baseline operational wind farm developments in conjunction with those granted planning consent i.e. under construction or approved schemes, assuming they are all constructed and operational; and
- Scenario 2 involves the assessment of the addition of the Development to a cumulative baseline comprising all schemes identified in Stage 1, in addition to submitted (but as yet undetermined) wind farm planning applications, assuming they are all constructed and operational.

8.51 Cumulative ZTVs for all wind farms which have been taken forward into the detailed cumulative assessment have been generated in order to determine the extent of the potential cumulative impacts. The assessment criteria for the magnitude of cumulative landscape and visual change reflects the criteria presented in Table 8.2.

Cumulative Sequential Visibility

8.52 Sequential visibility occurs when an observer moving through the landscape along a linear route (e.g. a road) experiences a series of repeated views containing the proposed development and other wind farms within the area. Following consultations with SNH, and with reference to the ZTVs, a series of linear corridors within the study area have been identified to represent potential sequential visibility, as follows:

- A76 which links Dumfries to Sanquhar and beyond and passes along the western boundary of the Site (also follows alignment of Dumfries to Glasgow railway line);
- A75 which links Gretna to Dumfries and Castle Douglas passing within approximately 10km to the south east; and
- M74 which links Glasgow to Carlisle and passes through the eastern half of the study area within 17km of the Development.

8.53 The assessment of sequential visibility describes the baseline conditions on each route and describes the visual impacts of the Development and other wind farms. Factors considered in the assessment of sequential impacts along identified routes include:

- Length of the route;
- Distance from the Development;
- Direction of view;
- Relationship to the ZTV coverage in terms of number of turbines visible;

- Extent of the proposed development visible; and
- Frequency and duration of available views encompassing the proposed development and other cumulative developments.

Nature of Impacts

8.54 The assessment considers the nature of landscape and visual impacts i.e. whether the change is direct or indirect, the duration of the impact i.e. short, medium, long term/ permanent or temporary and whether the change is reversible.

Significance of Impacts

8.55 The significance of the landscape or visual impacts (including cumulative and sequential) have been determined by assessing the sensitivity against the magnitude of change as indicated by the matrices in Tables 8.3 and 8.4 below. The assessment of significance of residual impacts takes into consideration mitigation measures implemented as part of the Development.

8.56 With reference to the Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2011, 'Significant' landscape and visual impacts are those assessed to be major or major/moderate and are indicated by shading in Table 8.3 and 8.4 below. These tables are used as a guide only and the assessment of significance of landscape, visual, cumulative and sequential impacts takes into account other modifying factors and professional judgement.

Table 8.3 Significance of Landscape Impacts

Magnitude of Change	Sensitivity				
	Very High	High	Medium	Low	Very Low
Very Large	Major	Major	Major/ Moderate	Moderate	Minor
Large	Major	Major	Major/ Moderate	Moderate	Minor
Medium	Major/ Moderate	Major/ Moderate	Moderate	Minor	Minor/ Negligible
Small	Moderate	Moderate	Minor	Minor	Minor/ Negligible
Very Small	Minor	Minor	Minor/ Negligible	Negligible	Negligible
Negligible	Minor/ Negligible	Minor/ Negligible	Negligible	Negligible/ Nil	Negligible/Nil

Table 8.4 Significance of Visual Impacts

Magnitude of Change	Sensitivity			
	Very High	High	Medium	Low
Very Large	Major	Major	Major/ Moderate	Moderate
Large	Major	Major	Major/ Moderate	Moderate
Medium	Major/ Moderate	Major/ Moderate	Moderate	Minor
Small	Moderate	Moderate	Minor	Minor
Very Small	Minor	Minor	Minor/ Negligible	Negligible
Negligible	Minor/ Negligible	Minor/ Negligible	Negligible	Negligible/ Nil

Baseline Environment

Introduction

8.57 The qualities and characteristics of the landscape and visual amenity within the 35 km study area are described in the following sections.

Operational Wind Farm Developments

8.58 Table 8.5 below, details operational wind farm developments within the study area, and describes the extent of their visibility with reference to the cumulative ZTVs. These wind farm developments are depicted in Figure 8.26 and 8.27.

Table 8.5 Operational Wind Farms within Study Area

Site Name	Height (to tip)	No. of Turbines	Description
Dalswinton	120m	15	Located within the Foothills with Forest LCT and directly to the east of the Development. The ZTV follows the same pattern and indicates extensive overlap with the Development ZTV.
Minsca	126.5m	16	Located within the Foothills LCT approximately 30km to the south east of the Development. The ZTV is generally focused around the valley slopes of Annandale, either side of the M74. There is overlap with the Development ZTV to the east of the M74, in the area north of Torthorwald Ridge, the uplands areas to the west of Nith Valley and out to sea in the Solway Firth.
Hare Hill	62m	20	Located within the Southern Uplands LCT approximately 30km to the north west of the Development. The ZTV is generally focused around the southern uplands and encompasses the northern section of the A76. Overlap with the Development ZTV is limited to fragmented upland areas within the Nith Valley and on the southern facing slopes of Criffel Hill.
Windy Standard	35m	36	Located within the Southern Uplands LCT approximately 30km to the north west of the Development. The ZTV is generally focused around the Southern Uplands with fragmented areas of overlap with the Development ZTV on the upland and western facing areas of the Nith Valley. However, as visibility within the Nith Valley of Windy Standard Wind Farm is generally over 25km away from this wind farm (and therefore not likely to result in significant impacts) and visibility from the viewpoints and sequential routes is limited this wind farm has not been taken forward into the detailed cumulative assessment.

Site Name	Height (to tip)	No. of Turbines	Description
Wether Hill	91m	14	Located within the Southern Uplands with Forest LCT approximately 25km to the north west of the Development. The ZTV is generally focused around the Southern Uplands with limited areas of overlap with the Development ZTV in the western upland areas of the Nith Valley and Southern Uplands where plantation woodland is widespread. More widespread overlap with the Development ZTV is anticipated from the eastern upland areas of the Nith Valley and to the east of the M74. However, as this is generally over 20km away from Development (and therefore not likely to result in significant cumulative impacts) and visibility from the viewpoints and sequential routes is limited this wind farm has not been taken forward into the detailed cumulative assessment.

8.59 As outlined above the operational Windy Standard and Wether Hill Wind Farms have been scoped out of the detailed cumulative assessment. Both wind farms are located over 20km away to the west of the Development. These wind farms are located in the Foothills with Forest and Southern Uplands LCTs, where residential receptors are limited, and outwith any landscape designations. Whilst ZTV overlap is anticipated from the western facing side of Nith Valley both wind farms are over 15km away from any viewpoints and sequential routes which have been assessed. Therefore, these wind farms are not anticipated to result in significant cumulative impacts.

8.60 Furthermore, combined views of the Development with both of these wind farms is only anticipated from the south eastern end of Nith Valley with both operational schemes over 30km away and therefore not likely to contribute to significant cumulative impacts. However, and where appropriate within the landscape and visual impacts section, reference is made to these wind farms within the landscape and visual impacts sections.

Landscape Designations

8.61 This section identifies key landscape designations of national, regional and local significance within the 35 km study area and with potential visibility of the Development. The locations of identified designated landscapes are shown on Figure 8.3 and with the ZTV in Figure 8.4.

National Scenic Areas

8.62 National Scenic Areas are a national designation identifying areas of outstanding natural beauty and amenity, safeguarded for national heritage. The ZTVs indicate two NSAs with potential visibility of the Development which are located within the 35 km study area; these are listed in Table 8.6.

Table 8.6 National Scenic Areas

National Scenic Areas	Distance from Site	Representative viewpoints
Nith Estuary	15km south	VP 10 and 16
East Stewarty Coast	28km south west	None

8.63 The ZTVs for the Development indicate visibility from the East Stewartry Coast NSA would be negligible. Due to this and the viewing distance it is not anticipated that there would be significant impacts resulting from the Development. Therefore, this NSA is not considered further within the assessment.

8.64 The SNH document "Identifying the Special Qualities of Scotland's Natural Scenic Areas, 2007"[3] sets out the citations for NSAs. A short description of the Nith Estuary NSA is provided below in the context of the visibility of existing wind farms.

Nith Estuary NSA

8.65 The special qualities of the Nith Estuary NSA are as follows:

- *"A working, farmed landscape against a backdrop of hill and estuary;*
- *Criffel, a Border landmark rising above the coastal flatlands;*
- *The meeting of land, sea and sky;*
- *The tide coming in at the 'speed of a galloping horse';*
- *The interplay of natural and cultural landscapes;*
- *A great diversity of habitats and wildlife;*
- *The detailed patterns of merse and estuary;*
- *A landscape of movement;*
- *A rich variety of colour, light, texture and scale;*
- *A landscape of distinctive sounds and smells;*
- *A peaceful landscape but with a long and troubled history;*
- *Landmarks, contributing to the identity of the area;*
- *The use of locally distinctive stone; and*
- *The view out to the Cumbrian Fells."*

8.66 Operational wind farms within close proximity to this NSA include the offshore Robin Rigg development. Whilst this wind farm is outwith the 35km study area, views of this wind farm from the Nith Estuary, located towards the southern edge of the study area, are obtainable.

Regional Scenic Areas

8.67 Regional Scenic Areas (RSA) are regional landscape designations within Dumfries and Galloway. With reference to the Dumfries and Galloway Structure Plan, 6 RSAs with potential visibility of the Development have been identified and are listed in Table 8.7.

Table 8.7 Regional Scenic Areas

Regional Scenic Area	Distance from Site	Representative viewpoints
Thornhill Uplands	Directly north	VP 1, 2, 4, 5 and 6
Terregles Ridge	6 km to south west	None
Solway Coast	13 km to south	None
Torthorwald Ridge	8 km to south east	None
Moffat Hills	20 km to north east	None
Galloway Hills	25 km south west	None

8.68 The ZTV for the Development indicates that visibility from within the Moffat Hills and Galloway Hills RSAs would all be over 25km away from the proposed turbines and visibility is very limited. An indicative wireline from both these landscape designations is included in Appendix 8.1 (Moffat Hill 310470, 610690 and Galloway Hills 258430, 575800) and indicates a very small magnitude of change. Therefore, it is not anticipated that there would be significant impacts as a result of the Development so these RSAs are not considered further within the assessment.

8.69 In addition there are two regional landscape designations to the north of the study area; the Clydeside Regional Scenic Area in South Lanarkshire and the Southern Uplands Special Landscape Area in East Ayrshire. However, visibility from both these designations is negligible so these have not been considered within the assessment.

8.70 A Technical Paper[4] on the identification of RSAs provides descriptions of each. A brief summary for each RSA is provided below and in the context of operational wind farms.

Thornhill Uplands RSA

8.71 This area encompasses varied and contrasting upland and valley scenery ranging from exposed, remote summits, wooded gorges and pastoral valleys. There are strong contrasts in relief and the main valley of Nith is a steeply wooded gorge in the north opening out into policy woodlands near Drumlanrig with broad pastoral valleys characterised by hedgerows, stone dykes and woodland in the south. The main valley is accessible from Dumfries and subject to pressure from residential development and the valley flanks and summits see continued demand for forestry and wind farm development. The operational Wether Hill Wind Farm is located to the west of this landscape designation and Dalswinton is located just beyond the southern boundary.

Terregles Ridge RSA

8.72 This ridge contains and forms the western setting to Dumfries, separating the Nith Valley from the contrasting drumlin landscapes stretching west to Castle Douglas. The ridge is dissected by the Old Water and other tributaries of the Nith to create a very diverse landscape of transitional uplands and steep sided valleys which are readily accessible through a network of footpaths and minor roads. There are currently no

operational wind farms within this landscape designation however, Dalswinton is located to the north.

Solway Coast RSA

8.73 This area embraces the varied coastlines of western Dumfriesshire and exhibits a diverse and attractive mixture of coastal landscape types including rocky coastlines, raised beaches, isolated coves and undulating open landscapes of improved grassland. This area includes the upper slopes of Criffel and the north flanks of Ward Law Hill because of their importance to the wider views of the estuary and uplands. Views across the Solway to the Cumbrian Mountains and the Isle of Man also contribute to the scenic quality of this area. There are currently no operational wind farms within this designated area.

Torthorwald Ridge RSA

8.74 Torthorwold Ridge forms a prominent hill between the well populated Nith and Annandale Valleys. The ridge forms an attractive and less extensively afforested example of the upland fringe landscape type characterised by large fields of improved pasture, enclosed by walls, beech hedges and trees. Rough grasslands and areas of heather moorland run along the top giving a sense of upland exposure. The landscape is crossed by a number of roads making it readily accessible. There are currently no operational wind farms within this RSA.

Historic Gardens and Designed Landscapes

8.75 Historic Gardens and Designed Landscapes (HGDL) are considered valuable assets at the regional and national level, and such sites are listed in the Inventory of Gardens and Designed Landscapes in Scotland. There are several HGDLs within the study area, and the ZTVs indicate that six have potential visibility of the Development, as listed in Table 8.8 below.

Table 8.8 Historic Gardens and Designed Landscapes

Historic Gardens and Designed Landscapes	Distance and direction from Site	Landscape Character Area
Drumlanrig Castle	10 km north west	Upper Dale (Valley)
Dalswinton	3 km south east	Middle dale (Valley)
Castlehill	5 km south east	Upland Fringe
Cowhill	4 km south east	Lower Dale (Valley)
Arbigland	28 km south	Coastal Flats
Threave	29 km south west	Drumlin Pastures

Drumlanrig Castle

8.76 As one of Scotland's finest grand designed landscapes this garden has terraces and banks dating back to the 17th century. The River Nith passes through this landscape, the castle is a listed building and this large site as a whole makes a major contribution to the surrounding scenery. The garden is open to the public on a seasonal basis. The

A76 and a network of minor roads pass through this landscape making parts accessible all year round. Views of the existing Dalswinton Wind Farm are available from this landscape.

Dalswinton

8.77 This is an informal garden of late 18th century design comprising woodland, parkland and lakes which overlay an earlier formal garden design. There is also an interesting shrub collection in the woodland garden. This garden is open to the public and open views towards the Development are available from limited parts of this garden.

Castlehill

8.78 Castlehill is an attractive 20th century garden that forms the setting to a Victorian house. As there is no formal access arrangements for the public this HGDL has not been considered further within the LVIA.

Cowhill

8.79 This is a 19th century designed landscape comprising parkland, woodland, an interesting shrub collection in a woodland glen and some architectural features of note. The garden is open occasionally to the public under Scotland's Gardens Scheme. However, given the dense area of woodland to the north west of the garden, which would screen views of the proposed development, and limited public access this HGDL has not been considered further within the LVIA.

Arbigland

8.80 Located next to the Solway Firth, this designed landscape of parkland and woodland provides an attractive setting for a category A listed building. This garden has historical connections to the founder of the US Navy and the mid 18th century landscape incorporates features from the 16th century. It is open to the public from May to September and has open coastal views. However, considering the distance to the Development (~28km – refer to Appendix 8.1 for indicative wireline 299375, 558225 which indicates a very small magnitude of change) significant impacts are not anticipated so this HGDL has not been considered further within the LVIA.

Threave

8.81 This attractive garden doubles as a horticultural training facility for the National Trust. Set around Kelton Hill, open views towards the Development are anticipated from the high ground to the north of this garden, which is open to the public. However, considering the distance to the proposed Development (~29km – refer to Appendix 8.1 for indicative wireline 275530, 560350 which indicates a very small magnitude of change) significant impacts are not anticipated so this HGDL has not been considered further within the LVIA.

Landscape Character

8.82 This section describes the landscape qualities and characteristics of the study area. A review of the relevant published landscape assessments has been carried out to identify and describe distinct landscape character types (LCTs) that are within the study area (refer to Figure 8.5) and fall within the Development ZTV (refer to Figure 8.6).

Landscape Fabric, Landform and Land Cover

8.83 Landform across the study areas varies within three broad landscape character types – Uplands; Foothills and Valleys; and Coastal Edge shown on Figure 8.5. Generally, the landform rises in height as one moves northwest and away from the Solway Firth up to a height of around 700m AOD within the Southern Uplands. Three major rivers flow through the study area in a south easterly direction – the Urr Water, River Nith and River Annan. These rivers all start in the uplands and flow through the valleys surrounded by foothills before passing through the coastal edge to meet the Solway Firth in the very south of the study area.

8.84 The Uplands, located in the north of the study area, typically range in height from 300m to 700m AOD and are characterised by large, smooth dome/ conically shaped hills. The hills have a strong relief and are dissected by steep sided glens. The majority of this landscape is covered in coarse grassland, with the higher areas in heather moorland. Large areas of plantation woodland, dominated by Sitka Spruce, are also common in the landscape. Forests generally extend over the summits or are concentrated on the side slopes leaving the summits exposed.

8.85 The Foothills and Valleys are broadly located in a band through the centre of the study area, and are a transitional landscape between the Uplands and the Coastal Edge. The landform ranges in height from around 300m to 50m AOD. Land cover is varied with the foothills more akin to the landscape character of the Uplands with coarse grassland and areas of plantation woodland.

8.86 Moving onto the lower ground and valley sides the land cover changes to semi-improved grassland used for grazing. Stone walls and blocks of native woodland are common along with smaller blocks of plantation woodland. In addition, scattered hillside farmsteads and farm buildings become more of a feature.

8.87 The valley floors are far more populated in nature and the agricultural land is of a higher quality so fields of arable land sit next to pasture. Large rivers gently meander along the valley floor with larger settlements located at crossing points. Native broadleaf is the dominant woodland coverage in the valleys.

8.88 The Coastal Edge, located to the south of the study area has a less varied topography, and is generally quite flat, ranging in height between sea level and 50m AOD. This is with the notable exception of Boreland and Criffel Hill, located to the west of the Nith Estuary. The higher Criffel Hill reaches a height of 569m and is a dominant landmark in the coastal landscape. A patchwork of arable fields separated by hedgerows and occasional belts of broadleaf trees is the dominant land cover with the coastal edge a

mix of expansive mud flats, sands and wetland areas heavily influenced by the proximity of the Solway Firth.

Scale and Enclosure

8.89 The Uplands are a large scale landscape, although there is some confinement between the peaks and within the narrow glens. Views generally tend to be open and expansive, and looking north reasonably undeveloped in character. To the south views overlook the more managed and settled Foothills and Valleys. As expected views within the large areas of plantation woodland are enclosed in nature.

8.90 The Foothills and Valleys are a medium scale landscape. Views within the valley floors tend to be enclosed by the surrounding foothills and are generally focused in a northern or southern direction looking up and down the valley along the path of the rivers. Longer distance views are afforded from the higher ground over an undulating patchwork of farmland, woods and settlement.

8.91 The Coastal Edge is large scale and long distance views over this flat, open and exposed agricultural landscape with its wide skies are commonplace. However, large hedgerows and blocks of woodland can foreshorten views due to the flat relief. Views from the edge of the Solway Firth tend to be focused to the south, over the open water and mud flats towards the coast of England, with the Cumbrian Fells beyond.

Human Influence

8.92 Man has had a strong role in defining the landscape character over most of the study area, particularly within the Foothills and Valleys and the Coastal Edge. The Valleys tend to be the most developed areas due to their sheltered nature and richer soils. Transport corridors often follow the alignment of rivers and there are numerous towns and villages within the valley floor, with a network of farmsteads linked by minor roads on the valley sides and lower foothills. The landscape is almost entirely managed for agriculture with a mix of arable and pasture fields delineated by post and wire fences, hedgerows and dry stone walls. Blocks of woodland provide shelter for grazing stock and have a strong relationship with farmsteads and settlements.

8.93 Due to its location on the Solway Firth, nearer the mouth of the estuary and subject to the tide which exposes large mud flats and limits access to the open sea, the coastal edge is not as heavily developed as in some locations on the Dumfries and Galloway coast. The landscape is dominated by farming and a network of minor roads which link the scattered farmsteads and villages. However, there are some areas which have been left relatively unaltered by man such as the coastal marshy areas which include the wildfowl and wetlands nature reserve at Caerlaverock.

8.94 Evidence of human influence on the Uplands, outwith the glens, is generally limited to large blocks of plantation woodland which are a common feature throughout this landscape. These woodlands are dominated by a monoculture of plant species and the rotational nature of forest management provides changing textures and colours as woodlands are harvested and re-planted. In addition to the plantation woodlands,

energy infrastructure such as overhead electricity lines, telecommunications masts and wind farms provide evidence of mans influence over the landscape.

Settlement Pattern

8.95 The Uplands are the least densely settled broad landscape type within the study area. Settlement tends to be focused along the major transport corridors and include the smaller towns of Kirkconnel, Sanquhar and Abington which are all outwith the ZTV of the Development.

8.96 Settlement pattern within the Foothills and Valleys is characterised by denser population centres within the valley floors located along the main transport corridors and includes the towns of Dumfries and Lockerbie. Smaller settlements such as Thornhill, Closeburn and Auldgirth are located within the Nith Valley along with a numerous individual properties, farmsteads and small villages some of which are located higher up the valley sides.

8.97 The Coastal Edge is less developed in character with the notable exception of the town of Annan, located on the south eastern edge of the study area and outwith the Development ZTV. Settlement is characterised by a network of farmsteads and small villages linked by minor roads.

Communication and Transportation

8.98 The key transport corridors through the study area include:

- The A76 which links Dumfries to Sanquhar in the north and Ayrshire beyond, and passes within 2km to the west of the proposed turbines;
- The A75 which is the major coastal route within Dumfries and Galloway and passes through Annan, Dumfries and Castle Douglas within the study area;
- The M74 which links Glasgow to Carlisle and passes within 20km to the east of the Development; and
- A network of A roads which radiate out of Dumfries and include the A701, A709 and A711.

8.99 Rail coverage within the study area includes the Dumfries to Glasgow line which broadly follows the alignment of the A76. The West Coast Mainline also follows the alignment of the M74 and there is a coastal line linking Dumfries to Carlisle.

Value

8.100 The study area contains a number of designated or valued landscapes which are generally focused along the coastal edge, upper Nith Valley and within the more picturesque upland areas (refer to Figure 8.3). Undesignated landscapes within the wider landscape setting generally exhibit an aesthetically pleasing composition dominated by settled valleys and farmed foothills.

National Landscape Character

8.101 The National Programme of Landscape Character Assessment, undertaken by SNH in partnership with local authorities and other agencies, involved the assessment of

landscape character for all of Scotland. The study area is covered by the Dumfries and Galloway Landscape Assessment (Report No. 94, Land Use Consultants) published by SNH in 1998[5].

8.102 The Site falls mostly within Area 16 Upland Fringe - Torthorwold. The key characteristics of this LCT are defined in the SNH assessment as:

- *"Elevated rolling pastures;*
- *Improved and rough grassland in close proximity;*
- *Hedgerow banks and tree lines along roads in some lower areas;*
- *Dry stone dykes;*
- *Squared forest blocks, increasing forestation evident;*
- *Contrast between wide open areas and more intimate landform;*
- *Panoramic views over valley lowlands;*
- *Small bridges over incised burns; and*
- *Iron age fortifications."*

8.103 The west and east of the Site are partially within the Middle Dale (Valley) and Foothills with Forest LCT which are described below (the turbines are all located within the Upland Fringe LCT and on the edge of the Foothills with Forest LCT). Furthermore, the key LCTs with potential visibility of the Development together with their defined key characteristics are listed in Table 8.9 below.

Table 8.9 Landscape Character Types with Potential Visibility of the Proposed Site

Landscape Character Type	Key Characteristics
Type 2 Coastal Flats – Nith Coastal Fringe	Generally lying between sea level and 50m AOD; Variety of landscape sub types identified such as coastal plain, estuarine flats, intimate coastal parkland and coastal moss and merse which have diverse characters but share their lowland coastal location as a unifying influence; and Much of the land is exposed with long views across the coastal flats as they merge into the waters of the Solway.
Type 5 Intimate Pastoral Valleys – Cairn and Old Water	Medium scale flat bottomed valley with steep slopes; Distinct pattern of pastoral enclosures extending up the valley sides, usually defined by dry stone dykes; Extensive pattern of broadleaf woodland (shelterbelts, riparian woodlands and policy woodlands) separating the pastures into small and medium scale open spaces; Isolated houses set within woodland frameworks on the valley sides; Small settlements at river bridging points; Intimate views framed by woodland and landform; and Minor roads following the sides of the valley floor.

Landscape Character Type	Key Characteristics
Type 6 Lower Dale – Lower Nithsdale and Lower Annandale	Wide, flat or gently undulating section of major rivers; Improved pastures and arable fields of medium to large size; Hedgerow field boundaries with occasional walls; Hedgerow tree lines and tree avenues predominantly beech and sycamore; Broadleaf shelterbelts; Open character, medium to long views determined by tree lines and shelterbelts; Wide meandering river channels; Network of communication lines; minor and major roads and railway lines; Many settlements including main towns at river bridging points, isolated developments and suburban expansion; and Archaeological feature particularly Roman and medieval forts and castles.
Type 7 Middle Dale – Mid Nithsdale and Mid Annandale	Broad valley with complex undulating topography and locally narrow sections; River meanders eroding bluffs in the valley moraines; Land cover predominantly improved pasture, lush green, sheep and cattle grazed; Medium scale field enclosures, a mixture of hedgerows and dry stone dykes; Extensive pattern of shelterbelts and farm woodlands with semi-natural woodlands on bluff slopes; Dale contained by uplands with forests and rough grazing on horizons; Country houses and designed landscapes; Settlement of high townscape quality; Medium scale views focused up/ down valley; and Communication routes.
Type 9 Upper Dale – Upper Nithdale	Wide 'V'-shaped valley, enclosed by high peaks and moorland; Open with long views; Improved valley pastures becoming rougher up the valley sides; Medium to large scale enclosures with dry stone dykes; Riparian woodlands along the main river and up tributary channels; Medium to large scale forestry plantations on the valley sides and extending over horizons from higher ground; and Mining settlements and remnants of industrial activity.
Type 10 Upland Glens – Scar and Shinnel	Deep 'U'-shape (and partially 'V'-shaped) valleys with steep sides and narrow flat valley floors; Rough grassland and moor above improved pastures; Medium sized enclosures with drystone dykes; Medium scale coniferous plantations (or parts of larger plantations) on the glen sides; Isolated farmsteads surrounded by trees; and Single road access.
Type 13 Drumlin Pastures – Milton and Deeside	Smooth convex slopes of improved pasture, grazed by sheep and cattle; Localised rugged knolls with gorse; and Medium scale fields with prominent wall and hedgerow patterns accentuating topography.
Type 16 Upland Fringe – Torthorwald, Dunscore, Cairn and Annandale.	See key characteristics as described for LCT in which Site falls.

Landscape Character Type	Key Characteristics
Type 18 Foothills – Annandale, Beattock, Nithsdale, Keir and Dalmacallan	Generally undulating land between 170 and 250m with rounded peaks; Higher in the west, up to over 350m with craggier peaks; Foothills dissected by incised valleys; Semi improved pasture enclosed in medium-large fields by stone walls, some rough pastures and heath on higher ground; Trees in sheltered pockets with some copses on top of hills; Many scattered farmsteads and small settlements; Network on minor roads; Open, long distance views; and Numerous archaeological sites particularly iron age defensive and Roman monuments.
Type 18a Foothills with Forest – Ae and Stroan	Dark green blanket of forest covering undulating foothills; Various stages of forest rotation evident in the landscape – young plantation, clear fell and deep ploughing; Tall mature conifers at roadside; Semi improved pasture with walled enclosures on open ground; Views frequently foreshortened by plantation woodland; and Some evidence of archaeological remains.
Type 19 Southern Uplands – Lowther and Nithsdale	Large, smooth dome/conical shaped hills, predominantly grass covered; Open and exposed character with panoramic views except within incised valleys; Distinctive dark brown/purple colour of heather on some of the higher areas; Pockets of woodland in incised valleys; Stone dykes occasionally define the lower limit; and Legacy of lead and other mining activity.

Local Landscape Character of the Site

8.104 The Site location is shown on Figure 1.1 and in addition to the Upland Fringe LCT, which forms the core of the Site, the Site also incorporates parts of the Middle Dale and Foothills with Forest LCTs. The proposed turbines are to be located in the upland area in the east of the Site. The landscape character of this area reflects the key characteristics of the Upland Fringe LCT - elevated rolling pastures, locally uneven topography with small knolls, both improved and rough grassland in close proximity, dry stone walls, woodland blocks and a contrast between open areas and more intimate landform.

8.105 However, the Site itself is surrounded by a mix of plantation woodland and mature beech woods, which limit views out and over the farmed valley floor to the west. Open ground within the Site is mostly improved grassland used for grazing sheep and cattle and the lush greens contrasts with the rough grassland and plantation woodland of the uplands, visible in more open views to the east.

8.106 The existing Dalswinton Wind Farm is also visible in close proximity from the open ground to the east of the Site located within the Foothills with Forest LCT. Field boundaries are a mix of post and wire fences and well-maintained dry stone walls. Other key features include a pond with some well-established wetland planting and a

row of wood-built cottages at High Auldgirth, with principal views north foreshortened by an area of rising ground characterised by rough pasture.

8.107 In the west of the Site, and outwith the core development area of the Site, the topography falls away to the village of Auldgirth. The village is linked to High Auldgirth by a steeply climbing single track road which traverses a small stone bridge and travels through dense plantation woodland. The A76 forms the western boundary of the Site (located approximately 2km away from the nearest turbine on the upland core of the Site) and the Dumfries to Glasgow rail line follows a similar alignment to the east of this. Auldgirth is nestled into the side of the hill and features a mix of traditional and modern properties. The hub of the village is the Auldgirth Inn, which is next to the village hall, and there is a small area of open ground with picnic benches outside.

Representative Viewpoints

8.108 Eighteen representative viewpoints were selected through desk-based review, field study and consultation with SNH and Dumfries and Galloway Council. The representative viewpoints are listed in Table 8.10 below and shown on Figure 8.2. Table 8.10 provides a comprehensive overview of the viewpoints in terms of their type, spatial relationship to the proposed development and lists the LCTs or any designations they are located within and for which they represent.

8.109 A number of additional viewpoints were suggested at scoping by Auldgirth Community Council and Closeburn Community Council. Whilst it was not possible to include all of these viewpoints within the landscape and visual assessment the opportunity was made available to the public to view wirelines (which could be generated from any location) at the public exhibition held in Auldgirth Hall in September 2011.

8.110 Baseline views for each of the viewpoints are illustrated on the wireline and photomontage illustrations in Figure 8.8 to Figure 8.25. Field survey and use of the wirelines and photomontages have been used as the basis for assessment of visual impacts.

8.111 Field surveys to identify and assess viewpoints were undertaken between July and September 2011 to record baseline conditions and to evaluate potential landscape and visual impacts. Prevailing weather conditions during the surveys was generally fine or overcast.

Table 8.10 Representative Viewpoints

VP No	Location	OS Grid Ref	Orientation (degrees)	Landscape Receptors		Visual Receptor Type/s	Distance to Nearest Visible Blackwood Turbine	Visualisation
				Landscape Character Type (SNH)	Designation			
1	High Auldgirth	E292281, N587778	50	Upland Fringe	N/a	Residential	0.8km	Figure 8.8 a -b
2	Ballochan Road, Auldgirth	N291229, E586938	50	Middle Dale	N/a	Residential	2.1km	Figure 8.9 a -b
3	Shawsholm Road, Closeburn	N289650, E592260	130	Middle Dale	Thornhill Uplands RSA	Residential/ Road	4.7km	Figure 8.10 a -b
4	Picnic spot, Drumlanrig Castle	N285417, E599091	140	Upper Dale	Thornhill Uplands RSA, Drumlanrig HGDL	Recreational	12.6km	Figure 8.11 a -b
5	Thornhill	N288083, E595205	140	Middle Dale	Thornhill Uplands RSA	Residential/ Road	7.9km	Figure 8.12 a -b
6	Auldgirth Bridge, Blackwood	N291153, E586339	40	Middle Dale	N/a	Recreational	2.6km	Figure 8.13 a -b
7	Ellisland Farm	N292922, E583845	350	Middle Dale	N/a	Recreational	4.2km	Figure 8.14 a -b
8	Dalswinton HGDL	N294379, E584219	340	Middle Dale	Dalswinton HGDL	Recreational	4.1km	Figure 8.15 a -b
9	Maxwelltown Railway Path, Dumfries	N297113, E577346	340	Lower Dale	N/a	Recreational	11.5km	Figure 8.16 a -b
10	Farmhouse Tower, Caerlaverock Wetland Centre	N305147, E565626	330	Coastal Flats	Nith Estuary NSA	Recreational	25.5km	Figure 8.17 a -b
11	Lambhill Terrace, Lockerbie	N314043, E582044	290	Lower Dale	N/a	Residential	21.8km	Figure 8.18 a -b
12	Throughgate House, Throughgate	N287374, E584257	50	Upland Fringe	N/a	Residential/ Road	6.8km	Figure 8.19 a -b
13	A76 near Muirside	N294071, E581478	350	Lower Dale	N/a	Road	6.7km	Figure 8.20 a -b
14	A75 near River Nith	N297961, E578186	330	Lower Dale	N/a	Road	11.1km	Figure 8.21 a -b
15	A75 near Castle Hill	N292472, E575154	360	Upland Fringe	Edge of Terregles Ride RSA and Solway Coast RSA	Road	13km	Figure 8.22a
16	Criffel Hill	N295725, E561871	350	Coastal Granite Uplands	Nith Estuary NSA	Recreational	26.4km	Figure 8.23 a -b
17	M74 near Millhouse Bridge	N312053, E584839	280	Middle Dale	N/a	Road	19.2km	Figure 8.24 a -b
18	A75 near Bettyknowes	N285563, E573798	20	Drumlin Pastures	N/a	Road	16.1km	Figure 8.25 a -b

Landscape Impacts

Landscape Assessment

8.112 The following sections sets out the analysis and assessment of the landscape impacts of the Development. For the purposes of this assessment the nature of landscape impacts resulting from the introduction of the Development are assessed as being indirect, long term, reversible and adverse unless otherwise stated.

Landscape Designations

Nith Estuary NSA

8.113 The Site is located approximately 15km to the north of the Nith Estuary NSA. The ZTV indicates widespread visibility from approximately half of this designation from around the mouth of the River Nith, along the Merse Sands, the northern facing slopes of Criffel Hill and from the open water. However, due to the coastal nature of this landscape actual visibility would be less widespread as a result of the screening offered by vegetation on flatter ground (not on the slopes of Criffel Hill).

8.114 Predicted impacts: Impacts are limited to distant views of the proposed wind farm seen in the context of the adjacent Dalswinton Wind Farm. None of the special qualities of the NSA would be directly affected. With regard to views, the key views from this area are out to the Cumbrian Fells, across the Solway Firth, which is in the opposite direction of the Development. From within the Nith Estuary NSA the viewpoint assessment has included two viewpoints (Viewpoint 10 and 16) for which a magnitude of change of very small is anticipated as a result of the Development.

8.115 As identified in these viewpoints long distance views of the operational Dalswinton Wind Farm (~17km) are apparent in views looking north. Furthermore, the operational Minsca Wind Farm (~23km) may be apparent in views looking northeast and Robin Rigg Offshore Wind Farm (which is outwith the 35km study area) readily apparent in successive views to the south. Limited visibility of Hare Hill (~47km) and other operational wind farms to the north east (Wether Hill and Windy Standard) are obtainable from this area.

8.116 Therefore, the Development would form an inconspicuous minor new landscape element resulting in a very minor alteration to the balance of the key landscape characteristics.

8.117 Magnitude of change: Very Small when you consider the representative viewpoint assessment, and that the special qualities of this NSA would not be directly impacted.

8.118 Significance: *Minor (not significant)*

8.119 The Site includes some areas within and along the southern edge of this regionally designated area however, the proposed turbines are located outside of the designation. The ZTV indicates widespread visibility concentrated around the central core and settled valley floor with a more fragmented pattern of visibility from the upland areas to the west, north and east. Actual visibility (particularly from the valley floor) is anticipated to be reduced due to the extensive deciduous woodland coverage especially around the policy woodlands of Drumlanrig Castle. That said, multiple viewing opportunities throughout the valley to the south of this landscape, which is more open in character, and from the generally exposed hillsides are anticipated.

8.120 Predicted impacts: Impacts are limited to views of the Development which is typically seen in the context of the adjacent, and closer proximity, Dalswinton Wind Farm (except in closer proximity views to the very south of this landscape). None of the key characteristics of the RSA would be directly affected. There are various key views as a result of the diverse landscape and the impacts on each are described below.

8.121 From the majority of the landscape designation and in the upland areas which include the Foothills, Foothils with Forest and Southern Uplands LCT visibility is more fragmented and plantation woodland, especially in the Foothills with Forest LCT, would reduce actual visibility. Furthermore, views typically tend to be longer distance and due to the elevated viewing nature views of operational wind farms are not uncommon. Dalswinton would be apparent along with Minsca Wind Farm (~30km) in combined views and Hare Hill Wind Farm (~9km) in successive views (along with other operational wind farms to the north west of the study area) from certain open viewing locations.

8.122 Therefore, from the upland areas within this landscape the Development would typically form an apparent, small new landscape element resulting in a minor alteration to key views and seen within the context of, and as an extension to, Dalswinton Wind Farm.

8.123 From the valley floor and sides to the north of the RSA and within the Upper Dale LCT woodland cover, especially around the policy woodland of Drumlanrig Castle, is anticipated to reduce visibility. Longer distance views focused south down the valley are obtainable (refer to Viewpoint 4) however, from this viewing distance the Development would form an apparent, small new landscape element (where views are obtainable) seen as an extension to Dalswinton, resulting in a small magnitude of change.

8.124 To the south of the RSA, and within the Middle Dale and Upland Fringes LCT, visibility is more widespread and these LCTs tend to be quite open in character with key views focused south down the valley and towards the Site. Viewpoints 3 and 5 are typical of the key views in the Middle Dale LCT and an indicative wireline from Barnmuir (291525, 591675 see Appendix 8.1) is typical of the elevated, open key characteristic views from this LCT between Park and Gatelaw. From these viewpoints a medium magnitude of change is anticipated and the Development is seen to the right of

Dalswinton Wind Farm, extending the horizontal angle occupied by turbines on the horizon. From this localised area from the valley floor and upland fringes to the south of this landscape the Development forms a conspicuous new landscape element, resulting in a partial alteration to key views.

8.125 To the very south of the RSA, and as identified in closer distance views from the valley floor/ upland fringes (such as Viewpoint 2 and 6) the majority of the Development is screened behind Blackcraig Hill/ Clauchrie Plantation with only the tips of turbines visible, resulting in a small magnitude of change. Views of the operational Dalswinton Wind Farm are generally not obtainable from this area however the Development would only from an apparent, small new landscape element.

8.126 Magnitude of change: From the majority of the RSA Small, however from a localised area to the south of the RSA within the Middle Dale and Upland Fringes LCT Medium.

8.127 Assessed sensitivity: This is varied and contrasting landscape with pastoral valleys, wooded gorges and upland, exposed areas with principal views generally oriented along a north to south axis, often towards the Development. Furthermore, and due to the settled nature of the valley and as reflected in this regional designation the assessed sensitivity of this landscape is High.

8.128 Significance: From the majority of this regionally designated landscape *Moderate (not significant)*. However, from a localised area in the south of the RSA *Major/ Moderate (significant)* on the basis of key views south from that area only, as none of the other key characteristics would be directly affected.

Terregles Ridge RSA

8.129 The Development is located approximately 6km to the north east of this regional landscape designation. The ZTV indicates fragmented visibility from approximately a quarter of this designation generally from the northern facing slopes around Bishop Forest, Dalquhairn and the Morris Hills. Occasional patches of plantation woodland are anticipated to further reduce actual visibility.

8.130 Predicted impacts: Impacts are limited to distant views of the Development which is typically seen in the context of the adjacent Dalswinton Wind Farm. None of the key characteristics of the RSA would be directly affected. With regard to key views, this RSA forms an upland western setting to Dumfries, which would remain unaltered. From within the Terregles Ride no viewpoints have been included within the viewpoint assessment. However, an indicative wireline from Bishop Forest Hill (284895, 579655 see Figure 8.34a-c) indicates a predicted magnitude of change of small is anticipated to be typical in views from this area.

8.131 The operational Dalswinton (~8km) Wind Farm is typically visible from areas where the Development is visible. Furthermore, Minsca (~30km) to the east and Hare Hill (~34km) and other operational wind farms located to the north west would also be apparent in combined and successive views from areas of ZTV overlap with Development.

8.132 The Development would form an apparent, small new landscape element resulting in a minor alteration to the balance of key landscape characteristics, seen as an extension to Dalswinton Wind Farm.

8.133 Magnitude of change: Due to the representative viewpoint assessment, extent of visibility and nature of views which contain operational wind farms a Small magnitude of change is anticipated. Furthermore none of the key characteristics of this landscape would be directly impacted and views of this ridge from Dumfries would remain unaltered.

8.134 Assessed sensitivity: This ridge forms the western setting to Dumfries and is a diverse landscape of uplands and valleys which are readily accessible. The topography forms distinctive horizons in views, generally free from vertical man made intrusions, and the quality and condition of the landscape results in an assessed sensitivity of High.

8.135 Significance: *Moderate (not significant)*

Solway Coast RSA

8.136 The Development is located approximately 13km to the north of this regional landscape designation. The ZTV indicates widespread visibility around the River Nith estuary, within 25km of the Development, and limited visibility beyond 25km along the western coastline of Dumfries. Actual visibility is anticipated to be reduced as this area is well settled and localised development and vegetation (including Mabie Forest) would screen views towards the Development.

8.137 Predicted impacts: Impacts are limited to distant views of the Development which is typically seen in the context of the adjacent Dalswinton Wind Farm. None of the key characteristics of the RSA would be directly affected. The key views from this area are out to sea, across the Solway Firth, which would remain unaltered. From within the Solway Coast the viewpoint assessment has included one viewpoint. Viewpoint 15 is located on the northern edge of this designation and from a more elevated vantage point (thus representing the worst case scenario) and for which a magnitude of change of very small is anticipated.

8.138 As identified in this viewpoint, long distance views of the operational Dalswinton (~13km) Wind Farm are apparent in views looking north. Combined views with other operational wind farms within the study area and from this designation are generally limited. Therefore, the Development would form an inconspicuous minor new landscape element, resulting in a very minor alteration to the balance of the key landscape characteristics. The Development would be back clothed against the landform beyond from more elevated positions (such as Criffel Hill) and seen within the context of the operational Dalswinton Wind Farm.

8.139 Magnitude of change: Due to the representative viewpoint assessment, nature of views (which contain operational wind farms) and that none of the key characteristics of this landscape would be directly impacted a Very Small magnitude of change is anticipated.

8.140 Assessed sensitivity: This is a high quality, well settled and varied landscape with complex coastlines and a regional landscape designation resulting in an assessed sensitivity of High.

8.141 Significance: *Minor (not significant)*

Torthorwald Ridge RSA

8.142 The Development is located approximately 8km to the north west of this regional landscape designation. The ZTV indicates visibility along the northern and western edges of this designation with a fragmented pattern of visibility from the high ground to the centre. This area is an attractive example of a less extensively forested upland landscape so open views are typical.

8.143 Predicted impacts: Impacts are limited to distant views of the Development which is typically seen in the context of the adjacent Dalswinton Wind Farm. None of the key characteristics of the RSA would be directly affected. With regard to key views this RSA forms a prominent ridge seen from the Nith and Annandale Valleys which would remain unaltered. From within the Torthorwald Ridge no viewpoints have been included within the viewpoint assessment. However, an indicative wireline from Back Hill (301950, 582340 see Figure 8.33a-c) to the north of this area and thus representing a worst case scenario indicates a predicted magnitude of change of small.

8.144 Furthermore, and as identified at this viewpoint, the operational Dalswinton Wind Farm (~7km) is visible. Hare Hill (~42km) and other operational wind farms to the northeast would also be apparent in combined views in the longer distance. Therefore, the Development would form an apparent, small new landscape element resulting in a minor alternation to the balance of the key landscape characteristics. Development would be seen as an extension to the operational Dalswinton Wind Farm.

8.145 Magnitude of change: Due to the representative viewpoint assessment, extent of visibility and nature of views (which contain operational wind farms) a Small magnitude of change is anticipated. Furthermore, none of the key characteristics would be directly affected and this ridge would remain unaltered in views from Nith and Annandale.

8.146 Assessed sensitivity: This is an open, exposed landscape which forms an attractive example of an upland landscape and is readily accessible through a network of minor roads. The area is generally free from vertical man made intrusions, and the quality, condition and regional designation results in an assessed sensitivity of High.

8.147 Significance: *Moderate (not significant)*

Drumlanrig Castle HGDL

8.148 The Development is located approximately 10km to the south east of this HGDL. The ZTV indicates widespread visibility from within this HGDL with two notable areas of visual screening along the northern end of the River Nith floodplain and to the

southwest around Bogrie Wood. Whilst widespread mature broadleaf woodland is anticipated to reduce actual visibility, open views looking south down the River Nith Valley and towards the Development are obtainable.

8.149 Predicted impacts: Impacts are limited to distant views of the Development which is typically seen in the context of the adjacent Dalswinton Wind Farm. None of the key characteristics of the RSA would be directly affected. With regard to key views the main vista from the castle entrance is orientated north away from the Development and would remain unaltered. From within Drumlanrig Castle HGDL the viewpoint assessment has included one viewpoint (Viewpoint 4) for which a magnitude of change of small is anticipated as a result of the Development.

8.150 As identified at this viewpoint the operational Dalswinton Wind Farm (~10km) is visible as would generally be the case from areas within this landscape where views of the Development are obtainable. No other operational wind farms are visible from this HGDL. Therefore, the Development would form an apparent, small new landscape elements resulting in a minor alteration to the balance of the key landscape characteristics. The Development would be seen on the horizon as an extension to the operational Dalswinton Wind Farm.

8.151 Magnitude of change: Small due to the findings of the viewpoint assessment, limited actual visibility and that none of the key characteristics would be directly impacted.

8.152 Assessed sensitivity: High as this designed landscape is open to the public with large areas of well maintained broadleaf woodland which creates a picturesque setting for Drumlanrig Castle.

8.153 Significance: *Moderate (not significant)* where woodland allows open views towards the Development.

Dalswinton HGDL

8.154 The Development is located approximately 3km north west of this HGDL. The ZTV indicates extensive visibility across the majority of this HGDL. However, widespread mature woodland is anticipated to greatly reduce actual visibility and open views towards the Development are very limited.

8.155 Predicted impacts: Impacts are limited to views of the Development which is typically seen in the context of the adjacent Dalswinton Wind Farm. None of the key characteristics of the RSA would be directly affected. With regard to key views there is an important vista over a man made pond which would be indirectly affected and is described below.

8.156 From within Dalswinton HGDL the viewpoint assessment has included one viewpoint (Viewpoint 8) for which a magnitude of change of small is anticipated as a result of the Development. Whilst the wirelines indicate a larger magnitude of change a coniferous woodland belt, with year round screening properties, screens the majority of the Development.

8.157 As identified at this viewpoint, tips of the operational Dalswinton Wind Farm (~4km) are visible, but the majority of this wind farm is also screened by woodland in the area. No other operational wind farms are visible from this HGDL. Therefore, the proposed Development would form an apparent, small new landscape element resulting in a minor alteration to the balance of the key landscape characteristics seen within the context of the operational Dalswinton Wind Farm.

8.158 Magnitude of change: Due to the nature of the indirect impacts on the key characteristics and limited areas where open views towards the Development are afforded a Small magnitude of change is anticipated.

8.159 Assessed sensitivity: High as this designed landscape is open to the public with large areas of well maintained broadleaf woodland, attractive vistas over man made ponds and interesting historic architectural features.

8.160 Significance: *Moderate (not significant)*

Landscape Character Types

8.161 The following section sets out the assessment of impacts on LCTs. Where significant landscape impacts have not been identified the full assessment on each LCT is included in Appendix 8.2. A brief summary table outlining the assessed sensitivity, magnitude of change and significance of impacts for these LCTs is included in Table 8.11.

Type 7 Middle Dale – Mid Nithsdale

8.162 Of the two sub types within this LCT the Development wind turbines are located approximately 1km to the east of Mid Nithsdale and 10km to the west of Mid Annandale. Impacts on Mid Annandale are described in Appendix 8.2. The ZTV indicates widespread visibility across Mid Nithsdale with some notable pockets of visual screening to the centre of this landscape around the A76 and in closer proximity to the Development.

8.163 Within Mid Nithsdale the landscape generally has an open character with medium scale key characteristic views focused in a north to south orientation along the valley. There are numerous residential receptors within the area consisting of scattered properties/ farmsteads and small settlements and villages of a high townscape quality. The A76 is also a dominant feature and key receptor through the centre of Mid Nithsdale.

8.164 There are no operational wind farms located within this landscape however, the operational Dalswinton Wind Farm (~3km) is located adjacent to the eastern boundary and the ZTV overlap between this wind farm and the Development are very similar. Views of other operational wind farms are limited.

8.165 Predicted impacts: Limited localised direct impacts are anticipated in Mid Nithsdale as a result of the access tracks works, resulting in the loss of some semi-improved pasture. This is discussed further in impacts on Landscape Fabric.

8.166 Outwith localised direct impacts, impacts are limited to those on the key characteristic views and the proposed wind farm is typically seen within these in the context of the adjacent Dalswinton Wind Farm. None of the other key characteristics of this landscape as identified in Table 8.10 would be affected. Viewpoints 2, 3, 5, 6, 7 and 8 are located within Mid Nithsdale and a magnitude of change ranging from medium to small is predicted from these views.

8.167 From the majority of this LCT sub type (just south of Closeburn stretching south to Holywood) and as identified in Viewpoints 2, 6, 7, and 8, a magnitude of change no greater than small is anticipated. To the south of the Development and as identified in Viewpoints 7 and 8 Mullach Hill Fort and woodland screens views of the wind farm. Where visible the Development is typically seen in the context of the operational Dalswinton Wind Farm which is often also partially screened by woodland.

8.168 In closer distance views, and as demonstrated in Viewpoint 2 and 6, landform would screen the majority of the operational Dalswinton Wind Farm so the Development would have the impact of introducing turbines in views on the horizon where there are currently none. However, it is anticipated that this would be from quite a limited area within the context of the whole LCT and landform and woodland would also screen the majority of the Development so that only the tips are visible resulting in a small magnitude of change. Furthermore, key views are generally orientated to the north and south along the valley and the Development is seen to the east from this location.

8.169 Viewpoints 3 and 5 are typical of the key characteristic views in the north of this LCT, which has a more open character, and for which a medium magnitude of change is anticipated. The Development is typically seen as an extension to the right of the operational Dalwinton, extending the horizontal angle occupied by turbines on the horizon in medium scale, partially enclosed views, looking south down the valley. From a localised area to the north of this LCT sub type (between Thornhill and stretching just to the south of Closeburn) the Development would form a conspicuous new landscape element resulting in a partial alteration to key characteristic views.

8.170 Magnitude of change: Generally Small from the majority of this landscape but medium from a localised area to the north (between Thornhill and just south of Closeburn) in key characteristic views.

8.171 Assessed sensitivity: High as this area has medium scale views and often quite an intimate nature with an attractive pattern of woodland, high quality architecture and diverse topography which is reflected in the regional landscape designation to the north of Mid Nithsdale. The area is also well settled.

8.172 Significance: *Moderate (not significant)* from the majority of this LCT sub type however, *Major/ Moderate (significant)* with regard to impacts on key characteristic views from a localised area to the north of this landscape between Closeburn and Thornhill.

Type 16 Upland Fringe – Torthorwald, Dunscore, Cairn and Annandale

8.173 The Development is located within this LCT, to the centre of the Torthorwald sub type. The ZTV indicates widespread visibility across the northern half of this area, with some notable patches of screening, generally on the northern facing slopes. Within the southern half visibility is less widespread and focused in a fragmented pattern along the western edge.

8.174 Within the Dunscore sub type, located approximately 3 km to the south west, the ZTV indicates a fragmented pattern covering approximately half of this area generally from the eastern facing slopes. A similar fragmented pattern of visibility from the eastern facing slopes, covering less than half of the landscape is apparent from the Cairn sub type, located approximately 8km away to the south west. Assessment of the Cairn LCT sub type is included in Appendix 8.2. The Annandale LCT sub type is over 15km away from the Development so is considered within the impacts on the wider landscape setting.

8.175 Within the Torthorwald and Dunscore LCT sub types squared blocks of plantation woodland are a key characteristic, which is anticipated to reduce actual visibility, and increasing forestation is evident. However, panoramic key characteristic views over the valley floor focused up, down and across the valley are typical from the numerous scattered farmsteads and minor roads on the valley sides.

8.176 There are no operational wind farms located within this landscape however, the ZTV overlap between the operational Dalswinton Wind Farm (~1km from Torthorwald LCT sub type) and the Development are very similar throughout these sub types. Longer distance combined views of Minsca Wind Farm (~28km) to the east would be obtainable from areas within Dunscore.

8.177 Very limited successive views of Hare Hill (~27km), Windy Standard (~13km) and Wether Hill (~24km) would also be obtainable from Dunscore. From Torthorwald combined views with Hare Hill (~43km), Windy Standard (~43km) and Wether Hill (~33km) in the distance may also be obtainable from limited areas, particularly to the south of this LCT sub type.

8.178 Predicted impacts: As the Development is located within the Torthorwald LCT direct impacts would include the loss of coniferous woodland and semi improved grassland, which is described further in impacts on Landscape Fabric.

8.179 Outwith localised direct impacts, impacts are limited to those on the key characteristic views and the Development is typically seen in the context of the adjacent Dalswinton Wind Farm. None of the other key characteristics of this landscape as identified in Table 8.10 would be affected.

8.180 Within the Torthorwald LCT sub type the visual assessment included one viewpoint from this area (Viewpoint 1) for which a magnitude of change of large was predicted. However, this is from a very close proximity view from the row of cottages at High Auldgirth, and the magnitude of change is anticipated to reduce with distance from the

Development. Furthermore, the nature of views tend to be more open and expansive and views of operational wind farms (typically Dalswinton) are not uncommon.

8.181 From the majority of this LCT sub type to the south of Mullach Hill Fort, and as identified from the representative wireline from Back Hill (301950, 582340 see Figure 8.33a-c) a magnitude of change no greater than Small is generally anticipated. Mullach Hill Fort and Dalswinton Wood to the south of the Site help to screen views of the Development so where clearer views become obtainable the increased viewing distance results in a small magnitude of change. The viewpoint from Back Hill is typical of the more open key characteristics views from the south of this LCT sub type.

8.182 To the north of the Site the Clauchrie Plantation screens views of the Development within the more immediate context however, from a localised area to the north of this LCT sub type between Park and stretching north to Gatelaw Bridge the Development is more apparent in key characteristic views. An indicative wireline from Barnmuir (291525, 591675 see Appendix 8.1) is typical of the elevated, open key characteristic views to the north of this LCT between Park and Gatelaw. From this viewpoint a medium magnitude of change is anticipated as the Development would form a conspicuous new landscape element resulting in a partial alteration to key characteristic views.

8.183 From Dunscore Viewpoint 12 indicates a small magnitude of change however, closer proximity views within 5km of the Development from the numerous residential receptors within this sub type are obtainable and an indicative wireline from Springfield (289900, 584600 see Appendix 8.1) presents a medium magnitude of change. This viewpoint is typical of the key characteristic views looking east over the Nith Valley.

8.184 From Dunscore the Development would form a conspicuous new landscape element resulting in a partial alteration to key characteristic views looking east over the Nith Valley. The Development would be seen to the left and in front of the operational Dalswinton, extending the horizontal angle occupied by turbines on the horizon. However, the magnitude of change is anticipated to reduce with distance within the western half of this sub type.

8.185 Magnitude of change: From Torthorwald generally Small however, from a localised area to the north of the LCT sub type (between Park and Gatelawbridge) Medium and increasing to Large in open, close proximity views within the Site.

8.186 From Dunscore, generally Medium but reducing with distance in the western half where visibility is less widespread.

8.187 Assessed sensitivity: High as the majority of these LCTs are within RSAs and these areas are highly visible from the surrounding settled lowlands, of medium scale and with numerous residential receptors.

8.188 Significance: For Torthorwald generally *Moderate (not significant)* however, Major to *Major/ Moderate (significant)* from a localised area in the north of this LCT and with regard to impacts on key characteristic views only. For Dunscore, generally

Major/Moderate (significant) with regard to impacts on key characteristic views but reducing to *Moderate (not significant)* in the western half.

8.189 The following table sets out a summary of the key LCTs within 15km and with potential visibility of the Development (as identified in Table 8.9) where significant landscape impacts have not been identified. A full assessment of the landscape impacts on these LCTs is included in Appendix 8.2.

Table 8.11 – Landscape Character Assessment Summary for LCTs where significant impacts have not been identified

Landscape Character Type	Sub Type	Assessed Sensitivity	Magnitude of Change	Significance	Summary
Type 2 Coastal Flats	Nith Coastal Fringe	Very High	Very Small	Minor	Site 15km to north west of this LCT ZTV indicates widespread visibility Key view orientated out to sea (opposite direction from Site) Views of operational wind farm apparent Development forms an inconspicuous minor new landscape element
Type 5 Intimate Pastoral Valleys	Cairn and Old Water	High	Very Small	Minor	Site 6km to east of this LCT ZTV indicates fragmented visibility from less than a quarter of LCT Intimate key views from valley floor are typically unaltered Views of operational wind farm apparent Development forms an inconspicuous minor new landscape element
Type 6 Lower Dale	Lower Nithsdale	Medium	Medium and reducing with distance	Moderate	Site 5km to north of this LCT ZTV indicates extensive visibility The Development visible in medium to long distance key views Views of operational wind farm apparent Development forms a conspicuous new landscape element
	Lower Annandale	Medium	Very Small	Minor/ Negligible	Site 12km to north west of this LCT ZTV indicates less widespread visibility Key views up/ down valley not orientated towards the Site Views of operational wind farm apparent Development forms an inconspicuous minor new landscape element
Type 7 Middle Dale	Mid Annandale	High	Very Small	Moderate	Site 10km to west of LCT ZTV indicates less widespread visibility Key views up/ down valley not orientated towards the Site Views of operational wind farm apparent Development forms an inconspicuous minor new landscape element

Landscape Character Type	Sub Type	Assessed Sensitivity	Magnitude of Change	Significance	Summary
Type 9 Upper Dale	Upper Nithsdale	High	Small	Moderate	Site 9km to south of LCT Widespread ,fragmented visibility to south of LCT Key views down valley orientated towards Site Views of operational wind farm apparent Development forms an apparent, small new landscape element
Type 11 Upland Glens	Scar	High	Small	Moderate	Site 11km to south east of LCT ZTV indicates fragmented visibility from less than a quarter of this LCT Development visible in open, elevated and longer distance views from valley sides (key views from valley floor more enclosed) Views of operational wind farm apparent Development would form an apparent, small new landscape element
	Shinnel	High	Small	Moderate	Site 11km to south east of LCT ZTV indicates fragmented visibility from less than a quarter of this LCT Development visible in open, elevated and longer distance views from valley sides (key views from valley floor more enclosed) Views of operational wind farm apparent Development would form an apparent, small new landscape element
Type 13 Drumlin Pastures	Milton and Deeside	Medium	Small	Minor	Site 12km to north east ZTV indicates limited visibility Varied key views due to diverse topography, Development visible in elevated open, longer distance views Views of operational wind farm apparent Development would form an apparent, small new landscape element

Landscape Character Type	Sub Type	Assessed Sensitivity	Magnitude of Change	Significance	Summary
Type 16 Upland Fringes	Cairn	High	Small	Moderate	Site 8km to north east from LCT Fragmented visibility from less than half of this LCT Development visible in panoramic views from valley slopes Views of operational wind farm apparent Development would form an apparent, small new landscape element
Type 18 Foothills	Nithsdale	High	Small	Moderate	Site 10km south east from LCT ZTV indicates visibility from approximately half of this LCT Development visible in open, panoramic long distance views where views of other wind farms are common Development would form an apparent, small new landscape element
	Keir	High	Small	Moderate	Site 5km east of LCT Fragmented visibility from less than half of this LCT Development visible in open, panoramic long distance views where views of other wind farms are common Development would form an apparent, small new landscape element
	Dalmacallan	High	Small	Moderate	Site 10km north east of LCT Fragmented visibility from less than half of this LCT Development visible in open, panoramic long distance views where views of other wind farms are common Development would form an apparent, small new landscape element
Type 18a Foothills with Forest	Ae	Low	Small	Minor	Directly to west of Site ZTV indicates a limited and fragmented pattern from less than a quarter of this LCT Key views are typically screened by plantation woodland Views of operational wind farm apparent Development would form an apparent, small new landscape element

Landscape Character Type	Sub Type	Assessed Sensitivity	Magnitude of Change	Significance	Summary
Type 19 Southern Uplands	Lowther	Medium	Small	Minor	Site 7km to south of LCT ZTV indicates a limited and fragmented pattern from less than a quarter of this LCT Development visible in open, panoramic long distance views where views of other wind farms are common Development would form an apparent, small new landscape element
	Nithsdale	Medium	Small	Minor	Site 11km to south east of LCT ZTV indicates a limited and fragmented pattern from less than a quarter of this LCT Development visible in open, panoramic long distance views where views of other wind farms are common Development would form an apparent, small new landscape element

Landscape Character of the Wider Setting

8.190 Within the wider landscape, beyond approximately 15km from the nearest proposed turbine, the impacts on landscape character would relate to the visibility of the Development. Beyond 15km the ZTV identifies that visibility would be sporadic and fragmented, with the notable exception of visibility to the south from the open water of the Solway Firth and to the east of the M74 around the west facing Annandale foothills. Viewpoints included within the wider landscape setting (Viewpoints 10, 11, 16 – 18) indicated a magnitude of change no greater than very small.

8.191 Where visibility of the Development is anticipated beyond 15km this tends to be from the more elevated open ground or the mouth of the River Nith, where vegetation permits. From such locations potential views of the five operational wind farms throughout the 35km study area generally tend to be more common. The Development would typically form an inconspicuous minor new landscape element resulting in a very minor alteration to the relationship of the key landscape characteristics. Depending on the viewing elevation the wind farm would be seen above the horizon or back dropped against the landform beyond.

8.192 Generally, the Development would be seen within the context of the existing wind farm at Dalswinton, and for the casual observer who does not know this wind farm well it could be difficult to tell there has been any change. This is anticipated to result in a minor alteration to the landscape character from areas with long distance views towards the Development and considering the worst case scenario the anticipated magnitude of change would not result in significant landscape impacts.

Landscape Fabric of the Site

Construction Phase

8.193 The construction of the Development would have a direct impact on the immediate Site and through gaining access to the Site. The anticipated construction phase would be approximately 9 months, which is relatively short-term. Construction traffic and plant would be apparent, especially as the Site access road passes through the village of Auldgirth. However, due to their temporary nature these impacts are not considered to be significant.

8.194 The activities and temporary features, with the potential to cause an impact on the landscape fabric i.e. to the land cover and habitats are described in Chapter 6: Ecology. The location and management of these features and activities have been carefully considered, and inherent mitigation measures have been incorporated into the construction programme to limit the transitory impacts of the construction phase as detailed in Chapter 3: Project Description.

<u>Coniferous Plantation Woodland</u>

8.195 There would be long-term, direct impacts on the landscape fabric of the Site because of some felling activities associated with forestry removal required to accommodate the Development. However, the trees to be removed would be in the main saplings

and this would be limited to very localised felling around two turbines and associated access tracks resulting in the loss of approximately 2.37 ha, of coniferous plantation woodland, the majority of which are relatively young saplings (see Figure 3.1). Within the context of the wider Clauchrie Plantation this is a small amount.

8.196 Given the forests nature as a commercial plantation, felling and removal of such would be programmed to occur at some point. It is therefore considered to be of Low Sensitivity and the magnitude of change of removing 2.37 ha is assessed as being Small. Therefore, the resulting assessed level of significance is *Minor (not significant)*.

Ancient and Other Deciduous Woodland

8.197 There are some stands of mature broadleaf woodland, including some areas of designated Ancient Woodland (refer to Figure 2.1), within the main core of the Site with some good examples of mature beech trees. The turbine locations and access track layout within the Site has been design to avoid these areas of woodland so no direct impacts are anticipated.

Other Landscape Features

8.198 Outwith areas where the Site access road and on Site access tracks follow existing forestry tracks, new roads and track are located in areas of grassland (improved, semi-improved and marshy). A small amount of grassland would be lost during the construction phase to accommodate access tracks. Furthermore, the turbine foundations, borrow pits and temporary construction compound and lay down areas would be located in areas of grassland resulting in a further small loss.

8.199 Grassland is considered to be of Low Sensitivity. Further more, the surrounding grassland would still be usable for grazing when construction of the Development is complete, and the construction compound, temporary lay down area and borrow pits would be made good and returned to their former habitats post construction. Therefore, the magnitude of change of permanently removing a small amount of grassland is Small, resulting in an assessed level of significance of *Minor (not significant)*.

8.200 Within the main Site there are also a number of dry stone walls, which have been well maintained and contribute in a positive manner to the landscape character of the Site. The access track alignment has been designed to avoid these features where possible however, crosses one wall to the north of Low Auldgirth. Due to the positive contribution they make to the landscape character of the Site dry stone walls are considered to be of High Sensitivity. As the access track only cross one wall resulting in a Very Small magnitude of change the assessed level of significance on dry stone walls is *Minor (not significant)*.

8.201 Where other field boundaries have been crossed these are typically post and wire fences which are considered to be of Low Sensitivity. As the number of field boundary crossings is limited, resulting in a Small magnitude of change, the assessed level of significance on boundaries is *Minor (not significant)*.

Operational Phase

8.202 Once operational, any activity on the Site would be restricted to servicing the operational Development, which would be restricted to the established access roads and turbines, and due to their transient nature not considered to be significant. In terms of impacts on the landscape fabric, other than the residual permanent impacts as indentified above, no significant impacts are anticipated to occur.

Decommissioning Phase

8.203 The decommissioning would result in similar impacts that are no greater than those described for construction. Potential landscape and visual impacts during the decommissioning phase would be minimal, achieved through limiting the duration of the works, by removing all above ground structures, leaving all below ground structures in place and restoring the ground disturbed by the works.

Visual Impacts

Representative Viewpoint Assessment

8.204 The following sections sets out the analysis and assessment of the visual impacts of the proposed development including representative viewpoints as listed in Table 8.10. The description of the existing outlook and predicted impacts from each viewpoint location is described with reference to the visualisations of the Development depicted on wireline and photomontage illustrations in Figures 8.8 to 8.25.

8.205 It should be noted that the assessment of the predicted impacts is primarily made by reference to the wireline images as these indicate a worse case scenario, i.e. they indicate maximum theoretically visibility of the proposed turbines. However, photomontage images for all the viewpoints excluding one have been produced to illustrate the likely view of the Development as would be seen within a photograph (not as it would appear to the human eye in the field). For the one viewpoint for which a photomontage was not produced (Viewpoint 15), localised vegetation cover which partially filtered views to the Development made modelling problematic.

8.206 Furthermore, the permanent met mast has been shown in all wirelines and photomontages within 5km of the Development. Beyond 5km, and due to the lattice construction of the met mast, it has been assumed that this feature of the Development would be difficult to discern so reference has not been made to in Viewpoints beyond 5km.

8.207 For the purposes of this assessment, the nature of visual impacts resulting from the introduction of the proposed turbines are assessed as being indirect, long term, reversible and adverse unless stated otherwise.

VP01: High Auldgirth (292281, 587778)

8.208 Baseline Views: (Refer to Figure 8.8a-b)

8.209 This viewpoint is representative of uninterrupted, oblique, north east facing views from a row of cottages at High Auldgirth. The viewpoint is located within Upland Fringe LCT.

8.210 From this location short distant views may be afforded from front aspect, single storey cottages, across a rising pastoral field defined by a stone wall to the front. The rising landform in the foreground obscures direct views towards the Site. Woodland partially encloses the view to the right and plantation woodland can be seen in the middle distance just above the horizon. No operational wind farms are apparent from this viewpoint. Wood pole pylons in the foreground break the horizon. This view has a secluded, agricultural character.

8.211 Predicted View: The hub of one turbine and the rotor blades of three turbines may be seen against the backdrop of the sky at a distance of 0.8km.

8.212 Magnitude of Change: Large as the development would form a prominent element within the view which would be easily seen.

8.213 Receptor type/s and sensitivity: Residential receptors are considered to be of High sensitivity to change.

8.214 Significance: *Major (significant)*

VP02: Ballochan Road, Auldgirth (291229, 586938)

8.215 Baseline Views: (Refer to Figure 8.9a-b)

8.216 This viewpoint is representative of uninterrupted, oblique and direct (various viewing angles), north east facing views from a cluster of two storey houses on Ballochan Road. The viewpoint is located within Middle Dale (Valley) LCT, with the Upland Fringe LCT located immediately beyond to the north east. This viewpoint is also representative of the Thornhill Uplands RSA.

8.217 From this location short distant views may be afforded from front aspect, upper and lower storey windows, across a modern residential estate defined by roads and private gardens. Direct views towards the Development are obstructed by the intervening ridgeline, which rises to form the horizon and is covered in commercial plantation. No operational wind farms are apparent from this viewpoint. The view has a developed, residential character.

8.218 Predicted View: The wireline indicates that the hub of one turbine and the rotor blades of three turbines are theoretically visible seen against the backdrop of the sky at a distance of 2.1km. However, wirelines do not take account woodland on the horizon which screens the majority of the proposed turbines (and all of the permanent met mast) so only the tips of one turbine is visible.

8.219 Magnitude of Change: Small as the development would form an apparent small element within the view which would be evident to the observer.

8.220 Receptor type/s and sensitivity: Residential receptors are considered to be of High sensitivity to change.

8.221 Significance: *Moderate (not significant)*

VP03: Shawsholm Road, Closeburn (289650, 592260)

8.222 Baseline Views: (Refer to Figure 8.10a-b)

8.223 This viewpoint is representative of uninterrupted, direct, southeast facing views from residential properties alongside Shawsholm Road. The viewpoint is located within the Middle Dale LCT and representative of the Thornhill Uplands RSA.

8.224 From this location middle distant views may be afforded from front aspect, upper and lower storey windows, across an open landscape of a flat to gently undulating relief of medium sized pastoral fields well defined by dry stone walls. Beyond these fields direct views towards the Site are obstructed by an intervening low ridgeline. The ridge top is clothed with large tracts of coniferous plantation, with the lower slopes covered by pastoral fields and linear deciduous shelterbelts. Above the coniferous ridgeline, the existing Dalswinton wind turbines are a conspicuous feature. Street lights in the foreground also break the horizon. This view has a varied character on the edge of developed area which contrasts with the surrounding farmland.

8.225 Predicted View: The upper towers, hub and rotor blades of four turbines, and the rotor blades of five turbines may be seen against the backdrop of the sky at a distance of 4.6km. The permanent met mast would also be visible to the right of turbine 4. The Development would be seen as an extension to the existing Dalswinton Wind Farm.

8.226 Magnitude of Change: Medium as the Development would form a conspicuous element within the view which would catch the eye.

8.227 Receptor type/s and sensitivity: Residential receptors are considered to be of High sensitivity to change and road users are considered to be of Medium sensitivity.

8.228 Significance: *Major/ Moderate (significant)* reducing to *Moderate (not significant)* for road users.

VP04: Picnic Spot, Drumlanrig Castle (285403, 599064)

8.229 Baseline Views: (Refer to Figure 8.11a-b)

8.230 This viewpoint is representative of uninterrupted, direct, south east views from a picnic spot on the driveway within Drumlanrig Castle HGDL. This viewpoint is located within the Upper Dale LCT and representative of the Thornhill Uplands RSA.

8.231 From this location medium scale views for recreational users across a broad sweeping pastoral field enclosed by policy woodland are obtainable. A post and wire fence encloses the field in the foreground. Beyond the woodland direct views towards the Site are obstructed by an intervening low ridgeline. The ridge top is clothed with large

tracts of coniferous plantation. The Dalswinton turbines are evident on the distant horizon between the woodland. This view has a parkland character.

8.232 Predicted View: The upper towers, hubs and tips of all five turbines may be seen against the backdrop of the sky at a distance of 12.6km. The Development would be seen as an extension to the existing Dalswinton Wind Farm.

8.233 Magnitude of Change: Small as the Development would form an apparent small element within the view which would be evident to the observer.

8.234 Receptor type/s and sensitivity: Recreational receptors within the HQDL are considered to be of High sensitivity.

8.235 Significance: *Moderate (not significant)*

VP05: Thornhill (288083, 595205)

8.236 Baseline Views: (Refer to Figure 8.12a-b)

8.237 This viewpoint is representative of interrupted, direct, south east facing views from residential properties on the southern edge of Thornhill. The viewpoint is located within the Middle Dale LCT, and on the periphery of Thornhill Conservation Area. The viewpoint is also representational of views within the Thornhill Uplands RSA.

8.238 From this location middle distant views may be afforded from front and side aspect, upper and lower storey windows, across a landscape of undulating farmland enclosed by hedgerows and woodland. Beyond these fields direct views towards the Site are obstructed by an intervening low ridgeline. The ridge top is clothed with large tracts of coniferous plantation, with the lower slopes covered by pastoral fields and linear deciduous shelterbelts. Above the coniferous ridgeline, the existing Dalswinton wind turbines are a conspicuous feature. This view has a varied character on the edge of developed area which contrasts with the surrounding farmland.

8.239 Predicted View: The upper towers, hubs and tips of all five turbines may be seen against the backdrop of the sky at a distance of 7.9km. The Development would be seen as an extension to the existing Dalswinton Wind Farm.

8.240 Magnitude of Change: Medium as the Development would form a conspicuous element within the view which would catch the eye.

8.241 Receptor type/s and sensitivity: Residential receptors are considered to be of High sensitivity to change and road users are considered to be of Medium sensitivity.

8.242 Significance: *Major/ Moderate (significant)* for residential receptors and *Moderate (not significant)* for road users.

VP06: Auldgirth Bridge, Blackwood (291153, 586339)

8.243 Baseline Views: (Refer to Figure 8.13a-b)

8.244 This viewpoint is representative of partially filtered, direct, north east facing views from Auldgirth Bridge. The viewpoint is located within the Middle Dale (Valley) LCT and on the periphery of the Upland Fringe LCT.

8.245 From this location short distant views may be afforded looking down the historic bridge with arable farmland and woodland to either side along the river corridor. Direct views towards the Development are obstructed by the intervening ridgeline, which rises to form the horizon and is covered in commercial plantation. On the lower slopes open areas reveal fields and houses associated with Auldgirth. No operational wind farms are apparent from this viewpoint. This view has a developed character.

8.246 Predicted View: The hubs and tips of one turbine and the tips of two turbines may theoretically visible seen against the backdrop of the sky at a distance of 2.6km. The permanent met mast would be visible in front of turbine 2. Deciduous woodland in the foreground is anticipated to screen views of the tips of one turbine.

8.247 Magnitude of Change: Small as the Development would form an apparent small element within the view which would be evident to the observer.

8.248 Receptor type/s and sensitivity: Pedestrians using the Auldgirth Bridge and road users on the A76 are considered to be of Medium sensitivity.

8.249 Significance: *Minor (not significant)*

VP07: Ellisland Farm (292922, 583845)

8.250 Baseline Views: (Refer to Figure 8.14a-b)

8.251 This viewpoint is representative of glimpsed, direct, north facing views from the car park of Ellisland Farm. The viewpoint is located within the Middle Dale (Valley) LCT.

8.252 From this location medium distance views may be afforded for recreational users within the farm car park looking over a broad sweeping pastoral field defined by hedgerows, hedgerows trees and woodland. Direct views towards the Development are obstructed by the intervening Mullach Hill which rises to form the distinctive horizon and is covered in patchwork of commercial forestry plantation and open farmland. Above the open ridgeline of Mullach Hill and between the woodland in the middle distance the existing Dalswinton wind turbines are an obvious feature. This view has a secluded, agricultural character.

8.253 Predicted View: The hubs and tips of one turbine and the tips of five turbines may theoretically visible seen against the backdrop of the sky at a distance of 4.3km. Woodland on the horizon is anticipated to screen views of the tip of the permanent met mast. The Development would be seen in the context of the existing Dalswinton Wind Farm, due to their similar turbine design and close proximity.

8.254 Magnitude of Change: Small as the Development would form an apparent small element within the view which would be evident to the observer.

8.255 Receptor type/s and sensitivity: Recreational receptors visiting Ellisland Farm with transient viewing opportunities are considered to be of Medium sensitivity to change.

8.256 Significance: *Minor (not significant)*

VP08: Dalswinton HGDL (294379, 584219)

8.257 Baseline Views: (Refer to Figure 8.15a-b)

8.258 This viewpoint is representative of glimpsed, direct, north facing views from Dalswinton HGDL. The viewpoint is located within the Middle Dale (Valley) LCT and representative of views within Dalswinton HGDL.

8.259 From this location medium distance views may be afforded for visitors to the HGDL looking over a picturesque man made pond. The pond is edged with avenue trees and policy/ coniferous woodland which obstruct direct views towards the Site. Beyond the woodland an intervening low ridgeline can be glimpsed between the trees clothed with pastoral fields and delineated with dry stone walls. Between the coniferous woodland on the horizon the tips of the existing Dalswinton wind turbines are obscured. This view has a parkland character.

8.260 Predicted View: The wireline indicates that the upper towers, hubs and tips of all five turbines are theoretically visible against the backdrop of the sky at a distance of 4.1km. However, the wireline does not take account of coniferous woodland in the middle distance, which would screen the majority of the Development with only the tips of two turbines and the top of the permanent met mast visible.

8.261 Magnitude of Change: Small as the Development would form an apparent small element within the view which would be evident to the observer.

8.262 Receptor type/s and sensitivity: Recreational receptors are considered to be of High sensitivity to change.

8.263 Significance: *Moderate (not significant)*

VP09: Maxwelltown Railway Path, Dumfries (297113, 577346)

8.264 Baseline Views: (Refer to Figure 8.16a-b)

8.265 This viewpoint is representative of uninterrupted, direct, north facing views from an open footpath. The viewpoint is located within the Lower Dale (Valley) LCT.

8.266 From this location medium distance views may be afforded for walkers and cyclists looking up the River Nith which is edged by riparian woodland to either side and which forms the horizon. The A75 road bridge can be seen crossing the River Nith in the middle distance. Beyond the woodland glimpsed long distance views of an intervening low ridgeline can be seen clothed with pastoral fields and commercial plantation. Above the horizon the existing Dalswinton wind turbines are evident. Street lighting along the A75 also breaks the horizon. This view has a parkland/ agricultural character on the edge of a well developed area.

8.267 Predicted View: The upper towers, hubs and tips of all five turbines are visible against the backdrop of the sky at a distance of 11.5km. The Development would be seen in the context of the existing Dalswinton Wind Farm, due to their similar turbine design and close proximity.

8.268 Magnitude of Change: Small as the Development would form an apparent small element within the view which would be evident to the observer.

8.269 Receptor type/s and sensitivity: Recreational receptors using local roads and footpaths are considered to be of Medium sensitivity.

8.270 Significance: *Minor (not significant)*

VP10: Farmhouse Tower, Caerlaverock Wetland Centre (305147, 565626)

8.271 Baseline Views: (Refer to Figure 8.17a-b)

8.272 This viewpoint is representative of elevated and uninterrupted, direct, north facing views from a public viewing tower within a nature reserve. The viewpoint is located within the Coastal Flats LCT and representative of the Nith Estuary NSA.

8.273 From this location long distance views may be afforded from an elevated viewing tower looking over a flat arable landscape and nature reserve delineated by hedgerows and woodland. Direct views towards the Site are obscured by an intervening low ridgeline clothed with pastoral fields and commercial plantation which forms a broad sweeping horizon. Above the horizon the existing Dalswinton wind turbines are visible but not an obvious feature within the landscape. This view has a natural character, which contrast with the farmland beyond.

8.274 Predicted View: The upper towers, hubs and tips of all five turbines are visible against the backdrop of the sky at a distance of 25.5km. The Development would be seen as an extension to the existing Dalswinton Wind Farm.

8.275 Magnitude of Change: Very Small as the Development would form an inconspicuous element within the view which would not be obvious to the observer.

8.276 Receptor type/s and sensitivity: Recreational receptors using a viewing tower are considered to be of Very High sensitivity as they have an overriding interest in their surroundings.

8.277 Significance: *Minor (not significant)*

VP11: Lambhill Terrace, Lockerbie (314043, 582044)

8.278 Baseline Views: (Refer to Figure 8.18a-b)

8.279 This viewpoint is representative of uninterrupted, direct, north west facing views from residential properties on Lambhill Terrace. This viewpoint is located within the Lower Dale (Valley) LCT.

8.280 From this location long distance views may be afforded from first and second storey windows looking over the town of Lockerbie. Beyond Lockerbie direct views towards the Site are obscured by an intervening low ridgeline clothed with pastoral fields and commercial plantation which forms a broad sweeping horizon. Above the horizon the existing Dalswinton wind turbines are visible but not an obvious feature within the landscape. This view has a developed, residential character.

8.281 Predicted View: The upper towers, hubs and tips of all five turbines are visible against the backdrop of the sky at a distance of 21.8km. The Development would be seen as an extension to the existing Dalswinton Wind Farm.

8.282 Magnitude of Change: Very Small as the Development would form an inconspicuous element within the view which would not be obvious to the observer.

8.283 Receptor type/s and sensitivity: Residential receptors are considered to be of High sensitivity.

8.284 Significance: *Minor (not significant)*

VP12: Throughgate House, Throughgate (287374, 584257)

8.285 Baseline Views: (Refer to Figure 8.19a-b)

8.286 This viewpoint is representative of uninterrupted, direct, north east facing views from a residential property in Throughgate. This viewpoint is located within the Upland Fringe LCT.

8.287 From this location medium distance views may be afforded from first and second storey windows looking over a pastoral field delineated by dry stone walls and with woodland clumps which partially enclose views to the right. Direct views towards the Site are obscured by Crawstone Hill which rises to form the horizon and is clothed in pastoral fields. To the right of the summit the existing Dalswinton wind turbines are evident. This view has a secluded, agricultural character.

8.288 Predicted View: The tips of one turbine is visible against the backdrop of the sky at a distance of 6.8km. The Development would be seen in front of the operational Dalswinton Wind Farm and appear as an extension to this wind farm.

8.289 Magnitude of Change: Very Small as the Development would form an inconspicuous element within the view which would not be obvious to the observer.

8.290 Receptor type/s and sensitivity: Residential receptors are considered to be of High sensitivity and road users of Medium sensitivity.

8.291 Significance: *Minor (not significant)* for residential receptors and *Minor/ Negligible (not significant)* for road users.

VP13: A76 near Muirside (294071, 581478)

8.292 Baseline Views: (Refer to Figure 8.20a-b)

8.293 This viewpoint is representative of uninterrupted, direct, north facing views for road users travelling in a northern direction on the A76. This viewpoint is located within the Lower Dale (Valley) LCT.

8.294 From this location medium distance views may be afforded for commuters from this long open section of road looking over farmland delineated by hedgerows, shelterbelts and woodland. Beyond a shelterbelt direct views towards the Site are obscured by Mullach Hill which rises to form a distinctive horizon and is clothed in pastoral fields. To the right of the summit and glimpsed between foreground woodland the existing Dalswinton wind turbines catch the eye. This view has a developed, agricultural character.

8.295 Predicted View: The upper towers, hubs and tips of all five turbines are visible against the backdrop of the sky at a distance of 6.7km. The Development would be seen in the context of the operational Dalswinton Wind Farm, due to their similar turbine design and close proximity.

8.296 Magnitude of Change: Medium as the Development would form a conspicuous element within the view which would catch the eye.

8.297 Receptor type/s and sensitivity: Road users are considered to be of Medium sensitivity.

8.298 Significance: *Moderate (not significant)*

VP14: A75 near River Nith (297961, 578186)

8.299 Baseline Views: (Refer to Figure 8.21a-b)

8.300 This viewpoint is representative of glimpsed, direct, north west facing views for road users travelling in a western direction on the A75. This viewpoint is located within the Lower Dale (Valley) LCT.

8.301 From this location long distance views may be afforded for commuters from this short open section of road (as it crosses the River Nith) looking over farmland delineated by hedgerows, shelterbelts and woodland. Direct views towards the Site are obscured by an intervening low ridgeline clothed with pastoral fields and commercial forestry plantation which forms a broad sweeping horizon. Above the horizon the existing Dalswinton wind turbines are evident. Street lighting on the A75 also breaks the horizon. This view has a developed, agricultural character.

8.302 Predicted View: The upper towers, hubs and tips of all five turbines are visible against the backdrop of the sky at a distance of 11.1km. The Development would be seen as an extension to the operational Dalswinton Wind Farm.

8.303 Magnitude of Change: Small as the Development would form an apparent small element within the view which would be evident to the observer.

8.304 Receptor type/s and sensitivity: Road users are considered to be of Medium sensitivity.

8.305 Significance: *Minor (not significant)*

VP15: A75 near Castle Hill (292472, 575154)

8.306 Baseline Views: (Refer to Figure 8.22a)

8.307 This viewpoint is representative of partially filtered, oblique, north facing views for road users travelling in a western direction on the A75. This viewpoint is located on the edge of the Terregles Ridge and Solway Coast RSA and Upland Fringe LCT.

8.308 From this location glimpsed, long distance views may be afforded for commuters looking through immature roadside woodland planting. Direct views towards the Site are obscured by the intervening landform which is clothed with pastoral fields and commercial forestry plantation and which forms a broad sweeping horizon beyond. Back clothed by the landform behind the existing Dalswinton wind turbines are visible but not an obvious element within the landscape. This view has a developed, agricultural character.

8.309 Predicted View: The upper towers, hubs and tips of all five turbines are visible against the backdrop of the landscape at a distance of 13km. The Development would be seen in the context of the operational Dalswinton Wind Farm, due to their similar turbine design and close proximity.

8.310 Magnitude of Change: Very Small as the development would form an inconspicuous element within the view which would not be obvious to the observer.

8.311 Receptor type/s and sensitivity: Road users are considered to be of Medium sensitivity.

8.312 Significance: *Minor/ Negligible (not significant)*

VP16: Criffel Hill (295725, 561871)

8.313 Baseline Views: (Refer to Figure 8.23a-b)

8.314 This viewpoint is representative of panoramic, direct, north facing views for walkers on the summit of Criffel Hill. This viewpoint is located within the Coastal Granite Uplands LCT and representative of the Nith Estuary NSA.

8.315 From this location open, long distance views may be afforded for recreational walkers looking over the undulating Dumfries landscape. Direct views towards the Site are obscured by the intervening landform which is clothed with pastoral fields and commercial plantation and forms a broad sweeping horizon beyond. Back clothed by the landform behind the existing Dalswinton wind turbines are visible but not an obvious element within the landscape. This view has an upland, remote character.

8.316 Predicted View: The upper towers, hubs and tips of all five turbines are visible against the backdrop of the landscape at a distance of 26.4km. The Development would be seen in the context of the operational Dalswinton Wind Farm, due to their similar turbine design and close proximity.

8.317 Magnitude of Change: Very Small as the Development would form an inconspicuous element within the view which would not be obvious to the observer.

8.318 Receptor type/s and sensitivity: Recreational walkers on the summit of this hill are considered to be of Very High sensitivity due to their overriding interest in their surroundings.

8.319 Significance: *Minor (not significant)*

VP17: M74 near Millhouse Bridge (312053, 584839)

8.320 Baseline Views: (Refer to Figure 8.24a-b)

8.321 This viewpoint is representative of glimpsed, oblique, west facing views for road users travelling in a northern direction on the M74. This viewpoint is located within the Middle Dale (Valley) LCT.

8.322 From this elevated vantage point (road bridge crossing M74) distant views may be afforded for commuters looking over farmland delineated by hedgerows and woodland blocks. Direct views towards the Site are obscured by an intervening low ridgeline clothed with pastoral fields and commercial plantation which forms a broad sweeping horizon. Seen above the horizon the existing Dalswinton wind turbines are visible but not an obvious element within the landscape. This view has a developed, agricultural character.

8.323 Predicted View: The upper towers, hubs and tips of all five turbines are visible against the backdrop of the sky at a distance of 19.2km. The Development would be seen as an extension to the operational Dalswinton Wind Farm.

8.324 Magnitude of Change: Very Small as the Development would form an inconspicuous element within the view which would not be obvious to the observer.

8.325 Receptor type/s and sensitivity: Road users are considered to be of Medium sensitivity.

8.326 Significance: *Minor/Negligible (not significant)*

VP18: A75 near Bettyknows (285570, 573790)

8.327 Baseline Views: (Refer to Figure 8.25a-b)

8.328 This viewpoint is representative of uninterrupted, direct, north east facing views for road users travelling in a easterly direction on the A76. This viewpoint is located within the Drumlin Pastures LCT.

8.329 From this location long distance views may be afforded for commuters from this open stretch of road looking over rolling farmland, partially enclosed by woodland to the right. Direct views towards the Site are obscured by the intervening landform which is clothed with pastoral fields and commercial forestry plantation and which forms the broad sweeping horizon beyond. Partially back clothed by the landform behind the

existing Dalswinton wind turbines are visible but not an obvious element within the landscape. Wood pole pylons also break the horizon in the foreground. This view has a developed, agricultural character.

8.330 Predicted View: The upper towers, hubs and tips of all five turbines are visible against the backdrop of the landscape at a distance of 16.1km. The Development would be seen as an extension to the operational Dalswinton Wind Farm.

8.331 Magnitude of Change: Very Small as the Development would form an inconspicuous element within the view which would not be obvious to the observer.

8.332 Receptor type/s and sensitivity: Road users are considered to be of Medium sensitivity.

8.333 Significance: *Minor/ Negligible (not significant)*

Visual Impacts on Settlements

8.334 Settlement pattern within the study area, and outwith the main towns and villages, is characterised by a network of farmsteads and individual residential properties. There are a high number of farmsteads/ properties within the 35km study area and it is difficult to ascertain with certainty the number and location of all properties which may have potential views of the Development due to:

- Varied viewing orientations of properties and farmsteads;
- Localised screening often offered by out buildings, fencing, woodland and private gardens; and
- Private nature of these properties which are often set within their own land where access is restricted.

8.335 However, and in accordance with the findings of the viewpoint assessment, where clear views of the Development are obtainable from properties within 10km the anticipated magnitude of change is likely to range between Large and Medium. As residential receptors are considered to be of a High visual sensitivity (due to their prolonged viewing opportunities) this would result in significant visual impacts as identified in Viewpoints 1, 3 and 5.

8.336 However, due to the presence of the existing Dalswinton Wind Farm and the nature of the landform, which can screen parts of the proposed development, not all residential receptors within 10km (and with potential views) are anticipated to experience significant visual impacts as identified in Viewpoints 2 and 12.

8.337 Generally speaking within 10km properties tend to be focused along the A76 with north to south viewing opportunities looking up/ down Nith Valley. In longer distance views the Development is seen to one side of Dalswinton, extending the horizontal angle occupied by turbines but within the context of, and as an extension to, Dalswinton. In closer proximity views the operational Dalswinton Wind Farm is often screened by the landform so from limited areas the Development introduces wind turbines into views where there are currently none. However, this is from a limited

number of properties and woodland and the landform also contributes to screening views of the Development as shown in Viewpoint 2.

8.338 To the west of the A76, on the Upland Fringes LCT there are also a high number of properties, within 10km with open, elevated viewing opportunities looking east and towards the Development. From this viewing orientation the Development is typically seen just in front of the operational Dalswinton Wind Farm and thus only partially extending the horizontal angle occupied by turbines in views, if at all (see Viewpoint 12). However, in closer proximity views (under 5km) significant visual impacts from properties with an open aspect towards the Development are anticipated.

8.339 In accordance with the findings of the viewpoint assessment, the main towns and settlements within 10km of the Development, with potential visibility and thus where significant visual impacts may be experienced, are listed below in Table 8.12. For each settlement the ZTV has been analysed and fieldwork undertaken to confirm potential actual visibility and if this would result in significant visual impacts.

Table 8.12 Settlements with Potential Visibility of the Development

Settlement (distance and direction from Site)	Comments on visibility
Auldgirth 1.8km SW	The majority of the village is outwith the ZTV and generally speaking principal views are orientated to the west and away from the Site. The north of the village is within the ZTV and as identified from Viewpoint 2 a small magnitude of change is anticipated, as the majority of the Development is screened by landform. Therefore no significant visual impacts are anticipated from Auldgirth.
Duncow 5.5km SE	The majority of this settlement falls within the ZTV however, this small village is set within woodland which is anticipated to screen the majority of views towards the Development. Views of the Development are anticipated from the northern edge of this village resulting in localised significant visual impacts.
Auchencairn 5.6km SE	The majority of this village is outwith the ZTV. Woodland in the foreground and on the horizon in views from the north western edge of this village is anticipated to screen potential views so no significant landscape and visual impacts are anticipated.
Kirkton 7.3km SE	This village is completely within the ZTV for the Development and as open views are available from the northern edge of the village localised significant visual impacts are anticipated.
Locharbriggs 9.3km SE	This large settlement on the north western outskirts of Dumfries is completely within the ZTV for the Development however, views from the vast majority of the houses would be screened by localised development. Limited open views from properties on the north western edge are available however, this is on the edge of where a medium magnitude of change is anticipated. Furthermore , as the majority of views within this settlement are screened significant visual impacts are not anticipated.
Amisfield 8.2km SE	The southern end of this linear village is within the ZTV and houses on the south western corner of the village have principal open views towards the Development. Whilst woodland on the horizon is anticipated to partially filter views, significant visual impacts are anticipated for a limited number of houses to the south of this village.

Settlement (distance and direction from Site)	Comments on visibility
Tinwald 9.8km SE	Small settlement with a church, graveyard and woodland to its north western edge which is anticipated to screen views towards the Development. Very limited open views towards the Development are available so significant visual impacts are not anticipated.
Newbridge 9.1km S	Settlement on the north western edge of Dumfries which is completely within the ZTV for the Development. However, woodland along the Cluden Water, to the north of this settlement, is anticipated to limit open views towards the Development so significant visual impacts are not anticipated.
Lincludden 9.7km S	Residential district on the north western edge of Dumfries which is completely within ZTV. Majority of views would be screened by localised development. Furthermore, development and woodland to north of this area is anticipated to limit open views towards the Development so significant visual impacts are not anticipated.
Holywood 6.9km S	Small linear row of cottages along the A76, which completely fall within ZTV for Development. However, principal views are orientated to the north east, and away from the Development so significant visual impacts are not anticipated.
Burnhead 3.9km S	Small settlement, with open views towards the Development and completely within ZTV. However, only the tips of the Development are visible resulting in a small magnitude of change so significant visual impacts are not anticipated.
Bardennoch 3.5km W	Small cluster of properties with open aspect to the Development and completely within ZTV. Significant visual impacts anticipated.
Thornhill 7.8km NW	Larger settlement, majority of which is within ZTV for Development. Whilst the majority of views in this settlement would be screened by local development open views from properties on the southern edge are anticipated to result in localised significant visual impacts as identified in Viewpoint 5.
Cample 5.8km NW	Small settlement mostly within ZTV for Development. Views are generally orientated to north west, away from Site. However, open views towards the Development are obtainable and there is a new build single house with an open aspect orientated towards the Site so localised significant impacts are anticipated.
Closeburn 4.5km NW	Settlement completely within ZTV for Development. Views from the majority of properties within the settlement would be screened by local development however, open views from the southern edge of this village are obtainable. As indicated in Viewpoint 3, localised significant visual impacts are anticipated.
Gatelawbridge 8km NW	Small village set within depression in the landscape in quite a wooded area which is anticipated to screen the majority of views towards the Development and as such significant landscape impacts are not anticipated.
Burnhead 9km NW	Small cluster of houses completely within ZTV for Development. However, majority of houses are not orientated towards the Site and woodland in foreground is anticipated to screen potential view so significant visual impacts are not anticipated.

Settlement (distance and direction from Site)	Comments on visibility
Penpont 9.8km NW	Large village completely within ZTV for Development. Majority of houses would have views towards Development obscured by local development. Open views are anticipated from limited properties on the south eastern edge of this village however, woodland in foreground is anticipated to limited views from certain properties so significant visual impacts are not anticipated.
Keir Mill 7.8km NW	Small village completely within ZTV for Development. Woodland, localised landform and industrial farm buildings on edge of village are anticipated to screen views towards the Development for the majority of houses and thus significant visual impacts are not anticipated.

8.340 In summary significant visual impacts from settlements are anticipated from Bardennoch (2.5km west) which is a very small settlement. From here the Development is seen to the right and in front of the operational Dalswinton, extending the horizontal angle occupied by turbines on the horizon and resulting in a medium magnitude of change.

8.341 Very localised significant impacts, generally from the edge of settlements with open aspects towards the Development are anticipated from Duncow, Kirkton, Amisfield, Thornhill (see Viewpoint 5), Cample and Closeburn (see Viewpoint 3). Medium to longer distance views of the Development seen to either side of the operational Dalswinton Wind Farm (depending on viewing orientation), extending the horizontal angle occupied by turbines on the horizon is anticipated. This would be from very limited properties on the edge of these settlements, resulting in a medium magnitude of change.

Cumulative Landscape and Visual Impacts

8.342 The purpose of the CLVIA is to describe, visually represent and assess the ways in which the Development would have additional impacts when considered together with other existing, consented or proposed wind farms and to identify related significant cumulative impacts arising from the Development.

8.343 The CLVIA considers the following scenarios:

- *Scenario 1 involves the assessment of the addition of the Development to the existing baseline operational wind farm developments in conjunction with those granted planning consent i.e. under construction, or approved schemes, and assuming they are all constructed and operational; and*
- *Scenario 2 involves the assessment of the addition of the Development to a cumulative baseline comprising all schemes identified in Scenario 1, in addition to submitted (but as yet undetermined) wind farm planning applications, and assuming they are all constructed and operational.*

Cumulative Wind Farm Developments

8.344 The location of operational, consented, proposed and scoping wind farm developments within 60km are depicted in Figure 8.26. In accordance with SNH guidance the detailed cumulative assessment has focused on wind farms within the 35km study area as these are more likely to lead to significant cumulative impacts. The ZTVs of all wind farms within the 35km study area have been analysed to decide which wind farms to take forward in the detailed cumulative assessment, which are listed in the following table (Table 8.13).

8.345 Sites within the 35km study area which have not been taken forward include Windy Standard and Wether Hill (both operational wind farms referred to in the baseline) the consented Windy Standard Extension and Blackcraig and the in planning Margree Wind Farms. ZTVs for these wind farms are included in ES Volume 2. These wind farms are all located to the north west of the study area (beyond 20km from the Development) and beyond 15km from all viewpoints and sequential routes considered within the cumulative assessment. With these wind farms cumulative impacts would generally be limited to successive views from the exposed upland areas of the Foothills, to the west of the Development, which are most commonly used for grazing.

8.346 Outwith this landscape, and in generally longer distance elevated views where the Development is visible with these wind farms there is typically clear separation between in views to the south and north. In views to the west the wind farms are seen in the distance behind the Development. Furthermore, in the longer distance views where the Development is visible with these wind farms the addition of the Development typically only represents a small magnitude of change. For this reason they have not been included within the detailed cumulative assessment.

8.347 Difficulty in obtaining details for Craig Hill and Afton Wind Farm has meant that these wind farms have also not been considered as part of the detailed cumulative LVIA. Furthermore, the layout for Harestanes Extension has not been finalised so the developer was unwilling to share these details.

Table 8.13 Wind farms within detailed cumulative assessment

Site Name - status	Approximate Distance and Direction	Number of Turbines	Blade Tip Height (maximum)	Landscape Character Type/ Designations	Description
Scenario One Wind Farms					
Clyde – under construction	22km north	152	125m	Southern Uplands LCT	ZTV focused to the east of the study area around the Annandale Valley and on the upland plateaus to the north of this area. ZTV overlap limited to the area around the M74 and a fragmented pattern of uplands to the west of Nith Valley. Refer to Figure 8.28a.
Dalswinton - operational	Directly east of the Development	15	120m	Foothills with Forest LCT	ZTV overlap with the Development is broadly similar. Refer to Figure 8.28b.
Ewe Hill (6 turbines) – under construction	33km east	6	126.5m	Foothills/ Southern Uplands LCT	ZTV focused around Annandale Valley and upland areas to east of study area. Fragmented pattern of ZTV overlap from uplands either side of Nith Valley with widespread overlap within open water of Solway Firth. Refer to Figure 8.28c.
Hare Hill - operational	33km north west	20	62m	Southern Uplands	ZTV focused to northern end of Nith Valley and uplands to either side to the north of the study area. Very limited and fragmented pattern of overlap from upland area to the south of Nith Valley. Sequential impacts from A76 main reason for inclusion. Refer to Figure 8.28d.
Harestanes – under construction	6km north east	71	125m	Foothills with Forest LCT	Located on the high ground between Nith Valley and Annandale there is widespread visibility from both these valleys and the upland areas in between. Widespread overlap with Development ZTV along western side and uplands of Nith Valley, Solway Firth and within Annandale. Refer to Figure 8.28e.

Site Name - status	Approximate Distance and Direction	Number of Turbines	Blade Tip Height (maximum)	Landscape Character Type/ Designations	Description
Minsca - operational	28km east	16	126.5m	Foothills LCT	ZTV focused around uplands ether side of Annandale and to the south of the valley floor. Widespread overlap from Solway Firth and in a fragmented pattern to upland areas either side of Nith Valley. Refer to Figure 8.28f.
Whiteside Hill – consented	26km north west	11	110m	Southern Uplands LCT	ZTV focused to the northern end of Nith Valley with widespread overlap from valley floor to the south and in a fragmented pattern to upland areas either side. Refer to Figure 8.28g.
Scenario Two Wind Farms					
Auchencairn – in planning	1km north east	16	121m	Foothills with Forest LCT	Broadly similar overlap with the Development ZTV however, Auchencairn has additional areas of visibility from uplands between Nith Valley and Annandale. Furthermore only the Development is visible from areas of Nith Valley to the south of the Development. Refer to Figure 8.28h.
Barnbackle – in planning	15km south west	2	100m	Drumlin Pastures LCT	ZTV focused to the south of the study area with fragmented overlap to the south of Nith Valley, the Solway Firth and from limited upland areas to the east of Annandale. Refer to Figure 8.28i.
Doon Hill – in planning	22km south west	2	100m	Drumlin Pastures LCT	ZTV focused to south of study area around Drumlin Pastures LCT. Fragmented pattern of overlap from upland areas either side of Nith Valley. Refer to Figure 8.28j.
Ewe Hill (22 turbines) – in planning	34km east	22	111m	Southern Uplands	ZTV focused to upland areas either side and to the north of Annandale. Fragmented pattern of overlap from upland areas to south of Nith Valley with more widespread overlap from the open water of the Solway Firth. The Ewe Hill 6 turbine scheme which has been given consent forms part of this scheme. The remaining 16 turbines are awaiting confirmation. Refer to Figure 8.28k.

Site Name - status	Approximate Distance and Direction	Number of Turbines	Blade Tip Height (maximum)	Landscape Character Type/ Designations	Description
Hare Hill Extension – in planning	32km north west	39	91m	Southern Upland LCT	ZTV focused to the northern end of Nith Valley. Very limited overlap from upland areas and valley sides along Nith Valley. The main reason this wind farm has been included is due to sequential impacts from the A76. Refer to Figure 8.28l.
Minnygap – in planning	11km north east	10	125	Foothills with Forest LCT	ZTV focused to the upland area between Nith Valley and Annandale with widespread overlap particularly along the western side of Nith Valley, from the Solway Firth and upland areas to east of Annandale. Refer to Figure 8.28m.
Newfield – in planning	22km east	21	125m	Foothills/ Upland Fringe LCT	ZTV focused along Annandale with overlap around M74, upland areas to the west of Nith Valley and from Solway Firth. Refer to Figure 8.28n.
Ulzieside – in planning	25km north west	12	120m	Southern Uplands	ZTV focused along Nith Valley and upland areas to north of the study area. Widespread overlap to south of Nith Valley around Dumfries area. Refer to Figure 8.28o.

Cumulative Landscape Assessment

8.348 The following sections sets out the analysis and assessment of the cumulative landscape impacts of the Development. For the purposes of this assessment the nature of landscape impacts resulting from the introduction of the Development are assessed as being indirect, long term, reversible and adverse unless otherwise stated. Wind Farms are also generally referred to by their place name only (i.e. Clyde).

Landscape Designations

Nith Estuary NSA

8.349 Viewpoint 16 from Criffel Hill has been presented as a cumulative viewpoint within this designation. The Development is located approximately 15km to the north of the Nith Estuary NSA and the Development ZTV indicates widespread visibility from approximately half of this designation (however, outside of Criffel Hill the flat nature of this landscape and vegetative screening is anticipated to reduce actual visibility). As determined in the landscape assessment, the assessed sensitivity of the NSA is Very High.

Table 8.14: Nith Estuary NSA Predicted Cumulative Impacts

Wind Farm	Distance and Direction	Comments on ZTV overlap between the Development and named cumulative wind farm/ typical nature of views
Scenario 1		
Clyde	40km north	Limited overlap from northern facing slopes of Criffel Hill/ combined views
Dalswinton	17km north	Broadly similar overlap/ combined views
Ewe Hill (6 turbines)	28km north east	Broadly similar overlap from land based views/ successive views
Hare Hill	47km north west	Limited overlap from northern facing slopes of Criffel Hill/ combined views
Harestanes	20km north	Broadly similar overlap/ combined views
Minsca Farm	23km north east	Broadly similar overlap/ successive views
Whiteside	40km north west	Less widespread overlap/ combined views
Scenario 2		
Auchencairn	17km north	Broadly similar overlap/ combined views
Barnbackle	7km north west	Limited overlap from northern facing slopes of Criffel Hill/ successive views
Doon Hill	7km west	Negligible overlap/ successive views
Ewe Hill (22 turbines)	26km north west	Broadly similar overlap/ successive views
Hare Hill Extension	45km north west	Limited overlap from northern facing slopes of Criffel Hill/ combined views
Minnygap	22km north	Broadly similar overlap/ combined views
Newfield	20km north west	Less widespread overlap/ successive views
Ulzieside	40km north west	Broadly similar overlap from land based views/ combined views

8.350 The Development would not constitute an unfamiliar element in views from this designated landscape as existing wind turbines are already a recognisable feature in the landscape.

8.351 For Scenario 1 and from open, elevated viewing positions looking in a northern direction there are three clear and distinct clusters of wind farms spread across the landscape with Dalswinton to the centre of view; Clyde and Haresanes to the right; and Whiteside and Hare Hill to the left.

8.352 The Development would generally be seen to the left, and in the context of, the operational Dalswinton Wind Farm due to their similar turbine design. The Development would marginally extend the horizontal angle occupied by turbines within this central grouping, introducing an inconspicuous new landscape element into the view from the limited areas with actual visibility.

8.353 Magnitude of Cumulative Change (Scenario 1): The addition of the Development to a future baseline comprising operational and consented wind farms is assessed as being Very Small

8.354 Cumulative Significance (Scenario 1): *Minor (not significant)*

8.355 In Scenario 2, and in views orientated north, Auchencairn is visible behind Dalswinton. Other in planning wind farms (including Minnygap and Ulzieside) add to the two distinct clusters of wind farms to the left and right of view. As above, the Development would generally be seen to the left of Dalswinton and in the context of Dalswinton, introducing inconspicuous new landscape elements.

8.356 Magnitude of Cumulative Change (Scenario 2): The addition of the Development to a future baseline comprising all Scenario 1 and proposed wind farms is assessed as being Very Small

8.357 Cumulative Significance (Scenario 2): *Minor (not significant)*

Thornhill Uplands RSA

8.358 Viewpoint 4 from Drumlanrig Castle has been presented as a cumulative viewpoint within this designation. The turbines associated with the Development are located directly to the south of this landscape designation. The Development ZTV indicates widespread visibility to the south of this designation focused around the central valley floor with a more fragmented pattern from the surrounding uplands. However, actual visibility, particularly from valley floor to the north of this landscape, is anticipated to be reduced by extensive woodland coverage. The valley floor to the south of this landscape is more open in character. As determined in the landscape assessment, the assessed sensitivity of this RSA is High.

Table 8.15: Thornhill Uplands RSA Predicted Cumulative Impacts

Wind Farm	Distance and Direction	Comments on ZTV overlap between the Development and named cumulative wind farm/ typical nature of views
Scenario 1		
Clyde	6km north west	Limited overlap from valley sides and uplands/ successive views
Dalswinton	1km south east	Broadly similar overlap/ combined views
Ewe Hill (6 turbines)	33km south east	Limited overlap from valley sides and uplands/ combined views
Hare Hill	9km north west	Limited overlap from eastern valley sides and uplands/ successive views
Harestanes	Directly to east	Widespread overlap to west of valley and in eastern uplands/ combined views
Minsca Farm	30km south east	Limited overlap from uplands/ combined
Whiteside	1km north west	Widespread overlap/ successive views
Scenario 2		
Auchencairn	1km south east	Broadly similar overlap/ combined views
Barnbackle	13km south	Less widespread overlap/ combined views
Doon Hill	19km south	Limited overlap from eastern uplands/ combined views
Ewe Hill (22 turbines)	30km south east	Limited overlap from western uplands/ combined views
Hare Hill Extension	7km north west	Limited overlap from eastern uplands/ successive views
Minnygap	3km east	Less widespread overlap from eastern valley slopes and uplands/ combined views
Newfield	20km east	Limited overlap from upland areas/ combined views
Ulzieside	1km west	Less widespread overlap/ successive views

8.359 The Development would not constitute an unfamiliar element in views from this designation as existing wind turbines are already a recognisable feature in views looking out from this landscape.

8.360 For Scenario 1 and typically from the valley floor/ upland fringes Dalswinton is the only scheme which is visible in views looking south east. Successive views of the under construction Whiteside are theoretically obtainable, however, due to tree cover 360 panoramic views from the valley floor are rare. The Development is usually only visible when views of Dalswinton are also obtainable. Therefore, the cumulative magnitude of change reflects the magnitude of change identified within the landscape assessment (medium but reducing with distance to small).

8.361 From elevated viewing positions on the valley sides and uplands a more complex cumulative picture emerges. From the western valley side in views orientated south east there are two clusters of wind farms with a group of wind farms including

Dalswinton, Minsca and Ewe Hill (6) to the centre of view and Harestanes visible to the left.

8.362 Similar views are obtainable from the eastern side of the valley, but with Minsca and Ewe Hill (6) to the left of view in the distance. Furthermore, from the peaks and summits on both sides of the valley successive views of more distant wind farms within the study area tend to be more readily obtainable, such as Ulzieside to the north west.

8.363 The Development is typically seen extending the horizontal angle occupied by turbines to the right of Dalswinton (with Minsca visible behind and in the distance from the western valley slopes) introducing conspicuous new landscape elements seen as an extension to Dalswinton due to the similar design and close proximity. However, this magnitude of change reduces with distance.

8.364 Magnitude of Cumulative Change (Scenario 1): the addition of the Development to a future baseline comprising operational and consented wind farms is assessed as being Medium from the valley floor/ upland fringes, but reducing with distance, and Small from the elevated valley sides and uplands where views of wind farms are more common and the Development is often partially back clothed.

8.365 Cumulative Significance (Scenario 1): *Major/ Moderate (significant)* from the valley floor/ upland fringes to the south of this landscape however, this reduces with distance and *Moderate (not significant)* from the elevated valley sides and uplands from the majority of this designation.

8.366 In Scenario 2 and from the valley floor/ upland fringes combined views including Auchencairn and Dalswinton are available to the south of this designation. The layout of Auchencairn is such that there is a noticeable gap in the Auchencairn scheme itself which makes this look like two wind farm proposals from the valley floor. Dalswinton and the right hand group of Auchencairn create a long string of turbines visible on the horizon and the Development extends this string of turbines to the right of view. The Development is very much seen as an extension to Dalswinton.

8.367 However, as Auchencairn and Dalswinton combine to create a long string of turbines dominating the horizon and the Development further extends this impact, into enclosed views focused down a valley, a cumulative magnitude of change of large is anticipated from the valley floor/ upland fringes. This impact is particularly apparent in the area around and to the south of Thornhill but reduces as one moves north and turbines become less prominent on the horizon.

8.368 From the western valley sides and uplands Minnygap, Auchencairn, Ewe Hill (22) and Newfield typically become apparent in combined views looking southeast, creating a large cluster of wind farm developments in the view. Auchencairn has the impact of joining the two clusters referred to in Scenario 1. The Development marginally extends the horizontal angle occupied by turbines to the right of this long cluster which is considered to result in a small magnitude of change from these open, expansive views.

8.369 From the eastern valley sides and uplands Auchencairn is seen in front of Dalswinton creating a central cluster of turbines in the view. The Development typically has the impact of extending the horizontal angle occupied by turbines to the right of this cluster, but very much within the context of this grouping resulting in a small magnitude of change from these open, expansive views. Barnbackle and Doon Hill are also visible in the distance to the right as a separate cluster

8.370 Magnitude of Cumulative Change (Scenario 2): The addition of the Development to a future baseline comprising all Scenario 1 and proposed wind farms is assessed as being Large from the valley floor and upland fringes (but reducing to the north of Thornhill) and Small from the elevated valley slopes and uplands from the majority of this landscape.

8.371 Cumulative Significance (Scenario 2): *Major (significant)* from the valley floors/ upland fringes from a localised area to the south of this landscape and *Moderate (not significant)* from the elevated valley sides and uplands from the majority of this landscape.

Terregles Ridge RSA

8.372 The viewpoint assessment included no viewpoints from this area, however, an indicative wireline from Bishop Forest Hill (284895, 579655 see Figure 8.34a-c) has helped to inform the assessment. The Development is located approximately 6km to the north east of this RSA and the ZTV indicates a fragmented pattern of visibility from approximately a quarter of this designation, from the northern facing slopes. As determined in the landscape assessment, the assessed sensitivity of this RSA is High.

Table 8.16: Terregles Ridge RSA Predicted Cumulative Impacts

Wind Farm	Distance and Direction	Comments on ZTV overlap between the Development and named cumulative wind farm/ typical nature of views
Scenario 1		
Dalswinton	8km north east	Broadly similar overlap/ combined views
Ewe Hill (6 turbines)	36km east	Broadly similar overlap/ successive views
Hare Hill	34km north west	Less widespread overlap/ successive views
Harestanes	16km north east	Broadly similar overlap/ combined views
Minsca Farm	30km east	Broadly similar overlap/ successive views
Whiteside	27km north west	Less widespread overlap/ successive views
Scenario 2		
Auchencairn	10km north east	Broadly similar overlap/ combined views
Barnbackle	4km south	Limited overlap/ successive views
Doon Hill	10km south	Limited overlap/ successive views

Wind Farm	Distance and Direction	Comments on ZTV overlap between the Development and named cumulative wind farm/ typical nature of views
Ewe Hill (22 turbines)	36km east	Broadly similar overlap/ successive views
Hare Hill Extension	32km north west	Limited overlap/ successive views
Minnygap	20km north east	Broadly similar overlap/ combined views
Newfield	23km north east	Widespread overlap/ successive views
Ulzieside	27km north west	Less widespread overlap/ successive views

8.373 The Development would not constitute an unfamiliar element in views from this designated landscape as existing wind turbines are already a recognisable feature in views from this landscape.

8.374 For Scenario 1 and in views orientated north east Dalswinton and Harestanes create a central cluster of wind farms, with Ewe Hill (6) and Minsca separated and visible to right of view and Whiteside Hill and Hare Hill visible in a cluster in longer distance views to the left. Typically, the Development would be seen in front on this central grouping, and would not extend the horizontal angle occupied by turbines thus resulting in a small magnitude of change.

8.375 Magnitude of Cumulative Change (Scenario 1): The addition of the Development to a future baseline comprising operational and consented wind farms is assessed as being Small

8.376 Cumulative Significance (Scenario 1): *Moderate (not significant)*

8.377 In Scenario 2, and in views orientated northeast Auchencairn and Minnygap add to the central cluster of wind farms in which the Development would be located in front of. Further proposed wind farms add to the groups of wind farms to the left and right of view. As with Scenario 1 the addition of the Development results in a Small magnitude of change.

8.378 Magnitude of Cumulative Change (Scenario 2): The addition of the Development to a future baseline comprising all Scenario 1 and proposed wind farms is assessed as being Small

8.379 Cumulative Significance (Scenario 2): *Moderate (not significant)*

Solway Coast RSA

8.380 Viewpoint 15 from the A75 has helped to inform the cumulative assessment from this designation. The Development is located approximately 13km to the north of this RSA and the ZTV indicates widespread visibility around the Nith estuary and limited visibility along the western coastline. Localised development and vegetation is anticipated to

reduce actual visibility. As determined in the landscape assessment, the assessed sensitivity of this RSA is High.

Table 8.17: Solway Coast RSA Predicted Cumulative Impacts

Wind Farm	Distance and Direction	Comments on ZTV overlap between the Development and named cumulative wind farm/ typical nature of views
Scenario 1		
Clyde	36km north	Limited overlap/ combined views
Dalswinton	13km north	Broadly similar overlap/ combined views
Ewe Hill (6 turbines)	24km north east	Less widespread overlap/ successive views
Hare Hill	42km north west	Limited overlap/ combined views
Harestanes	16km north	Broadly similar overlap/ combined views
Minsca farm	16km north east	Widespread overlap/ successive views
Whiteside	35km north west	Widespread overlap/ combined views
Scenario 2		
Auchencairn	14km north	Broadly similar overlap/ combined views
Barnbackle	3km west	Less widespread overlap, to west of Nith estuary/ successive views
Doon Hill	5km west	Limited overlap/ successive views
Ewe Hill (22 turbines)	24km north east	Widespread overlap/ successive views
Hare Hill Extension	41km north west	Limited overlap/ combined views
Minnygap	22km north	Widespread overlap/ combined views
Newfield	16km north east	Widespread overlap/ successive views
Ulzieside	36km north west	Widespread overlap/ combined views

8.381 The Development would not constitute an unfamiliar element in views from this designated landscape as existing wind turbines are already a recognisable feature in views from this landscape.

8.382 For Scenario 1 typically in views orientated north Dalswinton is at the centre of the view with Harestanes separated and in the longer distance to the right of view. From more elevated positions Ewe Hill and Minsca are visible in longer distance views to the right and Whiteside Hill and Hare Hill in longer distance views to the left.

8.383 As identified within the landscape assessment, the Development is seen to the left and in the context of Dalswinton, due to the similar turbine design. The proposed wind farm is often seen often back clothed by the landscape behind (due to the elevated nature of obtainable views) forming an inconspicuous minor new landscape element.

8.384 Magnitude of Cumulative Change (Scenario 1): The addition of the Development to a future baseline comprising operational and consented wind farms is assessed as being Very Small

8.385 Cumulative Significance (Scenario 1): *Minor (not significant)*

8.386 In Scenario 2, and in views orientated north Auchencairn is seen behind Dalswinton and Minnygap behind Harestanes. Other wind farms in planning add to the groupings of wind farms discussed above to the far right and left of view. The Development is still considered to introduce inconspicuous minor new landscape elements into the view.

8.387 Magnitude of Cumulative Change (Scenario 2): The addition of the Development to a future baseline comprising all Scenario 1 and proposed wind farms is assessed as being Very Small

8.388 Cumulative Significance (Scenario 2): *Minor (not significant)*

Torthorwald Ridge RSA

8.389 A cumulative wireline from Back Hill (301950, 582340 see Figure 8.33a-c) has been presented to help inform the cumulative assessment from this designation. The Development is located approximately 8km to the northwest of this RSA and the ZTV indicates visibility along the northern and western edges of this designation with a fragmented pattern from the high ground to the centre. As determined in the landscape assessment, the assessed sensitivity of this RSA is High.

Table 8.18: Torthorwald Ridge RSA Predicted Cumulative Impacts

Wind Farm	Distance and Direction	Comments on ZTV overlap between the Development and named cumulative wind farm/ typical nature of views
Scenario 1		
Clyde	25km north	Limited overlap from central high ground/ combined views
Dalswinton	7km north west	Broadly similar overlap/ combined views
Ewe Hill (6 turbines)	19km east	Limited overlap from central high ground/ successive views
Hare Hill	42km north west	Widespread overlap/ combined views
Harestanes	7km north	Widespread overlap/ combined views
Minsca Farm	8km east	Limited overlap from central high ground/ successive views
Whiteside	35km north west	Widespread overlap/ combined views
Scenario 2		
Auchencairn	7km north west	Broadly similar overlap/ combined views
Barnbackle	15km west	Broadly similar overlap/ successive views
Doon Hill	20km south west	Widespread overlap/ successive views
Ewe Hill (22 turbines)	19km east	Limited overlap from central high ground/ successive views
Hare Hill Extension	42km north west	Widespread overlap/ combined views
Minnygap	10km north	Limited overlap/ combined views
Newfield	8km east	Limited overlap from central high ground/ successive views
Ulzieside	34km north west	Widespread overlap/ combined views

8.390 The Development would not constitute an unfamiliar element in views from this designated landscape as existing wind turbines are already a recognisable feature in the landscape.

8.391 For Scenario 1 and in typical views orientated north west Dalswinton is visible to the centre of view with Whiteside Hill and Hare Hill in the distance behind. Harestanes is also visible to right of view. Views from the higher ground to the centre of this designation offer successive views of wind farms to the east.

8.392 The Development would be apparent to the left of Dalswinton (with Whiteside Hill and Hare Hill in the distance behind) and seen as an extension to this wind farm. The proposed wind farm would form a new, apparent and small landscape element in the view slightly extending the horizontal angle occupied by turbines.

8.393 Magnitude of Cumulative Change (Scenario 1): The addition of the Development to a future baseline comprising operational and consented wind farms is assessed as being Small

8.394 Cumulative Significance (Scenario 1): Moderate *(not significant)*

8.395 In Scenario 2, and in views orientated north west Auchencairn, Ulzieside and Hare Hill Extension add to the central cluster of wind farm, with Auchencairn substantially extending the horizontal angle occupied by turbines in this central cluster. Minnygap can also be seen to the right of Haresanes to the right of view and Barnbackle and Doon Hill in views to the left. Ewe Hill (22) and Minsca can also be seen in successive views to the east.

8.396 As with before the Development is seen as an extension to Dalswinton, marginally extending the horizontal angle occupied by turbines in this central cluster.

8.397 Magnitude of Cumulative Change (Scenario 2): The addition of the Development to a future baseline comprising all Scenario 1 and proposed wind farms is assessed as being Small

8.398 Cumulative Significance (Scenario 2): *Moderate (not significant)*

Drumlanrig Castle HGDL

8.399 Viewpoint 4 from Drumlanrig Castle has been presented as a cumulative viewpoint within this designation. The Development is located approximately 10km to the south east of this HGDL and the ZTV indicates widespread visibility however, this is anticipated to be reduced by extensive broadleaf woodland throughout this designation. As determined in the landscape assessment, the assessed sensitivity of this HGDL is High.

Table 8.19: Drumlanrig Castle HGDL Predicted Cumulative Impacts

Wind Farm	Distance and Direction	Comments on ZTV overlap between the Development and named cumulative wind farm/ typical nature of views
Scenario 1		
Dalswinton	10km south east	Broadly similar overlap/ combined views
Harestanes	13km east	Limited overlap from western side/ combined views
Scenario 2		
Auchencairn	8km south east	Broadly similar overlap/ combined views
Minnygap	15km east	Limited overlap from south west/ combined views

8.400 The Development would not constitute an unfamiliar element in views from this designated landscape as existing wind turbines are already a recognisable feature in the landscape.

8.401 For Scenario 1 and in typical views orientated southeast Dalswinton is visible to the centre of view on the horizon. The Development would be apparent to the right of Dalswinton and seen as a logical extension to it, forming an apparent, small new landscape element.

8.402 Magnitude of Cumulative Change (Scenario 1): The addition of the Development to a future baseline comprising operational and consented wind farms is assessed as being Small

8.403 Cumulative Significance (Scenario 1): *Moderate (not significant)*

8.404 In Scenario 2 combined views including Auchencairn and Dalswinton are typical. As identified in the cumulative assessment of Thornhill Uplands RSA, Dalswinton and Auchencairn create a long string of turbines visible on the horizon and the Development extends this string of turbines to the right of view.

8.405 However, due to the increased viewing distance, reduced viewing opportunities within the context of this designation (due to extensive woodland coverage within the HGDL) and higher percentage of horizon free of turbines a cumulative magnitude of change of small is still anticipated.

8.406 Magnitude of Cumulative Change (Scenario 2): The addition of the Development to a future baseline comprising all Scenario 1 and proposed wind farms is assessed as being Small

8.407 Cumulative Significance (Scenario 2): *Moderate (not significant)*

Dalswinton HGDL

8.408 The viewpoint assessment included one viewpoint from this area (Viewpoint 8) which has helped to inform the assessment. The Development is located approximately 3km north west of this HGDL and the ZTV indicates extensive visibility across the majority of this HGDL however, widespread mature woodland is anticipated to greatly reduce actual visibility and open views towards the Development are limited.

Table 8.20: Dalswinton HGDL Predicted Cumulative Impacts

Wind Farm	Distance and Direction	Comments on ZTV overlap between the Development and named cumulative wind farm/ typical nature of views
Scenario 1		
Dalswinton	4km north	Broadly similar overlap/ combined views
Whiteside	29km north west	Very limited overlap/ combined views

8.409 As open views towards the Development are very limited, and typically no other operational, consented or proposed wind farms are visible beyond Dalswinton (which has been considered within the landscape baseline) the cumulative assessment reflects the landscape assessment where significant impacts are not anticipated from this designation.

Landscape Character Types

8.410 Within the following assessment of cumulative impacts on LCTs and with regard to predicted impacts only the wind farms with widespread or higher ZTV overlap within each LCT are referred to (along with the distance and direction of the wind farm from that particular LCT). No significant cumulative impacts have been identified outwith those LCTs where significant landscape impacts have already been identified so the assessment on cumulative impacts for these LCTs is included in Appendix 8.2. A summary table which outlines the sensitivity, magnitude of change and significance of cumulative impacts is shown in Table 8.24 at the end of this report.

Type 7 Middle Dale – Mid Nithsdale and Mid Annandale

8.411 Viewpoint 17 has been presented as a cumulative viewpoint from within the Mid Annandale sub type. Of the two sub types the Development is located approximately 1km to the east of Mid Nithsdale and 10km to the west of Mid Annandale. The Development ZTV indicates widespread visibility within Mid Nithsdale. The assessment of cumulative impacts in Mid Annandale is included in Appendix 8.2. An extensive pattern of shelterbelts and woodland is anticipated to reduce actual visibility however, views to the north of Mid Nithsdale are more open in character. As determined in the landscape assessment, the assessed sensitivity of this LCT is High.

8.412 Predicted impacts: Within Mid Nithsdale widespread ZTV overlap with Dalswinton (3km east), Whiteside (15km northwest) for Scenario 1 wind farms and Auchencairn (3km east), Ulzieside (15km northwest) for Scenario 2 wind farms is anticipated.

8.413 This landscape has an open character with medium scale views focused up/ down the valley. The Development would not constitute an unfamiliar element in views from this landscape as existing wind turbines are already a recognisable feature.

8.414 For Scenario 1 in Mid Nithsdale there is a broadly similar ZTV overlap between Dalswinton and the Development. Successive and combined views including Whiteside, whilst theoretically possible, are rare and due to the longer viewing

distance would not contribute to significant cumulative impacts. As Dalswinton is considered in the landscape baseline the cumulative assessment reflects the landscape assessment for which a medium magnitude of change reducing to small in the south of this landscape.

8.415 Magnitude of Cumulative Change (Scenario 1): The addition of the Development to a future baseline comprising operational and consented wind farms is assessed as being Medium in Mid Nithsdale (but reducing Small in the south of this landscape).

8.416 Cumulative Significance (Scenario 1): *Major/ Moderate (significant)* from a localised area in the north (between Thornhill and just south of Closeburn) and in relation to key characteristic views but reducing to *Moderate (not significant)* in the south in Mid Nithsdale.

8.417 From Mid Nithsdale in Scenario 2 Auchencairn is typically visible on the horizon to the left of Dalswinton in views looking south from this north of this landscape. As identified in the cumulative assessment of Thornhill Uplands, Auchencairn and Dalswinton combine to create a long string of turbines visible on the horizon and the Development is visible to the right of Dalswinton, further extending this impact and resulting in a large cumulative magnitude of change.

8.418 To the south of this landscape, and in views looking north, Auchencairn is largely screened but tips are visible behind Dalswinton. Cumulative impacts therefore reflect Scenario 1.

8.419 Magnitude of Cumulative Change (Scenario 2): The addition of the Development to a future baseline comprising all Scenario 1 and proposed wind farms is assessed as being Large to the north of Mid Nithsdale (but reducing to Small in the south) and Very Small in Mid Annandale.

8.420 Cumulative Significance (Scenario 1): *Major (significant)* from a localised area to the north of Mid Nithsdale reducing to *Moderate (not significant)* in the south.

Type 16 Upland Fringe – Torthorwald, Dunscore, Cairn and Annandale

8.421 A representative viewpoint from within the Torthorwald landscape sub type is included within Appendix 8.1 (Barnmuir - 291525, 591675). An indicative wireline from the Dunscore sub type is also included in Appendix 8.1 (see Springfield 289900, 584600). As described in the landscape assessment the Annandale sub type is over 15km away from the Development so is considered within the impacts on the wider landscape setting. The ZTV indicates widespread visibility in the northern half of Torthorwald (the Development located within) with less widespread visibility within the southern half, fragmented visibility from approximately half of the Dunscore sub type (3km south west) and a fragmented pattern from less than half of the Cairn sub type (8km south west). The assessment of cumulative impacts on the Cairn sub type is included in Appendix 8.1. As determined in the landscape assessment, the assessed sensitivity of this LCT is High.

8.422 Predicted impacts: Within Torthorwald widespread ZTV overlap with Dalswinton (1km east), Harestanes (3km east), Whiteside (17km northwest) for Scenario 1 wind farms and Auchencairn (directly east), Doon Hill (14km southwest) for Scenario 2 wind farms is anticipated.

8.423 Within Dunscore widespread ZTV overlap with Dalswinton (4km east), Ewe Hill (6) (33km east), Harestanes (3km northeast), Minsca (28km east) for Scenario 1 wind farms and Auchencairn (5km northeast), Ewe Hill (22) (34km east), Newfield (22km east) for Scenario 2 wind farms is anticipated.

8.424 Woodland coverage is a key characteristic within this landscape which is anticipated to reduce theoretical visibility of the Development. Open panoramic views of the valley floor are often obtainable and the elevated nature of the valley sides means the Development would not constitute an unfamiliar element in views from this landscape as existing wind turbines are already a recognisable feature.

8.425 For Scenario 1 and within the Torthorwald LCT sub type, Dalswinton is often apparent in views looking south with Whiteside in longer distance successive views. To the south of this area and as identified in the indicative wireline from Back Hill (301950, 582340 see Figure 8.33a-c) Dalswinton, Hare Hill and Whiteside form a central cluster of turbines (with Hare Hill and Whiteside in the longer distance) with Harestanes to the right of view. Successive views of Ewe Hill (6), Minsca, Doon Hill and Barnbackle are also obtainable from the higher ground.

8.426 The Development is typically seen to the right or left of Dalswinton and often appears as a logical extension to this wind farm. However, as this wind farm is located within this LCT and close distance views of the Development are obtainable, the cumulative assessment reflects the landscape assessment for which a large to medium magnitude of change is anticipated (but reducing with distance and in the southern half to small where visibility is less widespread).

8.427 Within the Dunscore LCT sub type, Dalswinton is clearly visible on the horizon, with Ewe Hill (6) and Minsca in longer distance combined views to the right of view. Harestanes is also visible behind Dalswinton from the higher ground. Typically, the Development is seen in front and to the left of Dalswinton, extending the horizontal angle occupied by turbines on the horizon. Due to the closer proximity viewing opportunities, the cumulative assessment reflects the landscape assessment (medium magnitude of change but reducing to small to the west of this landscape).

8.428 Magnitude of Cumulative Change (Scenario 1): The addition of the Development to a future baseline comprising operational and consented wind farms is assessed as being Large to Medium in Torthorwald but reducing to Small in southern half; and Medium but reducing in the west to Small from Dunscore.

8.429 Cumulative Significance (Scenario 1): reflects the landscape assessment which is *Major* to *Major/ Moderate (significant)* in the north but reducing to *Moderate (not significant)* in the south of Thorthorwald. *Major/ Moderate (significant)* in the east of Dunscore but reducing to *Moderate (not significant)* in the west.

8.430 For Scenario 2, and as previously identified in views looking south from the north of the Torthorwald sub type, Auchencairn and Dalswinton combine to create a long string of turbines visible on the horizon and the Development extends this impact to the right of view, resulting in a generally large cumulative magnitude of change.

8.431 This impact is also anticipated to the south of this landscape (but with the Development seen to the left of Dalswinton) but typically only in longer distance views south of the A701 where turbines become a less dominant feature on the horizon. As the Development is also seen in front of Whiteside, Hare Hill and the in planning Ulzieside and Hare Hill Extension (in the longer distance) and only marginally extends the horizontal angle occupied by turbines a cumulative magnitude of change of small is anticipated.

8.432 For Scenario 2 in Dunscore the Development is seen in front of Dalswinton and Auchencairn and thus the horizontal angle occupied by turbines does not extend. However, as the Development is the closer wind farm to this landscape with the blade tip height above the level of Dalswinton a cumulative magnitude of change of medium is still anticipated to the east of this landscape.

8.433 Magnitude of Cumulative Change (Scenario 2): The addition of the Development to a future baseline comprising all Scenario 1 and proposed wind farms is assessed as being Large in Torthorwald but reducing to Small in southern half; Medium in Dunscore but reducing to Small in west.

8.434 Cumulative Significance (Scenario 2): *Major (significant)* for Thorthorwald but reducing to *Moderate (not significant)* in the southern half. *Major/ Moderate (significant)* within the east but reducing to *Moderate (not significant)* in the west of Dunscore.

Cumulative Impacts on Character of the Wider Landscape

8.435 Within the wider landscape setting, generally beyond 15km for the Site, the greatest potential for cumulative landscape character impacts is to the north and south of Nithsdale (and the open water of the Solway Firth) and from the southern end of Annandale.

8.436 To the northern end of Nithsdale, and with reference to the upland areas either side of the valley, there is a fragmented pattern of visibility from the higher ground and southern facing slopes. Typically the Development would be seen within a central cluster of wind farms including Dalswinton, Harestanes and the in planning Auchencairn and Minnygap generally marginally extending the horizontal angle occupied by turbines to the right of view. Closer proximity successive views of Hare Hill, Whiteside and the in planning Hare Hill Extension and Ulzieside are also more common from this area.

8.437 To the south of Nithsdale and from the open water of the Solway Firth, Dalswinton, Harsetanes and the in planning Auchencairn and Minnygap also form a central cluster of wind farms with Dalswinton typically seen to the left. A similar situation is apparent to the south of Annandale. Close proximity views of Minsca and the in planning Ewe

Hill (22), Newfield, Barnbackle and Doon Hill may also be apparent depending on viewing location.

8.438 From all viewing opportunities within the wider landscape setting the Development would generally be seen within the context of, or as a logical extension to, the operational Dalswinton (due to similar turbine design and proximity). Furthermore the Development would be seen as part of a large cluster of wind farms mainly located within the Ae Foothills with Forest LCT sub type.

8.439 When you consider this with the viewing distance from the wider landscape setting and the typically open and elevated nature of potential views were wind farms are not an unfamiliar feature, a cumulative magnitude of change of no greater than small is anticipated for Scenario 1 and 2. It therefore follows that significant cumulative landscape impacts are not anticipated within the wider landscape setting.

Representative Cumulative Viewpoints Assessments

8.440 The following section sets out the viewpoint analysis of the cumulative impacts resulting from the introduction of the Development. To ascertain which viewpoints would be suitable to consider as cumulative viewpoints a review of each viewpoint using WindFarm software with all the wind farms considered as part of the detailed cumulative assessment was undertaken (refer to Table 8.21).

8.441 For the purposes of this assessment the nature of landscape impacts resulting from the introduction of the Development are assessed as being indirect, long term, reversible and adverse unless otherwise stated.

Table 8.21 – Review of Viewpoints in relation to Wind Farms considered within the Cumulative Assessment

Viewpoint	Scenario 1 Wind Farms potentially visible	Scenario 2 Wind Farms potentially visible (in addition to Scenario 1)
VP 1 - High Auldgirth	N/a	N/a
VP 2 - Ballochan Road, Auldgirth	Whiteside Hill (26km northwest)	Ulzieside (25km northwest)
VP 3 - Shawsholm Road, Closeburn	Dalswinton (4km southeast) Whiteside Hill (21km northwest)	Auchencairn (3km southeast) Ulzieside (20km northwest)
VP 4 - Picnic spot, Drumlanrig Castle	Dalswinton (13km southeast)	Auchencairn (10km southeast)
VP 5 - Thornhill	Dalswinton (7km southeast)	Auchencairn (6km southeast)
VP 6 - Auldgirth Bridge, Blackwood	N/a	N/a
VP 7 - Ellisland Farm	Dalswinton (4km north)	Auchencairn (6km north)
VP 8 - Dalswinton HGDL	Dalswinton (3km north) Whiteside Hill (30km north west)	N/a

Viewpoint	Scenario 1 Wind Farms potentially visible	Scenario 2 Wind Farms potentially visible (in addition to Scenario 1)
VP 9 - Maxwelltown Railway Path, Dumfries	Dalswinton (11km north) Harestanes (15km north)	Auchencairn (12km north) Minnygap (16km northeast) Ulzieside (36km northwest)
VP 10 - Farmhouse Tower, Caerlaverock Wetland Centre	Dalswinton (25km northwest) Ewe Hill (6) (29km northeast) Harestanes (27km north) Minsca (22km northeast) Whiteside (51km north west)	Auchencairn (26km north) Ewe Hill (22) (29km northeast) Minnygap (29km north)
VP 11 - Lambhill Terrace, Lockerbie	Clyde (32km northwest) Dalswinton (20km west) Harestanes (17km northwest)	Auchencairn (21km north west) Minnygap (17km northwest) Newfield (3km north)
VP 12 - Throughgate House, Throughgate	Dalswinton (7km northeast)	N/a
VP 13 - A76 near Muirside	Dalswinton (7km north) Harestanes (13km northeast)	Auchencairn (7km north) Minnygap (16km northeast)
VP 14 - A75 near River Nith	Dalswinton (11km northwest) Harestanes (15km north)	Auchencairn (13km northwest) Minnygap (18km north)
VP 15 - A75 near Castle Hill	Dalswinton (14km north) Ewe Hill (6) (35km northeast) Harestanes (19km north)	Auchencairn (14km north) Ewe Hill (22) (35km northeast) Minnygap (23km northeast) Newfield (24km northeast)
VP 16 - Criffel Hill	Clyde (49km north) Dalswinton (26km north) Ewe Hill (6) (37km northeast) Hare Hill (54km northwest) Harestanes (31km north) Minsca (31km northeast) Whiteside (49km northwest)	Auchencairn (27km north) Barnbackle (14km northwest) Doon Hill (12km west) Ewe Hill (22) (39km northeast) Hare Hill Extension (55km northwest) Minnygap (34km north) Newfield (30km northeast) Ulzieside (49km northwest)
VP 17 - M74 near Millhouse Bridge	Clyde (29km northwest) Dalswinton (17km west) Harestanes (14km northwest)	Auchencairn (18km northwest) Minnygap (14km northwest) Newfield (3km east)
VP 18 - A75 near Bettyknowes	Dalswinton (16km northeast) Harestanes (24km northeast)	Auchencairn (17km northeast) Minnygap (27km northeast)

8.442 Considering the above and actual visibility as recorded from site survey the following viewpoints have been considered as cumulative viewpoints:

- Viewpoint 4 – Drumlanrig Castle, as a 120 degree viewpoint to consider cumulative visual impacts from the north of Nith Valley (360 degree views not obtainable due to woodland coverage);

- Viewpoint 14 – A75 near River Nith, as a 120 degree viewpoint to consider cumulative visual impacts from the south looking north up the Nith Valley (360 degree views not obtainable due to development in Dumfries to the south);
- Viewpoint 16 – Criffel Hill as the summit offers panoramic views from an important local landmark to the south of the Site (240 degree visualisations provided); and
- Viewpoint 17 – M74 as this offers elevated panoramic views to the west of the Site (240 degree visualisations provided).

8.443 Where there are no wind farms (which have been considered within the cumulative assessment) within the 120 degree field of view then a figure has not been provided.

8.444 In addition to the above, three 360 degree wirelines have been produced to aid in the assessment of cumulative impacts from landscape designations and landscape character types;

- Wauk Hill (284150, 590920) 9km west of the Site, to aid the assessment of the Foothills LCT;
- Back Hill (301950, 582340) 10km south east of Site, to aid in the assessment of Torthorwald Ridge RSA; and
- Bishop Forest Hill (284895, 579655) 12km south west of the Site, to aid in the assessment of Terregles Ridge RSA.

8.445 The location of these wirelines is shown on Figure 8.2. As these were additional viewpoints which were not requested through the consultation process (and therefore not included in the visual assessment) they have not been assessed within the cumulative assessment.

Cumulative VP04: Picnic Spot, Drumlanrig Castle (285417, 599091)

8.446 Baseline Views: (Refer to Figure 8.29)

8.447 This viewpoint is representative of views from recreational users within Drumlanrig Castle and of High sensitivity. This viewpoint is located within the Upper Dale LCT, representative of Thornhill Uplands RSA, Drumlanrig Castle HGDL and typical of views looking south east towards the Development in Nith Valley.

8.448 Predicted Cumulative View: For Scenario 1 Dalswinton is visible to the centre of view on the horizon. The Development would be apparent to the right of Dalswinton, seen as a logical extension to it, forming an apparent small element in the view. However, woodland in the foreground would partially screen views of Dalswinton Wind Farm.

8.449 In Scenario 2, combined views including Auchencairn and Dalswinton are available however, tree cover on the horizon and in the foreground would partially screen views of both wind farms. From this viewpoint Dalswinton and Auchencairn create a long string of turbines visible on the horizon and the Development extends this string of turbines to the right of view. However, as much of the horizon is screened by woodland and as the contribution the Development makes to turbines in the view is relatively small, the cumulative magnitude of change is still considered to be small.

8.450 Magnitude of Cumulative Change (Scenario 1): The addition of the Development to a future baseline comprising operational and consented wind farms is assessed as being Small

8.451 Cumulative Significance (Scenario 1): *Moderate (not significant)*

8.452 Magnitude of Cumulative Change (Scenario 2): The addition of the Development to a future baseline comprising all Scenario 1 and proposed wind farms is assessed as being Small

8.453 Cumulative Significance (Scenario 2): *Moderate (not significant)*

Cumulative VP14: A75 near River Nith (297961, 578186)

8.454 Baseline Views: (Refer to Figure 8.30)

8.455 This viewpoint is representative of road users travelling in a western direction on the A75 and of Medium sensitivity. This viewpoint is located within the Lower Dale (Valley) LCT and typical of views looking north west, towards the Development, within Nith Valley.

8.456 Predicted View Cumulative View: For Scenario 1 Dalswinton is apparent to the centre of view with Harestanes in the longer distance to the right of view. The Development is seen as an extension to the left of Dalswinton, forming an apparent, small new element and marginally extending the horizontal angle occupied by turbines.

8.457 In Scenario 2, Auchencairn is apparent to the right and rear of Dalswinton and Minnygap can be seen behind Harestanes. The Development, Dalswinton and Auchencairn are viewed as one cluster of wind farms to the centre of view with large gaps on the horizon, free of turbines to either side.

8.458 Magnitude of Cumulative Change (Scenario 1): The addition of the Development to a future baseline comprising operational and consented wind farms is assessed as being Small

8.459 Cumulative Significance (Scenario 1): *Minor (not significant)*

8.460 Magnitude of Cumulative Change (Scenario 2): The addition of the Development to a future baseline comprising all Scenario 1 and proposed wind farms is assessed as being Small

8.461 Cumulative Significance (Scenario 2): *Minor (not significant)*

Cumulative VP16: Criffel Hill (295725, 561871)

8.462 Baseline Views: (Refer to Figure 8.31a-b)

8.463 This viewpoint is representative of recreational walkers on the summit of Criffel Hill and of Very High sensitivity. This viewpoint is located within the Coastal Granite Uplands LCT and within the Nith Estuary NSA.

8.464 Predicted Cumulative View: For Scenario 1 looking in a northern direction there are three clear and distinct clusters of wind farms spread across the landscape with Dalswinton to the centre of view; Clyde and Haresanes to the right; and Whiteside and Hare Hill in the longer distance to the left. Successive views of Ewe Hill (6) and Minsca to the right are also obtainable. Due to the elevated viewing position the majority of wind farms are back clothed by the landscape behind.

8.465 The Development would generally be seen to the left, and in the context of, the operational Dalswinton Wind Farm. The Development would marginally extend the horizontal angle occupied by turbines within this central grouping, introducing an inconspicuous minor element into the view. The Development would also be back clothed by the landscape behind.

8.466 In Scenario 2, and in views orientated north, Auchencairn Wind Farm is visible behind Dalswinton Wind Farm. Other, in planning wind farms add to the distinct clusters of wind farms throughout the field of view with Newfield creating a new cluster of wind turbines on the landscape in successive views to the right. As above, the Development would generally be seen to the left of Dalswinton and Auchencairn, introducing a minor inconspicuous element back clothed by the landscape behind.

8.467 In both scenarios, there is clear separation between the clusters of wind farms on the horizon and despite the high number of wind farms visible, the viewing distance and separation means this could not be called a view of a landscape dominated by wind farms.

8.468 Magnitude of Cumulative Change (Scenario 1): The addition of the Development to a future baseline comprising operational and consented wind farms is assessed as being Very Small

8.469 Cumulative Significance (Scenario 1): *Minor (not significant)*

8.470 Magnitude of Cumulative Change (Scenario 2): The addition of the Development to a future baseline comprising all Scenario 1 and proposed wind farms is assessed as being Very Small

8.471 Cumulative Significance (Scenario 2): *Minor (not significant)*

Cumulative VP17: M74 near Millhouse Bridge (312020, 584860)

8.472 Baseline Views: (Refer to Figure 8.32a-b)

8.473 This viewpoint is representative of road users travelling on the M74 in a northern direction and of Medium sensitivity. This viewpoint is located within the Middle Dale (Valley) LCT.

8.474 For Scenario 1 in views orientated west to north Dalswinton, Harestanes and Clyde are apparent, with noticeable separation between the wind farms. No successive views of other Scenario 1 wind farms are obtainable from this vantage point. The Development is visible to the left and rear of Dalswinton, introducing an inconspicuous

minor new element into the view. The Development appears as a logical extension to Dalswinton and marginally extending the horizontal angle occupied by turbines on the horizon.

8.475 For Scenario 2 Auchencairn extends the horizontal angle occupied by turbines to the right of Dalswinton and Minnygap is apparent in front of Harestanes. Newfield is also apparent, in close distance successive views looking east. The Development continues to marginally extend the horizontal angle occupied by turbines to the left of the cluster of wind farms incorporating Dalswinton and Auchencairn. Furthermore, there is clear separation between the three clusters of wind farms in views orientated north west.

8.476 Magnitude of Cumulative Change (Scenario 1): The addition of the Development to a future baseline comprising operational and consented wind farms is assessed as being Very Small.

8.477 Cumulative Significance (Scenario 1): *Minor/ Negligible (not significant)*

8.478 Magnitude of Cumulative Change (Scenario 2): The addition of the Development to a future baseline comprising all Scenario 1 and proposed wind farms is assessed as being Very Small

8.479 Cumulative Significance (Scenario 1): *Minor/ Negligible (not significant)*

Representative Cumulative Visibility from Settlements Assessment

8.480 Within the 35km study area there are a range of fixed receptors, these being residential properties and settlements, which are among the most sensitive. As identified in Table 8.11, there are a number of settlements within 10km where significant visual impacts are more likely as a result of the Development. Table 8.22 below summaries the theoretical cumulative visibility from these settlements.

8.481 For settlements beyond 10km from the Development, the Development would typically introduce man made elements that may be apparent and seen as an extension to the operational Dalswinton Wind Farm. As identified within the viewpoint assessment this is unlikely to result in anything greater than a small cumulative magnitude of change, so significant cumulative impacts are not anticipated.

Table 8.22 Theoretical Cumulative Visibility from Settlements

Settlement (distance and direction from Development)	Scenario 1 wind farms theoretically visible (distance and direction from settlement)	Scenario 2 wind farms theoretically visible in addition to Scenario 1 (distance and direction from settlement)
Auldgirth 1.8km SW	Whiteside Hill (26km northwest)	Ulzieside (26km northwest)
Duncow 5.5km SE	Dalswinton (5km north)	Auchencairn – 1 tip (7km north) Barnbackle (13km southwest)
Auchencairn 5.6km SE	Majority of this settlement outwith ZTV for the Development	

Settlement (distance and direction from Development)	Scenario 1 wind farms theoretically visible (distance and direction from settlement)	Scenario 2 wind farms theoretically visible in addition to Scenario 1 (distance and direction from settlement)
Kirkton 7.3km SE	Dalswinton (7km north) Harestanes (12km north) Whiteside Hill (33km northwest)	Auchencairn (8km north) Minnygap (16km northeast)
Locharbriggs 9.3km SE	Very limited open views towards the Development	
Amisfield 8.2km SE	Dalswinton (8km northwest) Harestanes (10km north)	Auchencairn – tips (9km north west) Barnbackle (15km southwest) Minnygap (13km north)
Tinwald 9.8km SE	Very limited open views towards the Development	
Newbridge 9.1km S	Very limited open views towards the Development	
Lincludden (edge of Dumfries) 9.7km S	Very limited open views towards the Development	
Holywood 6.9km S	Principal views orientated away from Development	
Burnhead 3.9km S	Dalswinton (5km northeast)	Ewe Hill (22) (36km east) Newfield (24km east)
Bardennoch 3.5km W	Dalswinton (5km east)	Auchencairn (5km east)
Thornhill 7.8km NW	Dalswinton (8km southeast)	Auchencairn (5km southeast)
Cample 5.8km NW	Dalswinton (6km southeast) Whiteside Hill (21km northwest)	N/a
Closeburn 4.5km NW	Dalswinton (4km southeast) Whiteside Hill (21km northwest)	Auchencairn (4km southeast) Ulzieside (20km northwest)
Gatelawbridge 8km NW	Very limited open views towards the Development	
Burnhead 9km NW	Very limited open views towards the Development	
Penpont 9.8km NW	Very limited open views towards the Development	
Keir Mill 7.8km NW	Very limited open views towards the Development	

8.482 In summary no significant cumulative impacts are identified outwith those settlements where significant visual impacts have previously been identified. From Cample significant localised visual impacts were identified. However, as Dalswinton is the only other wind farm which is visible (Whiteside anticipated to be screened in successive views) and this was considered in the baseline, cumulative visual impacts reflect the visual impacts.

8.483 Therefore, significant cumulative impacts are anticipated at Bardennoch (however this is only a very small group of properties) and very localised significant cumulative impacts are identified on the edges of Kirkton, Amisfield, Bardenoch, Thornhill and Closeburn. Typically, negative cumulative impacts are greater for Scenario 2 as a result of combined views with Dalswinton and Auchencairn, creating a long string of turbines on the horizon with the Development extending this impact.

Sequential and Cumulative Sequential Impacts

Linear Route Receptors

8.484 The following linear route corridors within the Development ZTV have been identified for the assessment of sequential and cumulative sequential impacts (as shown on Figure 8.36):

- The A76 which links Dumfries to Sanqahar in the north and Ayrshire beyond, and passes within 5km to the west of the Development (this route also follows the alignment of the Dumfries to Glasgow train);
- The A75 which is the major coastal route within Dumfries and Galloway and passes through Annan, Dumfries and Castle Douglas within the study area; and
- The M74 which links Glasgow to Carlisle and passes within 20km to the east of the Development.

8.485 A total of eight viewpoints, assessed and described in the LVIA and CLVIA above, are representative of available views from these linear routes:

- Viewpoint 3 – Shawsholm Road, Closeburn (representative of A76);
- Viewpoint 5 – Thornhilll (representative of A76);
- Viewpoint 6 – Auldgirth Bridge, Blackwood (representative of A76);
- Viewpoint 13 – A76 near Muirside;
- Viewpoint 14 – A75 near River Nith;
- Viewpoint 15 – A75 near Castle Hill;
- Viewpoint 17 – M74 near Millhouse Bridge; and
- Viewpoint 18 – A75 near Bettyknowes.

8.486 The journey scenarios for the routes are presented below, together with an analysis of the ZTVs for each route which has determined:

- The length (km) of each route within the study area;
- The length (km) of each route within the Development ZTV;
- The length (km) of each route within the cumulative wind farm ZTVs;
- Type of views (direct or oblique (at right angles to direction of travel)); and
- Travel speeds for motorists on motorway (113kmph/ 70mph) and A roads (97kmph/ 60mph).

8.487 For the purposes of the sequential assessment road users and passengers travelling along identified carriageways are considered to have a medium sensitivity to change.

A76 from New Cumnock to Dumfries

8.488 This route links New Cumnock in the north (and just outwith the 35km study area) to Dumfries in the south. Approximately 53km of this road passes through the study area and is discussed below.

8.489 Starting from New Cumnock the roads passes through the Upper Dale LCT which is typically an open landscape which affords open and long views from the road over the

broad valley. Travelling south the roads drops in elevation and to the south of Thornhill the road passes through the Middle Dale LCT. This landscape is characterised by a broad valley where medium scale views are often obtainable however, an extensive pattern of shelterbelts and woodland often foreshortens and screens views from the road towards the Development. To the north of Holywood the road enters the Lower Dale LCT and continues to drop in elevation along a more subtle gradient as it nears Dumfries. This landscape has an open character, with medium to long views from the road often determined by tree lines and shelterbelts.

8.490 Journey scenarios for both a northbound and southbound journey have been explored for sequential and cumulative sequential impacts.

Journey Scenarios

8.491 For northbound journeys, starting from the northern edge of Dumfries, the road travels through Lincluden for approximately 1.5km. Whilst this section of the road is within the ZTV the surrounding development is anticipated to screen views towards the Development. North of Lincluden a stretch of predominantly open road approximately 7km long passes through the ZTV for the Development (prolonged views where the Development is visible for just over 4 minutes and within 3km south east at closest point). Viewpoint 13 represents typical views from this stretch of road and for which a medium magnitude of change is anticipated. Typically the Development is seen to the left of Dalswinton, with a slight gap between the two developments, but of a similar turbine design so that they relate well to each other.

8.492 North of Burnhead the road passes through an area which is outwith the Development ZTV before entering again for a shorter stretch of just over 1km, directly to the west of the Site and the village of Auldgirth. Viewpoint 6 represents typical oblique views along this stretch (where woodland and landform is anticipated to screen the majority of the Development and only the upper blade tips are visible) and a magnitude of change of small is anticipated. As cars travelling in a northbound direction have now passed the Site, the southbound journey scenario considers the remainder of this route.

8.493 For southbound journeys, starting east of New Cumnock the road passes through a long stretch (approximately 27km) which is outwith the ZTV. To the north of Carronbridge the A76 enters the ZTV for the Development and continues through this for approximately 10km and just to the south of Kirkpatrick (approximately 3km north west of the Development). The majority of this section is within the Middle Dale LCT (where roadside woodland is more common). There are also a number of settlements including Thornhill and Closeburn and some small patches which are outwith the ZTV so actual visibility from this stretch of road is anticipated to be reduced. However, and as identified from Viewpoints 5 and 3 open views towards the Development are obtainable, with the Development seen on the horizon to the right of Dalswinton, generally resulting in a magnitude of change of medium.

8.494 Continuing in a southern direction there is a further short section (less than 1km) of theoretical visibility with oblique views as the A76 passes along the western boundary

of the Site north of the village of Auldgirth. However, and as identified from Viewpoint 6, woodland and landform is anticipated to screen the majority of the Development from this area resulting with only the upper blade tips visible resulting in a small magnitude of change.

Summary of Impacts and Significance

8.495 For northbound and southbound journeys, an approximate distance of 19km with potentially visibility from the A76 is anticipated (equating to approximately 12 minutes or 35% of the road within the study area). For both journey scenarios the views tend to be infrequent, direct and prolonged, and the operational Dalswinton Wind Farm is also visible. However, actual visibility, especially in southbound journeys, is anticipated to be reduced by woodland coverage making views more intermittent.

8.496 Furthermore, for a short section as the road passes to the west of the Site (1km equating to under one minute) intermittent oblique views, where only the Development is visible, are obtainable.

8.497 A magnitude of change of no greater than medium is anticipated from areas with visibility on this road. As road users are considered to be of medium sensitivity a sequential level of significance of *Moderate (not significant)* is anticipated.

Cumulative Journey Scenarios

8.498 Theoretical visibility of Dalswinton (3km east at closest point), Hare Hill (3km south at closest point), Harestanes (10km east at closest point), Whiteside (6km south west at closest point) for Scenario 1 wind farms and Auchencairn (3km east at closest point), Barnbackle (10km south west at closest point), Hare Hill Extension (5km south west at closest point), Minnygap (16km north east at closest point), Newfield (22km east at closest point) and Ulzieside (5km south west at closest point) for Scenario 2 wind farms is anticipated.

8.499 In northbound journeys, the Development and Dalswinton have broadly similar ZTV overlap. The tips of Harestanes are apparent from the open stretch of road between Lincluden and just north of Holywood (12km northeast at closest point). Furthermore, to the north of this route and north of Enterkinfoot (in the Upper Dale LCT where views of the Development are not obtainable) sequential views of the operational Hare Hill and consented Whiteside are obtainable.

8.500 For southbound journeys and Scenario 1 wind farms the Development and Dalswinton have broadly similar ZTV overlap. There is a short section of road around Thornhill where Harestanes is theoretically visible, but only the tips are apparent and localised development is anticipated to screen views.

8.501 In both northbound and southbound journeys there is a short section of road to the west of Auldgirth where the Development introduces turbines into views where there are currently none. However, and as identified at Viewpoint 6, woodland and landform is anticipated to screen the majority of the Development resulting in a small magnitude of change from this area.

8.502 For Scenario 2, and in both journey Scenarios, Auchencairn is usually apparent in views from stretches of the road where the Development is visible. This is with the notable exception of a longer stretch of road to the west of Auldgirth and just south of Burnhead where Auchencairn is not visible.

8.503 Views of Barnbackle would generally be screen by localised development in Lincluden. Hare Hill Extension would be apparent in sequential views in northbound journeys to the northern end of this route. Minnygap would be apparent in combined views in northbound journeys from a short section of road between Lincluden and Holywood. Sequential views of Newfield in southbound journeys would be very limited to the area north of Holywood. Finally, Ulzieside would be apparent in sequential northbound views from the stretch of road around Closeburn (approximately 17km north west) and from the northern end of the road.

Summary of Cumulative Impacts and Significance

8.504 For Scenario 1, on the 53km stretch of the A76 which passes through the study area, theoretical visibility of operational wind farms is widespread. The types of views for Scenario 1 wind farms are as follows - Dalswinton (infrequent, prolonged direct), Hare Hill (infrequent, prolonged direct), Harestanes (infrequent, intermittent oblique) and Whiteside (infrequent, prolonged oblique). Actual visibility of wind farms is anticipated to be less widespread, particularly through the Middle Dale LCT where woodland is more characteristic.

8.505 The Development is typically only seen when views of the operational Dalswinton are obtainable (and in the context of this wind farm). Furthermore, as the stretch of road where new views of turbines are introduced is limited (and only a small magnitude of change is anticipated) the cumulative sequential impacts reflect the sequential impacts for which a level of significance of *Moderate (not significant)* is anticipated.

8.506 For Scenario 2, as with above, theoretical visibility of operational wind farms is widespread (actual visibly would be reduced by woodland cover and localised development). The types of views for Scenario 2 wind farms are as follows - (infrequent, prolonged direct), Barnbackle (limited, intermittent oblique), Hare Hill Extension (infrequent, prolonged direct), Minnygap (infrequent, intermittent oblique), Newfield (infrequent, intermittent oblique) and Ulzieside (infrequent, prolonged oblique).

8.507 The in planning Auchencairn contributes the greatest to creating cumulative impacts, and as identified within the CLVIA, combines with Dalswinton to create a long string of turbines on the horizon which the Development extends. This results in significant cumulative impacts from the area around Thornhill and Closeburn. However, and for Scenario 2, as the stretches of road where the Development introduces new views of turbines is limited and the Development is typically seen within the context of the operational Dalswinton the sequential level of significance is anticipated to remain *Moderate (not significant).*

8.508 Similar impacts from the Dumfries to Glasgow railway line, which broadly follows the same alignment as A76, are anticipated.

A75 from Twynholm to Annan

8.509 This route links Twynholm in the west to Annan in the east. Approximately 67km of this road passes through the study area and is discussed below.

8.510 Starting from Twynholm the road passes through the Drumlin Pastures LCT, characterised by undulating topography which creates varied horizons. East of Lochfoot the road climbs as it enters to Upland Fringe LCT (south of Terregles Ridge) before dropping on the descent into Dumfries where long distance views are obtainable. As the road runs around the northern outskirts of Dumfries it passes through the Lower Dale LCT. The topography is flatter is this landscape which is characteristically open, affording long distance views. However, localised development on the edge of Dumfries is anticipated to limited open views from this area.

8.511 Continuing west the road again begins to climb as it enters the Upland Fringe LCT around Torthorwald Ridge. Open, elevated views towards to the north are obtainable from the north western facing slopes of this hill group. The road then drops down the other side and into the Coastal Plateau and finally the Coastal Flats LCT around Annan. The flatter nature of the landscape in this area means long distance views are often afforded however, localised woodland and development can often foreshorten views.

8.512 Journey scenarios for both westbound and eastbound journeys have been explored for sequential and cumulative sequential impacts.

Journey Scenarios

8.513 Starting out on eastbound journeys there is a long stretch of road, approximately 24km, with no visibility of the Development. Between Larglea and Henderland the road enters a stretch of visibility for 4km which is represented by Viewpoint 18 and for which a very small magnitude of change is anticipated (with the Development approximately 14km north east). Continuing east there is a further 5km stretch of visual screening as the road climbs to the south of Terregles Ridge. On the descent into Dumfries and around the north western outskirts theoretical visibility is obtainable from a stretch of road approximately 7km long (with the Development approximately 11km north at it closest). Viewpoint 15 is typical of the views from this area and for which a magnitude of change of very small is anticipated. As the road crosses the River Nith views towards the Development would be orientated towards westbound travellers.

8.514 For westbound travellers the stretch of road between Annan and west of Carrutherstown (approximately 14km) is outwith the ZTV for the Development. Beyond this point continuous theoretical visibility of the Development is anticipated right up to the northern outskirts of Dumfries for a length of approximately 13km (with the Development approximately 11km north at it closest), where the route then

crosses the River Nith and views are orientated towards eastbound travellers. Viewpoint 14 represents typical views from this area and for which a magnitude of change of small is anticipated.

Summary of Impacts and Significance

8.515 For eastbound and westbound journeys an approximate distance of 24km with potentially visibility from the A75 is anticipated (equating to approximately 15 minutes or 36% of the road within the study area). For eastbound journeys, views tend to be infrequent, intermittent and oblique. For westbound journeys, views tend to be infrequent, prolonged and oblique. For both journey scenarios the Development is typically seen within the context of, or as an extension to the operational Dalswinton Wind Farm.

8.516 A magnitude of change of no greater than small is anticipated from areas with visibility on this road. Furthermore, actual visibility around the outskirts of Dumfries is anticipated be reduced due to localised development. As road users are considered to be of medium sensitivity a sequential level of significance of *Minor (not significant)* is anticipated.

Cumulative Journey Scenarios

8.517 Theoretical visibility of Clyde (40km north at closest point), Dalswinton (11km north at closest point), Ewe Hill (6) (17km north east at closest point), Hare Hill (50km north west at closest point), Harestanes (15km north at closest point), Minsca (12km north at closest point), Whiteside (6km south at closest point) for Scenario 1 wind farms and Auchencairn (12km north at closest point), Barnbackle (1km south at closest point), Doon Hill (6km south at closest point), Ewe Hill (22) (17km north at closest point), Hare Hill Extension (50km north west at closest point), Minnygap (17km north at closest point), Newfield (14km north at closest point), Ulzieside (5km south west at closest point) for Scenario 2 wind farms is anticipated.

8.518 As a result, there are limited stretches of this road where views of wind turbines would not be obtainable from the A75 for both Scenario 1 and 2. However, as the Development is usually only visible when views of Dalswinton are available, and as identified in the Viewpoints 14, 15 and 18 from this road, the Development appears as a logical extension to Dalswinton in long distance views marginally extending the horizontal angle occupied by turbines, cumulative sequential impacts are anticipated to reflect sequential impacts.

Summary of Impacts and Significance

8.519 The types of views for Scenario 1 wind farms are as follows – Clyde (limited, intermittent oblique), Dalswinton (infrequent, prolonged, oblique direct), Ewe Hill (6) (infrequent, prolonged oblique), Hare Hill (infrequent, intermittent direct), Harestanes (infrequent, prolonged oblique), Minsca (infrequent, prolonged oblique) and Whiteside (Infrequent, prolonged oblique).

8.520 The types of views for Scenario 2 wind farms are as follows – Auchencairn (infrequent, prolonged oblique), Barnbakle (infrequent, prolonged direct), Doon Hill (infrequent, prolonged direct), Ewe Hill (22) (infrequent, prolonged oblique), Hare Hill Extension (infrequent, intermittent direct), Minnygap (infrequent, intermittent, oblique), Newfield (infrequent, prolonged oblique) and Ulzieside (infrequent, prolonged direct).

8.521 Given that the Development is typically seen at a distance with the operational Dalswinton, and no new views of wind farms have been introduced on this road a sequential level of significance of *Minor (not significant)* is anticipated for both journey scenarios.

M74 from Abington to Eaglesfield

8.522 This route links Abington in the north to Eaglesfield in the south. Approximately 68km of this road passes through the study area and is discussed below.

8.523 Starting in Abington and from north to south the road travels through the Upland Glen, Southern Uplands, Foothills with Forest and Foothills LCT. Through these landscapes the road is travelling through the upper section of Annandale and views tend to be medium to short scale with the horizons formed by the distinctive and undulating surrounding hills. South of Beattock the road travels through the Mid and Lower Dale LCTs, where Annandale widens out and the surrounding hills are less elevated in nature offering longer distance views. To the south of Lockerbie the M74 begins to climb again as it enters the Upland Fringe LCT, which affords long distance views out to the Solway Firth.

8.524 A northbound journey scenario is discussed below as in southbound journeys open views orientated towards the Site are not obtainable until the Development is behind travellers.

Journey Scenarios

8.525 On northbound journeys, stating just south east of Eaglesfield, the M74 is within a short stretch of visibility (less than half a kilometre) before entering a longer stretch (approximately 8km) where views towards the Development are screened. The road then enters a longer stretch of theoretical visibility (16km which equates to 8.5 minutes) approximately 17km east of the Development. There are some gaps in visibility along this 16km stretch and roadside planting and areas of cut greatly reduce actual visibility. However, Viewpoint 17 is typical of the views from this area for which a very small magnitude of change is anticipated. The Development is seen to the left of Dalswinton, within the context of, and as an extension to, this operational wind farm. From the remainder of the M74 there are no views towards the Development.

Summary of Impacts and Significance

8.526 For northbound journeys an approximate distance of 16.5km with potentially visibility from the M74 is anticipated (equating to approximately 9 minutes or 24% of the road within the study area). Views of the Development are typically infrequent, prolonged and oblique and the Development is seen as an extension to the operational

Dalswinton Wind Farm at a distance. However, actual visibility is anticipated be significantly less than this due to roadside planting and where the road passes through areas of cut limiting open views towards the Development.

8.527 A magnitude of change of no greater than very small is anticipated from areas with visibility on this road. As road users are considered to be of medium sensitivity a sequential level of significance of *Minor/ Negligible (not significant)* is anticipated.

Cumulative Journey Scenarios

8.528 Theoretical visibility of Clyde (1km south at closest point), Dalswinton (15km east at closest point), Ewe Hill (6) (11km north east at closest point), Harestanes (8km west at closest point), Minsca (5km north east at closest point), Whiteside (50km north west at closest point) for Scenario 1 wind farms and Auchencairn (16km north west at closest point), Ewe Hill (22) (11km north at closest point), Minnygap (6km east at closest point), Newfield (3km east at closest point), Ulzieside (50km north west at closest point) for Scenario 2 wind farms is anticipated.

8.529 As a result, and mainly through the under construction Clyde Wind Farm to the north and operational Minsca to the south, there are limited stretches of this road where views of wind turbines would not be obtainable from the M74 for both Scenario 1 and 2. However, as the Development is usually only visible when views of Dalswinton are available, and as identified in Viewpoint 17 from this road, the Development appears as a logical extension to Dalswinton in long distance views, cumulative sequential impacts are anticipated to result in a very small magnitude of change.

Summary of Impacts and Significance

8.530 The types of views for Scenario 1 wind farms are as follows – Clyde (infrequent, prolonged direct), Dalswinton (infrequent, prolonged oblique), Ewe Hill (6) (infrequent, prolonged and oblique), Harestanes (infrequent, prolonged oblique), Minsca (infrequent, prolonged oblique) and Whiteside (infrequent, intermittent oblique).

8.531 The types of views for Scenario 2 wind farms are as follows – Auchencairn (infrequent, prolonged oblique), Ewe Hill (22) (infrequent, prolonged and oblique), Minnygap (infrequent, prolonged oblique), Newfield (infrequent, prolonged direct) and Ulzieside (infrequent, intermittent oblique).

8.532 Given that the Development is typically seen at a distance as an extension to the operational Dalswinton, and no new views of wind farms have been introduced on this road for both Scenario 1 and 2 a sequential level of significance of *Minor/ Negligible (not significant)* is anticipated.

Summary of Impacts and Significance

Landscape Designations and Character Types

8.533 The landscape assessment indicates that there would not be significant impacts on the character of the study area as a whole, nor on the majority of the designated

landscapes identified. Indeed only localised significant impacts are identified within parts of one landscape designation (the Thornhill Uplands Regional Scenic Area) closer to the Development and within parts of three Landscape Character Sub Types (Type 7 Middle Dale – Mid Nithsdale and Type 16 Upland Fringe – Torthorwald and Dunscore) closer to the Development. Significant impacts on landscape character are limited to those on key characteristic views to the south looking down the Nith Valley where the development is visible from more open parts of the landscape. None of the other key landscape characteristics of the RSA or LCTs would be significantly impacted. Where these localised significant impacts occur within the RSA they overlap with the corresponding LCTs.

8.534 Therefore, and within the context of the 35km study area, significant landscape impacts are limited and localised. Typically, the Development is only visible when views of the operational Dalswinton Wind Farm are apparent, with the Development seen as a logical extension or within the context of this scheme (as a result of the similar turbine design). Remote and wild landscapes are rare in the study area and generally where views of the Development are obtainable views of operational wind farms are not uncharacteristic of the receiving landscape.

8.535 Furthermore, there are very limited areas where the Development introduces views of turbines where there are currently none. This is with the exception of a small, localised area to the immediate west of the Development. However, the landform and woodland in this area combine to screen views of the majority of the Development so significant landscape impacts are not anticipated.

8.536 In the context of the nature of impacts described above localised significant landscape impacts generally occur immediately around and to the north of the Development (between 3km and 8km) from the settled valley floor and upland fringes within Nith Valley and relate only to impacts on key characteristic views. From this area closer proximity views of the proposed turbines are obtainable, with the Development typically seen to the right of the operational Dalswinton Wind Farm and appearing as a logical extension to the scheme.

8.537 Whilst wind farms are not uncharacteristic in views from this area, particularly Dalswinton, the viewing distance and sensitivity of the landscape (settled valley floor/ upland fringes with open, focused views to the south) combine to create localised significant impacts (on key characteristic views) within the Thornhill Uplands RSA, Middle Dale: Mid Nithsdale and Upland Fringes: Torthorwald Landscape Character Sub Types.

8.538 Localised significant impacts are also anticipated to the west of the Development, within the Upland Fringes: Dunscore Landscape Sub Type. From these well settled valley fringes closer proximity views of the Development, generally seen to the left of the operational Dalswinton Wind Farm, in medium scale views combine to create localised significant landscape impacts (on key characteristic views) in the eastern part of this landscape sub type.

8.539 Concerning cumulative landscape impacts, these typically reflect the impacts as identified within the landscape assessment, generally because the Development is seen as an extension to, or in the context of, the operational Dalswinton Wind Farm which is considered in the landscape baseline. Indeed there are no areas where significant cumulative impacts have been identified outwith the areas where significant impacts are indentified within the landscape assessment.

8.540 However, to the north of the Development (within 3km to 8km) and for Scenario 2 (which considers all operational, consented and proposed wind farms) a larger magnitude of change in relation to cumulative impacts is anticipated. In this instance, the operational Dalswinton and the in planning Auchencairn combine to create a long string of turbines of the horizon and the Development extends this impact to the right of view. Given this is from more enclosed, closer distance views from the settled valley floor and upland fringes this results in a higher level of cumulative significance from localised areas within the Thornhill Uplands RSA and Middle Dale: Mid Nithsdale and Upland Fringes: Torthorwald Landscape Character sub types.

8.541 A summary of the predicted impacts of the Development on designated landscapes and the landscape character is presented in Table 8.23 and 8.24 below. Where significant landscape impacts have been identified this is shown in bold.

Table 8.23 – Landscape Designations Assessment Summary

Designation	Name/ Location	Assessed Sensitivity	Magnitude of Change	Significance	Cumulative Magnitude of Change (Scenario 1)	Significance	Cumulative Magnitude of Change (Scenario 2)	Significance
National Scenic Area	Nith Estuary	Very High	Very Small	Minor	Very Small	Minor	Very Small	Minor
Regional Scenic Area	Thornhill Uplands	High	Valley floor/fringes between 3 to 8km Medium to Small elsewhere	**Major/Moderate** to Moderate	Valley floor/fringes between 3 to 8km Medium to Small elsewhere	**Major/Moderate** to Moderate	Valley floor/fringes between 3 to 8km High to Small elsewhere	**Major** to Moderate
	Terregles Ridge	High	Small	Moderate	Small	Moderate	Small	Moderate
	Solway Coast	High	Very Small	Minor	Very Small	Minor	Very Small	Minor
	Torthorwald Ridge	High	Small	Moderate	Small	Moderate	Small	Moderate
Historic Gardens and Designed Landscapes	Drumlanrig Castle	High	Small	Moderate	Small	Moderate	Small	Moderate
	Dalswinton	High	Small	Moderate	Small	Moderate	N/a	N/a

Table 8.24 – Landscape Character Assessment Summary

Landscape Character Type	Sub Type	Assessed Sensitivity	Magnitude of Change	Significance	Cumulative Magnitude of Change (Scenario 1)	Significance	Cumulative Magnitude of Change (Scenario 2)	Significance
Type 2 Coastal Flats	Nith Coastal Fringe	Very High	Very Small	Minor	Very Small	Minor	Very Small	Minor
Type 5 Intimate Pastoral Valleys	Cairn and Old Water	High	Very Small	Minor	Very Small	Minor	Very Small	Minor
Type 6 Lower Dale	Lower Nithsdale	Medium	Medium and reducing with distance	Moderate	Medium	Moderate	Medium	Moderate
	Lower Annandale	Medium	Very Small	Minor/ Negligible	Very Small	Minor/ Negligible	Very Small	Minor/ Negligible
Type 7 Middle Dale	Mid Nithsdale	High	Medium but reducing to Small in close proximity and to south	**Major/Moderate** to Moderate	Medium but reducing to Small in close proximity and to south	**Major/Moderate** to Moderate	High but reducing to Small in close proximity and to south	**Major** to Moderate
	Mid Annandale	High	Very Small and reducing with distance	Minor	Very Small	Minor	Very Small	Minor
Type 9 Upper Dale	Upper Nithsdale	High	Small	Moderate	Small	Moderate	Small	Moderate
Type 11 Upland Glens	Scar	High	Small	Moderate	Small	Moderate	Small	Moderate
	Shinnel	High	Small	Moderate	Small	Moderate	Small	Moderate
Type 13 Drumlin Pastures	Milton and Deeside	Medium	Small	Minor	Small	Minor	Small	Minor
Type 16 Upland Fringe	Torthorwald	High	Large to Medium in north reducing to Small in south	**Major** to **Major/Moderate** in north and Moderate in south	Large to Medium in north reducing to Small in south	**Major** to **Major/Moderate** in north and Moderate in south	Large in the north reducing to Small in south	**Major** in north and Moderate in south

Landscape Character Type	Sub Type	Assessed Sensitivity	Magnitude of Change	Significance	Cumulative Magnitude of Change (Scenario 1)	Significance	Cumulative Magnitude of Change (Scenario 2)	Significance
	Dunscore	High	Medium but reducing to Small in west	**Major/Moderate** in east Moderate in west	Medium but reducing to Small in west	**Major/Moderate** in east Moderate in west	Medium but reducing to Small in west	**Major/ Moderate** in east Moderate in west
	Cairn	High	Small	Moderate	Small	Moderate	Small	Moderate
Type 18 Foothills	Nithsdale	High	Small	Moderate	Small	Moderate	Small	Moderate
	Keir	High	Small	Moderate	Small	Moderate	Small	Moderate
	Dalmacallan	High	Small	Moderate	Small	Moderate	Small	Moderate
Type 18a Foothills with Forest	Ae	Low	Small	Minor	Small	Minor	Small	Minor
Type 19 Southern Uplands	Lowther	Medium	Small	Minor	Small	Minor	Small	Minor
	Nithsdale	Medium	Small	Minor	Small	Minor	Small	Minor

Landscape Fabric of the Site

8.542 The assessment of the landscape fabric of the Site indicates that there would be no significant impacts. There would be a permanent loss of approximately 2.09 ha of coniferous woodland mainly to accommodate two turbines. However, as this is a crop grown for harvest and a small amount of woodland within the context of Clauchrie Plantation this is not considered to result in significant landscape impacts.

8.543 The design of the access tracks and turbine hard standings has sought to avoid areas of deciduous woodland and landscape features of note on the Site such as dry stone walls. However, the proposed access track crosses one dry stone wall (to the north of Low Auldgirth) and some other field boundaries formed by post and wire fences. This is not considered to result in significant landscape impacts.

8.544 Outwith the areas of plantation woodland and mature deciduous woodland the Site is mainly characterised by grassland (improved, semi-improved and marshy) used for grazing. A small area of grassland would be permanently lost to accommodate the Development, with a smaller area temporarily disrupted during the construction period to accommodate construction works. However, as this land cover is considered to be of low sensitivity and the surrounding areas can still be used for grazing. This is not considered to result in significant landscape impacts.

8.545 Once operational, any activities on Site would be restricted to servicing the Development. In terms of impacts on the landscape fabric, and other than the residual impacts identified above, no significant impacts of the fabric of the Site are anticipated to occur.

8.546 A summary of the predicted impacts of the Development on the landscape fabric of the Site is shown in Table 8.25 below:

Table 8.25 Landscape Fabric Assessment Summary

Aspect	Assessed Sensitivity	Magnitude of Change	Significance
Coniferous Plantation Woodland	Low	Small	Minor
Deciduous Woodland	High	N/a	N/a
Boundaries (post and wire fences)	Low	Small	Minor
Boundaries (dry stone walls)	High	Very Small	Minor

Visual Impacts

8.547 Of the 18 representative viewpoints, the assessment finds that the Development would result in significant impacts (major or major/moderate) for the following three viewpoints:

- Viewpoint 1 – High Auldgirth;
- Viewpoint 3 – Shawsholm Road, Closeburn; and
- Viewpoint 5 – Thornhill.

8.548 Significant visual impacts relate to those sensitive receptors (residential) within relatively close proximity (10km) of the Development, where views of a substantial proportion of the Development would be gained and where turbines are a focal point of views.

8.549 From the majority of viewpoints (including Viewpoint 3 and 5) the Development is seen within the context of, or as an extension to, the operational Dalswinton Wind Farm. However, due to the viewing distance and sensitivity of the visual receptors from the southern edges of Closeburn and Thornhill significant visual impacts are anticipated.

8.550 Viewpoints where the Development introduces turbines into views where there are currently none are limited to the immediate west of the Development, and from the valley floor of Nith Valley landform and woodland screens the majority of the Development reducing the magnitude of change. However, and as identified in Viewpoint 1 (which is from the upland fringes of the Nith Valley and in close proximity to the Development) significant visual impacts are anticipated.

8.551 From settlements, significant visual impacts are anticipated from Bardennoch (2.5km west of the Development) which is a very small settlement. Localised significant impacts, generally from the edge of settlements with open aspects towards the Development are anticipated from Duncow (5.5km SE), Kirkton (7.3km SE), Amisfield (8.2km SE) and Cample 5.8km NW). Localised significant impacts are also anticipated from Closeburn (4.5km NW) and Thornhill (7.8km NW) as identified in Viewpoints 3 and 5.

8.552 With regards to cumulative impacts and of the four representative viewpoints which where were taken forward as cumulative viewpoints no significant cumulative impacts are anticipated. Typically, the Development is seen within a central cluster of wind farms on the high ground between Nith Valley and Annandale which includes Dalswinton and Harestanes for Scenario 1 plus Auchencairn and Minnygap for Scenario 2. As the Development is a small scheme of five turbines which relates well to Dalswinton due to the compatible turbine sizes and layout, often appearing to be part of the same scheme, significant cumulative impacts are generally not anticipated.

8.553 However, and from Viewpoint 3 and 5, significant cumulative impacts of a higher level than those identified in the viewpoint assessment are anticipated when you consider Scenario 2 (all operational, consented and proposed wind farms). This is as a result of the previously identified impact where the operational Dalswinton and the in planning Auchencairn Wind Farms combining to create a long string of turbines on the horizon in focused, closer proximity views from the settled valley floor. From these viewpoints the Development extends this impact. Representative wirelines which represent Scenario 2 from these viewpoints are included in Appendix 8.1.

8.554 Table 8.26 below summaries the visual impacts of the Development. Significant visual impacts are identified in bold.

Table 8.26 Summary of Representative Viewpoints

VP No	Location	Grid Ref	Receptor Type	Receptor Sensitivity	Magnitude of Change	Significance	Cumulative Magnitude of Change (Scenario 1)	Significance	Cumulative Magnitude of Change (Scenario 2)	Significance
1	High Auldgirth	292281, 587778	Residential	High	Large	**Major**	N/a	N/a	N/a	N/a
2	Ballochan Road, Auldgirth	291229, 586938	Residential	High	Small	Moderate	N/a	N/a	N/a	N/a
3	Shawsholm Road, Closeburn	289650, 592260	Residential Road	High Medium	Medium	**Major/Moderate** Moderate	N/a	N/a	Large	**Major**
4	Picnic spot, Drumlanrig Castle	285417, 599091	Recreational (within HGDL)	High	Small	Moderate	Small	Moderate	Small	Moderate
5	Thornhill	288083, 595205	Residential Road	High Medium	Medium	**Major/Moderate** Moderate	N/a	N/a	Large	**Major**
6	Auldgirth Bridge, Blackwood	291153, 586339	Recreational Road	Medium	Small	Minor	N/a	N/a	N/a	N/a
7	Ellisland Farm	292922, 583845	Recreational	Medium	Small	Minor	N/a	N/a	N/a	N/a
8	Dalswinton HGDL	294379, 584219	Recreational (within HGDL)	High	Small	Moderate	N/a	N/a	N/a	N/a
9	Maxwelltown Railway Path, Dumfries	297113, 577346	Recreational	Medium	Small	Minor	N/a	N/a	N/a	N/a
10	Farmhouse Tower, Caerlaverock Wetland Centre	305147, 565626	Recreational (viewing tower)	Very High	Very Small	Minor	N/a	N/a	N/a	N/a
11	Lambhill Terrace, Lockerbie	314043, 582044	Residential	High	Very Small	Minor	N/a	N/a	N/a	N/a

VP No	Location	Grid Ref	Receptor Type	Receptor Sensitivity	Magnitude of Change	Significance	Cumulative Magnitude of Change (Scenario 1)	Significance	Cumulative Magnitude of Change (Scenario 2)	Significance
12	Throughgate House, Throughgate	287374, 584257	Residential Road	High Medium	Very Small	Minor Minor/Negligible	N/a	N/a	N/a	N/a
13	A76 near Muirside	294071, 581478	Road	Medium	Medium	Moderate	N/a	N/a	N/a	N/a
14	A75 near River Nith	297961, 578186	Road	Medium	Small	Minor	Small	Minor	Small	Minor
15	A75 near Castle Hill	292472, 575154	Road	Medium	Very Small	Minor/Negligible	N/a	N/a	N/a	N/a
16	Criffel Hill	295725, 561871	Recreational (hill summit)	Very High	Very Small	Minor	Very Small	Minor	Very Small	Minor
17	M74 near Millhouse Bridge	312053, 584839	Road	Medium	Very Small	Minor/Negligible	Very Small	Minor/Negligible	Very Small	Minor/Negligible
18	A75 near Bettyknowes	285563, 573798	Road	Medium	Very Small	Minor/Negligible	N/a	N/a	N/a	N/a

Summary of Sequential and Cumulative Sequential Impacts

8.555 Of the three routes assessed (A76, A75 and M74) no significant sequential or sequential cumulative impacts have been identified. For the M74 and A75 infrequent, prolonged oblique views of the proposed wind farm are typical. The Development is generally seen as an extension, or in the context of, the operational Dalswinton Wind Farm in longer distance views.

8.556 Furthermore, the Development does not introduce views of wind farms from these routes where there are currently none for both Scenario 1 and 2 further reducing the potential for significant sequential impacts. Infrequent, prolonged and direct views of other wind farms are obtainable from both of these routes.

8.557 From the A76, which passes in close proximity to the west of the Development, closer distance views of the Development are anticipated but these are not considered to result in a magnitude of change greater than medium. Typically infrequent, prolonged and direct views of the Development are anticipated from this road.

8.558 Furthermore, the areas where the Development would introduce views of turbines from this route are very limited, and the Development would typically be seen as an extension to, or in the context of the operational Dalswinton Wind Farm (also apparent in infrequent, prolonged and direct views).

8.559 As road users are considered to be of medium sensitivity no significant sequential impacts are anticipated. Therefore, cumulative sequential impacts are anticipated to remain *Moderate (not significant)* for Scenario 1 and 2 wind farms.

Chapter 8 References

[1] SNH Policy Statement No. 02/02 *Strategic Locational Guidance for Onshore Wind Farms in Respect of the Natural Heritage* (updated March 2009

[2] Dumfries and Galloway Structure Plan (approved in 1999)

[3] "Identifying the Special Qualities of Scotland's Natural Scenic Areas, 2007

[4] Identification of Regional Scenic Areas – Technical Paper 6, 1999

[5] Dumfries and Galloway Landscape Assessment (Report No. 94, Land Use Consultants) published by SNH in 1998

9 ARCHAEOLOGY AND CULTURAL HERITAGE

Introduction

9.1 This chapter describes the impacts of the Development on the archaeological and cultural heritage resources on and around the Site. The assessment comprises an archaeological desk-based assessment, walkover survey and assessment of impact on setting. The scope for this chapter is based upon on the Blackwood Wind Farm Scoping Report[1] and scoping responses received from the Dumfries and Galloway Council Archaeologist and Historic Scotland.

Legislation and Policy

Legislation

9.2 This section summarises the statutory legislation relating to the historic environment and relevant to the Development.

Table 9.1: Statutory Legislation

Legislation	Jurisdiction	Key Issues
Ancient Monuments and Archaeological Areas Act (1979)	Historic Scotland/ Scottish Government	Provides statutory protection of ancient monuments. It is a criminal offence to carry out any works on or near a Scheduled Monument without Scheduled Monument Consent
Town and Country Planning (Scotland) Act 1997; Planning etc (Scotland) Act (Scotland) 2006	Scottish Government/ Dumfries and Galloway Council	Establishes framework for determining planning applications, the role of the local planning authority and the role of Development (Structure and Local) Plans within the process
Planning (Listed Buildings and Conservation Areas) (Scotland) Act (1997)	Scottish Government/ Dumfries and Galloway Council	Provides for statutory protection of listed buildings and conservation areas. No physical works can be carried out in relation to a listed building and its curtilage without listed building consent. It introduces a requirement to have special regard to the desirability of preserving the building or its setting in considering any proposed development which may affect these. In conservation areas, designation introduces general controls to conserve their character and appearance within the conservation area.
Town and Country Planning (General Development Procedure) Scotland Order 1992, Section 15(1) (j) as amended by the Town and Country Planning (General Development	Scottish Government/ Dumfries and Galloway Council	Requires that before granting planning permission for development, a planning authority shall consult with the Scottish Ministers, in the case of development which may affect a historic garden or designed landscape; development which may affect the site of a scheduled monument or its setting, or may affect a category A listed building or its setting.

Legislation	Jurisdiction	Key Issues
Procedure) (Scotland) (Amendment (No2) Order 1994, Section (5)		
Protection of Military Remains Act (1986)	Ministry of Defence	Outlines the criteria for designating a military crash site. Certain activities are prohibited at protected sites, without the authority of the Ministry of Defence
Scots Common Law	Procurator Fiscal/ Police	The movement or disturbance of human remains without lawful authority is illegal. Any human remains should be reported to the local police or Procurator Fiscal's office. Further disturbance must cease until permission to continue has been granted by the legal authorities

Policy

Various other documents also provide non-statutory protection for the historic environment in Scotland. The requirements of these documents have been compiled into the consolidated Scottish Planning Policy (SPP) and supplementary information, as outlined in Table 9.2 below.

Table 9.2: Policies

Document	Jurisdiction	Key Issues
Planning Advice Note (PAN) 2 / 2011 Planning and Archaeology (published July 27, 2011)	Scottish Government	Supersedes PAN 42 Archaeology – the Planning Process and Scheduled Monuments Procedures. Provides local government officers with advice for treating archaeological sites through the planning process, including consideration of setting and preservation *in situ*. Sets out Government policy on how archaeological remains and discoveries are dealt with within the existing development plan and development control processes
Scottish Historic Environment Policy (SHEP)	Scottish Government	Defines the Historic Environment and Scottish Government Policy.

Archaeological Standards

9.3 This assessment was undertaken in accordance with relevant Standard and Guidance and Code of Conduct (2010) from the Institute for Archaeologists, and relevant Historic Scotland guidance, as outlined in Table 9.3. The archaeological assessment was carried out between February and December 2011.

Table 9.3 Archaeological standards

Document(s)	Jurisdiction	Key Issues
Code of Conduct and Standards and Guidance for Archaeological Desk-based assessments	Institute for Archaeologists	Sets standards for undertaking archaeological desk-based work and sets principles by which all archaeological work should be undertaken

Document(s)	Jurisdiction	Key Issues
Managing Change in the Historic Environment Guidance Notes	Scottish Government/ Historic Scotland	Guidance to planning authorities and stakeholders regarding key issues relating to development, the planning process, and key issues pertaining to the historic environment. Most relevant are the guidance notes covering Setting (Oct 2010) and Historic Battlefields (March 2011).

Method of Assessment

Study Areas

9.4 For the purposes of the assessment, two study areas were defined, as follows.

9.5 Study Area A comprised a 1km area from the Site, designed to identify potential physical impacts on the known archaeological and cultural heritage resource, and the archaeological potential within the Site through the identification of any heritage assets within, or local trends immediately adjacent to, the Development footprint. This area includes the footprint of the Development, including access tracks, turbine locations and cable routes.

9.6 Study Area B comprised a 10km radius from the Site to identify visual impacts on designated heritage assets. The focus on a 10km zone for the consideration of visual impacts has been determined with reference to the Landscape and Visual Assessment Zone of Theoretical Visibility. Within 5km, visual impacts on Scheduled Monuments (SMs), Historic Battlefields, listed buildings, conservation areas, inventory and non-inventory Historic Gardens, promoted sites and Archaeologically Sensitive Areas have been assessed. Scheduled Monuments, Category A Listed Buildings, Historic Battlefields and inventory Historic Gardens and Designed Landscapes have been assessed up to the maximum 10km as these types of asset can be important in terms of location, elevation, landscape dominance and prominence and intervisibility, and can be influenced by changes to their contextual setting from development of the type proposed.

Data Sources

9.7 The following sources were consulted:

- The Dumfries and Galloway Council Historic Environment Record (HER); for lists of known archaeological sites and monuments, previous archaeological interventions, and promoted monuments (monuments identified by the Council as having a tourism or recreation value);
- Historic Scotland's databases of Listed Buildings, Scheduled Monuments, Historic Gardens and Designed Landscapes and monuments proposed for scheduling;
- The National Monuments Record of Scotland (NMRS);
- Vertical stereo aerial photographic coverage held by RCAHMS;
- Ordnance Survey map coverage from 1850 onwards, and any other readily available early cartographic sources held at the National Library of Scotland Map Library;

- Online resources, principally the Statistical Accounts of Scotland, the Historic Land Use Assessment (through RCAHMS) and Archway;
- Secondary written sources were accessed at the University of Glasgow Library, along with the Dalswinton Wind Farm Environmental Statement; [2] and
- In the absence of suitable archival material being present at the National and Dumfries and Galloway Council archives, privately held estate mapping for the Blackwood Estate was also interrogated.

Gazetteers

9.8 A gazetteer has been compiled, using information from the data sources listed above. The gazetteers include a summary of the known archaeological and cultural heritage resource within Study Areas A & B. The gazetteer is included as Appendix 9.1.

Site Boundaries and Plot Numbering

9.9 Each individual field (plot) where construction activities would take place within the Site was allocated an individual 'Plot Number' running from 1–12 for identification, description and assessment. These are shown on Figure 9.1 and referenced later in this chapter.

Site Visit and Assessment of Setting

9.10 The Site was visited on 29th and 30th October 2011 by two qualified RSK archaeologists, and a second visit made by a single archaeologist on 1st December 2011. Each plot where the Development installations might be located was visited and walked systematically, as was the proposed access route to the Site where this would be new or installed. Notes were taken on topography, land use, field boundaries, the condition of any previously recorded heritage assets, and potential previously unrecorded archaeological sites. The position of any identified sites or features were logged using a Trimble XT GPS, with photographic evidence taken alongside written records.

9.11 The site visit noted the current condition and nature of any recorded heritage assets and the potential for previously unrecorded assets. In addition, site visits were made to any heritage assets where an impact on the setting of the asset had been determined possible, according to the criteria outlined above. All receptors where a potentially moderate or greater significance of impact was predicted from desk-based research were visited. Notes were completed for each target heritage receptor, to allow for comments under the following prompts:

- Intended sight lines;
- Extent of setting;
- Views towards and from;
- Landscape situation;
- Dominance;
- Unaltered Cultural Landscape;
- Intervisibility; and

- Scale of proposed development.

Consultation

9.12 The Dumfries and Galloway Council Archaeologist and Historic Scotland were consulted during scoping, and formal responses received (see consultation matrix table in Chapter 1).

Assessment of Impacts

Importance

9.13 The relative importance of each receptor has been determined to provide a framework for comparison between different heritage assets. The categories of importance do not reflect a definitive level of importance or value of a heritage asset, but a provisional one based on a range of factors including current legal status, rarity, completeness, historical and cultural associations, and community, research and place-making potential. Assessing importance requires both professional judgement and consideration of the asset's legal or policy status. When combined, these factors offer representations of the importance of a given resource and provide an analytical tool that can inform later stages of archaeological assessment and the development of appropriate mitigation.

Table 9.4: Criteria for Determining Importance of Heritage Asset (Physical Impacts)

Importance	Definition
Very High	Assets and structures of acknowledged international importance. Examples include World Heritage Sites, and buildings of recognised international importance.
High	Assets and structures of acknowledged national importance. Examples include Scheduled Monuments, Listed Buildings, inventory Historic Gardens and Designed Landscapes, and Conservation Areas.
Medium	Assets and structures of acknowledged regional importance Examples include Archaeologically Sensitive Areas, non-inventory Historic Gardens and Designed Landscapes, and undesignated assets of value within the HER.
Low	Assets and structures of acknowledged local importance. Examples include historic (unlisted) buildings, assets of limited value registered in the HER, and assets compromised by poor preservation.
Negligible	Assets and structures known to be of low archaeological or historical importance. Examples include remains previously subject to large-scale destruction, assets with very little or no surviving archaeological or historic interest and assets that hold little intrinsic archaeological value.
Unknown	Assets and structures of uncertain character, extent and/or date where the importance cannot be ascertained.

Magnitude

9.14 Impacts can be considered to be either positive or negative. The magnitude of impact has been assessed according to the scale set out in Table 9. below. Unless expressly stated within the text, all impacts described in this chapter are adverse impacts.

Table 9.5: Criteria for Determining Magnitude of Impact

Magnitude	Definition
Major	Change to most or all key archaeological elements resulting in a total modification of the asset or structure, or comprehensive alteration to its setting and character.
Moderate	Change to many key archaeological elements resulting in a clear modification to the asset or structure, or considerable alteration to its setting and character.
Minor	Change to key archaeological elements resulting in a noticeable modification to the asset or structure, or slight alteration to its setting and character.
Negligible	Changes to archaeological elements resulting in a barely perceptible modification to the asset or structure, or very slight alteration to its setting and character.
No Change	Assets and structures subject to no change to their fabric or setting.

Significance

9.15 The significance of any impact has been assessed by comparing the importance of each known archaeological resource against the magnitude of the impact upon it (i.e. that arising from the implementation of the proposed scheme).

9.16 The significance of impact has been quantified below. For the purposes of this chapter, Very Large and Large impacts are significant. Moderate and Slight impacts are not significant.

Table 9.6: Grading System Defining Significance of Physical Impact

		Resource Importance				
		Very High	High	Medium	Low	Negligible
Magnitude of Physical Impact	Major	Very Large	Very Large	Moderate	Slight	None
	Moderate	Very Large	Large	Moderate	Slight	None
	Minor	Large	Moderate	Slight	None	None
	Negligible	Moderate	Slight	None	None	None
	No Change	None	None	None	None	None

Assessment of Impact on Setting

9.17 Impacts on setting are defined as any perceived change or impact of the Development on the setting of a protected asset, any change in levels of noise, movement or light (flicker) at the known asset, any impact on the sightlines (and views) to and from protected assets and any impact on the intervisibility between assets or deliberate

vistas from assets, where this distracts from the context, integrity or appreciation of the asset affected.

9.18 The methodology adopted for assessment of impact on setting is based on Historic Scotland's guidance note, *Managing Change in the Historic Environment: Setting,* [3] which defines a three-stage process:

- Stage 1: identify historic assets;
- Stage 2: define and analyse setting; and
- Stage 3: assess the impact of the new development.

9.19 Receptors considered for indirect impacts in this chapter are; Scheduled Monuments, Conservation Areas, listed buildings, World Heritage Sites, inventory Historic Gardens and Designed Landscapes, Historic Battlefields, non-Inventory Historic Gardens, Archaeologically Sensitive Areas and promoted sites. At the request of the Dumfries and Galloway Council Archaeologist, the assessment has also considered impacts on the setting of specific promoted sites. These sites are all considered to be of 'High' or 'Medium' importance against the criteria outlined in Table 9. above.

9.20 The potential impacts on setting from the Development have been assessed by comparing a defined zone of theoretical visibility (ZTV) against the location of the designated heritage assets, including the assessed extent of the setting of each asset, including shared setting extents if appropriate, and informed by the site visit. The significance of impacts on setting is therefore a consideration of the relative importance/sensitivity of the heritage asset, and the extent of its setting, in relation to the magnitude of change brought about by the Development.

Limitations of the Assessment

Data Sources

9.21 Information held by public data sources is considered to be reliable; however:

- Any HER can be limited because opportunities for research, fieldwork and discovery depend on the situation of commercial development, rather than the result of a more desirable structured research framework;
- There can often be a lack of dating evidence for archaeological sites;
- Documentary sources are rare before the medieval period, and many historic documents are inherently biased; and
- Primary sources, especially older records, can fail to accurately locate heritage assets and can be subjective in any interpretation.

Site Visit

9.22 An archaeological walkover survey has inherent limitations primarily because archaeological remains below ground level cannot be identified, and because land use such as coniferous plantations may mask extant earthworks.

9.23 The limitations of the physical impact assessment include:

- The lack of clarity surrounding the extent of some heritage assets. This makes it difficult to provide a precise assessment of potential impact; and
- The possibility that unknown archaeological sites would be encountered during construction.
- The assessment has considered all impacts associated with the Development, as described in Chapter 3. The route and nature of the grid connection does not form part of the planning application and is yet to be finalised so has not been assessed here. The applicant's preference is for the grid connection cables to be located in trenches in roadside verges; it is not anticipated there would be any significant environmental impacts associated with this option. However, the line would be considered in more detail and subject to environmental assessment by the Distribution Network Operator (DNO) prior to a formal application for this element of infrastructure. The scope of any such assessment would be agreed with DGC.

Baseline Environment

Location, Topography and Geology

9.24 The location of the Site is described in Chapter 3. The topography and geology of the Site are described in Chapter 5. A summary of their archaeological relevance is presented below.

9.25 The topography of the area is undulating hillslopes, with naturally occurring plateaus and hillsides overlooking Nithsdale to the west and south. The Site is bounded by Pennyland Burn to the east, Clauchrie Plantation to the north, Auldgirth and the River Nith to the west, and with the hillfort of Mullach to the south. Contemporary land use includes coniferous forestry plantation, much of it under a second rotation, and improved pasture fields. Part of the Site is a clay pigeon shooting ground, located in former coniferous plantation. Height above sea-level varies between 244m and 185m above Ordnance Datum (AOD).

Historic Land-use Assessment

9.26 At present, approximately 73% of the total surface area of Scotland is covered by the Historic Landscape Assessment.

9.27 The Study Area is currently undergoing data collection and interpretation and Historical Land-use Assessment data is currently unavailable. A summary of landscape use and change, based on other sources, is summarised below.

Historic Background

Prehistoric (500,000 BC – 43 AD)

9.28 The first recorded prehistoric occupation of Scotland occurred in the Palaeolithic period (500,000 – 12,000 BC). Until relatively recently, very little dating to the Palaeolithic had been found in Scotland.[4] However, recent discoveries at Howburn Farm, Biggar, South Lanarkshire[5], provide evidence for occupation during the late Upper Palaeolithic period. It is possible that Palaeolithic activity took place within the study area, but such occupation will have been destroyed by the glaciation of the area, which continued until the beginning of the Holocene geological epoch in this area, from 8,000 BC.

9.29 The first recorded prehistoric human activity in Study Area B occurred in the Mesolithic period (12,000 – 4,000 BC), in the form of a findspot of a single flint core at Bogrie [6], west of the Site. Antiquarian records at Shaws within Study Area A (RSK Site 32) refer to the discovery of animal bones, including reindeer antler and a bear skull, within peat deposits. Given that reindeer died out before 6,000 BC in Scotland,[7] such remains are likely to be Mesolithic in date.

9.30 The introduction of agriculture and stock-raising characterises the beginning of the Neolithic period (c. 3,500 – c. 2,000 BC).[8] Within the Study Area, evidence of funerary and ritual monuments are in evidence, such as the cairn at Auchencairn (RSK Site 61), long cairns at Capenoch (RSK Site 130) and Fleuchlarg (RSK Site 135), and the Holywood cursus complex near the Twelve Apostles stone circle (RSK Sites 132, 147 and 148). Settlement sites confirmed as dating to the Neolithic are not recorded in the HER within the Study Area, but multiple prehistoric enclosures and ring ditch sites are present.

9.31 Landscape change during the Mesolithic to Neolithic transition is likely to have taken the form of the removal of tree cover due to clearing for agriculture. However, such change, having commenced in the Mesolithic, is not thought to have been substantial until the later Prehistoric periods,[9] with Neolithic impacts are described as of limited spatial extent and short duration. These episodes of woodland clearance would be followed by regeneration, with tree and shrub levels returning to their original densities.

9.32 The Bronze Age (c. 2,000 – 600 BC) sees the introduction of copper and bronze metallurgy as well as a variety of changes in material culture and practice. The division between the Neolithic and Bronze Age periods is typically drawn by the introduction of Beaker pottery and its associated cultural suite, such as stone bracers, barb-and-tang arrowheads and short-cist inhumations. Later developments in the Bronze Age see a move towards smaller Food Vessels and cremation, often in round burial cairns (Ritchie and Ritchie 1991). Within Study Area A, a single site has been attributed to the Bronze Age – a burnt mound at High Townhead (RSK Site 29), but the antiquarian reference to a cairn and axe-hammer near Auldgirth Bridge (RSK Site 18), may date from either the late Neolithic or early Bronze Age periods. Within Study Area B, a wider variety of Bronze Age or suspected Bronze Age monuments are present, including the fort at Springfieldhill (RSK Site 42), cairns and cairnfields such as at Gawin Moor (RSK Site

47), Poldivan Bridge (RSK Site 131) and Shaw's Moor (RSK Sites 58 and 59), and ring ditches, such as Dalswinton Mains (RSK Site 56) and Fourmerkland (RSK Site 150).

9.33 Landscape change during the Bronze Age followed a similar pattern to the Neolithic, with the continued clearance of primary woodland. Archaeological and palynological (pollen) evidence indicates that cultivation extended into upland areas for the first time during the Bronze Age, from c. 2500 BC, leading to soil erosion in places, possibly from deforestation. However, the overall picture is of small isolated settlements isolated occupying clearings in the primary woodland.[10]

9.34 There are a considerable number of monuments of likely Iron Age date within Study Area A (c. 600 BC – 43 AD). The most obvious physical remains dating from this period belong to the hillforts, which are most commonly attributed to the Iron Age. Closest to the Development is the hillfort of Mullach (RSK Site 1), but further forts are located within Study Area B, such as The Belt (RSK Site 41), Barrs Hill (RSK Site 134), Hall Hill (RSK Site 142) and McNaughton's Fort (RSK Site 143). Evidence for settlements is also present at Whitespots Cottages (RSK Site 49) and West Gallaberry (RSK Site 136).

9.35 The Iron Age in Scotland is characterised by a non-uniform funerary tradition (Ritchie and Ritchie 1991), and no burial monuments from the period have been located near the Site. In terms of associating Dumfriesshire with a documented historical group during the later Iron Age, the contemporary written and cartographic sources are vague and difficult to interpret. The Royal Commission (1920) conjecture that the area was under the control of Ptolemy's Selgovae, who occupied the central area between the isthmuses of the Forth and Clyde, and Tyne and Solway.

9.36 The Iron Age in southern Scotland witnessed an increase in the overall level of anthropogenic (man-made) landscape change and exploitation, with permanent woodland clearance for the first time, and the expansion of arable and pastoral farming at the expense of forest.[11]

Roman (43 AD – 410 AD)

9.37 The initial wave of Roman occupation of Britain began in 43AD, but it was not until the campaigns of Agricola (80 AD) that southern Scotland was conquered, apparently without a battle.[12] The conquest was secured by the establishment of a network of roads and forts along the principal routeways between the Forth-Clyde and Tyne-Solway isthmuses, of which Nithsdale is one. The strategic importance of this route is underlined by the number of scheduled Roman military installations within Study Area B, such as the forts at Bankhead (RSK Site 48) and Carzield (RSK Site 135) temporary camps at Ellisland (RSK Site 53), Bankfoot (RSK Site 54) and Burnside of Baltersan (RSK Site 149), and the supposed Roman signal station at Templand Mains (RSK Site 144).

9.38 Landscape and land-use change during the Roman period is limited, and characterised as a continuation of the pattern shown in the Iron Age.

Early Medieval (410 AD –1123 AD)

9.39 According to the Royal Commission, the first historic figure to be associated with Dumfriesshire was Kentigern or St Mungo, later first Bishop of Glasgow.[13] Politically, the wider area lay under the political powers of the British kingdom Strathclyde to the north, with successively the British kingdom of Rheged and the Anglian kingdom of Northumbria to the south supplanting it in the later part of the period.[14] The re-introduction of Christianity in the 6th century is accompanied by the move to a new burial tradition, consisting of extended inhumation, without grave goods, in a long cist or grave. [15] The most striking evidence for Christianisation of Dumfriesshire comes in the form of crosses, of which the Ruthwell Cross is the most famous. There is an Early Medieval cross at Nith Bridge (RSK Site 137) within Study Area B, and records of a 10th-century AD cross-slab discovered at Closeburn Old Church (RSK Site 75).

9.40 The evidence of land-use and exploitation during the Early Medieval period shows a wide variation in southern Scotland, with evidence of some areas indicating a thriving rural economy, whereas in adjacent areas there is no continuity of exploitation of the land from the Roman through to the Early Medieval periods. [16]

Medieval (1124 AD –1500 AD)

9.41 The medieval period in Scotland is often traced from the kingship of David I (1124 – 1153AD).[17] However, Nithsdale, forming the West March of the Anglo-Scottish border was frequently a disputed area during the medieval period, "a veritable cockpit of local feuds and national wars."[18] The archaeology of the Study Area therefore reflects the importance of security. Tower-houses were typically built between the fourteenth and seventeenth centuries, with examples at Low Auldgirth (RSK Site 31), Lag Tower (RSK Site 45), Closeburn Castle (RSK Site 71), Bajarg Tower (RSK Site 94) and Isle Tower (RSK Site 106). There are historical references to a beacon at Mullach (RSK Site 1), to warn the Scots of the approach of English forces,[19] a fortified house at Dalswinton (RSK Site 43) and a motte and bailey at Nithside (RSK Site 44). Other notable sites include a coin hoard (RSK Site 24) and churches and burial grounds at Dunscore (RSK Site 84).

9.42 The settlement pattern for Nithsdale during the medieval period is likely to have consisted of small, nucleated settlements along the slopes to the east and west of the Nith, around fortified dwellings of various types. Tower-houses of diverse size would have provided both comfort and protection from feuding and raiding. The Douglas of Drumlanrig (RSK Site 165) and the Kirkpatricks of Closeburn (RSK Site 71) were two of the principal families of the region. [20]

9.43 In terms of landscape and land-use change during the medieval, it is clear that natural changes to the landscape have been far less important than anthropogenic ones. [21] These were caused in part by a general increase in population, leading to a greater demand for arable and pastoral farming. Various dykes and land divisions in the area may date from fifteenth century or later divisions of land into "infield", representing accessible, good quality land close to townships, and "outfield", which was more marginal. Upland, outfield areas were exploited as summer pasture for livestock, with

moorland expanding at the expense of forest. The larger settlements were clustered in the lowland areas, with scattered shielings in the uplands.[22]

Post-medieval (1501 AD – 1900 AD)

9.44 The post-medieval period is notable for two particular episodes which changed the landscape of Nithsdale and the surrounding area: the "Agricultural Revolution" and the "Industrial Revolution", with the landscape changes of the agricultural revolution being the most prominent within the Study Area, given its rural character.

9.45 The troubled history of the region continued during the earlier part of the post-medieval period, as shown by the building and occupation of tower-houses up until the 17th century. Following the Act of Union in 1707, there is a change in high-status dwellings in the region from fortified places to country houses such as Blackwood (RSK Site 5), and Dalswinton (RSK Site 112), built in 1750 and 1785 respectively. The late turn of the 18th century was important for landscape change also, with legal changes allowing fields using the traditional run-rig system to be reallocated, moving to a more individual-based system of farming, land-use and land-ownership[23]. This "Agricultural Revolution" or Improvement, witnessed increasing investment in agricultural practices by rural landowners and their tenants. The aim was maximising revenue from the land, and led to the draining and exploitation of land previously considered marginal. The Statistical Account of Scotland [24] (written in 1791) attests to this change, indicating a rapid increase in the population of the parish, accompanied by "extensive lime-works in the parish, the division of farms, making of roads, and other improvements." Arable agriculture was concentrated on the banks of the Nith, with forest of natural and plantation origin on the slopes above the river.[25] New settlements were concentrated along the main turnpike road running through the parish from Dumfries to Glasgow (roughly along the route of the modern-day A76), with the Auldgirth Bridge (RSK Site 3) built in 1780, and Auldgirth Inn, built in c.1800, being notable examples. Other prominent buildings of the time included Closeburn School (RSK Site 67), built in 1723[26].

Modern (1901 AD – Present)

9.46 The modern period in Dumfries and Galloway sees considerable and extensive changes in land-use. A review commissioned by Scottish Natural Heritage[27] shows a dramatic five-fold expansion of woodland between the 1940s and 1970s. This pattern is clearly apparent within the Site, with areas of rough grassland being replaced by commercial coniferous plantations. Further notable changes in Study Area A are the upgrading of the A76 (e.g. the new Auldgirth road bridge, RSK Site 22).

Known Archaeological and Heritage Resources

Scheduled Monuments (SMs)

9.47 There are no SMs within the Site. There is one SM within Study Area A: the hillfort and beacon of Mullach, located 1.0km to the south of the nearest turbine, recorded in the Gazetteer as RSK Site 1. There are a total of 42 SMs within Study Area B.

Conservation Areas

9.48 The Site does not lie within a Conservation Area. There are three conservation areas located within Study Area B (but outwith Study Area A). These are:

- Thornhill – located 7.9km northwest of the nearest turbine; and
- East and West Cluden – located 8.5km south of the nearest turbine.
- Kirkton – located 7.8km southeast of the nearest turbine

Listed Buildings

9.49 There are 11 listed buildings (LBs) within Study Area A. These are:

- RSK Site 2: Blackwood House, stables (Category A) located 2.5km southwest of the nearest turbine;
- RSK Site 3: Auldgirth Bridge (Category A) located 2.6km southwest of the nearest turbine;
- RSK Site 4: Windsover Cottages (Category B) located 3.3km southwest of the nearest turbine;
- RSK Site 5: Blackwood House (Category B), located 2.5km southwest of the nearest turbine;
- RSK Site 6 Blackwood House, walled gardens, glasshouse and folly (Category B), located 2.5km southwest of the nearest turbine;
- RSK Site 7 Blackwood House Lodge (Category B) located 2.7km southwest of the nearest turbine;
- RSK Site 8 Blackwood House cottages and walled garden (Category B) located 2.3km southwest of the nearest turbine;
- RSK Site 9 Ballochan Linn railway viaduct (Category B) located 2.0km southwest of the nearest turbine;
- RSK Site 10 Auchrennie (Category B) located 1.8km west-northwest of the nearest turbine;
- RSK Site 11 Auldgirth Inn (Category B) located 2.3km southwest of the nearest turbine; and
- RSK Site 12 Clauchrie (Category B) located 1.4km west of the nearest turbine.

9.50 There are a total of 73 further listed buildings in Study Area B, three of which are also SMs. It should be noted that those listed buildings that are also Scheduled Monuments have been annotated as Scheduled Monuments only, on Figure 9.1. Listed buildings are concentrated around designed landscapes such as Dalswinton (RSK Site 122), Cowhill Tower (RSK Site 130), Closeburn (RSK Site 127) and Bajarg Tower (RSK Site 126).

Inventory Historic Gardens and Designed Landscapes (HGDLs)

9.51 There are no Inventory Historic Gardens or Designed Landscapes (HGDLs) within Study Area A. There are five HGDLs within Study Area B. Two are within 5km of the Site: Dalswinton (RSK Site 122), and Cowhill Tower (RSK Site 129). There are three outwith 5km: Maxwelton (RSK Site 163) to the west; Castlehill (RSK Site 164), to the southeast, and Drumlanrig (RSK Site 165), located northwest of the nearest turbine.

Non-inventory Historic Gardens (NIDLs)

9.52 There is one NIDL within Study Area A, the garden around Blackwood House (RSK Site 35). There are six NIDLs within 5km of the Site: Friar's Carse (RSK Site 123); Portrack House (RSK Site 124); Allanton House (RSK Site 125); Bajarg Tower (RSK Site 126), and Closeburn Castle (RSK Site 127).

Archaeologically Sensitive Areas (ASAs)

9.53 Dumfries and Galloway Council's Local and Structure Plans identify specific places as Archaeologically Sensitive Areas (ASAs). There are no ASAs within Study Area A. There is a single ASA, Whitestanes Moor (RSK Site 128), located within Study Area B.

Promoted sites

9.54 The Dumfries and Galloway Archaeologist requested that specific promoted sites, i.e. cultural heritage sites or monuments identified by the Council as having a tourism or recreation value, within the vicinity of the Site, be considered as part of the assessment. The following sites have been considered:

- Ellisland Farm. Also a Category A LB, located 4.2km south of the nearest turbine (RSK Site 86); and
- Bronze Sculptures at Glenkiln, located 12.2km southwest of the nearest turbine (RSK Site 166).

9.55 There are a further four promoted sites considered within the assessment that are detailed within the gazetteer.

Non-scheduled heritage sites and monuments

9.56 There are 22 non-scheduled heritage sites and monuments within Study Area A recorded on the Dumfries and Galloway HER and National Monuments Record. These are grouped by period below. Seven are considered of medium importance, 14 low importance, and one of negligible importance.

<u>Prehistoric (500,000 BC – 43 AD)</u>

9.57 The earliest likely site within Study Area A is an antiquarian reference to the discovery of animal bones within peat deposits at Shaws (RSK Site 26) that are of likely Mesolithic date.

9.58 There are two sites of likely Bronze Age date within Study Area A: a cairn and findspot of an axe-hammer at Auldgirth Bridge (RSK Site 18); and a burnt mound at Townhead (RSK Site 29). There are also two antiquarian references to a cairn (RSK Site 19) and possible fort (RSK Site 20), both of which are likely to date from prehistoric periods.

<u>Medieval (1124 AD –1500 AD)</u>

9.59 There are two non-scheduled sites dating to the medieval period in Study Area A. These are a findspot of late medieval Scottish coins at Rhoneston Bridge (RSK Site 24), and the now demolished remains of a tower house at Low Auldgirth (RSK Site 27).

Post-medieval (1501 AD – 1900 AD)

9.60 The post-medieval period accounts for 12 non-scheduled archaeological sites within Study Area A. The majority of these are farmhouses, farmsteads and associated installations, including Cairnhill (RSK Site 13); Hillend (RSK Site 14); Mo-Diadh (RSK Site 17); Holmhead (RSK Site 21); Low Auldgirth (RSK Site 26); Foresthead (RSK Site 28); Old Pennyland (RSK Site 30) and Pennyland (RSK Site 31). Other types of site represented include a dovecote and schoolhouse at Blackwood House (RSK Sites 15 and 16); the village of Auldgirth (RSK Site 23); and a plantation bank at Cairn (RSK Site 25).

Modern (1901 AD – Present)

9.61 A single site was identified as belonging to the modern period – the New Bridge at Auldgirth over the Nith (RSK Site 22) within Study Area A.

Map Regression

9.62 Historic mapping of the area was consulted in order to provide information on the use and development of the land during the post-medieval and modern periods. The picture that the historical maps paint is one of little change over time, with the Site being used for pasture throughout the period covered by the pre-1950s mapping.

Pont 35 of Nithsdale (1580s to 1590s)

9.63 Pont's map of Nithsdale is the first to depict Study Area A in detail, depicted Nithsdale from Sanquhar to the Solway Firth. High Auldgirth (RSK Site 38) is depicted, labelled "Aldgirth", as is Dalswinton. An unnamed tributary, corresponding to Ballochan Linn, is depicted draining into the Nith to the west.

Blaeu's Atlas of Scotland (1654)

9.64 Blaeu's Atlas was based on surveys undertaken by Pont and Robert Gordon, and depicts Auldgirth within the area of Nithsdale. Aldgirth, Dalswinton, and "Freers Carse" (Friar's Carse) are depicted, along with the Nith and Ballochan Linn.

Moll, H. The Shire of Dumfries or Nithisdale (1745)

9.65 Moll's map shows Auldgirth, and also labels a set of hills to the east of Auldgirth as the "Aldgirth Hills", within the Site.

Roy's Military Survey of Scotland: Lowlands (1752-55)

9.66 Roy's map shows the principal settlements in Nithsdale, in addition to tracks, areas of cultivation, and watercourses, in the period before to enclosure and agricultural improvement began in earnest. High Auldgirth is labelled "Aldgirth" (RSK Site 38), with the area to the east of High Auldgirth, probably corresponding to Black Craig, labelled as "Aldgirthill". No cultivation marks are depicted around Aldgirthill. Low Auldgirth (RSK Site 26) is labelled as "Lower Aldgirth", with a track depicted leading north-northeast to south-southwest to the east of Low Auldgirth. Mullach Hill (RSK Site 1) is labelled as

"Mollochill" as a topographic feature. Clauchrie (RSK Site 12) is depicted for the first time.

Blackwood Estate map (1804)

9.67 This map, held privately by David Matthews of Blackwood, shows lands around Clauchrie, Cairn and Auldgirth. A similar pattern of enclosure is depicted as on the modern OS mapping. It depicts the keeper's cottages at High Auldgirth in their present position (RSK Site 38) as a set of three structures around a central courtyard. Low Auldgirth (RSK Site 26) is called "Laigh Auldgirth" and depicted as three structures around a central courtyard. Auldgirth Inn (RSK Site 11) is labelled as a smithy. A single structure is depicted in area of woodland to the north of Low Auldgirth (RSK Site 168. The structure is linked by a track to Auldgirth smithy (RSK Site 11).

9.68 The plantation bank at Cairn (RSK Site 25) is depicted as a tree-covered mound. Woodland is depicted, but is far less extensive than the current extent of commercial forestry. Small woodland areas, such as Knocknutshell and Lambrig Wood are depicted, as well as the plantation to the southeast of High Auldgirth (RSK Site 37).

Thomson's Atlas of Scotland (1832)

9.69 Thomson's atlas divides Dumfriesshire by parish. Auldgirth Bridge (RSK Site 3), Blackwood (RSK Site 5) and Pennyland are depicted for the first time. Low Auldgirth is labelled as "Hayfield" (RSK Site 27), with Lintmill, Cairn and Clauchries also depicted.

Blackwood Estate map (c.1830s)

9.70 This map, held privately by David Matthews of Blackwood, shows part of the estate of Blackwood, including Auldgirth, Low Auldgirth and High Auldgirth. It is thought to date from the 1830s[28]. The pattern of enclosure first depicted in the 1804 map is present, with few changes visible in subsequent 1st Edition and later Ordnance Survey mapping. The map is very similar in both style and content to the 1804 map, although the structure at Hayfield (RSK Site 168) is not depicted. The route of the Glasgow and Southwestern Railway is marked in pencil.

Ordnance Survey First Edition (published 1861)

9.71 The first edition Ordnance Survey, surveyed in 1855 or 1857, was available in six and 25 inch to the mile scales for the Site. It depicts the majority of the Site as consisting of enclosed fields, with the highest areas of the site such as Blackcraig Hill and Glenloy, depicted as scrubland. The Glasgow and Southwestern Railway is depicted for the first time, with a bridge across it by Auldgirth (RSK Site 167). The pattern of enclosure is slightly denser than is shown on modern OS mapping, but follows the same pattern. Woodland is depicted, but is far less extensive. Small woodland areas, such as Knocknutshell and Lambrig Wood are depicted. Three archaeological sites were identified from the First Edition mapping. Two are quarries shown around Blackcraig and Blackcraig Hill (RSK Sites 33 and 34) respectively). A third site (RSK Site 37) is a circular enclosure depicted as rough grassland, built into the field boundary to the

southeast of High Auldgirth. It is likely to be the sheepfold associated with the farmstead.

Aerial Photography

9.72 Aerial photographs from RCAHMS for Study Area A were examined, covering 1946 to 1988. These show the gradual afforestation of the Site, first with Clauchrie Plantation (depicted from 1962) then Glenloy. Three new areas of archaeological interest were identified from the aerial photographs. These are cultivation marks around Knocknutshell (RSK Site 42). An extensive area of cropmarks oriented east-west were identified to the south of Knocknutshell. Smaller areas of possibly cultivation marks, oriented northeast to southwest, were identified in areas of what is now forestry to the west and northwest of Knocknutshell, as depicted on Figure 9.1.

Site Visit

9.73 Weather conditions were generally good, although low cloud affected visibility on the 29th October. Visibility for archaeological remains was good in pasture fields, and poor in fields of commercial forestry.

9.74 In general, the Site is situated on hillslopes overlooking the River Nith to the west and Pennyland Burn to the east. The terrain is undulating and uneven, with several high points, but no dominant hilltop. The eastern fields face eastwards towards Pennyland Burn, Pennyland Moor and the existing Dalswinton wind farm. The westernmost fields are at greater altitude, and have more open views to the south, east and west. Field boundaries included modern fencing, as well as well-established drystone walls. Evidence for improvement of pasture through modern drainage practices and stone-picking was also observed. No evidence of relict field boundaries was observed.

9.75 The access route to the Site consists of areas of road to be upgraded between Auldgirth and from the south of Low Auldgirth, and from the north of Low Auldgirth and Muirstraploch Wood. The access road to be upgraded consists of an unnamed metalled single carriage road (u492n) through Auldgirth as far as High Auldgirth, which crosses a railway bridge (RSK Site 167). Beyond High Auldgirth the route consists of an unmetalled forestry track. Along the majority of its route, fences bound the road to be upgraded, beyond which is commercial forestry plantation. An area of new track is required around Low Auldgirth. This passes through undulating pasture field bounded by drystone walls or fences, slowly rising to the east.

9.76 The site visit revealed the existence of a possible archaeological site (RSK Site 39). This consists of a series of possible earthworks occupying the shoulder of a hill overlooking Pennyland Burn to the east, including a large oval earthwork (8m by 9.5m), five “satellite” circular earthworks of between 2m and 5m diameter, and two disturbed stone piles of possible modern date. These are shown in Plates 1 – 3 in Appendix 9.2. A potential site near Muirstraploch Wood (RSK Site 40; Plate 4) was identified during the course of the site visit. However, the feature was interpreted as a natural knoll, one of many located within the Site. Further details are provided in the gazetteer.

Table 9.7: Summary of Archaeological Site Visit

Plot Number	Plot description	Archaeological comments
1	Establishing 2nd planting of coniferous forestry plantation on E-facing hillslope	V. poor visibility due to establishing forestry. V. low likelihood of preservation of unrecorded, buried remains due to ploughing. Southern field boundary a drystone wall
2	Establishing 2nd planting of coniferous forestry plantation with a landscaped area for clay pigeon shoot	V. poor visibility due to establishing forestry. V. low likelihood of preservation of unrecorded, buried remains due to ploughing.
3	Improved pasture field on E-facing hillslope Powerlines cross the field	RSK Site 39: Series of possible earthworks on shoulder of hill within field 3. Includes one oval possible earthwork, five circular possible earthworks, and two stone piles.
4	Undulating improved pasture field	Wood to the west of the field – Knocknutshell – observed to be very mature. Southern field boundary is a drystone wall
5	S-facing convex improved pasture field	Stone pile was observed adjacent to a modern field drain. Sherds of field drain tile also present. RSK Site 36: No visibility of cultivation marks identified from aerial photography
6	Convex semi-improved field located close to summit of hill	Likely to formerly have been improved pasture, now fenced off and overgrown.
7	Undulating improved pasture field	RSK Site 40: a natural mound or knoll observed on summit of hill against the northwest field boundary. Likely to be a natural, grassed-over bedrock outcrop
8	N-facing improved pasture field. Buried power cables line the track.	Good visibility for earthworks. Field bounded on southeast and northwest by fences and tracks. The southeast field boundary lines the track leading from Low Auldgirth to High Auldgirth.
9	Convex improved pasture field	Good visibility for earthworks. A line of mature oaks, a track and a drystone wall form the western field boundary, with the access track oriented to avoid the trees.
10	Undulating improved pasture field	Good visibility for earthworks. RSK Site 25 located on the western field boundary of the plot. Field bound by a drystone wall to the south
11	Undulating improved pasture field	Good visibility for earthworks. Field bound by drystone wall and fence on its western side, with a drop in height to plot 12
12	Undulating improved pasture field	Good visibility for earthworks. Drystone wall and road (u492n) form the southern field boundary.

Archaeological Potential

Prehistoric

9.77 There are numerous prehistoric sites recorded in the HER and NMRS, but none within the Site. Most prominent of these is the hillfort at Mullach (RSK Site 1). Other sites of Mesolithic and Bronze Age date exist within the area, but these are at a greater distance from the Site, located on lower ground close to watercourses. RSK Site 39, located within the Site, may be of prehistoric date. Therefore, the archaeological

potential of the Site in terms of prehistoric periods is low, except around RSK Site 39, where it is moderate.

Roman

9.78 Roman-period sites within Study Area B are military in nature, and concentrated within the river valley of the Nith. Therefore, the archaeological potential of the Site in terms of Roman remains is considered to be low.

Early Medieval

9.79 There are no early medieval sites identified within Study Area A, and few within Study Area B. It is possible that settlements attributed to other periods were also occupied or exploited during the early medieval period. However, the potential for encountering sites of early medieval date is considered to be low.

Medieval

9.80 A site of likely medieval date is located in proximity to the access track, a tower house at Low Auldgirth (RSK Site 27). Other sites, such as High Auldgirth (RSK Site 38) may have had medieval origins, but this cannot be proven based on current evidence. Although cultivation marks were identified within the Site (RSK Site 36), these were very linear in nature, and are unlikely to have originated in the medieval period. The archaeological potential of the Site in terms of medieval remains is, therefore, considered to be low.

Post-medieval

9.81 There is considerable evidence for occupation and exploitation of Study Area A in the post-medieval period, primarily through occupation and agricultural improvement. The reorganisation of fields will have left traces of former field boundaries, and the practice of 'night soiling' (or manuring) is likely to leave finds evidence from this period in the topsoil. While the likelihood of encountering any such remains is high, their archaeological importance is expected to be negligible.

Modern

9.82 The modern period is well represented by mapping and it is deemed very unlikely, therefore, that hitherto unknown heritage assets of this date should exist within the Site. The archaeological potential for this period is therefore considered to be low.

Project Characteristics

Potential Physical Impacts of the Development

9.83 It is anticipated that any physical impacts on archaeological remains would occur during construction. The Development would involve several activities during construction, which have the potential for a physical impact on both buried and above ground archaeological and cultural heritage resources. These activities include:

- Excavation for turbine foundations;
- Excavation for crane hard standing areas;
- Excavation of temporary construction compounds and access tracks (including improvements to existing road systems to allow for access of construction traffic);
- Excavation of permanent access tracks;
- Excavation for the substation;
- Excavation of service trenches, cable routes and substation sites; and
- Delivery of materials to the Site.

9.84 A maximum micrositing tolerance of 30m in any direction has been assumed in assessing the potential physical impact of the Development in this chapter.

9.85 Based on the assessment of archaeological potential outlined above, the likelihood of encountering previously unrecorded buried archaeological remains within the footprint of the Development is considered to be low to moderate.

Potential Impacts on the Setting of Cultural Heritage Receptors

9.86 The Development has the potential to impact the setting of cultural heritage receptors during operation. These can generically be described as follows:

- Interruption of sight lines and monument intervisibility is possible where the heritage asset is superseded in terms of landscape prominence and/or dominance by the Development thus diminishing the appreciation of the monument as it was originally intended or has subsequently been perceived.
- Views into, out of, and within the area of interest, particularly in terms of conservation areas; the visual impact is caused if the Development becomes a significant factor in the views out of the protected site or to it from the surrounding landscape. This is especially significant if the designation of that area took account of the landscape (or townscape) setting of the designated area.

9.87 Possible indirect impacts can also include:

- Change in levels of noise, movement or light (flicker) at a known asset are possible during the commissioning of the wind farm for receptors within 1 km of a turbine.

Predicted Impacts

Site-specific Physical Impacts

9.88 Of 13 identified potential archaeological sites within or partially within the Site shown in Figure 9.1, there is a potential adverse physical impact on two sites. Any impact would occur during the construction phase of the Development. The sites are RSK Sites 40 and 167. RSK Site 40 is a natural knoll of negligible importance and no significance of impact. RSK Site 176 is a nineteenth-century railway bridge first depicted on the 1st Edition Ordnance Survey map. The railway was built in the 1830s through the Blackwood Estate lands. 29 The bridge carries the road linking Auldgirth to Low Auldgirth over two pairs of railway tracks for the line between Glasgow and Dumfries.

The bridge consists of a single arch of red sandstone, ivy-covered on its southwest side, and is a single carriageway in width. The Traffic and Transport assessment of the ES (Chapter 11) identifies that construction-related traffic mitigation work would be required on the bridge in the form of carriageway widening within the existing verge of the bridge, consultation with Network Rail and the Dumfries and Galloway Council Architectural Engineering Design Services. Such work is not predicted to affect the heritage value of this undesignated archaeological value of the site. Therefore, the level of physical impact is judged to be negligible on asset of low importance, leading to a significance of impact of none.

Assessment of Impact on Setting

9.89 Of the 138 designated heritage receptors within Study Area B, 21 were outwith the ZTV.

9.90 The following sections expand on the assessments in the Gazetteer (Appendix 9.1) for the 15 heritage assets where a slight to moderate potential impact was predicted, or where statutory consultees have specifically requested that their setting be considered in detail. For all other heritage assets, a significance of impact of none was recorded.

Mullach hillfort and beacon (RSK Site 1)

9.91 Mullach hillfort is described fully in Appendix 9.1. The receptor is notable for its likely use as a hillfort in the Iron Age, located on a prominent hill overlooking the east bank of the River Nith. It is also a known beacon stance, based on Scottish legislation from 1448 AD, although no earthworks remain as a result of this later use. There is considerable debate about the usefulness of hillforts in a conventional defensive military sense, and interpretations of excavated examples has varied from functions as stock enclosures through to high status defensive settlements. Mullach has not been excavated, so it is not possible to state with certainty whether the hillfort represents a site that was occupied constantly or infrequently, or had a purely defensive or largely display-focused function. However, given the fort's strategic location and earthworks, RSK Site 1 is likely to have performed a dual function of providing a defensive strongpoint for the local inhabitants and a means of control of the communication route through Nithsdale.

9.92 Nithsdale has been an important communication route between the isthmuses of the Forth-Clyde and Tyne-Solway throughout prehistoric and historic periods. The selection of Mullach as a hillfort during the Iron Age and as a beacon stance during the medieval stems from its geographical position and altitude, affording views down Nithsdale towards the Solway Firth to the southeast, and north-westwards towards the Central Lowlands to the northwest. In terms of its Iron Age use, intervisibility with contemporary fortified sites, such as forts of The Belt (RSK Site 41) located 1.0km to the south-southeast, and Springfieldhill (RSK Site 42) located 4.2km to the southwest across the Nith, are important, creating a shared setting between these three monuments that incorporates the valley bottom of Nithsdale. In terms of the monument's use as a beacon stance, intervisibility with other identified beacon stances is intrinsic to understanding the monument. The Act of 1481 names a series of prominent hills where beacons were to be erected, linking the Solway Firth to the Clyde through Nithsdale.

Table 9.8: Identified Contemporary Beacon Stance Locations in Nithsdale and Surroundings[30]

Name[31]	Contemporary name	Location[32]	Comments
Wardlaw	Wardlaw (Caerlaverock)	NY023 667	Closest to Solway Firth
Rahothoun	Trohoughton (Dumfries)	NX995 727	
Barlouch	Barlouth, Beacon Hill	NY055 792	
Pantua	Panteth Hill	NY075 717	Junction of Nithsdale and Annandale
Malowhill	Mullach Hill	NX930 866	RSK Site 1
Corsencoune	Corswinton (New Cumnock)	NS670 147	
Crwfell	Crufell (Sanquhar)	NS694 050	
Dowlerk	Dowlarg (Troqueer parish)	NX976 744	Approximate location only
Watchfell	Unknown	Not located	

9.93 In terms of appreciation of the monument in the contemporary context, there is no right of way close to the monument, with the public road to High Townhead (1.0km to the south) the closest public right of way. However, the monument is prominent within the landscape along Nithsdale. Views from track leading to High Townhead (293330 E 586860N), the closest view of the monument from a public place, Edgarton (290320E 584570N), located 3.4km southwest, Moat (289800E 585620N), located 3.3km to the west-southwest, the A76 between Ellisland and Friar's Carse (291980E 584730N), located 2.3km to the southwest, and the car park of Ellisland Farm (RSK Site 86), the nearest public attraction.

9.94 In summary, the setting of RSK Site 1 consists of the boundary of the scheduled area, the shared setting of the valley of Nithsdale between RSK Sites 1, 41 and 42, and sightlines to intervisible former beacon sites outlined in the table above.

9.95 There is a guided view along the track to High Townhead (see Plate 5), but views of both the hillfort and the turbines along the length of this track are glimpsed. There is no intervisibility along the track between Mullach and The Belt (RSK Site 41). When viewed from Edgarton, there are uninterrupted views of the Development, but the existing wind farm of Dalswinton forms the backdrop to the view, with a single turbine visible behind the hillfort presenting an altered cultural landscape (see Figure 9.3 in ES Volume 2. Viewed from Moat (RSK Site 55), there are oblique views of the Development, with the Development a prominent but not dominant feature from the valley, and largely masked in the valley bottom by the intervening Craig of Forest, a hill closer to the river. From the southwest and west, sensitive views where the hillfort is prominent are not affected. From the south, such as from the A76, the major road leading through Nithsdale, and the visitors' car park for Ellisland Farm, a local public attraction, there are glimpsed views of RSK Site 1 in a prominent position, in which the Development would backdrop the hillfort.

9.96 Mullach hillfort has significant prominence within the landscape, and that landscape is intrinsic to appreciation of the fort. The magnitude of impact is rated as minor on a

receptor of high importance, as the Development does not interrupt any sightlines, key views or intervisibility to contemporary heritage assets, in particular Iron Age fortified monuments or the location of medieval beacon stances. Prominent views of the hillfort from locations along Nithsdale are present, but are within an altered cultural landscape incorporating the subsequent activities of natural woodland clearance, enclosure and agricultural improvement, modern infrastructure, such as the A76 road and Dumfries to Glasgow railway line, and the existing wind farm of Dalswinton. Therefore, the overall significance of impact is moderate. This is not a significant impact.

Blackwood Non-inventory Designed Landscape (RSK Site 35) and associated Listed Buildings (RSK Sites 2 and 5 – 8).

9.97 The Blackwood NIDL consists of a wooded estate and river terrace around a courtyard forming the core of the estate which lines the western bank and hillslope beside of the Nith. Arranged around the courtyard are listed buildings comprising the stables (RSK Site 2; a Category A LB); country house (RSK Site 5; a Category B LB) and walled gardens, glasshouse and folly (RSK Site 6; a Category B LB). There are also a Lodge (RSK Site 7; a Category B LB) and cottages and walled garden (RSK Site 8; a Category B LB) located to the on the southern edge of the NIDL and on the east side of the Nith respectively. The NIDL is private, and access could not be obtained during the assessment. The LBs arranged around the courtyard are focussed on the courtyard itself. The country house's (RSK Site 5) long axis is oriented northwest to southeast, with open views southeastwards across open arable river terrace (see Plate 6). The NIDL has an enclosed and wooded character. The setting of the NIDL and LBs consists of the boundary of the NIDL itself, and views from the country house (RSK Site 5) southeastwards along the River Nith

9.98 The Development would be clearly visible to the east of the garden, forming a backdrop behind Blackcraig Hill (see Figure 9.4). However, no guided sightlines within the NIDL or from any LBs are affected, and intervisibility between designated assets within the NIDL would not be affected.

9.99 No turbines are proposed within the setting of the NIDL or LBs. The magnitude of impact is considered to be minor to the NIDL (RSK Site 35; of medium importance) and negligible to the country house (RSK Site 5, of high importance). No change is predicted to the other LBs within the NIDL (RSK Sites 2; 6 – 8). Therefore slight or no significance of impact is predicted, as laid out in the assessment (Appendix 9.1). These are not significant impacts.

The Belt fort (RSK Site 41)

9.100 The Belt, High Townhead is a stone-walled promontory fort located 2.2km south of the nearest turbine. It is recorded as a single-walled ring with a narrow passage entrance to the southeast. It is intervisible with Mullach hillfort (RSK Site 1), which may have been contemporary. It is covered in mature woodland (see Plate 7). It shares a setting with Mullach, located 1.0km to the north-northwest and Springfieldhill (RSK Site 42), located 4.0km to the west-southwest, incorporating the valley bottom of Nithsdale. It is a prominent feature (105m aOD) above the River Nith to the south, but higher hills at

Mullach (245 aOD) to the north, Glenbrae Wood (162m) to the northwest and Cleugh Plantation (125m) enclose the monument and its prominence to its immediate surroundings.

9.101 The setting of RSK Site 41 consists of the boundary of the scheduled area and the shared setting of the valley of Nithsdale between RSK Sites 1, 41 and 42.

9.102 The Development would be visible from monument, but are heavily screened by the wood growing on the site, and by topography to the north. The Development would not detract from its prominence within its setting.

9.103 The magnitude of impact is considered to be negligible on an asset of high importance. Therefore a slight significance of impact is predicted. This is not a significant impact.

Springfieldhill fort, palisaded enclosure (RSK Site 42)

9.104 Springfieldhill is an oval fort consisting of inner and outer ramparts, partly plough-damaged, with a pair of concentric trenches visible on aerial photographs within the ramparts. The fort is located in enclosed pasture fields, on a prominent hillock overlooking Nithsdale to the north, east and southeast of the monument. Mullach (RSK Site 1), located 4.2km to the northeast, and The Belt (RSK Site 41), located 4.0km to the east-northeast across the Nith, are important, creating a shared setting between these three monuments that incorporates the valley bottom of Nithsdale.

9.105 The setting of RSK Site 42 consists of the boundary of the scheduled area and the shared setting of the valley of Nithsdale between RSK Sites 1, 41 and 42.

9.106 The Development would be visible to the northeast of the monument, with the nearest turbine 5.2km away. There are distant oblique views of turbines when looking across Nithsdale to similar monuments such as Mullach and The Belt. However, the turbines do not form a backdrop to, or obscure views, to likely contemporary monuments within its setting, and do not detract from the monument's prominence within the landscape.

9.107 The magnitude of impact is considered to be negligible on a monument of high importance. Therefore, a slight impact is predicted. This is not a significant impact.

Dalswinton Inventory Garden and Designed Landscape (RSK Site 122) and associated SMs (RSK Sites 43 and 56) and Listed Buildings (RSK Sites 112– 119).

9.108 The Dalswinton HGDL consists of an informal late 18th century designed woodland, parkland and lakes, overlaying an earlier formal one. It is rated as having a high horticultural, architectural and nature conservation importance by Historic Scotland, with some work of art and scenic importance. [33] The HGDL has two SMs within it: Dalswinton Old House (RSK Site 43) and Dalswinton Mains, ring ditch and pit alignments (RSK Site 56). There are eight Listed Buildings within the HGDL, comprising Dalswinton House (RSK Site 112, a Category A LB); the Dalswinton Loch dam (RSK Site 113; Category B); dovecote (RSK Site 114; Category B); walled garden (RSK Site 115; Category B); back and east lodges and gatepiers (RSK Sites 116 and 117; Categories C(S) and Category B respectively); stables (RSK Site 118; Category B); and

chapel (RSK Site 119). The formal element of the HGDL comprises the walled garden (RSK Site 115).

9.109 In terms of the HGDL's scenic importance, the site visit identified two key views within the garden of relevance the Development. One is formed by the circuit of Dalswinton Loch (RSK Site 113) and incorporates the dovecote (RSK Site 114). Following this circuit, there is a guided view from the southwestern edge of Dalswinton Loch looking northwestwards, following a recently planted tree-lined avenue, with views of the dovecote (RSK Site 114) in the foreground. The second is open views across the HGDL from Dalswinton House (RSK Site 112; see Plate 8). The setting of the HGDL consists of the boundary of the HGDL, and sightlines from Dalswinton Loch. Dalswinton House's setting consists of the HGDL and sightline northwestwards. The setting of all other sites (RSK Sites 43, 46 and 112 – 119) within the HGDL consists of the HGDL itself.

9.110 The photomontage taken from Dalswinton Loch looking northwestwards (Figure 8.15) shows that existing vegetation within the HGDL largely masks views of the turbines along the sightline adjacent to Dalswinton Loch. The open views across the HGDL from Dalswinton House are similar in nature, with Mullach hillfort (RSK Site 1) in the middle ground, and views of turbines partially screened by existing vegetation within the HGDL. There is no view of turbines from the formal, walled part of the garden. The remaining protected sites (RSK Sites 43, 46 and 112 – 119) are not prominent outwith the boundary of the HGDL.

9.111 The magnitude of impact is considered to be negligible to the HGDL and Dalswinton House (RSK Sites 122 and 112), which are both of high importance. Therefore a slight significance of impact is predicted, as laid out in the assessment (Appendix 9.1). These are not significant impacts.

Gawin Moor cairn and field system SM (RSK Site 47)

9.112 This monument is located within the hills of Auchencairn Forest to the northeast of the Site, extending over 3.0 hectares. The entire monument and its surroundings are under commercial coniferous forestry plantation. The SM shares a setting with cairns on Auchencairn Height, White Hill and Blackstand Rig to the south and southeast of the SM within the forestry, with intervisibility between these monuments being important in understanding the receptor. Therefore, the setting of the cairn is considered to be the extent of the scheduled area and sightlines to intervisible cairns within the wider landscape.

9.113 In views from Gawin Moor SM, the Development would form a backdrop to other potentially contemporary cairns, but do not interrupt sightlines. Such views of turbines would be distant, with the nearest turbine located 2.6km to the southwest, while the cairns on Auchencairn Height are located 1.2km to the southwest of RSK Site 47. Visibility of the turbines is obscured by coniferous plantation around the cairns, but if this is felled then visual relationships to neighbouring cairns, and views of the Development, would become apparent.

9.114 The magnitude of impact is considered to be negligible on an asset of high importance. Therefore slight significance of impact is predicted. This is not a significant impact.

Moat enclosure SM (RSK Site 55)

9.115 This earthwork enclosure is recorded a natural knoll to the southwest of the River Nith. Its precise date is not certain, although Iron Age or medieval origins have been suggested. Upstanding remains are relatively slight, limiting the receptor's significance in terms of setting, but it occupies a prominent hill overlooking Nithsdale. Views to Mullach (RSK Site 1), located 3.4km to the northeast, and Springfieldhill fort 1.5km to the south (RSK Site 42), are important, creating a shared setting between these monuments that incorporates the valley bottom of Nithsdale. The setting of RSK Site 55 consists of the boundary of the scheduled area and the shared setting of the valley of Nithsdale between RSK Sites 1, 42 and 55.

9.116 The Development would be visible to the northeast of the monument, with the nearest turbine 4.1km away from the monument. There are distant oblique views of turbines when looking across to similar monuments such as Mullach. However, turbines do not form a backdrop to, or obscure views to, possible contemporary monuments within its setting, and do not detract from the monument's prominence within the landscape.

9.117 The magnitude of impact is considered to be negligible on an asset of high importance. Therefore a slight significance of impact is predicted. This is not a significant impact.

Whitestanes Moor Archaeologically Sensitive Area (RSK Site 128), incorporating Shaw's Moor cairnfields (RSK Sites 58 and 59)

9.118 The Whitestanes Moor ASA is identified within Dumfries and Galloway Council planning policy as a broad area of archaeological interest not confined to individual sites. It incorporates Whitestanes Moor, Shaw's Moor and Watchman Moor. Within the boundary of the ASA area are two SMs at Shaw's Moor (RSK Sites 58 and 59) consisting of cairnfields and ring-cairns. The ASA is primarily moorland and rough grazing, with the majority of Shaw's Moor now commercial forestry.

9.119 Both the SMs are primarily subsurface features, with very few extant remains now visible. They are located within enclosed rough grazing land adjacent to an area of commercial forestry. Due to their primarily subsurface nature, geographical proximity and low prominence within the landscape, the setting of these features consists of the extent of each scheduled area, the area between them, and their immediate surroundings. Whitestanes ASA's setting is considered to be the extent of the ASA itself, as depicted on Figure 9.2. Within the wider landscape, the ASA's prominence is affected by the Dalswinton wind farm, located 1.0km to the west (see Figure 9.5). The wind farm in planning of Auchencairn, located to the northwest, would also be visible from the higher elements of the ASA.

9.120 The Development would be visible from the highest parts of the moor, around Watchman and Cocklet Hill. The Development would appear contiguous to the existing Dalswinton wind farm. Lower areas of the ASA, including 58 and 59 would be partly masked by coniferous plantation that forms part of the ASA. In terms of cumulative

impact, the potential wind farm development of Auchencairn to the northwest would lie behind the existing Dalswinton wind farm. Considering the ASA, the magnitude of impact is considered to be minor on a receptor of medium importance, leading to a slight significance of impact. For RSK Sites 58 and 59, no change is predicted on assets of high importance, leading to no significance of impact. These are not significant impacts.

Closeburn Non-inventory Designed Landscape (RSK Site 127) and associated Listed Buildings (RSK Sites 67 and 71 – 78).

9.121 The Closeburn NIDL consists largely of arable lands, garden and woodland to the east of the A76, the village of Closeburn and the river Nith. The NIDL incorporates the listed buildings of Closeburn School (RSK Site 67; a Category A LB); Closeburn Castle (RSK Site 71; Category B); Closeburn Castle gatepiers to the east of the Castle (RSK Site 72; Category B); Closeburn Castle south lodge and gatepiers (RSK Site 73; Category B); Closeburn Church (RSK Site 74; Category B); Closeburn Old Church (RSK Site 75; Category B); Closeburn Mains and Closeburn Mains walled garden (RSK Sites 76 and 77; both Category B) and Closeburn Primary School (RSK Site 78; Category B). The majority of the NIDL and surroundings of the LBs lies within a rural landscape of rolling arable fields. The formal elements of the NIDL are within the grounds of Closeburn Castle, and are private.

9.122 In terms of the setting of the Listed Buildings of the schools, castle and churches (RSK Sites 67; 71; 74 – 75 and 79), the visual relationship between them – in particular the Castle (RSK 71) and the Old Church (RSK Site 75) – within the NIDL are key to their appreciation. The setting of the lodges (RSK Sites 72 and 73) is considered to be their immediate surroundings and sightlines to Closeburn Castle (RSK Site 71). The setting of the NIDL (RSK Site 127) consists of the boundary of the NIDL itself, as depicted on Figure 9.2.

9.123 The Development would be visible in distant views to the southwest, with the nearest turbine located 3.3km from the boundary of the NIDL (see Figure 9.6). The Development would not affect the visual relationship between the LBs within the Closeburn NIDL, and are not visible along intended sightlines within the formal element of the NIDL, such as the view along the driveway to Closeburn Castle from the South Lodge and gatepiers. The magnitude of impact is considered to be negligible to the NIDL, which is of medium importance. No change is predicted on the setting of the LBs, which are all of high importance. Therefore no impact is predicted on the NIDL and LBs.

Ellisland Farm LB and Promoted Site (RSK Site 86)

9.124 Ellisland Farm is a Category A Listed Building, and identified by Dumfries and Galloway Council as a promoted site. It is a late eighteenth-century farmhouse and steading on the southwestern banks of the Nith and to the northeast of the A76, and is now run as a visitor attraction. The value of the receptor lies in its historical associations with Robert Burns, the quality of preservation of the late eighteenth-century and early nineteenth-century buildings, and the attractiveness of the vernacular architecture. The setting of the receptor consists of the approach to the farmstead, the buildings, courtyard and

walled garden that comprise the steading. The majority of the buildings face the courtyard, which provides the focus for the receptor. The setting of the receptor is considered to be the curtilage of the listed building and its immediate surroundings, in particular the guided view along the driveway to the steading from the A76.

9.125 There is no view of turbines from the courtyard, walled orchard, or buildings comprising the receptor, due in part to tree cover along the banks of the River Nith immediately to the northeast (see Plate 9). There are distant, oblique views of turbines from the visitor car park and on the approach to the receptor, with the nearest turbine located 4.2km to the north, and the Development appearing as an extension of the existing Dalswinton wind farm (see Figure 9.7). However, such views do not impact on the setting of Ellisland Farm.

9.126 Considering Ellisland Farm, no change is predicted on an asset of high importance, leading to no significance of impact. This is not a significant impact.

Friars Carse NIDL (RSK Site 123) and associated Listed Buildings (RSK Sites 87 and 88).

9.127 Friars Carse NIDL consists of the grounds of a former estate now run as a hotel complex. The NIDL incorporates the listed buildings of the Burns Hermitage (RSK Site 87) and former stables (RSK Site 88). The majority of the NIDL consists of wooded shelterbelts around open rolling pasture fields. A tree-lined walk lines the south bank of the River Nith. Both the Burns Hermitage and former stables are located within the wooded shelterbelts. There are few sightlines or designed vistas within the NIDL. There is an open view of the River Nith through a break in the tree cover to the northwest of the hotel complex. Formerly formal elements of the garden enclosed to the west of the hotel building are now overgrown and un-maintained. The settings of the LBs within the NIDL are defined by the extent of the NIDL itself, as depicted on Figure 9.2, and the NIDL's setting is considered to be the NIDL's boundary and views along the River Nith.

9.128 The Development would be largely masked by tree cover throughout the NIDL, with glimpses of blade tips possible from gaps in vegetation only (see Figure 9.8). The most open elements of the NIDL lie outwith the ZTV (see Figure 9.2). Considering the NIDL, the magnitude of impact is therefore considered to be negligible on a receptor of medium importance, leading to no significance of impact. No change is predicted on the setting of the LBs, which are of high importance. These are not significant impacts.

Cowhill Tower Inventory Designed Landscape (RSK Site 129) with associated Listed Buildings (RSK Sites 92 and 93).

9.129 Cowhill Tower HGDL is located on the southwestern bank of the River Nith. It is rated as having a high work of art, historical, horticultural and architectural importance by Historic Scotland, with some scenic and nature conservation importance. [34] The HGDL incorporates the Listed Buildings of Cowhill House and the house's former stables (RSK Sites 92 and 93, both Category B). The HGDL is private, and access could not be obtained during the site visit. The Historic Scotland entry for the garden identifies that the policies at Cowhill are largely screened from view from the surrounding area, although the woodlands provide some scenic interest both from the access road and

from across the River Nith. Cowhill Tower itself (RSK Site 92) is set above the Nith, with extensive views along the valley to the northwest and southeast. The setting of the HGDL and Cowhill Tower consists of the extent of the HGDL, along with sightlines to and from these receptors along the banks of the River Nith.

9.130 The nearest turbine would be located 5.5km to the north-northwest of the boundary of the HGDL. There would be oblique views of turbines from the LB looking along the valley to the northwest (see Figure 9.9), although vegetation and woodlands within the HGDL would provide screening of turbines that is not portrayed within the wireframe.

9.131 The house is set above the river with extensive views along the valley to north-west and south-east. When clear, the views to the south-west extend to the hills of the Lake District. Views into the designed landscape are limited by the policy woodlands which are themselves a feature in the surrounding flat landscape.

9.132 The magnitude of impact is considered to be negligible to the HGDL and house (RSK Sites 129 and 92), with no change to the stables (RSK Site 93), which are all of high importance. Therefore a slight significance of impact is predicted, as laid out in the assessment (Gazetteer in Appendix 9.1). These are not significant impacts.

Portrack House NIDL (RSK Site 124) and associated Listed Buildings (RSK Sites 106 and 120– 121).

9.133 Portrack House NIDL consists of gardens around an early nineteenth-century country house (RSK Site 120; a Category C(S) LB) and summer house (RSK Site 121; Category B). The tower house of Isle Tower (RSK Site 106) lies outwith the NIDL, but immediately to the northwest. The NIDL is private, and access could not be obtained during the site visit. Both Isle Tower and Portrack House lie to the southwest of the River Nith. The setting of the NIDL and Portrack House is delineated by the boundary of the NIDL. The setting of Isle Tower consists of the building's immediate surroundings, along with open views to and from the tower along the north bank of the River Nith.

9.134 There are uninterrupted views of the Development to the north from the driveway leading through the NIDL leading to Portrack house, with the nearest turbine located 4.9km away (see Figure 9.10). However, this is not an intended sightline for the garden or LBs, with Portrack House itself facing south-west towards the lawn and summer house (RSK Site A79). In terms of Isle Tower, which could not be visited, distant views of turbines to the north would not detract from the receptor's prominence within its immediate surroundings and from views along the River Nith.

9.135 Considering the NIDL, the magnitude of impact is therefore considered to be negligible on a receptor of medium importance. No change is predicted on Portrack House LBs (RSK Sites 120 and 121) and a negligible impact is predicted on Isle Tower (RSK Site 106), leading to a slight significance of impact on assets of high importance. These impacts are not significant.

Allanton House World Peace Sanctuary NIDL (RSK Site 125)

9.136 Allanton House is a non-Inventory Designed Landscape, consisting of a tree-lined avenue oriented northwest to southeast, mixed woodland forming the northwestern quarter of the NIDL, a walled garden, house and open pasture fields forming the eastern half of the NIDL. The setting of the NIDL consists of the extent of the NIDL itself, as identified in Figure 9.2, and open, more distant views to the southeast.

9.137 Turbine blade tips are visible from the open ground in front of the house within the NIDL (see Figure 9.11), with the nearest turbine located 3.6km to the northeast. There is no visibility of turbines along identified sightlines or key views from the garden, such as along the tree-lined avenue or from Allanton House looking south-eastwards.

9.138 The magnitude of impact is therefore considered to be negligible on a receptor of medium importance, leading to no significance of impact. This is not a significant impact.

Drumlanrig Inventory Garden and Designed Landscape (RSK Site 145)

9.139 Drumlanrig HGDL is located along both banks of the River Nith, with the formal gardens located to the southwest of Drumlanrig Castle, which forms the nucleus of the HGDL and is a Category A Listed Building. It is rated as having outstanding work of art, historical, horticultural, architectural, scenic and nature conservation importance. [35] An important sightline leads from and to Drumlanrig Castle along the avenue leading to it from the northeast. There are formally laid out gardens to the west, south and east of Drumlanrig Castle consisting of garden terraces, with the Castle itself facing south-southwest towards extensive mature mixed estate woodland plantation. At present, there are distant views to the southeast of the existing Dalswinton Wind Farm, located 15km away from the core of the HGDL. Therefore, the setting of the GDL is considered to be the extent of the GDL itself, with distant views to the Lowther Hills to the east also forming part of the setting.

9.140 Views of the Development are predicted (see Figures 9.2 and 8.11), with the nearest turbine located 12.8km to the southeast of the garden terraces. On a clear day, the new turbines would appear as an extension of the existing Dalswinton wind farm against the skyline. However, the focus of the HGDL is on the relationship between the formal gardens, Drumlanrig Castle, the extensive woodland plantations surrounding it and the Lowther Hills to the east, rather than on distant views south-eastwards (see Plates 10 and 11). Views within the woodlands, where there are extensive woodland walks, are likely to be masked.

9.141 The magnitude of impact is considered to be negligible on the HGDL, which is of high importance. Therefore, a slight significance of impact is predicted. This is not a significant impact.

Mitigation

Physical Impacts

9.142 The turbine and location of the Development installations has been devised to avoid impacts to known archaeological remains. In particular, Turbine 5 was moved to avoid direct impacts to RSK Site 39. Strategies for archaeological mitigation against physical impacts typically consider two options, these are:

- Preservation *in situ*: the preservation without disturbance of sensitive archaeological remains, this can be achieved through engineering solutions (e.g. foundation design) or amendments to the Development layout;
- Preservation by record (excavation): where preservation in situ is not feasible or desirable an alternative mitigation is pre-construction archaeological excavation. This consists of a detailed programme of archaeological fieldwork to preserve, by record, the archaeological value of the heritage asset.

9.143 Following implementation of a mitigation programme, physical archaeological impacts within the footprint of the Development would be fully neutralised. Accordingly there would be no residual physical impacts expected during the decommissioning phase.

Impacts on setting

9.144 The turbine layout has been through design iterations that have attempted to minimise visual impacts to designated heritage assets. Particular attention has been paid to reducing the impact to Mullach Hillfort (RSK Site 1) and Dalswinton HGDL (RSK Site 122).

9.145 No further mitigation with regards to impacts on setting is proposed.

Residual Impacts

9.146 During the operation phase of the Development, a moderate impact on the setting of Mullach Hill fort (RSK Site 1), and slight impacts are predicted on the setting of a further 11 monuments. Following decommissioning, these impacts on setting would be fully reversible, leaving no residual impacts. These impacts would be negated following decommissioning of the Development.

Cumulative Impacts

Physical Impacts

9.147 In terms of physical impacts during construction, the cumulative physical impacts of other developments would be no greater than that of each individual development on the archaeological resource. Following the implementation of appropriate mitigation in the case of each development, there would be a no significance of impact on the archaeological resource within the Site.

Impacts on Setting

9.148 The assessment of impact on setting has concluded no likely significant impacts on cultural heritage receptors located within 10km of the Development. A moderate, non-significant impact was predicted on RSK Site 1: Mullach hillfort,

9.149 For the purposes of this chapter, the existing Dalswinton wind farm has been considered as part of the environmental baseline for the Development. The Dalswinton wind farm Environmental Statement (ES) 36 concluded that there would be no significant impacts on the setting of protected sites within the vicinity of the wind farm. The existing Dalswinton wind farm is visible from the majority of the receptors discussed within this chapter, and is discussed in detail in the assessments to Mullach hillfort (RSK Site 1); Shaw's Moor cairnfields (RSK Sites 58 and 59); Whitestanes Moor (RSK Site 128); Ellisland Farm (RSK Site 86) and Drumlanrig (RSK Site 165).

9.150 In assessing potential cumulative impacts arising from other wind farms, the proposed Auchencairn wind farm (see Figure 8.28h) and consented Harestanes wind farm (see Figure 8.28e) were considered in detail. These two developments had the potential to cause a cumulative impact to receptors within Nithsdale, particularly to the north of the Site (e.g. Closeburn NIDL, RSK Site 127), and to the Whitestanes Moor ASA (RSK Site 128) to the east of the Site. These cumulative developments lie outwith the setting of the receptors, do not lie along any intended sightlines, and do not interfere with the visual relationship between receptors. Therefore no significant cumulative impacts on the settings of heritage receptors are predicted.

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[24] Yorstoun, A. 1978. Parish of Closeburn. In D. J. Withrington and I. R. Grant (eds) *The Statistical Account of Scotland: Volume IV: Dumfriesshire*: 53.

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[26] *Ibid*: 57.

[27] Mackey, E. C., M. C. Shewry and G. J. Tudor 1998. *Land Cover Change: Scotland from the 1940s to the 1980s.*

[28] David Matthews 2011 *pers. comm*.

[29] Davi David Matthews 2011 *pers. comm*.

[30] Based on Neilson, G. 1896 Repentance Tower and its tradition*. Transactions of the Glasgow Arrchaeological Society*. New Series Vol II: 356. and Royal Commission on the Ancient and Historical Monuments of Scotland 1920. Seventh report with inventory of monuments and constructions in the County of Dumfries. Edinburgh : H.M. Stationery Office: xxxii.

[31] Name as identified within the Act of 1481.

[32] Locations approximate, and based primarily on place-name evidence obtained during the preparation of this chapter.

[33] http://data.historic-scotland.gov.uk/pls/htmldb/f?p=2400:15:0:::GARDEN:GDL00131. Accessed on 19th October 2011

[34] http://data.historic-scotland.gov.uk/pls/htmldb/f?p=2400:15:0:::GARDEN:GDL00109. Accessed on 20th October 2011

[35] http://data.historic-scotland.gov.uk/pls/htmldb/f?p=2400:15:0:::GARDEN:GDL00143. Accessed on 20th October 2011.

[36] Entec UK Ltd 2003. *Dalswinton Windfarm: Environmental Statement*.

Proposed Turbine
Site Boundary
Existing Road to be upgraded
Proposed New Access Track
Crane Hard Standing
Proposed Construction Compound including Substation
Proposed Met Mast Location
1 Field Number
1km distance marker
Scheduled Monument
Garden and Designed Landscapes
Listed Building Category A
Listed Building Category B
Listed Building Category C
Conservation Areas
Non Inventory Garden and Designed Landscapes
Site

590000 N
589500 N
589000 N
588500 N
588000 N
587500 N
587000 N
586500 N
586000 N
585500 N
289500 E
290000 E
290500 E
291000 E
291500 E
292000 E
292500 E
293000 E
293500 E
294000 E
294500 E
295000 E
295500 E

Ayr
Dumfries
Carl

Rev	Date	Description	Drn	Chk	App
03	23.12.11	1km Constraints Plan	BF	MK	MK
02	02.12.11	1km Constraints Plan	BF	MK	MK
01	29.11.11	1km Constraints Plan	BF	MK	MK
00	24.10.11	1km Constraints Plan	BF	MK	MK

FORCE 9 ENERGY

Blackwood Wind Farm

RSK

Figure 9.1: Archaeological Constraints within Study Area A

SCALE: 1:20,000 @ A3 | REV 03

FILE NAME: P:\ENVIRONMENT\190000 - EIA Glasgow\P190282 Blackwood Wind Farm\08 GIS\ES Figure 9.1.Wor

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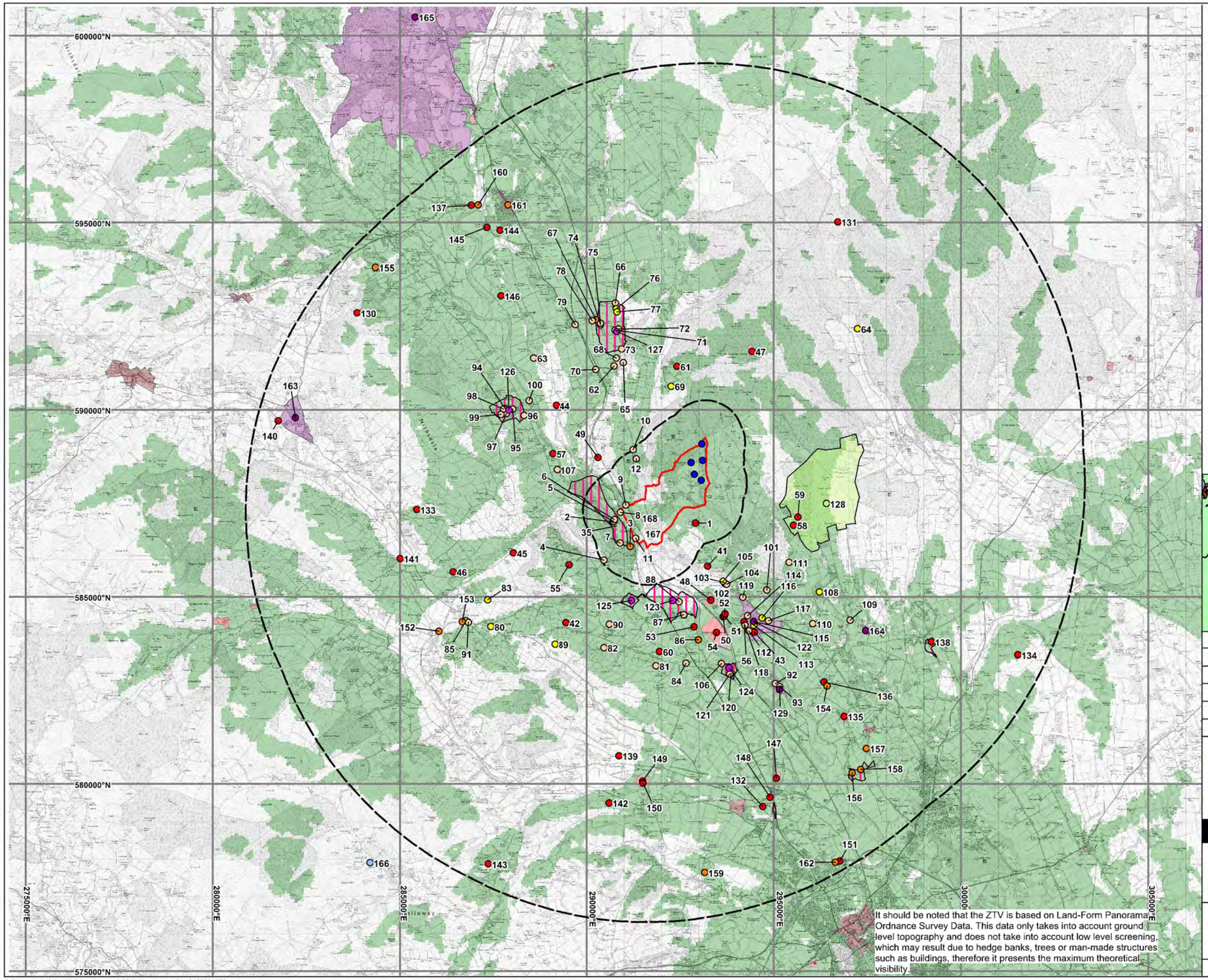

It should be noted that the ZTV is based on Land-Form Panorama Ordnance Survey Data. This data only takes into account ground level topography and does not take into account low level screening, which may result due to hedge banks, trees or man-made structures such as buildings, therefore it presents the maximum theoretical visibility.

Rev	Date	Description	Drn	Chk	App
00	24.10.11	Key visual heritage	BF	MK	MK

FORCE 9 ENERGY

Blackwood Wind Farm

RSK

Figure 9.2: Key visual heritage receptors

SCALE: 1: 100 000 @ A3 | REV 00

FILE NAME: P:\ENVIRONMENT\190000 - EIA Glasgow\P190282 Blackwood Wind Farm\08 GIS\Figure 9.2 and 9.3 .Wor

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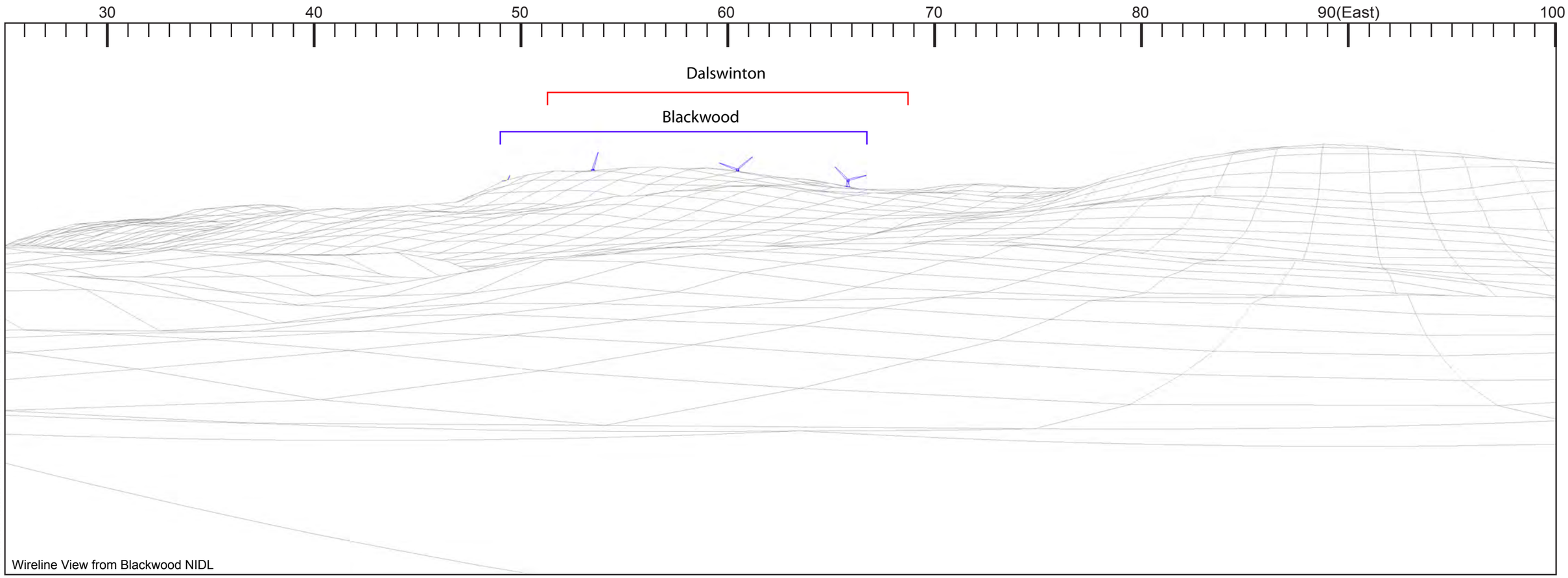


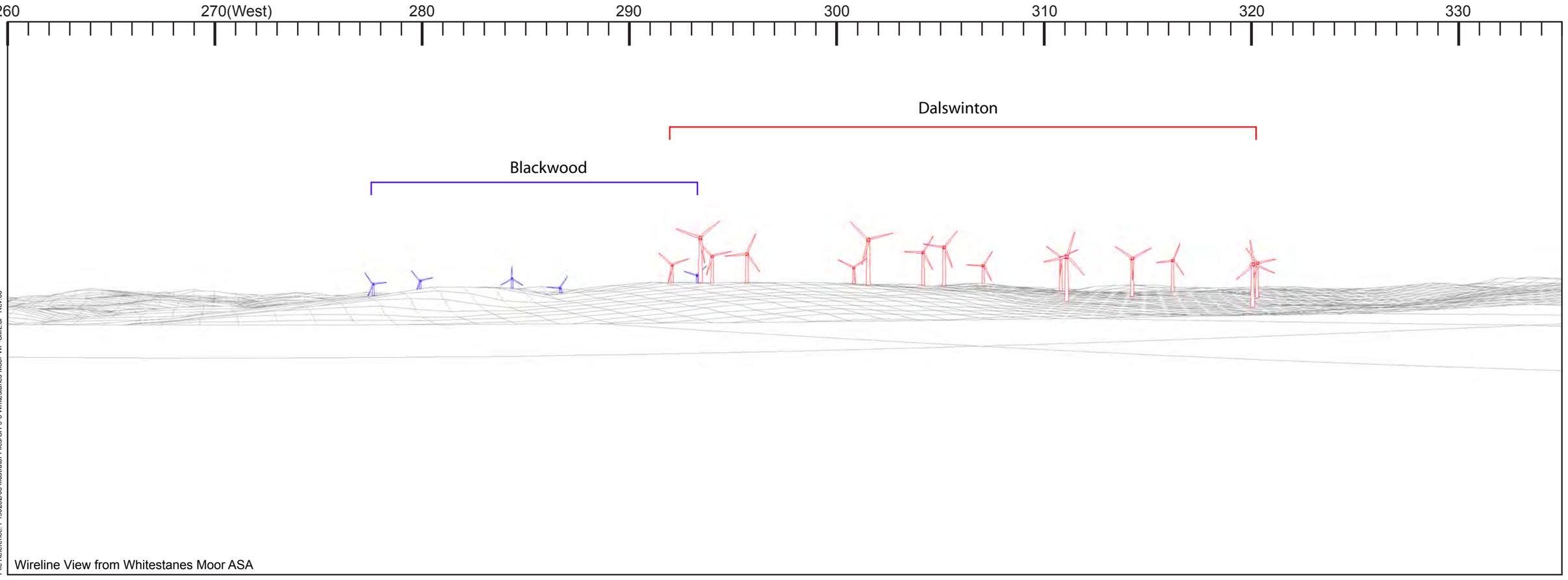
Wireline View from Blackwood NIDL

File Reference: P19\282\03 Illustrator Files\Ch 9-4 Blackwood WF-CML.ai Rev:00

RSK FORCE 9 ENERGY	Viewpoint Title : Blackwood NIDL	Included Angle of View : 75°	Number of turbine blade tips visible : 4
	NGR : 290740, 587070	Elevation : 37m	Number of turbine hubs visible : 2
	Direction of View : 62.5°	Distance to Development : 2.45km	Correct Viewing Distance : 30cm

Figure 9.4:
Blackwood NIDL
Cumulative Wireline

Blackwood Wind Farm



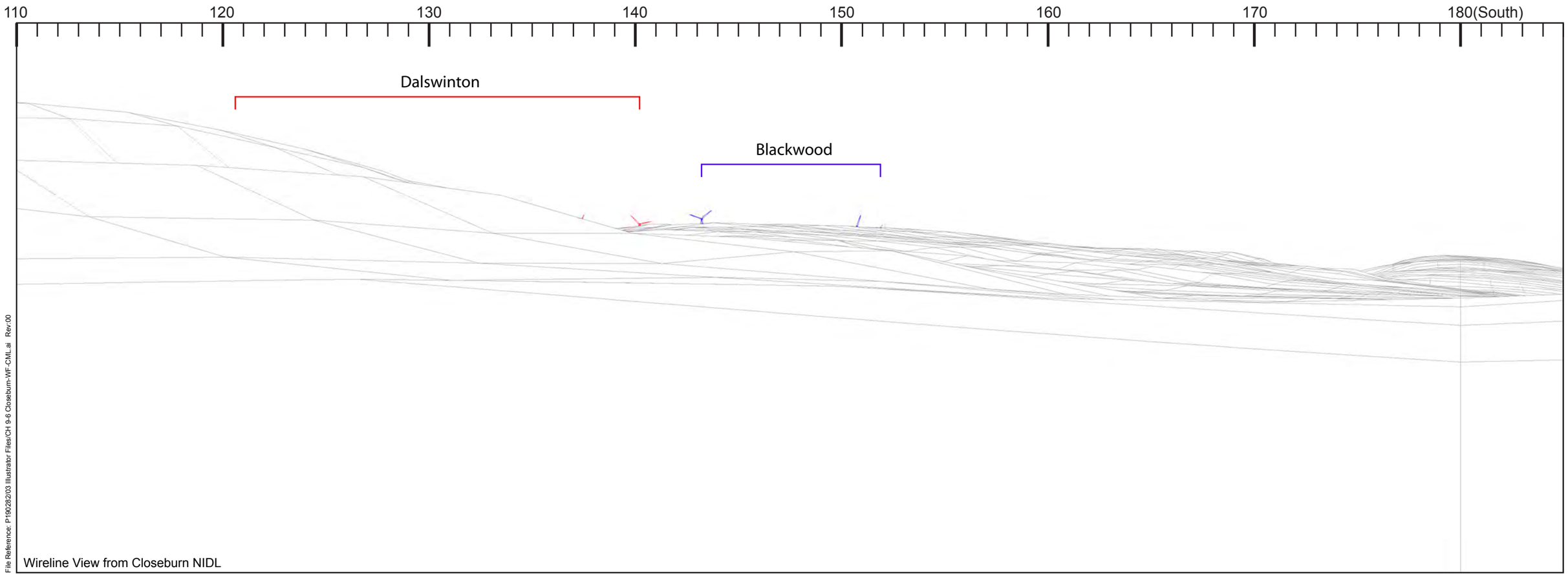
File Reference: P19O282/03 Illustrator Files/CH 9-5 Whitestanes Moor-WF-CML.ai Rev:00

Wireline View from Whitestanes Moor ASA

RSK FORCE 9 ENERGY	Viewpoint Title : Whitestanes Moor ASA	Included Angle of View : 75°	Number of turbine blade tips visible : 5
	NGR : 296390, 587670	Elevation : 251m	Number of turbine hubs visible : 5
	Direction of View : 297.5°	Distance to Development : 3.36km	Correct Viewing Distance : 30cm

Figure 9.5:
Whitestanes Moor ASA
Cumulative Wireline

Blackwood Wind Farm



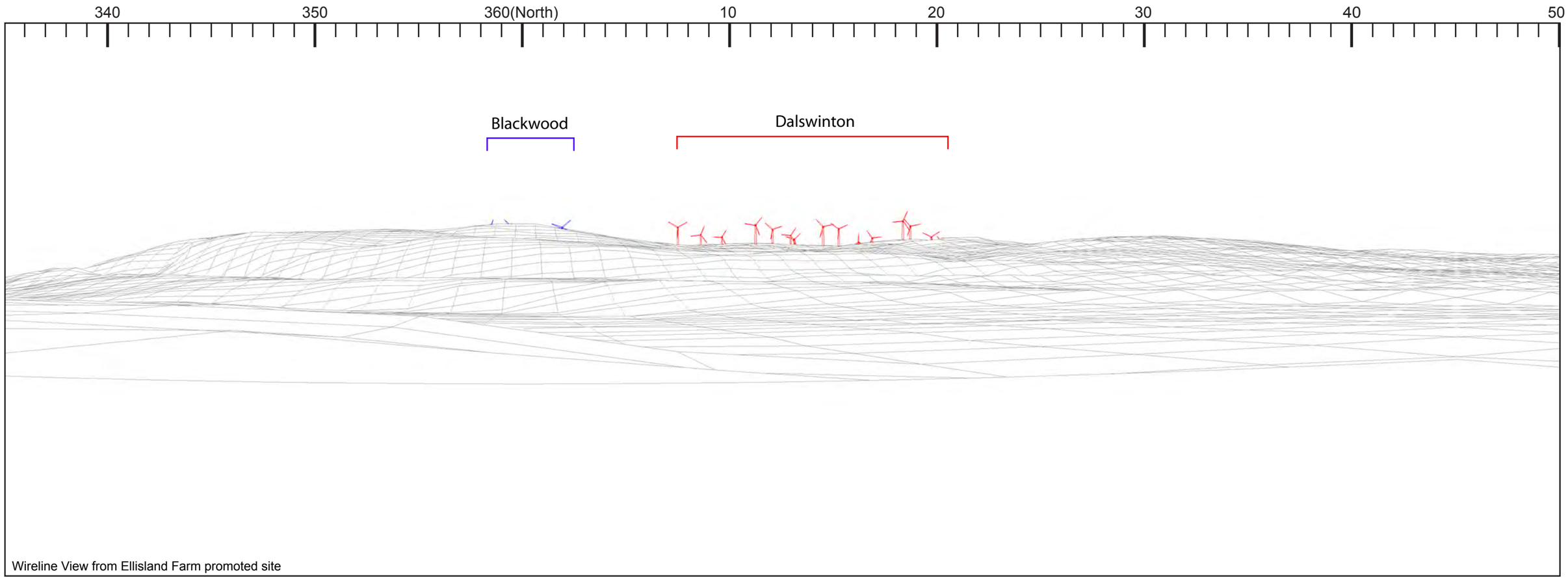
File Reference: P19\282\03 Illustrator Files\Ch 9-6 Closeburn-WF-CML.ai Rev:00

Wireline View from Closeburn NIDL

RSK FORCE 9 ENERGY	Viewpoint Title : Closeburn NIDL	Included Angle of View : 75°	Number of turbine blade tips visible : 3
	NGR : 290800, 592137	Elevation : 67m	Number of turbine hubs visible : 1
	Direction of View : 147.5°	Distance to Development : 3.8km	Correct Viewing Distance : 30cm

Figure 9.6:
Closeburn NIDL
Cumulative Wireline

Blackwood Wind Farm



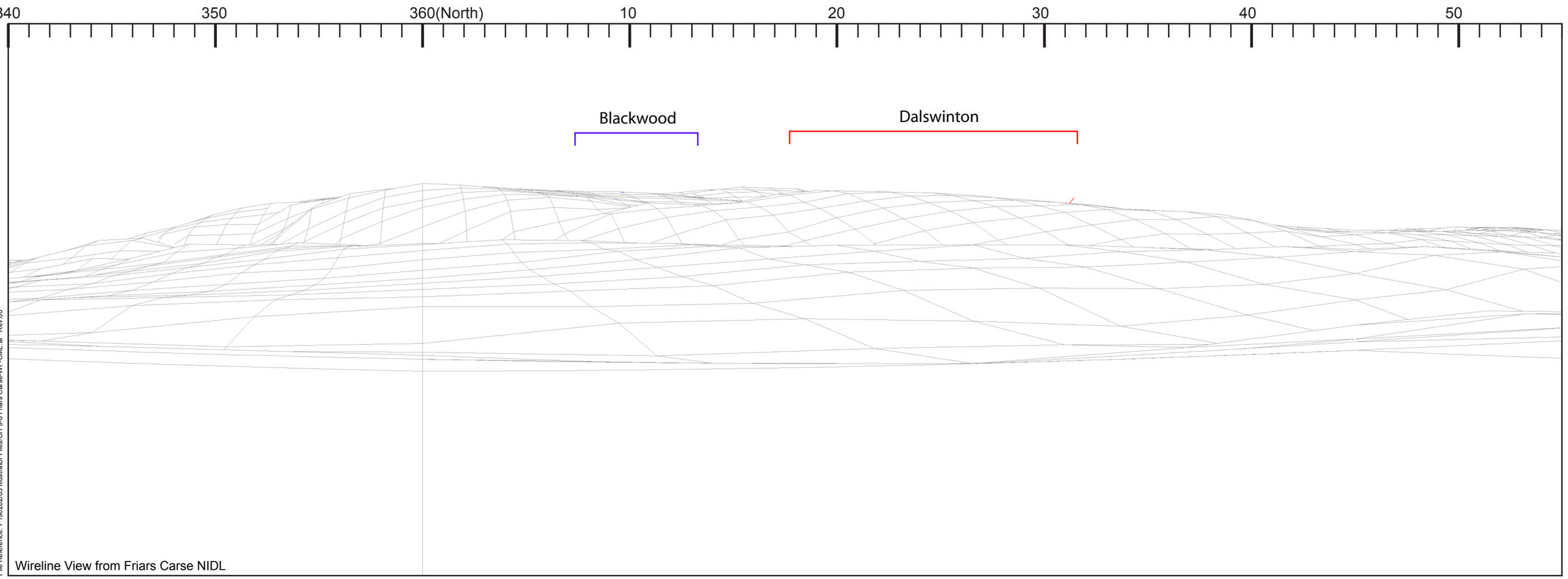
File Reference: P19O282/03 Illustrator Files/CH 9-7 Ellisland Farm-WF-CML.ai Rev:00

Wireline View from Ellisland Farm promoted site

RSK FORCE 9 ENERGY	Viewpoint Title : Ellisland Farm promoted site	Included Angle of View : 75°	Number of turbine blade tips visible : 5
	NGR : 290800, 583820	Elevation : 30m	Number of turbine hubs visible : 1
	Direction of View : 12.25°	Distance to Development : 4.23km	Correct Viewing Distance : 30cm

Figure 9.7:
Ellisland Farm
Promoted Site
Cumulative Wireline

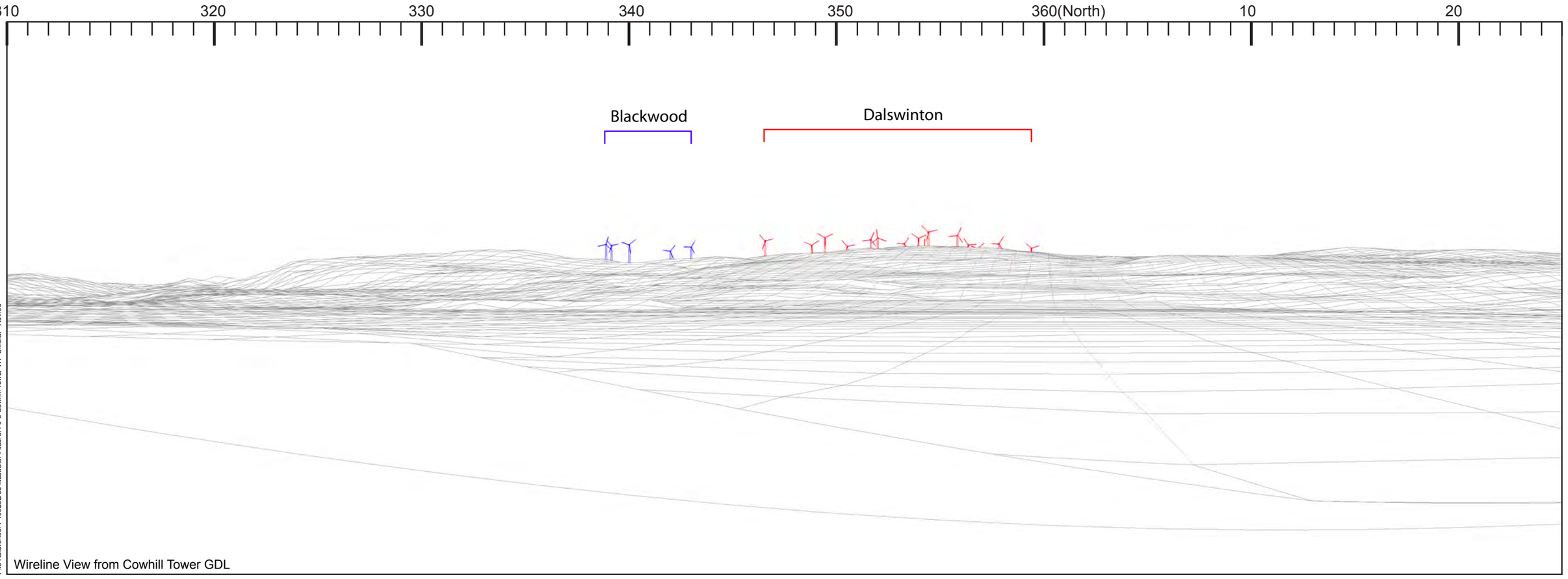
Blackwood Wind Farm



Wireline View from Friars Carse NIDL

File Reference: P19\282\03 Illustrator Files\CH 9-8 Friars Carse-WF-CML.ai Rev:00

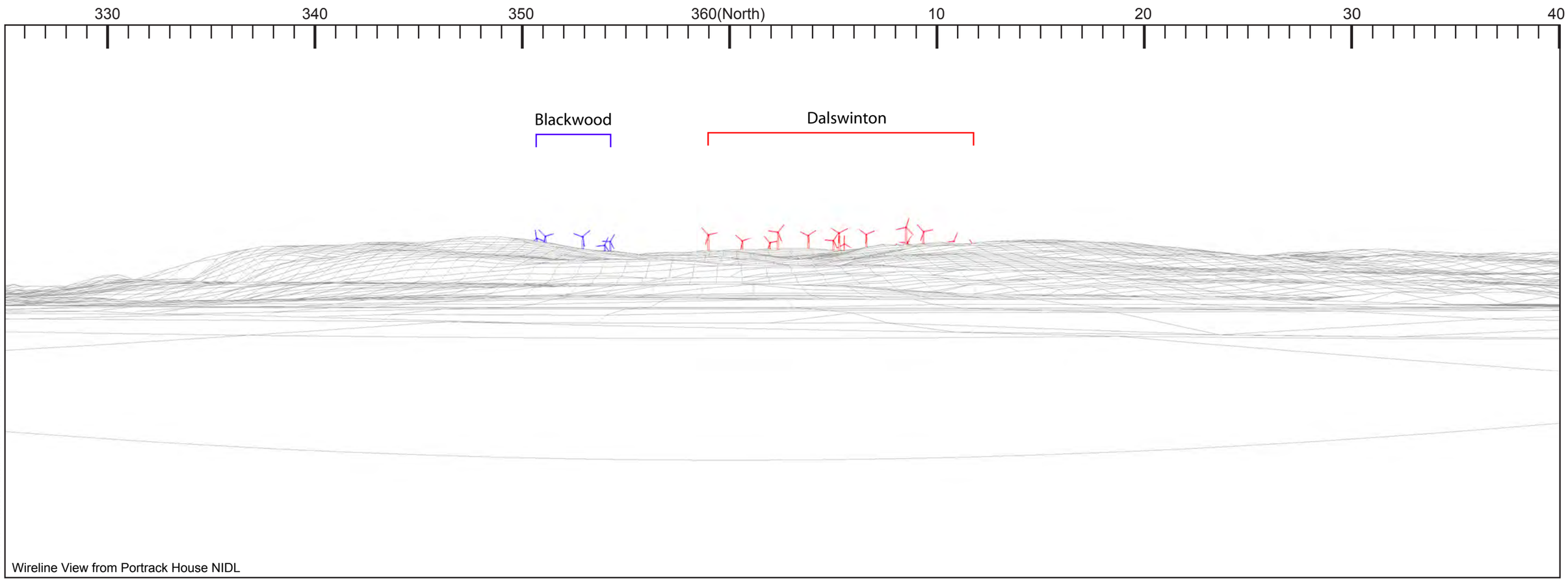
Viewpoint Title : Friars Carse NIDL	Included Angle of View : 75°	Number of turbine blade tips visible : 1	**Figure 9.8: Friars Carse NIDL Cumulative Wireline**
NGR : 292300, 584900	Elevation : 31m	Number of turbine hubs visible : 0	
Direction of View : 17.5°	Distance to Development : 3.3km	Correct Viewing Distance : 30cm	**Blackwood Wind Farm**



File Reference: P19O282/03 Illustrator Files/CH 9-9 Cowhill Tower-WF-CML.ai Rev:00

Wireline View from Cowhill Tower GDL

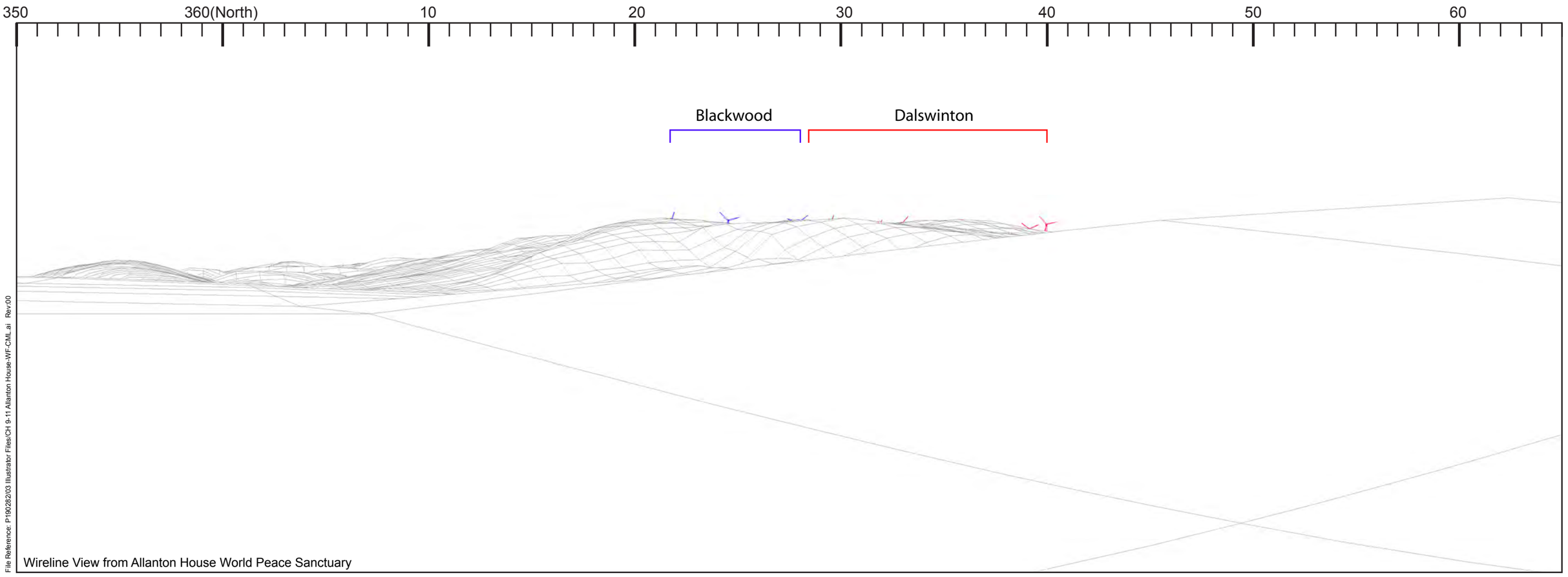
Viewpoint Title : Cowhill Tower GDL	Included Angle of View : 75°	Number of turbine blade tips visible : 5	**Figure 9.9: Cowhill Tower GDL Cumulative Wireline**
NGR : 295036, 582689	Elevation : 31m	Number of turbine hubs visible : 5	**Blackwood Wind Farm**
Direction of View : 347.5°	Distance to Development : 5.6km	Correct Viewing Distance : 30cm	



File Reference: P190282/03 Illustrator Files/CH 9-10 Portrack House-WF-CML.ai Rev:00

Wireline View from Portrack House NIDL

Viewpoint Title : Portrack House NIDL	Included Angle of View : 75°	Number of turbine blade tips visible : 5	**Figure 9.10: Portrack House NIDL Cumulative Wireline**
NGR : 293678, 583185	Elevation : 20m	Number of turbine hubs visible : 5	
Direction of View : 2.5°	Distance to Development : 4.97km	Correct Viewing Distance : 30cm	**Blackwood Wind Farm**



File Reference: P190282/03 Illustrator Files/CH 9-11 Allanton House-WF-CML.ai Rev:00

Wireline View from Allanton House World Peace Sanctuary

RSK FORCE 9 ENERGY	Viewpoint Title : Allanton House World Peace Sanctuary	Included Angle of View : 75°	Number of turbine blade tips visible : 3
	NGR : 291193, 584594	Elevation : 39m	Number of turbine hubs visible : 1
	Direction of View : 27.5°	Distance to Development : 3.99km	Correct Viewing Distance : 30cm

Figure 9.11:
Allanton House
World Peace Sanctuary
Cumulative Wireline

Blackwood Wind Farm

10 NOISE

Introduction

10.1 The Development has the potential to generate noise that might affect local residents. This chapter of the ES assesses the predicted noise emissions from construction, operation, and decommissioning of the Development against relevant standards and guidelines, and the existing background noise climate.

10.2 During construction, noise impacts would be temporary in nature and relate to both moving and static sources, e.g. construction traffic and items of plant. Assessment to British Standard methodology allows these temporary impacts to be understood and for suitable mitigation measures to be identified to minimise any potential adverse impacts.

10.3 When operational, wind turbines emit two types of noise: mechanical and aerodynamic. Mechanical noise from a modern wind turbine is negligible as the main sources of this noise are components housed within the nacelle, e.g. the gearbox and generator, and the nacelle is acoustically isolated to prevent structure borne noise. Aerodynamic noise occurs from the movement of the turbine blades passing through the air. At high wind speeds, aerodynamic noise is usually masked by the increasing sound of wind blowing through trees and around buildings. Other, non-wind related sources can also mask turbine noise, e.g. road traffic and flowing water in streams or rivers. The level of masking determines the perceived audibility of the wind farm. The noise impact assessment establishes the relationship between wind turbine noise and other masking noise within the environment and assesses levels against established standards.

Policy and Legislation

10.4 Relevant national, regional and local planning policy is discussed in ES Chapter 4: Planning.

Construction

10.5 Guidance to assess noise from construction is set out in BS 5228-1:2009, "Code of practice for noise and vibration control on construction and open sites".[1] BS 5228-1 contains methodology for predicting noise levels arising from items of mobile plant using haul roads, and details methods of reducing noise emissions from construction sites. The standard contains an updated resource of noise reference data for a wide range of site plant and activities. This data incorporates that published previously by DEFRA[2].

Operation

10.6 Scottish planning policy advice in respect of noise is provided by Planning Advice Note 1/2011 "Planning and Noise"[3] (PAN 1/2011). In relation to onshore Wind Farms, PAN 1/2011 states that an online update[4] should be followed when assessing noise from onshore wind farms. The update states that:

"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 asses 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 suggests appropriate noise conditions", and

"The most conclusive summary of the implications of low frequency Wind Farm noise for planning policy is given by the UK Government's statement regarding the findings of the Salford University report into Aerodynamic Modulation of Wind Turbine Noise. The report concludes that there is no evidence of health effects arising from infrasound or low frequency noise generated by wind turbines."

10.7 Since the publication of ETSU-R-97[5], additional advice has been presented in the Institute of Acoustics Bulletin ('IOA Bulletin')[6], which clarifies preferred modelling parameters and an updated methodology for predicting windshear during noise monitoring.

Method of Assessment

Noise Terminology

10.8 The following section provides an overview of the scale and indices used to measure noise, and an explanation of the terminology that is used in the assessment of wind farm noise, specifically tonal noise and wind shear.

10.9 A logarithmic scale, the decibel (dB) scale, is used in noise level measurement, and relates to the fluctuations in air pressure caused by sound waves. The logarithmic scale is used as the ear is able to detect an extremely wide range of pressure changes. Noise is made up of a number of different frequencies of sound waves, and the ear does not 'hear' all frequencies identically, as it has adapted to be more sensitive to the frequencies most used for speech. This response pattern is taken into account during environmental noise studies by using the 'A weighting', which provides a good representation of the performance of the human ear and has been found in many international studies to relate well to human response to noise. The use of the A weighting is notated as dB(A).

10.10 Typical dB(A) noise levels for familiar noises are given in Table 10.1.

Table 10.1 Typical Noise Levels

Noise level at source (dB)	Example
0	Limit of hearing
35	Quiet Bedroom
50	Ordinary Conversation

Noise level at source (dB)	Example
60	Busy general office
95	Pneumatic drill
140	Threshold of pain
Source: Adapted from Planning Advice Note 1/2011, Scottish Government, March 2011	

10.11 The following indices are used when describing noise:

- L_w is the sound power level and the L_{WA} is the A-weighted sound power level. These are used to quantify the amount of energy emitted by a source as noise;
- L_p is the sound pressure level and used to describe the noise level at an instant in time. If a noise level is not continuous, the sound pressure level can vary significantly over time;
- $L_{eq,\ T}$ is the equivalent continuous sound level over time 'T' and can be considered to be the 'average' noise level. The $L_{Aeq,T}$ is the A-weighted equivalent continuous sound level;
- $L_{A90,\ T}$ index represents the noise level exceeded for 90% of the time-period T and is used to indicate quieter times during the measurement period. It is often used to measure the background noise level and is used within the UK to assess noise from wind turbines. The $L_{A90,\ T}$ is the A-weighted background noise level; and
- L_{Amax} is the A-weighted maximum recorded noise level during the measurement period.

10.12 The ETSU-R-97 guidance includes a specific definition of tones in relation to wind farm noise. Wind turbines typically emit noise over a wide spectrum of frequencies, but the situation can arise when tones are generated. In broad terms, noise generated by a turbine is tonal if a specific pitch of noise is audible over the general wide spectrum noise. Modern turbines are carefully designed to minimise the occurrence of such tones. The assessment point for defining tonality of a wind turbine noise is at the receptor.

10.13 The noise assessment requires consideration of local ground conditions, since noise transmitted will be absorbed or reflected by the ground to a different degree according to surface conditions. The following descriptors are applicable to the assessment:

- Hard Ground – a ground cover which includes paving, water, ice, concrete and all other ground surfaces that are 'good' reflectors of noise;
- Soft Ground – ground cover which includes ground covered by grass, trees or other vegetation, and all other ground surface suitable for the growth of vegetation, such as farming land. These surfaces are 'poor' reflectors of noise; and
- Mixed ground – the surface consists of both hard and soft (porous) ground.

10.14 Noise levels from the same source at the same distance will be less if the intervening ground is soft compared to if the intervening ground is hard. This is because some of the noise will be absorbed by the 'soft' features (e.g. vegetation)

10.15 A final non-acoustic descriptor used in this assessment is wind shear. Wind shear is used to describe the variance of wind speed with height, as normally wind speeds are lower closer to the ground because the air flow near the ground is obstructed by topography, trees and buildings. The wind shear at a location is defined by a coefficient which can be used to convert the wind speed measured at one height to the wind speed at another height.

Scoping Exercise

10.16 The Environmental Impact Assessment (EIA) Scoping Report included a noise section with a methodology for undertaking the baseline noise survey and the subsequent assessment of predicted noise levels at identified sensitive receptors.

10.17 In order to identify receptors requiring further investigation, a noise model was produced with the 35 dB(A) L_{A90} noise contour plotted for the 10m/s wind speed (unless otherwise stated, levels within this chapter refer to the L_{A90} background level index). This identified properties within the 35dB(A) contour where noise limits might be exceeded as a result of the Development, and which were proposed for further consideration. This method is suggested within ETSU-R-97, which states that a noise limit of 35 dB(A) *"would offer sufficient protection of amenity".*

10.18 The following consultation responses were received in relation to the noise section of the Scoping Report.

Dumfries and Galloway Council

10.19 The Environmental Protection team at Dumfries and Galloway Council (DGC) was consulted regarding the methodology used to undertake this assessment and no changes were necessary to the methodology set out in the scoping report. In addition, an officer from DGC attended during installation of the baseline noise monitoring equipment and agreed that the locations chosen were suitable to obtain representative measurements.

Thornhill Community Council

10.20 Thornhill Community Council (TCC) requested that a number of residential receptors be considered outside of the 35 dB(A) scoping noise contour. The assessment has accordingly considered these additional residents.

10.21 TCC also stated that the Nith valley has 'unique acoustics' that should be considered in the EIA. TCC cited occasions when shooting noise travelled several miles down the valley. It is considered that the shooting noise (a high level impulsive noise) was able to travel so far on these occasions as it was likely to have been generated close to the bottom of the valley and reflected from the valley sides as it travelled along the valley. In addition, if the valley was filled with cold air, there could potentially have been an 'inversion layer' above the valley, at the boundary of the cold air and warmer air above. Shooting noise may also have reflected off such an inversion layer. However, wind turbine noise would be much quieter than the shooting activities and the source of the noise would be well above the valley sides. As such, it is considered highly unlikely that the valley would affect the propagation of noise from the wind turbines other than

through the attenuation of noise via topographical screening and ground absorption. On this basis this issue has not been considered further in the assessment.

10.22 The following aspects of noise and vibration have been scoped out of the assessment as they are not considered to have the potential to cause significant noise and/or vibration for the reasons stated:

- Vibration due to construction works (due to the large distances between areas of construction works and sensitive buildings);
- Vibration due to operation (as wind turbines do not generate significant levels of ground-borne vibration);
- Traffic-related noise changes during operation (traffic generated would be limited to occasional maintenance visits as stated in Chapter 11: Transport and Access); and
- The construction and operation of the substation as its proposed location would be a sufficient distance from the nearest receptor (1,100 metres to the south-east of the proposed substation location) that it would not be a potential source of noise.

10.23 The assessment has considered all impacts associated with the Development as described in Chapter 3. The route and nature of the grid connection does not form part of the planning application and is yet to be finalised so has not been assessed here. The applicant's preference is for the grid connection cables to be located in trenches in roadside verges; it is not anticipated there would be any significant environmental impacts associated with this option. However, the line would be considered in more detail and subject to environmental assessment by the Distribution Network Operator (DNO) prior to a formal application for this element of infrastructure. The scope of any such assessment would be agreed with DGC.

10.24 The following descriptions summarise the assessment approach. Further detail is provided in Appendix 10.1.

Construction Assessment

10.25 The assessment of construction noise has been undertaken with reference to BS 5228. BS 5228 Part 1 does not specify absolute daytime noise limit levels from construction sites, as these are best determined according to local conditions. It does, however, provide two methods of assessment and details the key factors that might affect the acceptability of noise and vibration from construction sites. These factors are:

- Site location;
- Existing ambient noise levels;
- Duration of site operations;
- Hours of work;
- Attitude to site operator; and
- Noise and vibration characteristics of the work.

10.26 In order to calculate changes in traffic noise from the A76 as a result of construction activity, the methodology in the Department of Transport technical memorandum "Calculation of Road Traffic Noise" (CRTN)[7] 1988 has been used. CRTN is widely

accepted as the relevant guidance document for the prediction of noise from road vehicles using the public highway. However, CRTN states that the calculation methodology for traffic flows below 50 vehicles per hour is unreliable. As such a different approach is required for the assessment of construction traffic noise along the access route within the Site (the unclassified road between Auldgirth and High Auldgirth is predicted to carry less than 50 vehicles per hour, as set out in Chapter 11: Traffic and Transport). The BS 5228 methodology has been used to calculate traffic noise generated along this route.

10.27 This method defines an impact as 'significant' (as defined by BS 5228) if the pre-construction ambient noise level plus construction noise exceeds the pre-construction ambient noise by 5 dB or more, subject to minimum limits of 65, 55 and 45 dB(A) for day, evening and night-time periods.

Operational Assessment

ETSU-R-97

10.28 The assessment within this chapter has followed the methodology within ETSU-R-97 and the most recent advice within the IOA Bulletin Article. The IOA Bulletin Article was prepared by a number of noise consultants who act on behalf of both developers and opponents of wind farms, many of whom sat on the ETSU Noise Working Group The document clarifies preferred modelling parameters and provides an updated methodology for predicting wind shear during noise monitoring.

10.29 The ETSU-R-97 assessment methodology takes into account the fact that noise emissions from wind farms varies with wind speed, as measured at the Site. Background noise levels ($L_{A90,10min}$) are measured at representative sensitive receptor locations. For each 10-minute baseline noise level measurement the simultaneous wind speed and direction are recorded on the Site. A subsequent plot of the background noise level against wind speed allows the trend in noise level with wind speed at the receptor to be determined by fitting a single line to represent the relationship between wind speed and background noise level ('curve fitting' the data).

10.30 ETSU-R-97 states that the noise limits should relate to the cumulative effect of all wind turbines in the area contributing to noise at receptors. Therefore, the predicted noise from the Development is assessed with noise emission contributions from the adjacent operational Dalswinton Wind Farm within the cumulative impact assessment within this chapter. The Auchencairn Forest Wind Farm is currently the subject of a planning application and is also included in the cumulative assessment within this chapter. Figure 10.1 shows the location of the Development in relation to the adjacent Dalswinton and proposed Auchencairn Forest Wind Farm.

Identification of Receptors and Noise Monitoring

10.31 The 10m/s wind speed noise contour plot for the Site is presented on Figure 10.2, together with the properties located within (or close to) the area where noise levels are predicted to exceed 35 dB(A).

10.32 In consultation with DGC, it was determined that two monitoring locations (High Auldgirth and Shield Hill) could be used to obtain representative noise data for the receptor locations. The identified receptors are set out in Table 10.1, which also includes the reasons for considering which background monitoring location was representative of the background noise levels at each receptor. Receptors outside of the 35 dB(A) noise contour were retained in response to the request by TCC.

10.33 ETSU-R-97 states that existing wind farms should not be considered as part of the prevailing background. Therefore, at properties close to the nearby operational Dalswinton Wind Farm i.e. the Pennyland and Shaws receptors, data from the Noise Assessment reported in the Dalswinton Wind Farm ES has been used to define the noise limit curve. This ensures that this assessment uses the baseline data collected before the construction (and operation) of the Dalswinton Wind Farm. Apart from the Dalswinton wind farm, there have been no changes to noise sources around these two properties and therefore noise levels measured for the Dalswinton ES can be considered to be representative of baseline levels in the absence of wind turbine noise.

10.34 The Dalswinton noise limit curves were derived based on wind speed data measured at the Dalswinton wind farm site. If the wind speed at Dalswinton is significantly different from the simultaneous wind speed at the Site, there would be potential for the limit curves for Pennyland and Shaws to be unrepresentative of the relationship between wind speed (and consequently turbine noise emissions at Blackwood), and the background noise level. If simultaneous wind speeds were lower at Blackwood than Dalswinton, Blackwood turbine noise emissions would be underestimated within the assessment.

10.35 Wind modelling has been undertaken by Force 9 Energy of simultaneous wind speeds on the two wind farm sites under a range of wind speeds and directions. The results of the modelling indicate that on average, simultaneous wind speed variance between Blackwood and Dalswinton is around +/- 0.2 m/s (for the turbine operating range). The maximum variances have been modelled as +/- 1.0m/s. Further information on the wind modelling process is provided in Appendix 10.2

10.36 It was noted within the Dalswinton ES that the noise levels measured at Pennyland were unusually high. The noise survey was repeated for the Dalswinton ES in order to eliminate the possibility of equipment error. The noise levels from the second survey were also high and therefore equipment error was ruled out as was low frequency contribution and electromagnetic interference. The report concluded that the background noise levels were therefore representative. The measured levels were subsequently used by the local authority to define Dalswinton turbine noise limits at this location and as such, are considered suitable for use within this assessment.

Table 10.2 Noise Receptors and Background Noise Monitoring Locations

Receptor	Background Data Used	Reasoning
R1 Auchencairn	Auchencairn Forest ES Data	This receptor is outside the 35 dB modelled level at all assessed wind speeds. For information purposes it is included, utilising background noise measurements presented within the ES for the Auchencairn Forest ES.
R2 Shield Hill	Shield Hill	This receptor is outside the 35 dB modelled level at all assessed wind speeds. For information purposes it is included. Noise measurements have been undertaken at this location.
R3 Clauchrie	High Auldgirth	This receptor is outside the 35 dB modelled level at all assessed wind speeds. For information purposes it is included, utilising background noise measurements at Shield Hill as a representative measurement location based on proximity.
R4 Cairn Farm	High Auldgirth	This receptor is outside the 35 dB modelled level at all assessed wind speeds. For information purposes it is included, utilising background noise measurements at High Auldgirth as a representative measurement location based on proximity.
R5 High Auldgirth	High Auldgirth	This receptor is within the 35 dB modelled level at 6m/s wind speeds and above. Noise measurements have been undertaken at this location.
R6 Pennyland	Pennyland (data collected prior to construction of Dalswinton Wind Farm)	This receptor is within the 35 dB modelled level at 5m/s wind speeds and above. Due to the proximity of the existing Dalswinton Wind Farm, the background levels for this location are based upon previous noise monitoring undertaken for, and prior to the development of, the Dalswinton Wind Farm.
R7Shaws	Shaws (data collected prior to construction of Dalswinton Wind Farm)	This receptor is within the 35 dB modelled level at 6m/s wind speeds and above. Due to the proximity of the existing Dalswinton Wind Farm the background levels for this location are based upon previous noise monitoring undertaken for, and prior to the development of, the Dalswinton Wind Farm.

10.37 The baseline noise survey was undertaken from 21 September to 11 October 2011. Photographs of the long-term measurement locations are shown in Appendix 10.3 and calibration certificates for the sound level meters are provided in Appendix 10.4. As required by ETSU-R-97 10-minute L_{A90} noise levels were measured until sufficient noise data at various wind speeds and directions were collected.

10.38 Meteorological data was recorded by a 'SODAR' system, which measures wind speed and direction at various heights to enable wind shear to be calculated. In addition, the 'SODAR' recorded rainfall and temperature data.

Definition of Turbine Noise Limit

10.39 In order to calculate noise limits, the background noise data for the ETSU-R-97 'daytime amenity' and 'night time' periods were plotted against the wind speed at 10m height.

10.40 Regression analysis of the data is undertaken to derive background noise level, at successive integer wind speeds, and the data has been used to define noise limits, as recommended in ETSU-R-97 and shown in Table 10.3. ETSU-R-97 defines limits for daytime amenity hours and night-time. The 'daytime amenity' period covers evenings and weekend daytimes and represents those times when the population is most likely to using external areas of their properties e.g. gardens for leisure.

Table 10.3: ETSU-R-97 Noise Limit Criteria

Period	Time of Day (24 hour clock)	Recommended Noise Limit
Night-time	2300 – 0700 hours	43 dB(A) or 5 dB(A) above the prevailing night-time background noise whichever is the greater
Amenity Hours Quiet day time	1800 – 2300 hours evenings 1300 – 1800 hours on Saturdays 0700 – 1800 hours on Sundays	35-40 dB(A) or 5 dB(A) above the prevailing quiet daytime background noise which ever is the greater. The fixed minimum limit depends on the number of dwellings in the neighbourhood, effects of limit to power generation, the duration and level of noise exposure.

10.41 The lowest daytime amenity limit of 35 dB(A) has been used to calculate minimum fixed noise limits as a worst-case, although there are relatively few properties exposed , existing noise levels are below 30 dB(A) for a substantial portion of the time.

10.42 Wind farm noise assessment is part of the overall design process for the wind farm, the aim of which is to achieve a design from which noise emissions meet limits derived following the approach given in ETSU-R-97 *The Assessment and Rating of Noise from Wind Farms*. The overall design of the wind farm, and in particular the layout of the turbines, is chosen to ensure that necessary operational noise limits are met and no mitigation measures are necessary.

Operational Noise Modelling

10.43 In line with the IOA bulletin article, the turbine noise models within this assessment use the algorithm set out within ISO 9613-2 *Acoustics* - Attenuation *of sound during propagation outdoors.* This algorithm was found to be the most robust prediction method of wind turbine noise by a Joint European Commission research project into wind farm noise over large distances. The research found that the ISO 9613-2 algorithm would be likely to over-estimate noise levels at nearby dwellings, but the results it produced are good representations of noise levels at a dwelling when the wind direction is blowing from the turbine towards the dwelling. In conditions when the wind is blowing from the dwelling towards the turbine, the noise level predicted by the ISO 9613-2 algorithm is as much as 10-15 dB(A) above the actual noise level.

10.44 The models take in to account the following parameters

- Geometric divergence (attenuation with distance);
- Air absorption;
- Barriers (including buildings or topography);

- Screening (including vegetation); and
- Ground absorption and reflection.

10.45 The turbine sound power levels used in the assessment are discussed later in this section and are detailed in Table 10.10. The frequency spectrum for each turbine model considered within this assessment is detailed in Table 10.11 and Table 10.12. The spectrum was determined at a wind speed of V_{10} = 8 ms^{-1}.

Baseline Environment

Noise Environment at Monitoring Locations

High Auldgirth, 291921 589876

10.46 At the time of the initial visit (installing noise monitoring equipment), the weather was dominated by strong winds and rain. Other sources of noise expected during the noise survey (but not identified while installing or decommissioning the noise equipment) would include any activity at the shooting range and small numbers of passing vehicles visiting the houses at High Auldgirth or passing along the track into the "Cow Cleugh" woodland and Knocknutshell to the east.

Shield Hill, 292182 587777

10.47 At the time of the initial visit, the weather was dominated by strong winds and rain. The exposed nature of the dwelling implies that wind noise is likely to be a common occurrence. Vehicles using the A76 were also audible at Shield Hill.

Derivation of noise limits

10.48 Noise data from the most appropriate monitoring location (see Table 10.2) has been used to derive regression curves for the background, L_{A90} noise level at each sensitive receptor (with the exception of Pennyland and Shaws). The curves for each monitoring location are presented in Appendix 10.5.

10.49 Noise limits have been defined using ETSU-R-97 methodology. In order to ensure that cumulative noise from the Development and the Dalswinton turbines do not exceed ETSU-R-97 limits, noise levels from the Dalswinton turbines (calculated using the methodology set out in the 'operational impacts' section later in this chapter) have been logarithmically subtracted from the limits to provide limits for the Development alone. These limits would be suitable for use within a Planning Condition. The derived limits at each windspeed at each receptor are presented in Table 10.4 and Table 10.5. It may be noted that some of the limits in Tables 10.4 and 10.5 are below the ETSU R-97 minimum limits. This is because the limits have been corrected to ensure that cumulative noise levels from both the Blackwood and neighbouring Dalswinton wind farms do not exceed the ETSU R-97 limits.

10.50 At Pennyland and Shaws, identical background curves and limits to those presented in the Dalswinton ES have been used within this assessment. This ensures that the ETSU R-97 requirement to consider background noise levels in the absence of wind farm noise is met.

Table 10.4: Derived Daytime Noise Limits (dB LA_{90})

Wind Speed	Receptor						
	1 Auchencairn*	2 Shield Hill	3 Clauchrie	4 Cairn Farm	5 High Auldgirth	6 Pennyland***	7 Shaws*
5	34.6	38.8	38.7	36.2	35.8	49.2	36.1
6	37.0	40.7	40.6	37.4	36.8	50.4	34.5
7	40.2	42.7	42.7	38.7	38.3	51.8	36.1
8	43.6	44.8	44.8	40.2	39.9	53.2	38.2
9	46.8	46.9	46.9	41.6	41.4	54.6	39.9
10	49.8	49.1	49.0	43.1	42.9	56.1	41.3
11	52.4	51.2	51.2	44.6	44.4	57.5	42.6
12	54.2	53.4	53.4	46.1	46.0	58.9	43.8

*Taken from Auchencairn Wind Farm ES

** Taken from Dalswinton ES

Table 10.5: Derived Night-time Noise Limits (dB L_{A90})

Wind Speed	Receptor						
	1 Auchencairn*	2 Shield Hill	3 Clauchrie	4 Cairn Farm	5 High Auldgirth	6 Pennyland**	7 Shaws**
5	42.9	43.0	42.9	42.9	42.9	42.8	42.2
6	42.8	42.9	42.9	42.9	42.8	43.7	41.4
7	42.7	42.9	42.8	42.9	42.7	45.5	41.1
8	42.7	42.9	42.8	42.9	42.7	47.3	41.1
9	42.7	42.9	42.8	42.9	42.7	48.9	41.1
10	42.7	44.0	44.0	42.9	42.7	50.5	41.1
11	42.7	45.7	45.7	43.7	43.6	52.0	41.1
12	42.7	47.5	47.5	45.8	45.7	53.5	42.2

*Taken from Auchencairn Wind Farm ES

** Taken from Dalswinton ES

Project Characteristics

10.51 The characteristics of the Development, which includes a level of 'embedded mitigation', are set out in Section 3, Project Description. Further noise specific detail on the 'embedded mitigation' to be included during the construction and operational phases of the Development is provided in the following sub-sections.

Construction

10.52 It is anticipated that the construction of the Development would involve several stages. These are as follows:

- Preparation of site and access routes to turbine locations including construction of new sections of access track;
- Excavations for Borrow pits (including crushing of stone) and turbine and lifting pad foundations;
- Construction of turbine and lifting pad foundations;
- Dewatering of foundation areas;
- Assembly of turbines;
- Cable trenches and installation of cables to the substation building; and
- Minor forestry clearance to allow widening of existing access tracks and construction of some of the turbines and sections of new access tracks.

10.53 Piling would not be required for the Development as the turbines would be supported on concrete foundations directly on bedrock.

Embedded Mitigation during Construction

10.54 The construction work would be undertaken during daytime hours i.e. 07:00 – 19:00 (as stated in Chapter 3 Project Description), although there may be specific activities that require continuous 24-hour operation of plant, such as de-watering of excavations. Where absolutely necessary, any 'out of hours' working would be planned and agreed in consultation with the local DGC Environmental Protection team.

10.55 The mitigation measures below would be included in a Construction Project Environmental Management Plan (CEMP) adopted by the project to control noise impacts. The CEMP would be implemented during the works and take account of the following:

- The proper use of such plant with respect to minimising noise emissions;
- The proper maintenance of plant, including plant housings and silencers;
- The selection of inherently quiet plant, and use of enclosures and screens around noisy fixed plant;
- The use of plant with super-silenced exhausts, where possible;
- The use of site hoardings, where appropriate to provide up to 10 dB of acoustic protection via screening effects, provided they are of suitable construction and properly installed;
- Where possible, placing noisy plant as far as possible from sensitive receptors;
- Informing local residents and the DGC Environmental Protection Department when particularly noisy or potentially disturbing operations are planned;
- Appointing an Environmental Liaison Officer to deal with noise and other environmental matters; and
- Preferred working hours to be agreed with DGC.

10.56 It is planned to excavate material from Borrow Pits within the site boundary. Due to the geology of the area, blasting would be required to excavate the pits. There is potential for blasting to cause short term disturbance to local residents, but this would be mitigated against through the use of a blasting noise and vibration management plan, to be agreed with the DGC Environmental Protection Department and included in the CEMP. The plan is likely to include limits on noise, vibration and air overpressure, and

is also likely to include a scheme to publicise dates and times of blasts to minimise concern or alarm amongst local residents.

Embedded Mitigation during Operation

10.57 Turbine noise was considered throughout the turbine layout design process, together with other environmental constraints (as described in ES Chapter 2: Alternatives and Design Evolution). The project team considered several iterations of turbine layout and certain iterations (including the locations and numbers of turbines) were rejected due to preliminary noise modelling indicating that the ETSU-R-97 limits might be exceeded at sensitive receptors.

Predicted Impacts

Construction Impacts

General Construction works

10.58 The construction work would be phased with one of each operation undertaken at any one time, i.e. all five turbine locations could be under construction, but at different phases (assuming cable route trenching is undertaken whilst upgrading and constructing the access tracks). An analysis of the potential plant used and associated noise levels is presented in Appendix 10.1.

10.59 For representative ambient noise levels (in low wind conditions) the following assumptions have been used. Day-time L_{Aeq} noise levels vary depending on location, however a day-time level of 50 dB(A) is generally representative with levels typically varying between 45 and 60 dB(A). It is assumed that night-time works would not be undertaken, with the exception of de-watering equipment which would need to run overnight. An ambient noise level of 30 dB(A) has been assumed for the purposes of the construction noise assessment.

10.60 Table 10.6 gives the levels predicted for a range of distances based on the data presented in Appendix 10.1. For individual construction phases, both daytime and night-time noise levels are predicted to meet the BS5228 criteria.

Table 10.6: Noise Levels Predicted at Representative Distances

Construction Operation	Operation Emission Level at 10 m L_{Aeq} dB(A)	Ambient Background Level L_{Aeq} dB(A)	Increase of Combined Construction and Ambient Noise over Ambient L_{Aeq} dB(A) (Without Mitigation)			
			Distance to Receptor m			
			100	200	500	1000
Site Access	83.5	50 (day-time)	13.7	8.2	2.8	0.9
Foundation excavation	77.5	50 (day-time)	8.2	3.8	0.9	0.2
De-Watering	71.0	50 (day-time)	3.5	1.2	0.2	0.1

Construction Operation	Operation Emission Level at 10 m L_{Aeq} dB(A)	Ambient Background Level L_{Aeq} dB(A)	Increase of Combined Construction and Ambient Noise over Ambient L_{Aeq} dB(A) (Without Mitigation)			
			Distance to Receptor m			
			100	200	500	1000
		30 (night-time)	21.0	15.1	7.8	3.5
Concreting foundation	78.6	50 (day-time)	9.2	4.5	1.1	0.3
Turbine Assembly	81.2	50 (day-time)	11.5	6.3	1.8	0.5
Forestry Clearance	86.0	50 (day-time)	16.1	10.4	4.1	1.5

10.61 The combined noise levels from the Site construction phases have been predicted at the receptor nearest to the largest number of turbines (Pennyland), assuming one of each of the five turbine construction phases is underway at turbine locations nearest noise sensitive receptors and vegetation clearance is also undertaken at the closest turbine location.

10.62 For each turbine distance, a worst case scenario has been considered, i.e. the phase with highest noise levels predicted at the nearest turbine location, the phase with the second highest noise levels predicted at the second nearest turbine. The results of this assessment are presented in Table 10.7.

Table 10.7: Combined General Construction Phase Noise Predictions at Nearest Receptor

Turbine ID	Phase	Operation Emission Level at 10 m L_{Aeq} dB(A)	Distance (m)	Sound Level dB(A) at Receptor
5	Site Access	83.5	640	47.4
2	Excavation	77.5	1080	36.8
1	De-watering	71.0	1260	29.0
4	Concreting foundation	78.6	850	40.0
3	Turbine Assembly	81.2	700	44.3
5	Clearance	86.0	640	49.9
Combined Sound Level and Ambient dB(A)				52.9

10.63 The results show that at the receptor, which would be considered to be most affected by potential construction noise, the combined noise from a worst case scenario, would not exceed 5 dB above the ambient or the 65 dB(A) L_{Aeq} threshold level. This falls below the threshold for 'significant impact', as defined by BS 5228.

10.64 Data from Paragraphs 11.44 and 11.45 within the traffic and transport chapter have been used to calculate the number of additional vehicle journeys during the construction phase and CRTN used to calculate the increase in $L_{A10,1hour}$ due to the increase in traffic. The calculations are based on a worst-case hour during the peak of the

construction generated traffic (i.e. within month 5 of the construction programme). A summary of the assessment is presented in Table 10.8.

Table 10.8: Traffic Assessment Results

Information	Baseline	2013 With Construction
Total vehicles (per hour)	249	254
HGV %	18	18
Speed (kph)	70	70
Predicted $L_{A10, 1\ hour}$	69.2	69.4

10.65 During the worst case construction period, the increase in noise levels on the A76 due to construction traffic (both cars and HGVs) would be significantly less than 1 dB(A). This would not be noticeable and is therefore not significant.

Access track around Low Auldgirth

10.66 To facilitate construction of the Development, it is proposed to construct a new road around Low Auldgirth. The properties at Low Auldgirth may be affected by noise during construction of this track, and by construction vehicles using this track following its completion.

10.67 At the closest point of the track to Low Auldgirth the distance between the two is approximately 40m, and the resulting noise levels from construction of the track at this point would be approximately 71 dB(A). This is above the BS5228 threshold of 65 dB(A) for significant impact. Once the works are further than approximately 90m from Low Auldgirth, the construction noise level would drop below the BS 5228 threshold of 65 dB(A) for significant impact. The time when construction works would be closer than 90m is estimated as approximately 2-3 weeks. As this period is relatively short, construction of the access track would be unlikely to give rise to significant disturbance.

10.68 Table 10.9 shows the calculation for noise from construction traffic using the new section of road. The 'CRTN' methodology is not suitable for use on this stretch of road because of the low traffic volume, so the BS 5228 'Haul Routes' methodology has been used as an alternative.

Table 10.9: Construction Traffic Assessment along Access Route within the Site

LwA (dB)	Calculations				$L_{Aeq,1hr}$ with façade reflection
	-33 (dB)	+10logQ	-10LogV	-10logd	
111	78	78	65	58	61

10.69 The results show that the predicted hourly noise level from the traffic on the haulage route would be within the daytime minimum criteria of 65 dB(A) $L_{Aeq,1hr}$ and as such, significant disturbance would be unlikely.

Operational Impacts

10.70 This section presents the input to the ISO 9613 prediction noise model, the resulting output and the subsequent assessment of operational noise from the Development in accordance with the provisions of ETSU-R-97.

Turbine Locations and Acoustical Data

10.71 The proposed locations of the five turbines are shown on Figure 3.2. The candidate turbine used for this assessment is the RePower MM82, the warranted sound power data for which has been provided by RePower[8]. Excerpts of the summary table from the RePower acoustic report are presented in Table 10.10.

10.72 The measurement uncertainty is included within the noise levels provided by RePower. In order to convert the sound power levels to L_{A90} sound power levels a 2 dB(A) correction has been subtracted from the predicted noise levels.

Table 10.10: RePower Acoustic Data for the MM82 Turbine

Parameter	Value At Prevailing Wind Speed					
Wind speed at 10 m height m/s	5	6	7	8	9	10
Sound power level L_{WA} dB (80m hub height)	101.7	104.5	105.0	105.0	105.0	105.0
Sound power level L_{WA} dB (100m hub height)	101.9	104.7	105.0	105.0	105.0	105.0

10.73 The RePower data states that the noise from the turbine does not contain tonal characteristics that would necessitate the addition of a tonal penalty to the noise emission levels.

10.74 Octave band data for the MM82 was provided by RePower from an earlier test report[9]. A correction was added to the spectrum in order for the broadband levels to equal the latest sound power levels as presented in Table 10.10. The resultant octave band frequency data are presented in Table 10.11 and 10.12. Data for wind speeds from 7 m/s upwards are identical.

Table 10.11: Manufacturer's Wind Turbine Noise Emission Data (80m hub height)

Wind Speed m/s	Octave Frequency Band (Hz) Noise Level dB(A)								Sound Power L_{WA} dB(A)
	63	*125*	*250*	*500*	*1000*	*2000*	*4000*	*8000*	
5	84.2	91.5	96.1	96.1	95.0	91.1	85.1	78.8	101.7
6	87.0	94.3	98.9	98.9	97.8	93.9	87.9	81.6	104.5
7	87.5	94.8	99.4	99.4	98.3	94.4	88.4	82.1	105.0
8	87.5	94.8	99.4	99.4	98.3	94.4	88.4	82.1	105.0
9	87.5	94.8	99.4	99.4	98.3	94.4	88.4	82.1	105.0
10	87.5	94.8	99.4	99.4	98.3	94.4	88.4	82.1	105.0

Table 10.12: Manufacturer's Wind Turbine Noise Emission Data (100m hub height)

Wind Speed m/s	Octave Frequency Band (Hz) Noise Level dB(A)								Sound Power L_{WA} dB(A)
	63	*125*	*250*	*500*	*1000*	*2000*	*4000*	*8000*	
5	84.4	91.7	96.3	96.3	95.2	91.3	85.3	79.0	101.9
6	87.2	94.5	99.1	99.1	98.0	94.1	88.1	81.8	104.7
7	87.5	94.8	99.4	99.4	98.3	94.4	88.4	82.1	105.0
8	87.5	94.8	99.4	99.4	98.3	94.4	88.4	82.1	105.0
9	87.5	94.8	99.4	99.4	98.3	94.4	88.4	82.1	105.0
10	87.5	94.8	99.4	99.4	98.3	94.4	88.4	82.1	105.0

10.75 This octave band noise data has been used to generate the noise model of the Development, treating each turbine as a point source at a height of equal to the relevant hub height above the ground.

Predicted Wind Turbine Noise Emission

10.76 Predicted noise levels from the Development turbines at each receptor location were plotted with the derived noise limits during the daytime amenity and night-time periods over the range of wind speeds. Graphs for all residences assessed are presented in Appendix 10.6. Numerical results for the graphs are presented in Table 10.13 and 10.14.

10.77 As the limit curves for Pennyland and Shaws are based on wind data from the nearby Dalswinton, there is potential for a difference of +/-1.0m/s between the simultaneous wind speeds at each location, as set out in paragraphs 10.31 and 10.32, although the average variance is +/- 0.1m/s. This would have the effect of moving the noise emission lines on the graphs in Appendix 10.6 left or right by 1m/s. This would not result in any exceedances of the defined limits.

Table 10.13 Noise Assessment - Daytime

Wind Speed (m/s)	5	6	7	8	9	10
1 Auchencairn						
Background noise curve	30.4	32.8	35.7	38.8	41.9	44.9
ETSU-R-97 derived noise limit	34.6	37.0	40.2	43.6	46.8	49.8
Predicted turbine noise	24.9	27.7	28.1	28.1	28.1	28.1
Margin under noise limit#	-9.7	-9.3	-12.1	-15.5	-18.7	-21.7
2 Shieldhill						
Background noise curve	33.9	35.9	37.9	39.9	42.0	44.1
ETSU-R-97 derived noise limit	38.8	40.7	42.7	44.8	46.9	49.1
Predicted turbine noise	26.5	29.3	29.7	29.7	29.7	29.7
Margin under noise limit#	-12.3	-11.4	-13.0	-15.1	-17.2	-19.4
3 Clauchrie						
Background noise curve	33.9	35.9	37.9	39.9	42.0	44.1
ETSU-R-97 derived noise limit	38.7	40.6	42.7	44.8	46.9	49.0
Predicted turbine noise	27.1	29.9	30.3	30.3	30.3	30.3
Margin under noise limit#	-11.6	-10.7	-12.4	-14.5	-16.6	-18.7
4 Cairn Farm						
Background noise curve	31.4	32.7	34.0	35.4	36.8	38.2
ETSU-R-97 derived noise limit	36.2	37.4	38.7	40.2	41.6	43.1
Predicted turbine noise	25.5	28.3	28.7	28.7	28.7	28.7
Margin under noise limit#	-10.7	-9.1	-10.0	-11.5	-12.9	-14.4
5 High Auldgirth						
Background noise curve	31.4	32.7	34.0	35.4	36.8	38.2
ETSU-R-97 derived noise limit	35.8	36.8	38.3	39.9	41.4	42.9
Predicted turbine noise	32.6	35.4	35.9	35.9	35.9	35.9
Margin under noise limit#	-3.2	-1.4	-2.4	-4.0	-5.5	-7.0
6 Pennyland						
Background noise curve	44.5	45.8	47.1	48.5	49.8	51.2
ETSU-R-97 derived noise limit	49.2	50.4	51.8	53.2	54.6	56.1
Predicted turbine noise	35.5	38.3	38.7	38.7	38.7	38.7
Margin under noise limit#	-13.7	-12.1	-13.1	-14.5	-15.9	-17.4
7 Shaws						
Background noise curve	33.6	34.5	35.4	36.3	37.2	38.1
ETSU-R-97 derived noise limit	36.1	34.5	36.1	38.2	39.9	41.3
Predicted turbine noise	24.8	27.6	27.9	27.9	27.9	27.9
Margin under noise limit#	-11.3	-6.9	-8.2	-10.3	-12.0	-13.4

[#]Negative values indicate turbine noise lies below noise limit

Table 10.14 Noise Assessment – Night-time

Wind Speed (m/s)	5	6	7	8	9	10
1 Auchencairn						
Background noise curve	28.6	29.0	29.5	30.0	30.4	30.9
ETSU-R-97 derived noise limit	42.9	42.8	42.7	42.7	42.7	42.7
Predicted turbine noise	24.9	27.7	28.1	28.1	28.1	28.1
Margin under noise limit#	-18.0	-15.1	-14.6	-14.6	-14.6	-14.6
2 Shieldhill						
Background noise curve	31.1	32.7	34.2	35.8	37.4	39.1
ETSU-R-97 derived noise limit	43.0	42.9	42.9	42.9	42.9	44.0
Predicted turbine noise	26.5	29.3	29.7	29.7	29.7	29.7
Margin under noise limit#	-16.5	-13.6	-13.2	-13.2	-13.2	-14.3
3 Clauchrie						
Background noise curve	31.1	32.7	34.2	35.8	37.4	39.1
ETSU-R-97 derived noise limit	42.9	42.9	42.8	42.8	42.8	44.0
Predicted turbine noise	27.1	29.9	30.3	30.3	30.3	30.3
Margin under noise limit#	-15.8	-13.0	-12.5	-12.5	-12.5	-13.7
4 Cairn Farm						
Background noise curve	28.6	30.1	31.6	33.3	35.0	36.9
ETSU-R-97 derived noise limit	42.9	42.9	42.9	42.9	42.9	42.9
Predicted turbine noise	25.5	28.3	28.7	28.7	28.7	28.7
Margin under noise limit#	-17.4	-14.6	-14.2	-14.2	-14.2	-14.2
5 High Auldgirth						
Background noise curve	28.6	30.1	31.6	33.3	35.0	36.9
ETSU-R-97 derived noise limit	42.9	42.8	42.7	42.7	42.7	42.7
Predicted turbine noise	32.6	35.4	35.9	35.9	35.9	35.9
Margin under noise limit#	-10.3	-7.4	-6.8	-6.8	-6.8	-6.8
6 Pennyland						
Background noise curve	38.8	40.3	41.7	43.1	44.5	45.9
ETSU-R-97 derived noise limit	42.8	43.7	45.5	47.3	48.9	50.5
Predicted turbine noise	35.5	38.3	38.7	38.7	38.7	38.7
Margin under noise limit#	-7.3	-5.4	-6.8	-8.6	-10.2	-11.8
7 Shaws						
Background noise curve	31.7	32.7	33.7	34.7	35.7	36.7
ETSU-R-97 derived noise limit	42.2	41.4	41.1	41.1	41.1	41.1
Predicted turbine noise	24.8	27.6	27.9	27.9	27.9	27.9
Margin under noise limit#	-17.4	-13.8	-13.2	-13.2	-13.2	-13.2

#Negative values indicate turbine noise lies below noise limit

10.78 The results show that predicted turbine noise levels would fall below the derived limits at all receptors.

Decommissioning Impacts

10.79 The potential impacts of the decommissioning works would be considerably less than the construction works on account of requiring similar equipment and plant, but not requiring the construction of access routes, excavation of stone or construction of foundations (with associated concrete deliveries). As stated in Chapter 3: Project Description it is assumed that the turbine concrete foundation structures would not be removed, as the extraction of large, deep foundations would be a significant undertaking, involving excavation and potentially cutting or mechanical disintegration of concrete.

10.80 Construction traffic figures for the decommissioning phase would also be lower than for the construction phase. Therefore, impacts during construction are unlikely to be significant.

Mitigation

Construction Phase

10.81 Construction mitigation has been embedded as described in Chapter 3: Project Description. No further mitigation would be required.

Operational Phase

10.82 Operational mitigation, in terms of careful siting of the turbines to avoid exceeding noise limits, has been embedded within the Development design. No further mitigation would be required.

Decommissioning Phase

10.83 Mitigation of noise from decommissioning works would be dependent on the extent to which the Site is to be decommissioned and restored. Mitigation methods are considered to be similar to those required for the construction phase, i.e. the application and use of best practical means and best available techniques, along with control of working hours.

Residual Impacts

10.84 As embedded mitigation results in the predicted impacts for all phases of the Development being within acceptable limits, impacts remain unchanged.

Cumulative Impacts

10.85 The review of existing, consented wind farms and those in planning has identified the following wind farm developments that add or could add to noise levels at receptors considered within this assessment:

- Dalswinton Wind Farm (operational) consisting of 15 x 80 m hub height RePower MM82 wind turbines; and
- Auchencairn Forest Wind Farm (in planning), consisting of 16 x 80 m hub height Acconia AW 82 wind turbines.

10.86 Noise emission data for the above turbines is presented in Appendix 10.1

Construction

10.87 It is possible that if consented, construction works for the Auchencairn Forest Wind Farm and the Development could coincide. The nearest receptor to both proposed developments is Auchencairn Cottage, which is approximately 1.6 km from the location of the nearest turbine within the Development and 1.9 km from the nearest Auchencairn Forest wind turbine. The relatively large distance between the two sites means that there is no potential for exceedance of BS 5228 criteria at Auchencairn Cottage or any other receptors from cumulative construction noise.

Operation

10.88 The cumulative noise impact from the proposed Auchencairn Forest Wind Farm and existing Dalswinton Wind Farm has been predicted and assessed against ETSU-R-97 criteria. Data from the noise assessment contained in the Environmental Statements for the Auchencairn Forest Wind Farm[10] has been used to generate cumulative impact noise models within CadnaA. The data taken from the Environmental Statement, and summarised in Appendix 10.1, includes the following:

- Turbine location;
- Turbine hub height; and
- Turbine noise emission data for different wind speeds (6-10 m/s).

10.89 The MM82 turbine is in operation on the Dalswinton Wind Farm and the 15 turbines have been modelled accordingly at the correct heights and using the data in Table 10.11. The sound power levels for the MM82 have been provided for both 2007 (the year prior to the completion of Dalswinton) and 2009, with no changes to sound levels. It is therefore considered that these sound power levels are appropriate for use in modelling both the Dalswinton Wind Farm and the Development.

10.90 Predicted cumulative noise levels from the turbines from all three Wind Farms at each receptor location are plotted with the derived noise limits during the daytime amenity and night-time periods over the range of wind speeds in Appendix 10.6. The graphs show an additional separate line for the Dalswinton and Blackwood cumulative noise level (i.e. without Auchencairn Forest Wind Farm). Numerical results for the cumulative assessment are presented in Table 10.15 and 10.16.

Table 10.15 Cumulative Noise Assessment - Daytime

Wind Speed (m/s)	6	7	8	9	10
1 Auchencairn					
Background noise curve	32.8	35.7	38.8	41.9	44.9
ETSU-R-97 derived noise limit	37.8	40.7	43.8	46.9	49.9
Predicted turbine noise	33.3	33.8	33.8	33.8	33.8
Margin under noise limit#	-4.5	-6.9	-10.0	-13.1	-16.1
2 Shield Hill					
Background noise curve	35.9	37.9	39.9	42.0	44.1
ETSU-R-97 derived noise limit	40.9	42.9	44.9	47.0	49.1
Predicted turbine noise	31.5	32.1	32.1	32.1	32.1
Margin under noise limit#	-9.4	-10.8	-12.8	-14.9	-17.0
3 Clauchrie					
Background noise curve	35.9	37.9	39.9	42.0	44.1
ETSU-R-97 derived noise limit	40.9	42.9	44.9	47.0	49.1
Predicted turbine noise	32.2	32.8	32.8	32.8	32.8
Margin under noise limit#	-8.7	-10.1	-12.1	-14.2	-16.3
4 Cairn Farm					
Background noise curve	32.7	34.0	35.4	36.8	38.2
ETSU-R-97 derived noise limit	37.7	39.0	40.4	41.8	43.2
Predicted turbine noise	30.6	31.3	31.3	31.3	31.3
Margin under noise limit#	-7.1	-7.7	-9.1	-10.5	-11.9
5 High Auldgirth					
Background noise curve	32.7	34.0	35.4	36.8	38.2
ETSU-R-97 derived noise limit	37.7	39.0	40.4	41.8	43.2
Predicted turbine noise	36.7	37.2	37.2	37.2	37.2
Margin under noise limit#	-1.0	-1.8	-3.2	-4.6	-6.0
6 Pennyland					
Background noise curve	45.8	47.1	48.5	49.8	51.2
ETSU-R-97 derived noise limit	50.8	52.1	53.5	54.8	56.2
Predicted turbine noise	42.2	42.6	42.6	42.6	42.6
Margin under noise limit#	-8.6	-9.5	-10.9	-12.2	-13.6
7 Shaws					
Background noise curve	34.5	35.4	36.3	37.2	38.1
ETSU-R-97 derived noise limit	39.5	40.4	41.3	42.2	43.1
Predicted turbine noise	38.3	38.8	38.8	38.8	38.8
Margin under noise limit#	-1.2	-1.6	-2.5	-3.4	-4.3

Table 10.16 Cumulative Noise Assessment - Night-time

Wind Speed (m/s)	6	7	8	9	10
1 Auchencairn					
Background noise curve	29.0	29.5	30.0	30.4	30.9
ETSU-R-97 derived noise limit	43.0	43.0	43.0	43.0	43.0
Predicted turbine noise	33.3	33.8	33.8	33.8	33.8
Margin under noise limit#	-9.7	-9.2	-9.2	-9.2	-9.2
2 Shield Hill					
Background noise curve	32.7	34.2	35.8	37.4	39.1
ETSU-R-97 derived noise limit	43.0	43.0	43.0	43.0	44.1
Predicted turbine noise	31.5	32.1	32.1	32.1	32.1
Margin under noise limit#	-11.5	-10.9	-10.9	-10.9	-12.0
3 Clauchrie					
Background noise curve	32.7	34.2	35.8	37.4	39.1
ETSU-R-97 derived noise limit	43.0	43.0	43.0	43.0	44.1
Predicted turbine noise	32.2	32.8	32.8	32.8	32.8
Margin under noise limit#	-10.8	-10.2	-10.2	-10.2	-11.3
4 Cairn Farm					
Background noise curve	30.1	31.6	33.3	35.0	36.9
ETSU-R-97 derived noise limit	43.0	43.0	43.0	43.0	43.0
Predicted turbine noise	30.6	31.3	31.3	31.3	31.3
Margin under noise limit#	-12.4	-11.7	-11.7	-11.7	-11.7
5 High Auldgirth					
Background noise curve	30.1	31.6	33.3	35.0	36.9
ETSU-R-97 derived noise limit	43.0	43.0	43.0	43.0	43.0
Predicted turbine noise	36.7	37.2	37.2	37.2	37.2
Margin under noise limit#	-6.3	-5.8	-5.8	-5.8	-5.8
6 Pennyland					
Background noise curve	40.3	41.7	43.1	44.5	45.9
ETSU-R-97 derived noise limit	45.3	46.7	48.1	49.5	50.9
Predicted turbine noise	42.2	42.6	42.6	42.6	42.6
Margin under noise limit#	-3.1	-4.1	-5.5	-6.9	-8.3
7 Shaws					
Background noise curve	32.7	33.7	34.7	35.7	36.7
ETSU-R-97 derived noise limit	43.0	43.0	43.0	43.0	43.0
Predicted turbine noise	38.3	38.8	38.8	38.8	38.8
Margin under noise limit#	-4.7	-4.2	-4.2	-4.2	-4.2

10.91 The graphs show that the cumulative turbine noise levels are below the derived limit at every receptor location. Therefore, predicted noise levels meet ETSU-R-97 criteria.

Decommissioning

10.92 It is considered highly unlikely that the Dalswinton Wind Farm, Auchencairn Forest Wind farm and Blackwood Wind Farm would be decommissioned at the same time. However, as per the construction assessment, there would be no potential for BS5228 limits to be exceeded from the cumulative decommissioning noise impacts of the three wind farms if this was to occur simultaneously.

Chapter 10 References

[1] BS 5228-1:2009: Code of practice for noise and vibration control on construction and open sites

[2] Update of Noise Database For Prediction of Noise on Construction and Open Sites, DEFRA, 2005

[3] http://www.scotland.gov.uk/Resource/Doc/343210/0114180.pdf

[4] http://www.scotland.gov.uk/Resource/Doc/212607/0120077.pdf

[5] ETSU-R-97: The Assessment and Rating of Noise from Wind Farms, The Working Group on noise from Wind Turbines, 1996.

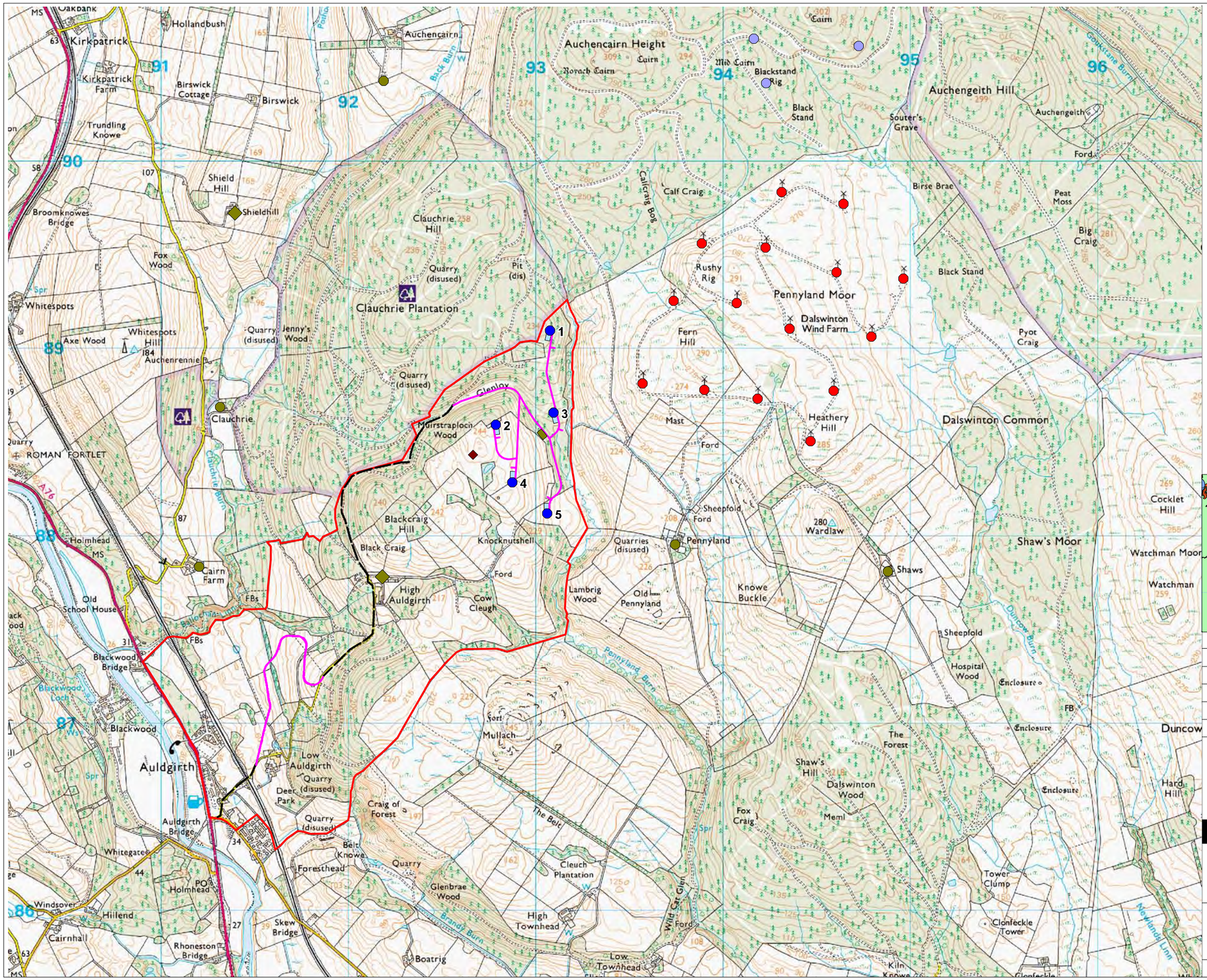
[6] Prediction and assessment of wind turbine noise" Acoustics Bulletin March/April 2009 pp 35 -37

[7] Department of Transport, Calculation of Road Traffic Noise, 1988

[8] RePower Document-No.: SD-2.5-WT.PC.02-B-C-EN, Dated 20/10/2010

[9] Wind Test Document-No.: WT 7178/09, Dated 20/04/2009

[10] Auchencairn Forest Windfarm Environmental Statement, Acciona Energy Ltd, September 2011



Rev	Date	Description	Drn	Chk	App
01	22.12.11	Layout	BF	MK	MK
00	01.11.11	Layout	BF	MK	MK

FORCE 9 ENERGY

Blackwood Wind Farm

RSK

Figure 10.1 - Receptor and Noise Montoring Location Plan

SCALE: 1:20,000 @ A3 | REV 01

FILE NAME: P:\ENVIRONMENT\1190000 - EIA Glasgow\P190282 Blackwood Wind Farm\08 GIS\ES Fig 10.1 Wor

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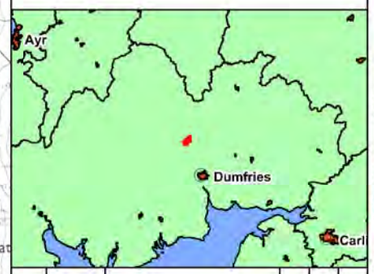
Proposed Turbine
Receptors
Dalswinton Wind Farm
Auchencairn Wind Farm
< 35.0 dB
> 35.0 dB
> 40.0 dB
> 43.0 dB

Auchencairn
Shieldhill
Clauchrie
Cairn Farm
High Auldgirth
Pennyland
Shaws



Rev	Date	Description	Drn	Chk	App
00	12.01.11	Noise	BF	MK	MK

FORCE 9 ENERGY

Blackwood Wind Farm

RSK

Figure 10.2: Predicted Wind Turbine LA90 Levels

Wind Speed - 7m/s

SCALE: 1:20,000 @ A3

REV 00

FILE NAME: P:\ENVIRONMENT\190000 - EIA Glasgow\P190282 Blackwood Wind Farm\08 GIS\Figure 10.2 - Noise Levels Wor

11 TRAFFIC AND TRANSPORT

Introduction

11.1 This chapter assesses the potential traffic and transport impacts associated with the construction, operation and decommissioning of the Development, including those relating to access, potential disruption and changes to traffic volumes on the local road network.

11.2 The chapter is supported by an access study prepared by Grontmij, which is included in the ES as Technical Appendix 11.1.

Policy Context

11.3 Relevant national, regional and local planning policy is discussed in ES Chapter 4: Planning. Planning Advice Note PAN 75 – Planning for Transport[1] states that all planning applications that involve the generation of person trips should provide information which covers the transport implications of the development. The level of detail should be proportionate to the complexity and scale of impact of the proposal.

11.4 PAN 75 includes discussion of Travel Plans, to encourage sustainable travel once the development is operational. It is not anticipated that a Travel Plan would be required for the Development, given the low numbers of operational vehicle movements generally associated with this type and scale of development (as described later in the chapter).

11.5 The Dumfries and Galloway Local Transport Strategy (LTS)[2] sets out an action plan for transport in the local area, for the period 2011 – 2016. The strategy notes there is a high level of car ownership and usage in the area. Strategic objectives highlight where travel is necessary, efficient and sustainable transport should be encouraged.

Method of Assessment

Guidance

11.6 The assessment has been prepared with reference to the following guidelines:

- Institute of Environmental Assessment, Guidelines for the Environmental Assessment of Road Traffic[3]; and
- Scottish Executive, Transport Assessment and Implementation[4].

Scope of Assessment

11.7 The project description on which the assessment is based is contained in Chapter 3: Project Description, with further detail in the Project Characteristics section below.

11.8 Since the majority of traffic movements would occur within the construction and decommissioning phases of the Development, the assessment concentrates on these phases. (Only a small number of vehicle movements would be associated with the operational phase of the Development, to undertake turbine maintenance and repair works.) On this basis a formal Transport Assessment has not been undertaken, as a TA is not considered to be required for temporary construction works (as noted in guidance from both the IHT and Transport Scotland).

11.9 In order to determine the potential transport and access impacts of the Development, the following steps have been completed:

- Compilation of baseline traffic and accident levels on the local road network (the A76(T));
- Calculation of construction / decommissioning and operational derived traffic;
- Determination of the changes in traffic volumes (and Heavy Goods Vehicles (HGV)) levels on the local highway network (A76(T) and U492n) from the construction and decommissioning of the Development and assessment in relation to road capacity, potential driver delay and safety and pedestrian severance; and
- Agreed measures to mitigate impacts if required and assessment of residual impacts.

11.10 The impact of traffic on the A74(M) has not been considered as the relatively low level of trip generation from the Site is not anticipated to have any impact on this highly trafficked route.

11.11 Given the relatively remote location of the Development, bus and/or rail are not considered to be feasible options for the transport of staff and/or goods to the Site and have therefore not been considered further in this assessment.

11.12 Potential noise impacts associated with construction traffic are considered in Chapter 10: Noise. As stated in the Scoping Report potential air quality impacts associated with vehicle emissions have been scoped out of the EIA.

11.13 The assessment has considered all impacts associated with the Development as described in Chapter 3. The route and nature of the grid connection does not form part of the planning application and is yet to be finalised so has not been assessed here. The applicant's preference is for the grid connection cables to be located in trenches in roadside verges; it is not anticipated there would be any significant environmental impacts associated with this option. However, the line would be considered in more detail and subject to environmental assessment by the Distribution Network Operator (DNO) prior to a formal application for this element of infrastructure. The scope of any such assessment would be agreed with DGC.

Sources of Information

11.14 The assessment has been informed by a desk-based study of the existing local road network, local public transport services and the access study for the Site completed by Grontmij in 2010 (a copy of which is contained in Technical Appendix 11.1).

11.15 Baseline road traffic count data was obtained for the A76(T) from Transport Scotland[5]. Road traffic accident data was also obtained for the A76(T), for the period between 1st January 2008 and 27th July 2011 – this was provided by Amey and JMP Consulting Ltd. No traffic data is available for the unclassified public road U492n within the Site.

11.16 Estimates of construction derived traffic have been made based on experience of other similar sized wind farm schemes. Peak predicted traffic levels have been used in the assessment to provide a reasonable worst case assessment.

11.17 The chapter also draws on the transport impact assessments completed for the adjacent operational Dalswinton Wind Farm[6] and the Auchencairn wind farm[7], which is currently in planning.

Consultations

11.18 Transport and access related scoping responses are summarised in Table 11.1 below.

Table 11.1 Transport Related Scoping Responses

Organisation	Key Comments from Scoping Response
Transport Scotland	Noted that overall there would be a minimal increase in traffic on the trunk road network during the operation of the wind farm and therefore the proposed development is not likely to have a significant impact on the operation of the trunk road network. Also noted that abnormal loads may require authorisation from BEAR Scotland. Recommended that BEAR consulted as to feasibility of transport of abnormal loads to the site. Due to the frequency and number of these loads it is UK policy to restrict these movements via the nearest suitable port.
Dumfries and Galloway Council Development Team Leader (Nithsdale roads)	The ES should provide comprehensive details of the following (traffic related details): • The sizes of the prefabricated turbine components and the size and type of delivery vehicles, including predicted route, swept-path tracks and number of trips; • Any alterations required to the existing public road network and any potential impact on utility services within the public road boundary. Permits will be required under the Roads (Scotland) Act 1984 for any such works; • Confirmation on whether suitable and sufficient borrow pits have been identified within the Site; • A Traffic Management Plan for the construction phase, which should be agreed with the Police and the local roads authority prior to the start of any construction • Transport Scotland and Network Rail should be consulted regarding access via the A76(T) and the railway bridge at U492n respectively. • Further detail provided on existing road network, which is described in the baseline environment section.
Dumfries and Galloway Constabulary	If full planning permission was to be granted, then early discussions would be required to agree a safe working plan, including the police escorting the abnormal loads associated with the development. Consultation with Crime Reduction Officer is recommended prior to start

Organisation	Key Comments from Scoping Response
	of construction, to discuss site security.
Auldgirth Community Council	The council notes the U492n from Auldgirth Village Hall to Low Auldgirth is narrow in places and runs through farm buildings at Low Auldgirth, serving a number of properties. The road is used for street parking for community activities at the village hall – the EIA needs to address how these problems would be overcome.

11.19 The scoping responses and desk-based study were considered to provide a sufficient level of information such that no further consultation was needed for the purposes of the EIA. However, subject to the granting of planning consent, further consultation would be undertaken at the post-planning stage.

Assessment Criteria

11.20 The IEA guidelines suggest that two broad rules can be used as a screening tool to determine the scale of the traffic assessment required:

- Rule 1: Include highway links where two-way traffic flows are predicted to increase by more than 30% (or where the number of heavy goods vehicles would increase by more than 30%); and
- Rule 2: Include any other specifically sensitive area where two-way traffic flows would increase by 10% or more

11.21 Where the predicted increase is less than the thresholds the guidelines suggest that the significance of the change to traffic flows is low or insignificant i.e. negligible and does not require further assessment. To allow for a relative assessment of any changes to traffic flows in environmental terms, percentage changes to traffic flows have been used to define impact magnitude, as noted in Table 11.2 below.

11.22 Impact significance can be defined as a function of the magnitude of change and the sensitivity of the receptor e.g. junction, transport route or transport user. There are no standard assessment criteria for transport impact assessment, but to ensure a relative assessment of any beneficial or adverse changes to road traffic (and associated potential delay and severance in the case of traffic increases) the criteria outlined in Tables 11.2 to 11.4 have been applied.

Table 11.2: Impact Magnitude

Impact Magnitude	Criteria Description
Major	Permanent considerable deterioration/improvement in district level conditions or circumstances > +/-60% vehicle flow change (or +/-20% vehicle flow change in sensitive areas)
Moderate	Permanent readily apparent change in local conditions or circumstances or temporary considerable change in local conditions > +/-45% vehicle flow change (or > +/-15% vehicle flow change in sensitive areas)
Minor	Perceptible temporary change in local conditions or circumstances > +/-30% vehicle flow change (or >+/-10% vehicle flow change in sensitive areas)
Negligible	No discernible change in conditions or circumstances < +/-30% vehicle flow change

11.23 The sensitivity of receptors is considered in respect of the users of each transport corridor, the level and frequency of use, and adjacent sensitive land uses.

Table 11.3 Receptor Sensitivity

Receptor Sensitivity	Example of Receptor
High	Adjacent receptors of greatest sensitivity e.g. schools and colleges, hospitals, retirement homes and playgrounds, accident blackspots, public transport interchanges, nationally important tourist routes, highly trafficked motorways, densely populated residential areas.
Medium	Adjacent receptors include parks and community centres, congested junctions and highly trafficked trunk roads, high frequency public transport corridors, regionally important tourist routes, residential areas with adequate footway provision.
Low	Adjacent receptors include public open space and nature conservation areas, low frequency public transport corridors, roads operating well within capacity, locally important tourist routes.
Negligible	Receptors of low sensitivity to traffic e.g. industrial areas.

Table 11.4 Impact Significance

Receptor Sensitivity	Impact Magnitude			
	Major	**Moderate**	**Minor**	**Negligible**
High	Major	Major	Moderate	Minor
Medium	Major	Moderate	Minor	Negligible
Low	Moderate	Minor	Negligible	Negligible
Negligible	Minor	Negligible	Negligible	Negligible

11.24 For the purposes of this assessment, major and moderate impacts are considered to be significant impacts.

Baseline Environment

Local Road Network

11.25 The Site is located in a rural area of Dumfries and Galloway. Dumfries is the regional centre and is located approximately 14km to the south of the Site. The nearest major roads are the A74 (M) located approximately 20km to the east of the Site (which links Scotland and England) and the A76(T).

11.26 The A76(T) trunk road is a single two-lane carriageway of approximate width 7.5m[13], that runs in a north-south direction adjacent to the west of the Site through Nithsdale. It provides connections between Dumfries to the south and Ayrshire, Kilmarnock and Prestwick Airport to the north and can therefore be considered of regional importance. A Route Action Plan was published for the A76(T) in 1996, which has been partly implemented[5].

11.27 Dumfries and Galloway has the highest amount of forestry activity in Scotland and a number of 'agreed routes' have been set for timber traffic. The A76(T) is not an agreed route or excluded route[8] though the C11n road leading south from Auldgirth (which was used to access the Dalswinton wind farm) and the minor road to the north of the Clauchrie Plantation are shown as 'consultation routes' on the Forestry Commission maps[15].

11.28 The U492n is an unclassified public road that extends from the C11 / U541n junction at Auldgirth Inn to Low Auldgirth. It leads in a generally north easterly direction across the Nith Valley railway line to the Low Auldgirth settlement. The junction of the A76(T) trunk road and the U492n is not signalled but a ghost island right turn facility is provided. DGC has advised that:

- The U492n is locally weak, restricted in terms of horizontal and vertical geometry and visibility, with few passing places and a restricted junction onto the U541n adjacent to the Auldgirth Inn, and that appropriate improvements would not appear feasible;
- Between Auldgirth and Low Auldgirth the public road crosses the Dumfries to Kilmarnock railway line, over a hump back bridge. This requires assessment to ensure vehicles do not ground on the bridge; and
- The U492n at Auldgirth Village lies between two development sites. The Local Plan review included reference to these two sites and the U492n, stating that it is unsuitable for any significant increase in vehicular movements and that's its upgrading would be difficult, particularly at the bend to the north of the public hall.

11.29 The Grontmij access study (Appendix 11.1) confirmed that access is feasible from the A76(T) onto the U492n by access through Auldgirth to Low Auldgirth. From Low Auldgirth to High Auldgirth the existing private road is highly constrained and would not be suitable as an access route to the proposed turbines. However, the Development includes for the construction of a new private access road from Low Auldgirth to High Auldgirth as described in the Project Characteristics section below.

11.30 Local sensitive receptors in close proximity to the public road network (the A76(T) and U492n) comprise residential properties located at Auldgirth and Low Auldgirth together with the Auldgirth Village Hall.

Road Traffic Data

11.31 Average traffic flow data for the A76(T) was obtained from Transport Scotland – this is summarised in Table 11.5 below. Baseline traffic flows on the local road network would be anticipated to increase year on year, broadly in line with National Road Traffic Forecasts (NRTF) growth factors. However, there is a decrease in traffic between 2009 and 2010 as shown in Table 11.5 and there was a decrease in HGV traffic and only a very slight increase in other traffic between 2008 and 2009.

11.32 On this basis the 2010 five day traffic flows have been used as the future baseline scenario (2013), against which predictions have been made to identify the percentage change in vehicles on the local road network due to the Development. However, when considering road capacity and total volumes in the impact assessment, the future baseline as set out in Table 11.5 will be used. This scenario has been calculated by applying a NRTF 'low' growth factor of 1.035% to the 2010 traffic flows.

Table 11.5 Road Traffic Data

Road Link	Vehicle	2009 Average		2010 Average		2013 Predicted Average	
		5 day	7 day	5 day	7 day	5 day	7 day
A76(T) northbound	LGV/HGV	573	460	541	436	560	451
	Other vehicles	2,465	2,394	2,413	2,331	2,497	2,413
A76(T) southbound	LGV/HGV	561	446	527	420	545	435
	Other Vehicles	2,477	2,391	2,432	2,334	2,517	2,416
A76(T) Total	LGV/HGV	1,134	906	1,068	856	1,105	886
	Other Vehicles	4,942	4,785	4,845	4,665	5,015	4,828

11.33 Typical capacities for a variety of road types are provided within the DMRB Volume 15[9]. For a rural single carriageway road such as the A76(T), the capacity is stated to be 1,200 vehicles / hour / direction i.e. 28,800 vehicles per day in each direction. Current traffic levels are therefore well within the carrying capacity of the road.

11.34 No traffic data is available for the U492n, which provides access to approximately 11 properties and the clay pigeon shoot at Glenloy. It is estimated that peak flows on this road would not exceed 20 two-way vehicle movements per hour and total two-way vehicle movements for the 12 hour period 7am to 7pm (the proposed working hours for construction of the Development) would not exceed 96 two-way vehicle movements i.e. four vehicles per hour).

Accident Data

11.35 Personal Injury Accident data was obtained from JMP Consulting Ltd and Amey, for the local road network for the period January 2008 – July 2011. For the section of the A76(T) between Barburgh Mill and Allanton there were six incidents recorded as 'slight' and one 'serious' incident injury (adjacent to Barbugh Mill, approximately 2km to the north of Auldgirth).

11.36 For the same period there has been a total of 98 accidents for the stretch of the A76(T) between Dumfries and Cannock, including three fatalities in the Kirkconnel area, approximately 30km to the north of Auldgirth. The accidents were located along the length of the route and it is concluded that, with the exception of the Kirkconnel area, there are no locations on the local highway network considered to be accident blackspots.

Project Characteristics

Access

11.37 The construction of the Dalswinton Wind Farm has established that an access route exists for abnormal loads (the turbine blades, tower sections and nacelles) to be transported to the entrance to the Site, at the junction of the A76(T) with the C11n. Similarly the access study completed for the Auchencairn Wind Farm[10] confirms an access route exists for the transport of turbine components from Gretna to Auldgirth, though highlights some works would be required at the A76(T) / Lochside Road roundabout in Dumfries (assuming a maximum vehicle length of 43.7m).

11.38 The Access Study completed by Grontmij included swept path analysis of key junctions within the Site, for turbine delivery vehicles up to 43.5m in length as a worst case (including blade overhang), using Autotrack software. It should be noted the turbine blades and tower components would be up to 40m in length and the nacelles would be approximately 18m in length.

11.39 Access to the turbine area within the Site would use the existing U492n track to a point south of Low Auldgirth, where a new section of track (a private road) would provide access towards High Auldgirth and onwards to the turbine area, as shown on Figure 3.2. Access would avoid routing through Low Auldgirth and would be subject to a combination of further assessment, local upgrades and monitoring at key locations. The main points from the access study can be summarised as follows:

- Irrespective of the turbine delivery vehicle modelled and the direction of vehicle arrival, some carriageway widening would be required to the west verge of the A76(T) and the south side of the access slip road;
- Should a turbine delivery vehicle of 43.5m be used, some carriageway widening would also be required adjacent to the Auldgirth Inn;
- Dependent on the length of the turbine delivery vehicle, some stabilisation works may also be required to the embankment between the road and the Auldgirth Inn;

- Further assessment of the road adjacent to the Dunduff property would be required and/or a drive through by an experienced haulage contractor to ensure there would be no conflict with the existing retaining wall to the garden of this property;
- Further land take may be required adjacent to Dunduff for the decommissioning of the wind farm and removal of turbine components. This would require further assessment following confirmation of the length of delivery vehicle; and
- Carriageway widening works would be required within the existing verge of the railway bridge. Following the initial access study, Grontmij undertook further assessment of the railway bridge, which indicated some works would also be required on the approach / exit to the bridge to reduce the gradients (the 'hump'), although not within land owned by Network Rail. Confirmation was received from Network Rail that the structural capacity of the bridge was sufficient for the loading indentified from the proposed delivery vehicles. Consultation with Network Rail would be undertaken prior to any works in the area of the bridge.

11.40 In addition all existing drains and culverts would be subject to upgrades as necessary to ensure they could withstand the vehicle loads, once details of the vehicles are confirmed (refer to Chapter 5: Physical Environment for further details).

Construction Programme and Vehicle Estimates

11.41 A detailed description of the Development is provided in Chapter 3, including working hours. The construction works would follow a nine month programme with a start date on-site in 2013, allowing the Development to commence operation in 2014. A six day working week i.e. a 26 day working month is assumed. Estimated numbers of construction deliveries, based on the project description and construction programme, are provided in Table 11.6 below.

11.42 Note that two preferred locations for borrow pits have been identified on-site (as described in Chapter 3) which are assumed to provide 6F material suitable for use in the construction works. Stone of suitable quality may also be obtained on-Site as excavations are completed for the new lengths of access track and turbines. However, for the purposes of this assessment and to provide a worst case it is assumed that 6F material would be imported for the new section of access track around Low Auldgirth. Type 1 material would also be imported for the top dressing of the access tracks to ensure the track is of suitable quality for the construction vehicles and 6N structural fill material would be imported for the turbine platforms.

Table 11.6 Construction Deliveries

Type of Load	Vehicle Type	Estimated No. Deliveries (movements)
Pre construction	Low loaders	4 (8)
Construction Vehicles	Various e.g. excavators, dump trucks, rollers, stone crusher	12 (24)
Imported fill and stone	Road Lorry (total 10,000m^3, 8m^3 per delivery)	1,250 (2,500)
Turbine Foundation Concrete	Road Lorry (350m^3 per base, 7m^3 per concrete delivery)	250 (500)
Reinforcement Steel and Base Rings	Articulated Lorry	4 (8)
Turbine Deliveries	Oversize road transporter - blades	15 (30)
	Oversize road transporter – tower sections	20 (40)
	Oversize road transporter - Nacelles	5 (10)
	Articulated lorry (rotors, electrical equipment and cables)	10 (20)
Cable and cable sand	Articulated lorry	20 (40)
Transformers and Sub-station	Articulated lorry and low loaders	16 (32)
General supplies (anemometer, drainage, culvert sections etc.)	Articulated lorry	20 (40)
Cranes	Mobile cranes and articulated lorries	4 (8)
Fuel, Water and Waste Disposal	Tankers and lorries	114 (228)
	TOTAL	**1,744 (3,488)**

11.43 Whilst the number of construction staff on-site would vary over the construction period it is assumed that staff would travel to the Site using private vehicles (car or van), with an average of 10 vehicle trips i.e. 20 vehicle two-way movements per day. This would give a total of 2,340 trips (4,680 two-way movements) over the construction period. It is estimated that construction staff numbers would peak between approximately weeks 16 and 24, when construction of the turbine foundations, access tracks, turbines and substation / control building would be ongoing, with a maximum of 40 two-way movements per day.

11.44 The estimated distribution of traffic movements across the proposed construction timetable is summarised in Table 11.7.

Table 11.7 Construction Vehicle (two-way) Movements during the Construction Works

Type of Load / Month	Month								
	1	2	3	4	5	6	7	8	9
Pre construction	8								
Construction Vehicles	12								12
Type 1 stone deliveries	600	600	500	400	300	100			
Turbine Foundation Concrete			120	180	120	80			
Reinforcement Steel and Base Rings			2	4	2				
Turbine Deliveries				10	30	30	30		
Cable and sand				10	10	10	10		
Transformers and Sub-station				10	22				
General supplies	10	20	10						
Cranes			2	4	2				
Fuel and Waste Disposal	16	16	24	28	36	32	32	24	20
Construction staff	200	200	500	800	1000	1000	400	300	280
TOTAL (all traffic)	**846**	**836**	**1,158**	**1,446**	**1,522**	**1,252**	**472**	**324**	**312**

11.45 On the basis of the above there would be an average of 36 two-way vehicle movements per day over the construction period, with a peak of 60 two-way vehicle movements per day during Month 5 (numbers are rounded up to allow for outward and return vehicle journeys).

11.46 If it is assumed that all vehicles other than those for construction staff are LGV/HGVs, the construction works would generate an average of 16 two-way LGV/HGV movements per day, with a peak of 20 two-way LGV/HGV movements per day during Month 5.

Embedded Mitigation

11.47 As stated in Chapter 3: Project Description, if the Development were to be granted planning consent a Traffic Management Plan (TMP) would be prepared and implemented for the construction and decommissioning works.

11.48 Further detailed analysis, and consultations with Transport Scotland and the Dumfries and Galloway Constabulary, would be undertaken in order to agree an access route for abnormal loads to the Site. All abnormal loads would be escorted to the Site by police vehicles and would be programmed to avoid peak traffic periods on the local road network. Any temporary traffic management measures required for local roads would be implemented under the appropriate Acts and Agreements to ensure safe access.

Operational Vehicle Estimates

11.49 It is anticipated that routine servicing of the turbines would typically be undertaken twice a year, with a full annual service and a minor service every six months. In the first year, there is also likely to be an initial three-month service post-commissioning. A team of two people would carry out the servicing and would access the Site with a van or 4 x 4 vehicle. On average it would take the team one day to service each turbine. Should oils and components require changing this would increase the service time on-site by one day per turbine. In the worst case servicing would therefore require one vehicle to access the Site each day for a period of two weeks.

11.50 Occasional flat bed or articulated lorries would deliver replacement components to the Site and mobile cranes would be brought onto Site should any significant repairs or maintenance be required. Associated traffic numbers would be low and infrequent.

11.51 Operational waste would generally be restricted to small volumes of waste generated from machinery repair and maintenance. The maintenance team would dispose of any such waste off-site, in line with Scottish waste management regulations and duty of care, no additional vehicles would be required.

11.52 Blade inspections are likely to be required between every two and five years. This would be undertaken using a cherry picker or similar, but may also be performed with a 50T crane and a man-basket. Repairs to blades would utilise the same equipment. It could take around a week to undertake a full blade inspection of the Development.

11.53 Once the Development is operational the volume of traffic using the access tracks would be low (although heavy plant is particularly wearing). The need for any track maintenance is anticipated to be low and infrequent but could require a delivery of stone and / or an excavator and grader / roller.

Decommissioning

11.54 The number of vehicles required for the decommissioning phase of the Development would be significantly less than that for construction, since there would be no stone, concrete or cable deliveries (which together account for over 85% of the deliveries).

Predicted Impacts

Construction Impacts

11.55 The addition of the peak 60 vehicle movements to the predicted 2013 baseline traffic flows on the A76(T) at Auldgirth (6,120 two-way movements five day average) gives a total of 6,180 daily two-way vehicle movements. This results in a change in traffic volumes of approximately 1%. Given the capacity of the A76(T) is for 28,800 vehicles per day in each direction this road would continue to operate well within capacity. The A76(T) is considered to be a receptor of low sensitivity and the impact magnitude in relation to traffic flow and capacity is considered to be negligible, therefore a negligible (not significant) impact is predicted.

11.56 As a worst case, using the 7 day average 2010 baseline daily flows of 856 LGV/HGV movements on the local road network and the peak of 20 daily HGV movements predicted from the construction works, it is predicted there would be a 2% change in HGV numbers on the A76(T) i.e. an impact of negligible magnitude. The impact significance would therefore be negligible (not significant).

11.57 The predicted increase in traffic on the A76(T) is sufficiently small that it would not have a significant impact on the physical structure of the A76(T). The U492n would be subject to upgrades and maintenance as required for the duration of the construction works under the TMP.

11.58 The transportation of the abnormal loads (and bulky goods) to Site has potential to cause some delay and disruption to users of the A76(T), due to the necessary slow vehicle speeds and potential difficulties in passing. There would be a relatively small number of such loads, which would be under police escort. In accordance with the TMP vehicle movements would be timed to avoid peak hours and would be advertised in advance. Therefore, temporary, short term and intermittent impacts of no more than minor magnitude are predicted to this low sensitivity receptor, resulting in a negligible (not significant) impact.

11.59 The access route to the turbines has been designed to avoid Low Auldgirth and routing directly past the cottages at High Auldgirth. However, the U492n provides access from the small number of properties at High and Low Auldgirth to the A76(T) and access to the Burntkettle Shooting Ground. It also routes in proximity to the Auldgirth village hall. On this basis the road is considered to be a receptor of medium sensitivity.

11.60 The construction works would result in a significant increase in the number of vehicles (and particularly HGVs) using the U492n. Whilst the road has sufficient capacity for the additional vehicles, the percentage increase in daily traffic is estimated to range between 38% and 62%, if average and peak construction vehicle numbers are used (of which approximately one third would be LGVs/HGVs). This would be a change in vehicle flows of minor to major magnitude and therefore some minor to major adverse (i.e. some significant) impacts are predicted for both road and pedestrian users of the U492n. These would relate to potential increases in journey time and impacts on pedestrian severance and amenity. The significant impacts would be temporary and intermittent during the construction works and implementation of the TMP would require timing of deliveries to minimise potential delays, disruption and severance.

11.61 There has only been a small number of reported ('slight') accidents in the immediate locality of Auldgirth. Without mitigation the construction traffic, notably the abnormal loads, could result in a temporary adverse impact on road safety at the junction of the A76(T) and U492n. However, implementation of the TMP would ensure that overall impacts would be negligible (not significant).

11.62 Subject to the further detailed engineering assessment of the railway bridge and consultation with Network Rail, negligible (not significant) impact is predicted to local rail services.

Operational Impacts

11.63 The number of vehicles travelling to and from the Site would be considerably lower for the operational phase of the Development. On this basis impacts of traffic flows on the local network are concluded to be negligible (not significant).

Decommissioning Impacts

11.64 During decommissioning of the Development, impacts to the local road network would be similar in nature to those experienced during the construction works i.e. temporary increase in traffic volumes, disruption and delay. It is not possible to accurately predict the traffic flows on the local road network for the year of decommissioning (2039). However, as the traffic volumes would be significantly lower than the construction period i.e. there would be no importation of stone and fill material or concrete deliveries, impacts are concluded to be negligible (not significant).

Mitigation

11.65 In addition to the embedded mitigation as described above, the following measures are proposed to reduce or avoid construction impacts as far as practicable:

- Completion of a further consultation exercise by the appointed transport consultant for the Development:
  - It is yet to be determined whether turbine components would arrive to the Site from the north or the south. The route to be used for abnormal load deliveries would therefore require agreement with BEAR Scotland, DGC and Dumfries and Galloway Constabulary. Details of the route, frequency and number of vehicles and their dimensions and weights would be presented. The appointed haulier would be involved in these discussions and in arrangements made with the police; and
  - The DGC Bridges section of Architectural Engineering Design Services would be consulted, to check bridge carrying capacities and any restrictions.
- Once the turbine to be used at the Development had been finalised, further detailed assessment would be undertaken of the access route within the Site, notably for the sections of existing road adjacent to the Dunduff property;
- Further assessment of the agreed abnormal load route would be undertaken to confirm any improvement/ remedial works required e.g. temporary removal of street furniture, additional signage and road markings; and
- Carriageway widening and road improvement works. Some carriageway widening would be required to the west verge of the A76(T) and the south side of the access slip road; Carriageway widening works would be required within the existing verge of the railway bridge Should a turbine delivery vehicle of 45m be used, some carriageway widening would also be required adjacent to the Auldgirth Inn.

11.66 As no significant impacts were identified for the operational phase of the Development, no further mitigation measures are proposed. Similarly no further mitigation is proposed for the decommissioning phase of the Development.

Residual Impacts

11.67 Subject to implementation of the TMP and the mitigation measures detailed above, the residual traffic and transport construction impacts of the Development would not be significant, with the exception of some occasional temporary and intermittent significant impacts to users of the U492n, due to the increase in vehicle numbers on this road.

11.68 Residual transport impacts of the operation and decommissioning of the Development would not be significant.

Cumulative Impacts (with other wind farms)

11.69 A planning application for the Auchencairn Wind Farm was submitted to Dumfries and Galloway Council in September 2011. This would be a 16 turbine wind farm located approximately 4km to the north of the Site. There is the potential for the construction periods of the two wind farms to overlap and for construction traffic associated with both wind farms to utilise the A76. Liaison would be required between the appointed contractors for the two wind farms to ensure there were no cumulative transport impacts on this trunk road.

11.70 The locations of other wind farms identified for the cumulative Landscape and Visual Impact Assessment (refer to ES Chapter 8) are such that alternative construction traffic routes are likely to be used, and therefore no other cumulative transport impacts are anticipated.

Chapter 11 References

[1] Scottish Government, 2005, Planning Advice Note 75, Planning for Transport
[2] Dumfries and Galloway Council, 2011, Local Transport Strategy 2011 - 2016
[3] Institute of Environmental Assessment, 1993, Guidelines for the Environmental Assessment of Road Traffic
[4] Scottish Executive, 2005, Transport Assessment and Implementation: A Guide
[5] http://www.transportscotland.gov.uk/road/technology/traffic-count/map-application
[6] Amec, Dalswinton Wind Farm Environmental Statement
[7] Arcus Renewable Energy for Acciona, 2011, Auchencairn Wind Farm Environmental Statement
[8] http://maps.forestry.gov.uk/imf/imf.jsp?site=TTAR
[9] http://www.sias.com/ng/NESA/images/200507NesaManual.pdf
[10] Colin Buchanan access study for Auchencairn Wind Farm Environmental Statement.

12 CLIMATE CHANGE

Introduction

12.1 A key benefit of wind farms (as with other renewable energy technologies) is their ability, once operational, to generate electricity without releasing greenhouse gases (GHGs). This contrasts with the majority of electricity distributed on the UK's national grid, which is generated by fossil fuels such as coal and gas, and as a result gives rise to significant releases of GHGs.

12.2 Scientific consensus acknowledges the significant contribution of man-made GHG emissions to climate change, and the range of social, economic and environmental impacts that are predicted unless appropriate action is taken[1]. Reducing GHG emissions ("climate change mitigation") is therefore central to minimising or avoiding climate change and its effects.

12.3 Before they become operational, however, wind farm developments can give rise to GHG emissions from various activities including manufacture of the turbines and site preparation and construction activities such as forestry felling. The overall climate change impact of a wind farm (or any other development) is the *net balance* of GHG emissions and emissions savings over its lifecycle, with *net positive* emissions contributing to climate change and *net negative* emissions helping mitigate against climate change impacts[2].

12.4 This ES chapter reports the approach taken, and findings of, a detailed Carbon Balance Assessment undertaken for the Development in order to establish its net GHG impact and therefore its overall climate change impact.

12.5 The terms 'GHG' and 'carbon' have the same meaning in this context due to the six GHGs covered by the Kyoto Protocol[3] being reported in terms of *"CO_2 equivalent"* (CO_2e) which is their global warming potential relative to 1 unit of CO_2.

Table 12.1 Kyoto Protocol Greenhouse Gases (GHGs) and their Global Warming Potential

Greenhouse gas (GHG)	Global Warming Potential (CO_2e)
Carbon dioxide (CO_2)	1
Methane (CH_4)	25
Nitrous oxide (N_2O)	298
Hydro fluorocarbons (HFCs)	Depends on specific gas
Sulphur hexafluoride (SF_6)	22,800
Perfluorinated compounds (PFCs)	Depends on specific gas

12.6 For example, 1 kg of methane (CH_4) has the same global warming effect as 25 kg of CO_2, whilst 1 kg of SF_6 has 22,800 times the effect as 22,800 kg (or 22.8 tonnes) of CO_2.

Legislation and Policy

National Policy

Climate Change (Scotland) Act 2009

12.7 Reducing GHG emissions and transitioning to a low carbon economy is a key action in contributing to the Scottish Government's Purpose to create a more successful country, with opportunities for all of Scotland to flourish, through increasing sustainable economic growth. The Climate Change Act (Scotland) 2009[4] creates the statutory framework for GHG emissions reductions in Scotland by setting an interim 42% reduction target for 2020 and an 80% reduction target for 2050. The Scottish Government commitment to increase the amount of electricity and heat generated from renewable sources is a vital part of the response to climate change.

Scottish Planning Policy (2010)

12.8 National planning policy on renewables is set out in the Scottish Planning Policy (SPP)[5] which includes support for the development of a diverse range of renewable energy technologies, for decentralised energy and heat supply systems and spatial guidance for wind farms.

Web-based Guidance - Wind Farm Developments On Peat Land

12.9 PAN 45 Renewable Energy Technologies and Annex 2 Spatial Frameworks and Supplementary Planning Guidance for Wind Farms has been replaced with web based renewables advice.

12.10 The Scottish Government has supported the development of a carbon calculator for use in the consideration of carbon savings from wind farm developments on Scottish peatlands[6]. Originally published in 2008, the calculator has been refined (currently version 2.4.0) following feedback and further research in order to provide an even more effective tool. The purpose of the tool is to assess, in a comprehensive and consistent way, the carbon (GHG emissions) impact of windfarm developments. This is done by comparing the carbon costs of wind farm developments with the carbon (GHG emissions) savings attributable to the wind farm. The calculation is summarised as the length of time (in years) it will take the carbon savings to amount to the carbon costs; this is referred to as the payback period.

12.11 Applications for wind farms (or extensions of wind farms) submitted under s36 of the Electricity Act (for proposals of more than 50 MW capacity) are screened to establish whether they are on deep peat sites i.e. greater than 0.5 metres thickness and where loss or disturbance to peat could occur. Where they are located on such sites, developers will be expected to use the carbon calculator in preparing their application.

As part of their statutory consideration of windfarm applications, SEPA will validate final carbon assessments supporting Section 36 applications and the findings will be a material consideration by Ministers in determining such applications. It should be noted that the Development is not a S36 application due to its proposed capacity being below 50MW. This ES chapter has been prepared to address climate change impacts and the need for a carbon balance assessment following SEPA's scoping opinion.

Planning & Climate Change; Key Agency & Scottish Government Resources & Guidance (2010)

12.12 The Scottish Government's Energy Consents Unit promotes the use of the above tool to calculate carbon savings from onshore wind farms subject to a Section 36 Electricity Act application (i.e. over 50 MW).

SEPA Response to Blackwood Wind Farm EIA Scoping – Carbon Balance & Peat

12.13 The response received from SEPA of 14th June 2011 regarding the Blackwood Wind Farm EIA Scoping Report[7] states the following in relation to carbon and peat issues:

"Scottish Planning Policy (SPP) recognises that 'the disturbance of some soils, particularly peat, may lead to the release of stored carbon, contributing to carbon emissions' (Paragraph 133). In line with SPP 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. Please refer to the Scottish Government guidance Calculating carbon savings from windfarms on Scottish peat lands – A New Approach, which provides a methodology for estimating the impacts of this type of development on carbon dynamics of peat lands.

The ES should include preventative/mitigation measures to avoid significant drying or oxidation of peat through, for example, the construction of access tracks, drainage channels, cable trenches, or the storage and re-use of excavated peat. A detailed peat management scheme setting out these measures may be required through a planning condition, to ensure that the carbon balance benefits of the scheme are maximised. In addition to validating any carbon balance appraisals for Section 36 windfarms (based upon the revised guidance) we will provide comment on drainage and waste management aspects of the peat management scheme."

Local Policy

Dumfries & Galloway Local Development Plan; Main Issues Report (March 2011)

12.14 Dumfries and Galloway Council's Local Development Plan (LDP) Main Issue Report[8]sets out five key elements for their vision for 2030, namely: Economy, Place Making, Housing & Infrastructure, Environment and Climate Change.

12.15 The Climate Change (Scotland) Act 2009 and the emission reduction targets it contains is key to the contribution the region can make to climate change mitigation through the accommodation of renewable energy technologies. A number of small and large scale wind energy developments are now in operation across the region both on land and offshore. Extensive forestry cover can also assist in reducing green house gases as trees absorb and store atmospheric carbon dioxide (CO_2). Land coverage by forestry and woodland in the region is approximately 28%. Carbon rich soils, such as peat which are common in some parts of the region, can also act as carbon store.

Method of Assessment

12.16 The latest version (v2.4.0) of the Carbon Balance Assessment method for onshore windfarms on peatland developed for the Scottish Government[6] has been used for the Development, in accordance with SEPA's EIA Scoping Response and requirements of web-based guidance for Wind Farm Developments On Peat Land. This tool has been used despite the development not being a Section 36 application, and despite the absence of peat deposits likely to be affected at the Site.

12.17 RSK and Force 9 have sought to maximise the use of Site and scheme- specific data to ensure an accurate assessment that relates as far as possible to the particular Site conditions and development proposals. It should be noted, however, that default and/or assumed values have been used in some areas where scheme or site specific data is not available. Details of all values used in the carbon balance assessment and their source are provided in Appendix 12.1.

12.18 This methodology accords with IEMA guidance in relation to Climate Change Mitigation and EIA guidance, in that it considers carbon emissions and savings across the Development lifecycle (manufacturing, site preparation, construction, operation and decommissioning). It derives the net carbon impact and period following construction by which operational GHG savings offset carbon losses during construction – otherwise known as the carbon balance period.

12.19 Guidance for determining the significance of identified net climate change impacts, be they adverse or beneficial impacts, is not yet available from IEMA or other sources. In the absence of such guidance, the significance of the calculated net climate change impact of the Development is stated to be positive or adverse.

12.20 It should be noted that the assessment has considered all impacts associated with the Development as described in Chapter 3. The route and nature of the grid connection does not form part of the planning application and is yet to be finalised so has not been assessed here. The applicant's preference is for the grid connection cables to be located in trenches in roadside verges; it is not anticipated there would be any significant environmental impacts associated with this option. However, the line would be considered in more detail and subject to environmental assessment by the Distribution Network Operator (DNO) prior to a formal application for this element of infrastructure. The scope of any such assessment would be agreed with DGC.

Baseline Environment

12.21 Baseline conditions regarding potential climate change impacts from the Development would relate to existing features at the Site (such as forestry or peat) that could be impacted by the Development and release GHG emissions as a result. These can be summarised as follows:

- Forestry: The Site comprises mainly semi-improved grassland and areas of mature coniferous plantation, some of which have recently been harvested and replanted, with small stands of deciduous woodland in the north and south west of the Site;
- Peat: A review of available information and site visits by qualified consultants has concluded that peat is only present in one area at the Site, adjacent to the Burnkettle Shooting Ground at Glenloy, which would not be impacted by the Development; and
- Drainage: The Site is relatively well drained by existing natural watercourses, with the majority of the area around the proposed turbine locations draining into tributaries of Pennyland Burn and several smaller, un-named tributaries in the eastern side of the Site drain into Clauchrie Burn and Ballochan Linn. In addition, the 2,500m of existing access track include drainage features, as does the conifer plantation. The water table is anticipated to be at a depth of 2 to 3 m below ground level (2.5m is assumed).

Project Characteristics

12.22 Characteristics of the Development have the potential to result in significant GHG emissions and savings, hence climate change impacts both positive and negative, through the project lifecycle, as summarised below.

Forestry

12.23 The turbines, access tracks and ancillary features would be located away from the more mature areas of conifer plantation and the small stands of deciduous woodland in the north and south west of the Site. This would ensure these features are not impacted by the Development.

12.24 Trees (the majority of which are recently planted saplings) would be cleared from around two of the five wind turbines (turbines 1 and 3). Because these trees would be replanted on a like-for-like basis as part of the Development, and because the carbon balance assessment method relates to the mature forestry, sapling removal / replanting is excluded from the assessment but would cancel itself out in GHG emissions terms in any case.

Peat

12.25 Changes in local hydro-geological and drainage conditions in areas of peat deposits can result in GHG emissions from the drying of the peat and the release of CO_2 from the oxidation of carbon contained by the peat. The Construction Environmental Management Plan (CEMP) as set out in the embedded mitigation for the Development (Chapter 3: Project Description) would highlight the area of peat recorded to the west of

Glenloy in order to ensure its protection. The embedded mitigation for the Development, also includes for ground investigation within the turbine locations and access track routes prior to commencement of construction, to confirm ground conditions are suitable for construction but also to confirm peat deposits are not present.

Drainage

12.26 Changes to the general water table depth at the Site as a result of construction or decommissioning works could affect habitats and peat deposits present.

Predicted Impacts

12.27 The results of the Carbon Balance Assessment carried out for the Development are presented below for each project stage.

Construction and Decommissioning

12.28 Of all project stages, the construction stage has the greatest potential to cause new GHG emissions from such activities as:

- Manufacture of the wind turbines;
- Loss of soil organic carbon from the construction of new access tracks, borrow pits, turbine foundations and hardstanding areas; and
- Reduced carbon fixing potential of plants following their removal to facilitate the above construction.

12.29 No permanent changes to the general water table depth at the Site are anticipated as a result of the construction or decommissioning of the Development.

12.30 Because the impacts listed above would take place before the Development is operational, net positive GHG emissions i.e. adverse climate change impacts, are anticipated during this stage of the Development, which are summarised in Table 12.2 and Figure 12.1.

12.31 Decommissioning provides an opportunity to return the Site to its previous use and condition. For the purposes of this carbon balance assessment, Site decommissioning is assumed to comprise only the removal of turbines and the restoration of the borrow pits. No new forestry planting is proposed at this stage as no mature forestry would be felled, and the removal of the drainage features associated with the access tracks of the Development is not anticipated.

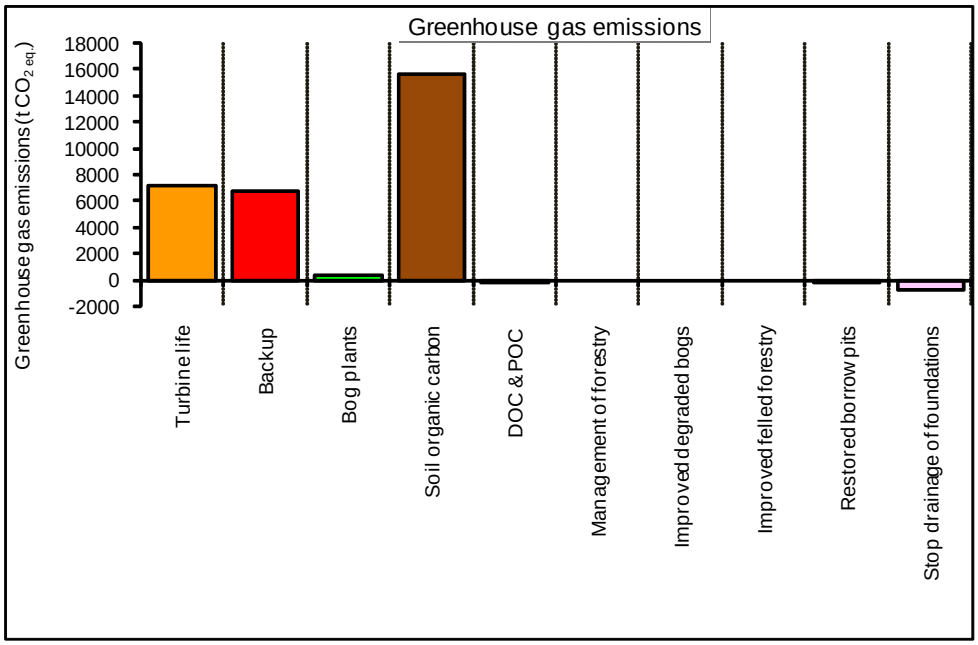
12.32 As such only minor GHG savings are anticipated from decommissioning, which are also summarised in Table 12.2.

Table 12.2 Expected GHG Losses and Savings from Development Construction and Decommissioning

Source of GHG Emissions / Savings	GHG Emissions (tCO_2e)
Construction	
Turbine manufacture, construction & decommissioning	7,239
Back-up	6,813
Reduced carbon fixing potential	408
Loss of soil organic matter	15,745
Leaching of Dissolved Oxygen Content (DOC) and Portable Oxygen Content (POC)	0
Forestry felling	0
Sub-total	30,206
Decommissioning	
Improvement of degraded bogs	0
Improvement of felled forestry	0
Restoration of borrow pits	- 83
Removal of drainage from foundations & hardstanding	- 727
Sub-total	- 810
Total	**29,397**

12.33 A total of 30,206 tonnes CO_2e is predicted to be emitted during construction, and GHG savings of 810 tonnes are expected from decommissioning, giving a net GHG impact from these two project stages of 29,397 tonnes CO_2e. These estimated GHG emissions and GHG savings from construction and decommissioning are presented in Figure 12.1.

Figure 12.1 GHG Emissions & Savings from Wind Farm Construction & Decommissioning



12.34 It can be seen that loss of impacts to soil organic carbon is the largest source of GHG emissions during construction despite the general absence of peat likely to be affected at the Site. GHG emissions from turbine manufacture and back-up also give rise to GHG emissions, although GHG losses from other sources are minimal. Minor GHG savings are predicted during decommissioning.

Operation

12.35 The Development's operational stage is considered most likely to result in the greatest effect on GHG emissions and hence climate change impacts. This is because GHG emissions from construction activities would have ceased, and the operation of the wind turbines would generate zero carbon electricity, which saves substantial GHG emissions (0.43kgCO_2e / kWh) when used in place of electricity generated from fossil fuels. The expected GHG savings are summarised in Table 12.3.

Table 12.3: Expected GHG Savings from Development Operation (against 'Fossil Fuel Mix' of Electricity)

Source of GHG Emissions / Savings	GHG Emissions (tCO_2e)
Development operation	- 16,351
Total CO_2 Savings	**- 16,351**

Carbon Payback Period

12.36 The construction and decommissioning stages of the Development are predicted to result in net GHG emissions of 29,397 tonnes CO_2e. Dividing this by the annual GHG savings predicted from the Development operation (16,351 tonnes CO_2e) gives a carbon payback period of 1.8 years (or 21.6 months) against a fossil fuel grid mix. That is, net GHG emissions from construction and decommissioning would be offset by GHG savings from the Development operation at 1.8 years following the opening of the wind farm.

Net GHG Impact

12.37 The Development has a lifetime of 25 years, and will therefore continue delivering GHG savings once the 1.8 year carbon payback period is reached. The net GHG impact can be calculated by multiplying the period of time the Development will operate after the carbon payback period (23.2 years) by the annual GHG saving (16,351 tCO_2e) which gives net positive GHG impact of 379,343 tonnes CO_2e over its lifetime.

Mitigation

Construction

12.38 The key mitigation measure at construction stage in relation to climate change is the avoidance of areas of existing woodland for the Development. This is mitigation built into the design and no further mitigation measures are proposed.

Operation

12.39 The Development itself represents a major source of climate change mitigation, and therefore additional mitigation measures are not required.

Decommissioning

12.40 The restoration of borrow pits is the sole mitigation measure assumed at decommissioning. Refer to Chapter 3 Project Description for further details.

Residual Impacts

12.41 Because mitigation measures associated with the Development (such as the general location of development away from areas containing forestry or significant peat deposits) are accounted for in the carbon balance assessment method, residual impacts i.e. those following mitigation remain unchanged from the impacts as reported above.

12.42 In summary, GHG emissions are predicted from various activities construction activities, particularly turbine manufacture, back-up, and the loss of soil organic matter from the construction of foundations, borrow pits, hardstanding and new access tracks. Only minor GHG savings are predicted from site decommissioning activities (the restoration of borrow pits).

12.43 However, these GHG emissions are predicted to be offset within 1.8 years of the Development becoming operational against a fossil fuel grid mix, and it is predicted that the Development would deliver total GHG savings of some 379,343 tonnes over its 25 year lifetime.

12.44 This net GHG impact is considered to represent **a significant positive and long-term climate change effect**.

12.45 Regarding planning policy requirements, the latest version of the Carbon Balance Assessment tool for Windfarms on Scottish Peatland (v2.4.0) has been applied to the development proposals, as requested by SEPA's EIA Scoping Response despite the development not comprising a Section 36 application (in view of it having a total capacity below 50MW).

12.46 Furthermore, no peat is present on site, and no forestry will be removed to facilitate development. Although some recently planted tree sapling will be removed from around the turbine locations to facilitate development, these this will be offset by like-for-like sapling planting as part of the development.

12.47 This approach helps ensure the development can be constructed without significant carbon / climate change related impacts from the disturbance of natural features such as peat and forestry.

12.48 The carbon balance assessment undertaken for the development concludes it will make a significant net reduction in GHG emissions, and hence have a significant beneficial effect in relation to climate change mitigation.

12.49 This approach and result of the assessment is considered to accord in full with relevant planning policy at the national and local levels.

Cumulative Impacts

12.50 Should all the wind farms, as listed in Chapter 8 and shown on Figure 8.27, be consented and constructed, there would be a net GHG saving and positive impact of greater significance than that of the Development alone.

Chapter 12 References

[1] Inter-Governmental Panel on Climate Change (IPCC) 4th Assessment Report; AR4.
[2] Climate Change Mitigation & EIA; IEMA Principles Series; version 1.1; IEMA; 2010.
[3] Kyoto Protocol to the United Nations Framework Convention on Climate Change: (UNFCCC).
[4] Climate Change (Scotland) Act (2009) (asp 12).
[5] Scottish Planning Policy (SPP) (2010)
[6] Carbon Calculator for Wind Farms on Peatlands; Version 2.4.0; Scottish Government; 2011.
[7] Blackwood Wind Farm EIA Scoping Opinion letter; (Ref. PCS 113887); SEPA, 14th June 2011.
[8] Dumfries & Galloway Local Development Plan; Main Issues Report (March 2011)

13 SOCIO-ECONOMICS

Introduction

13.1 This chapter assesses the potential impacts of the Development on the local economy i.e. employment and trade, and on recreation and tourism, including perceptions of visitors to the area, local tourist attractions and leisure activities.

13.2 The chapter outlines relevant planning policy and strategy, describes the methods used to assess the impacts, summarises existing local conditions, and the potential direct and indirect impacts anticipated to result from the construction, operation and eventual decommissioning of the Development.

13.3 This chapter has been prepared by RSK Environment Ltd. Landscape and visual impacts e.g. on national and regional scenic areas are considered in ES Chapter 8, noise impacts are considered in ES Chapter 10.

Legislation and Policy

13.4 Key strategy and policy documents of relevance to the Development and the assessment were reviewed, relevant policy is discussed in Chapter 4: Planning and strategy documents are summarised in Table 13.1 below.

Table 13.1. Key Planning Policy and Strategy

Source	Policy/Title	Description
Scottish Government	The Government Economic Strategy, September 2011[1]	Sets six strategic priorities that drive economic growth: • A supportive business environment; • Transition to a low carbon economy; • Learning, skills and well-being; • Infrastructure development and place; • Effective government; and • Equity. The urgent need to meet emissions targets and to take advantage of the current economics conditions has resulted in the creation of a specific Strategic Priority focused on the low carbon economy; an addition from the 2007 strategy. Energy (including renewables) is one of the seven growth sectors identified in the economic strategy
Scottish Government	Government Low Carbon Economic Strategy[2]	Transforming the energy sector in Scotland is seen as pivotal to the development of a low carbon economy, providing benefits including reduced GHG emissions and enhanced energy security.

13.5 Scottish Planning Policy[3] states that increasing sustainable economic growth is the overarching purpose of the Scottish Government (achieving a sustainable economy also being an objective of the UK Sustainable Development Strategy[4]). With regard to rural development the aim should be to enable development which supports prosperous and sustainable communities whilst protecting and enhancing environmental quality.

13.6 The Dumfries and Galloway Structure Plan[5], the Nithsdale Local Plan[6] and the Dumfries and Galloway Local Development Plan Main Issues Report[7] were reviewed, but these did not contain any specific policies (or emerging policies in the case of the Main Issues Report) of relevance to the assessment.

Method of Assessment

Scope of Works

13.7 In assessing the potential impacts the chapter has considered both the local area to the Site, and the wider impact area of Dumfries and Galloway. However, given the proposed scale of the Development and prevailing baseline conditions (as described below) it is anticipated that impacts would be largely confined to the local area.

13.8 A desk-based study has been completed to compile relevant baseline information for the Site and the local and regional areas. This comprised a review of the following and subsequent activities:

- Ordnance Survey mapping for the Site and local area and compilation of relevant map information (such as identified footpaths and rights of way[8]);
- The Forestry Plan for the current activities on-site[9] and consultation with the Forestry Estate Manager;
- Review of relevant Scottish Government and Dumfries and Galloway Council (DGC) plans and strategy documents;
- Information on Promoted Sites held by the Dumfries and Galloway Historic Environment Record (HER);
- An internet-based data search e.g. National Records of Scotland, VisitScotland, the National Trust and DGC; and
- Current research on impacts of wind farms on tourism e.g. Scottish Government 2008[10].

13.9 A quantitative assessment has been completed where possible e.g. predicted job numbers are compared to existing employment levels, but the impact assessment is largely qualitative, using experience of previous wind farm projects and professional judgement.

Significance Criteria

13.10 There is no best practice guidance or standard significance criteria relating to socio-economic impacts. The significance of impacts has therefore been determined by assessing the sensitivity of the identified receptors and the potential magnitude of change arising from the Development, as set out in Tables 13.2 and 13.3.

Table 13.2. Receptor Sensitivity

Receptor Sensitivity	Example
High	Areas noted for their high unemployment rates compared to the national average. Tourist or leisure and recreational features or facilities considered to be of international or national importance, possibly legally protected and/or scheduled, with very high visitor numbers. Land uses considered highly sensitive to change.
Medium	Areas with unemployment rates that are notably above the national average. Tourist or leisure and recreational features or facilities considered to be of regional importance, but not legally protected. Land uses considered moderately sensitive to change.
Low	Areas with unemployment rates that are broadly consistent with the national average. Locally important tourism or leisure features and resources (not legally protected). Land uses considered slightly sensitive to change.
Negligible	Areas noted for their low unemployment rates compared to the national average. Leisure and recreation features and resources which are of low importance (rarely visited). Land uses considered robust to change.

Table 13.3. Impact Magnitude.

Magnitude	Example
Large	Complete or almost complete permanent destruction or disruption of the resource. Substantial, permanent impact on the regional or national economy, including tourism and recreation facilities. Permanent and large scale changes to employment rates.
Moderate	A moderate to high proportion of the resource destroyed or disrupted. Moderate temporary or permanent impact on the economy, including tourism and recreation facilities and resources. Permanent/ temporary medium scale changes to employment rates.
Small	A small proportion of the environmental resource destroyed or disrupted. Minor temporary or permanent impact on the economy, including tourism and recreation. Temporary short term changes to employment rates.
Negligible	Resource will not be materially affected and no discernable changes in employment.

13.11 The combination of receptor sensitivity and magnitude of change allows impact significance to be determined, as summarised in Table 13.4.

Table 13.4 Impact Significance

Receptor Sensitivity	Impact Magnitude			
	Large	Moderate	Small	Negligible
High	Significant	Significant	Not Significant	Not Significant
Medium	Significant	Significant	Not Significant	Not Significant
Low	Not Significant	Not Significant	Not Significant	Not Significant
Negligible	Not Significant	Not Significant	Not Significant	Not Significant

Assumptions and Limitations

13.12 The 2001 census data has been used to assess baseline environment. Whilst the 2011 census has been completed, the results are not due to be published until the latter half of 2012. It is assumed that, in the absence of any more recent data, the 2001 data still provides reasonable baseline population and economic data for the region.

13.13 Potential visual impacts of the Development are assessed in detail in Chapter 8: Landscape and Visual Amenity. For the purposes of this assessment, the magnitude of potential indirect visual impacts has been determined using a combination of the visibility of the Development from the feature of interest e.g. footpath, golf course or tourist attraction and anticipated perceptions of the user / visitor, based on published literature and reports on the subject.

Baseline Environment

The Site and Local Area

13.14 The Blackwood Estate comprises a mix of farmland and woodland (which predominantly comprises coniferous species but also some deciduous broadleaf species). A forestry plan is in operation for the estate for the period 2006 – 2025, to restructure the age class of the woodland areas on-Site. Some areas of the Site, in the area of the proposed turbines, have recently been replanted, as shown on Figure 3.1. The forestry provides a source of income for the landowner, in addition to providing ecological and landscape benefits.

13.15 The Burntkettle Shooting Ground is located within the Site at Glenloy, in proximity to the proposed turbine locations. The shooting ground operates to the Scottish Clay Target Association (SCTA) code of practice[11], which ensures visitors can enjoy the facility whilst their health and safety is protected. The facility is open for practice every Sunday, and other days by appointment. Deer stalking and pheasant shooting are other sports available on the estate, run by the Newlands Estate in combination with Dalswinton and Duncow estates[12].

13.16 In the western section of the Site community facilities are provided at Auldgirth in the form of the playing field and village hall. A tearoom is also located in the village and the Auldgirth Inn provides accommodation for visitors and tourists. Holiday accommodation is also available at the Friars Carse Country House, located approximately 2km to the south of the Site boundary and within the Dalswinton Estate to the south east. A number of self-catering holiday cottages are also located within the wider local area.

13.17 To the north of the Site is the Clauchrie Forest, which extends to some 235 hectares and is currently the subject of a community buyout. Currently owned by Forestry Commission Scotland, the Closeburn Community was offered the opportunity to purchase the forest in 2009. The scoping response from the Closeburn Community Council stated that, through its local charity Nith Valley LEAF Trust, it was currently in negotiation with the Forestry Commission Scotland to lease the woodland as a community forest. The feasibility study for the acquisition[13] stated that ‘the local

community currently makes relatively little use of the forest and those that do so use it for walking'. There is potential to increase the use of the forest, both for recreational purposes e.g. walking, cycling and riding, and also education / training.

13.18 Heritage Paths is a project set up by Scotways (the Scottish Rights of Way and Access Society). Two Heritage paths run through the Forest of Ae, these are the 'Daerhead to Kirkpatrick' and 'Beattock Old Drove Road' paths, located approximately 3km to the north and 5.4km to the east of the Site respectively.

13.19 Dumfries and Galloway Council have produced a draft Core Paths Plan[14] in accordance with the Land Reform (Scotland) Act 2003, which is intended to define key paths in the council area. The routes of two proposed Core Paths run in close proximity to the Site, 4442 to the north within the Clauchrie Forest and 46/47 approximately 200m to the east of the Site, following the field boundaries of the Dalswinton Wind Farm area as shown on Figure 13.1.

Population and Local Economy

13.20 Data from the 2001 census[15], as interpreted by DGC for the 2007 Ward areas, indicates that Dumfries and Galloway has a population of approximately 147,765 with 11,845 in Mid and Upper Nithsdale, the ward within which the Site is located. Dumfries is the largest town in the region, located approximately 14km to the south; other villages within this radius of the Site include Thornhill, Closeburn, Kirkton, Ae Village, Penpont and Locharbriggs.

13.21 Dumfries and Galloway is primarily a rural economy. The Regional Economic Strategy (RES)[16] defines the key sectors to be tourism, food and drink, forestry, energy, agriculture and business. Small and medium enterprises (SMEs) employ a significant proportion of the working population in the area, in comparison to Scotland as a whole[17]. Employment statistics in the 2001 census indicate that for Mid and Upper Nithsdale there were 8,497 people of working age, but unemployment is slightly above the Scottish average (4%) at 4.7%.

13.22 The Regional Tourism Strategy for Dumfries and Galloway (2011 - 2016)[18] states that tourism is a key sector in the regional economy, supporting approximately 5,977 full time jobs and it is estimated that tourism (directly and indirectly) accounts for approximately 11% of employment in the region.

Tourism and Recreation

Tourism

13.23 The Scoping Opinion issued by DGC in July 2011 (Ref 11/E/3/0011) states that the historic environment and the overall environmental quality of the area are the main reasons that attract visitors to the area.

13.24 VisitScotland holds records of Scottish Tourist Board registered tourist attractions and activities in Dumfries and Galloway[19]. These, together with the local visitor attractions noted in the Scoping Opinion (particularly those highlighted by Auldgirth Community

Council), and Promoted Sites in the HER are summarised in Table 13.5 below. If travelling by car, visitor access to Dumfries and Galloway, and to Nithsdale, is available from the A75 and the A76.

Table 13.5. Visitor attractions within a 15km radius of the Site

No.	Attraction	Location	Approximate Distance from Site
1	Allanton World Peace Sanctuary	Nithsdale	2km to south
2	Garden of Cosmic Speculation at Portrack House	Nithsdale	4km to the south
3	Grieson of Lag grave, Dunscore Churchyard (Covenanters Trail)	Dunscore	4.5km to the south west
4	Ellisland Farm (former home of Robert Burns and Promoted Site)	Nithsdale	3.5km to south
5	Amisfield Tower (Promoted Site)	Amisfield	7km to southeast
6	Twelve Apostles stone circle (Promoted Site)	East Cluden	8km to south
7	Maxwelton House (Promoted Site)	Nithsdale	8.5km to west
8	Nith Bridge cross (Promoted Site)	Thornhill	8.5km to northwest
9	Newtonairds Lodge, Hostas and Garden	Newtonairds	9km to south west
10	Glenkiln Sculptures	Shawhead	11km to the south west
11	Morton Castle (Promoted Site)	Thornhill	11km to north
12	Drumlanrig Castle and Gardens (Inventory Garden and Designed Landscape)	Nithsdale	10km to north west
13	Lincluden Collegiate Church (Promoted Site)	Dumfries	10km to southeast
14	Terregles Queir (Promoted Site)	Terregles	10.5km to south
15	Dumfries and Galloway Aviation Museum	Dumfries	12km to the south east
16	Robert Burns Centre	Dumfries	14km to the south
17	Robert Burns House	Dumfries	14km to the south
18	Dumfries Museum and Camera Obscura	Dumfries	14km to the south
19	The Old Bridge House Museum	Dumfries	14km to the south
20	The Globe Inn	Dumfries	14km to the south
21	Dock Park and Castledyke Park Play Areas	Dumfries	15km to south east

13.25 In 2008 the Scottish Government issued a study report on the potential impacts on tourism arising from wind farm developments[9]. The study's findings noted that a significant minority of tourists (20% to 30%) preferred landscapes without wind farms. Of this percentage, however, only a very small proportion would change their intentions about revisiting Scotland. Under all circumstances, the vast majority of those who had seen a wind farm (93-99%) suggested that the experience would not have any impact.

13.26 The study's findings, based on a number of case studies (including studies in Dumfries and Galloway), estimated a reduction in general expenditure of tourists of between

1.30% and 1.72%, and a reduction of between 0.48% and 1.59% in expenditure on accommodation. This equates to a predicted economic impact from wind farms on tourism in Scotland (as a whole), as a loss of 211 Full Time Equivalent Jobs (equivalent to 0.1% of tourism employment in Scotland). In general, this indicates the negative impact of wind farms on tourism at national level is small and any reduction in employment in tourism would be less than the numbers directly employed in the wind power industry.

Outdoor Recreation

13.27 In addition to the specific attractions and venues listed in Table 13.5 above, visitors to the region and residents are understood to use the local area for outdoor sporting activities including walking, mountain biking, pony trekking, golf and fishing.

13.28 There are no national or regional cycle routes on or in the vicinity of the Site[20] and there are no local cycle routes in the immediate area (the closest being those around Closeburn and Thornhill to the north)[21].

13.29 The watercourses on-Site feed into the River Nith. The Blackwood and Dalswinton Estates own and operate fishing beats on the Nith (in the vicinity of Auldgirth and the Site) for a range of species including Salmon, Sea Trout and Trout. There are also private beats in this area.

13.30 Thornhill Golf Club is located approximately 8km to the north of the Site and mountain biking is available at Drumlanrig Castle (also to the north). Three golf courses are located around the town of Dumfries, namely Dumfries and Galloway Golf Club, Crichton Golf Club and Dumfriesshire Golf Centre.

13.31 It was noted in the Scottish Government report[10] that outdoor enthusiasts are likely to have a particular interest in landscape. However, 45% of hill walkers expressed positive views about wind farms rather than negative ones (19%).

Project Characteristics

13.32 As discussed in Chapter 2, the Development design has been through a number of iterations, taking account of the environmental designations and constraints both within and in the vicinity of the Site, thus ensuring that, as far as practicable, negative impacts from the Development are minimised.

13.33 The characteristics of the project are generally set out in Section 3, Project Description. Included in the embedded mitigation is a Construction Project Environmental Management Plan (CEMP), which would be adopted by the project (during both construction and decommissioning) to control environmental impacts such as noise and dust generation. Working hours would also be set and a Traffic Management Plan would be implemented.

13.34 Local facilities and features may be impacted by the following construction activities:

- Construction of the turbines and substation / control building;

- Use of cranes and half-constructed turbines forming a visible feature;
- Excavations for the borrow pits, foundations and access tracks;
- Any vegetation clearance required and replacement planting;
- Transportation of materials and labour to and from the construction site – disturbance and delay;
- Activities at the construction compound; and
- Construction of the substation / control building (disturbance).

13.35 Once operational, the turbines have potential to result in noise impacts on local community and recreational facilities, and visual impacts to features within the wider local area. These are discussed below.

13.36 A Community Fund is proposed in association with the Development, the nature of which is subject to negotiation with the local community and Dumfries and Galloway Council. The community fund could be used to support the community buyout of the Clauchrie Forest, other educational activities, energy efficiency measures or supporting local groups and clubs.

Predicted Impacts

Construction Impacts

Employment

13.37 Since unemployment in the Nithsdale area is slightly above the national average, the area is considered to be a receptor of medium sensitivity in relation to employment. In terms of magnitude of impact, approximately 20 staff would be employed on the project during the proposed nine-month construction period. Whilst a proportion of those staff would be employed from further afield due to specialist requirements, Force 9 Energy would seek to employ the services of local people and businesses, wherever possible, to support the construction works. This is a small magnitude of change resulting from the creation of jobs and the impact would therefore be beneficial but **not significant.**

Local Economy

13.38 Given the landowner agreements in place for the wind farm, the forestry management plan and the attempts to improve the regularity in return from the plantation harvesting on the Blackwood estate, current commercial operations on the Site are considered to be of relatively low sensitivity. A total plantation area of 2.09 ha (the majority of which comprises relatively recently planted saplings) would require clearance to allow construction of the turbines and associated access tracks. However, this would be relatively small in comparison to the existing areas of plantation on-site and the area cleared would be replaced through additional planting elsewhere within the estate, at an appropriate location to be agreed with the landowner and forestry manager. There would therefore be no net loss of income in terms of timber sales, the impact magnitude would be negligible and the impact **not significant**.

13.39 The Burntkettle shooting ground is a locally important recreational business and given its proximity to the proposed turbine locations is considered to be of medium sensitivity. Its proximity to the proposed turbine locations and construction compound suggests significant potential for noise impacts and general disturbance during the construction works, which could affect income and future trade (return visits). However, the shoot is generally open on Sundays, when there would be no ongoing construction works, and the CEMP would include a requirement for consultation with the shooting ground team throughout the construction period. Knowledge of potential activities at the shooting ground during the week would allow scheduling of works to minimise potential noise and visitor delay impacts On this basis the impact magnitude is concluded to be small and the impact **not significant**.

13.40 With respect to businesses in the wider community, the Development would result in a small additional contribution to local trade during the construction works through the requirements for local accommodation and use of local services by construction staff. The magnitude of impact is anticipated to be small (given the numbers involved and relatively short term timescale), and with low sensitivity receptors (due to their local nature) the impact would be beneficial but **not significant**.

Tourism

13.41 The visitor attractions listed in Table 13.5 are considered to range from local to regional importance i.e. of low to medium sensitivity. This is due to the nature of the attractions and likely visitor numbers and opening times e.g. Portrack House is only open to the public one day a year. Several of the attractions have an outdoor focus, with a corresponding increase in the importance of their visual setting.

13.42 There would be no direct impacts to the identified visitor attractions since none are located within the Site and all are located a sufficient distance from the Site such that there would be no construction noise impacts.

13.43 Potential indirect impacts may be experienced by visitors using the A76, if subject to minor delays due to abnormal load deliveries (refer to Chapter 11: Traffic and Transport). This would be an impact of small magnitude and the impact would be adverse but **not significant**.

13.44 The ZTV (Figure 8.7 in ES Volume 2) suggests views of the Development would be available from the majority of visitor attractions listed in Table 13.5, though it should be noted that the ZTV is generated without taking account of existing buildings and vegetation. Visitors to these attractions are a transient receptor; views experienced would therefore be temporary and potentially intermittent. Given the relatively short term nature of the construction works, the equipment on-site and the existing Dalswinton wind farm to the east (which may have already altered visual perceptions of the wider area), indirect visual impact magnitude is considered to be small. The indirect visual impacts of the Development on tourist attractions during the construction works are therefore concluded to be **not significant**.

Recreation and Community

13.45 The fishing beats within the Nith are considered to be a locally important feature from a recreational / visitor perspective (potential ecological impacts are considered in Chapter 6: Ecology), that is a receptor of low sensitivity.

13.46 With the embedded mitigation described in Chapter 3 (including implementation of the CEMP) and further mitigation as set out in Chapters 5 and 6 (water quality and ecology respectively), the magnitude of change on fish-stocks and fishing quality within the beats during construction is predicted to be negligible, and thus the overall scale of impact, not significant.

13.47 The core paths in the vicinity of the Site, and other outdoor features in the wider local area are considered to be locally important i.e. of low receptor sensitivity. During the construction of the Development, construction activity would be visible from the core path to the east (and potentially on an intermittent basis from the path within the Clauchrie Forest), with more distant views available from the local golf courses. The potential visual impact magnitude is considered to generally be small, but moderate to large for the core path to the east. The impact significance is therefore determined to be **not significant**.

13.48 The CEMP would include a requirement for consultation with the community councils throughout the construction period, to stay up to date on programmed activities at the Auldgirth Village Hall. In doing so, construction activities and deliveries would then be programmed accordingly to avoid any delay and disturbance. The village hall is a local feature of low receptor sensitivity but the impact magnitude of the construction works would be negligible and the overall impact significance **not significant.**

Operational Impacts

Employment

13.49 The operation of the Development would result in negligible beneficial change to local employment, since any maintenance and servicing would be completed by staff associated with the operator of the Development. On this basis employment impact significance would be **not significant**.

Local Economy

13.50 As stated previously the current commercial operations on the Site are considered to be of low sensitivity. The operational Development would result in the loss of approximately 2.37 ha of land during its 25 year lifetime. However, this would not significantly impact forestry operations (as noted previously) and the estate would obtain a revenue for the operation of the Development, resulting overall in a beneficial impact of small magnitude. The impact significance would be **not significant**.

13.51 The Burntkettle shooting ground is a locally important recreational business but given its proximity to the proposed turbine locations is considered to be of medium sensitivity. The proximity of the operational turbines to the shooting ground would result in noise

and visual impacts for visitors to the ground, and would be likely to result in a permanent change to their perception of the Site. More significantly, part of the shooting ground, which provides over 50% of the income to the business, is orientated toward the proposed location of Turbine 3. The national code of practice, to which the clay pigeon shoot adheres, requires a minimum exclusion zone of 275m (300yd) in every direction in which shooting is likely to occur, in front of every layout. The lower sweep of the turbine blade potentially falls within this exclusion zone. In addition, maintenance staff would visit the Site to service and repair the turbines as required. There is the potential for staff servicing Turbine 3 to enter the exclusion zone; this part of the shooting ground would then have to temporarily cease operation. Since this area provides a significant proportion of income for the shooting ground there is the potential for an impact of large magnitude to the business, resulting in a **significant** impact.

13.52 Tourist accommodation is also a locally important business and is defined as a low sensitivity receptor. The Scottish Government report[10] indicates that most individuals preferred a landscape from a hotel bedroom without a wind farm. The ZTV suggests that the Friars Carse Hotel would not have visibility of the Development. Equally, although the Auldgirth Inn lies within the ZTV, there would be no view of the Development from the inn. Overall a small magnitude of impact is anticipated, in anticipation of a variable visibility of the Development from different windows and receptors e.g. other self-catering accommodation in the local area. Overall, the impact significance is concluded to be **not significant**.

Tourism

13.53 The visitor attractions listed in Table 13.5 are considered to range from local to regional importance i.e. of low to medium sensitivity. There would be no direct impacts to the identified visitor attractions since none are located within the Site and all are located a sufficient distance from the Site such that there would be no operational noise impacts.

13.54 As noted for the construction impacts, the ZTV (Figure 8.7 in ES Volume 2) suggests views of the Development would be available from the majority of visitor attractions listed in Table 13.5. However ES Chapter 8: Landscape and Visual Assessment reports that significant landscape and visual impacts are anticipated to extend approximately 3-8km to the north of the Site, with open and exposed views toward the Development from these areas. No such visitor attraction fall within this area. In addition, visitors to the attractions listed in Table 13.5 are a transient receptor; views experienced would therefore be temporary and potentially intermittent. The Scottish Government study[10] also indicated that tourist perceptions were unlikely to significantly alter on viewing a wind farm. Given the existing Dalswinton wind farm to the east (which may have already altered visual perceptions of the wider area), the indirect visual impact magnitude is considered to be small. The indirect visual impacts of the Development on tourist attractions are therefore concluded to be **not significant**.

Recreation and Community

13.55 The core paths in the vicinity of the Site, and other outdoor features in the wider local area are considered to be locally important i.e. of low receptor sensitivity. Once

operational, the Development would be highly visible from the proposed core path to the east (see Figure 13.1) and on an intermittent basis from the path within the Clauchrie Forest, with more distant views available from the local golf courses. The potential visual impact magnitude is considered to generally be small, but large for the core path to the east. The impact significance is therefore determined to be **not significant**.

13.56 Clauchrie Forest is of local community importance and a low sensitivity receptor. Users of the forest for recreation and education would be likely to experience some views of the Development, intermittently with views of the adjacent Dalswinton Wind Farm. Impact magnitude would vary according to the visibility of the Development and adjacent wind farm and the perception and attitudes of the different users to wind farms, but in the worst case is considered to be adverse and moderate. Impact significant would therefore be **not significant**.

Decommissioning

13.57 It is considered that the decommissioning works would have largely the same impacts as those predicted for the construction phase of the Development; i.e. impacts would be **not significant**.

Mitigation and Residual Impacts

13.58 The assessment above takes into account the inherent mitigation within the design and the embedded mitigation as set out in Chapter 3: Project Description. The assessment is also made assuming mitigation measures proposed in other relevant chapters within this ES would be implemented.

13.59 The only potentially significant identified impact is the impact on the recreational business, the Burntkettle Shooting Ground, during the Development operation. In order to mitigate this impact it is proposed to re-orientate and landscape the shooting ground within the terms of its existing planning permission, so that both the ground and the Development can co-exist within the terms of the SCTA code of practice and technical guidance. The restructured shooting ground would be likely to include features and landscaping to enhance its attractiveness as a venue for clay pigeon shooting. As such any impact would be expected to be fully mitigated, with the potential to improve and grow the business.

Cumulative Impacts

13.60 As described in Chapter 1 potential cumulative impacts can take two forms:

- A combination of individual impacts from the Development experienced by an individual receptor e.g. a recreational user of the nearby core path could experience both noise and visual impacts; and/or
- Impacts from several different developments on a receptor – impacts from the individual developments may not be significant, but there could be a significant impact when considered cumulatively.

13.61 There is the potential for users of Clauchrie Forest and the core paths to experience combined noise and visual impacts associated with the construction and operation of the Development. In combination these may result in a large impact magnitude to an individual user, but as a low sensitivity local receptor, the overall impact significance would be considered not significant.

13.62 A planning application for the Auchencairn Wind Farm was submitted to Dumfries and Galloway Council in September 2011. This would be a 16 turbine wind farm located approximately 4km to the north of the Site. There is the potential for greater combined indirect visual impacts on recreational and tourist features during both construction and operation of the two developments. However, the features that are considered to have the potential to be impacted would be of local importance i.e. of low sensitivity and therefore, following Table 13.5, impacts would be not significant.

Chapter 13 References

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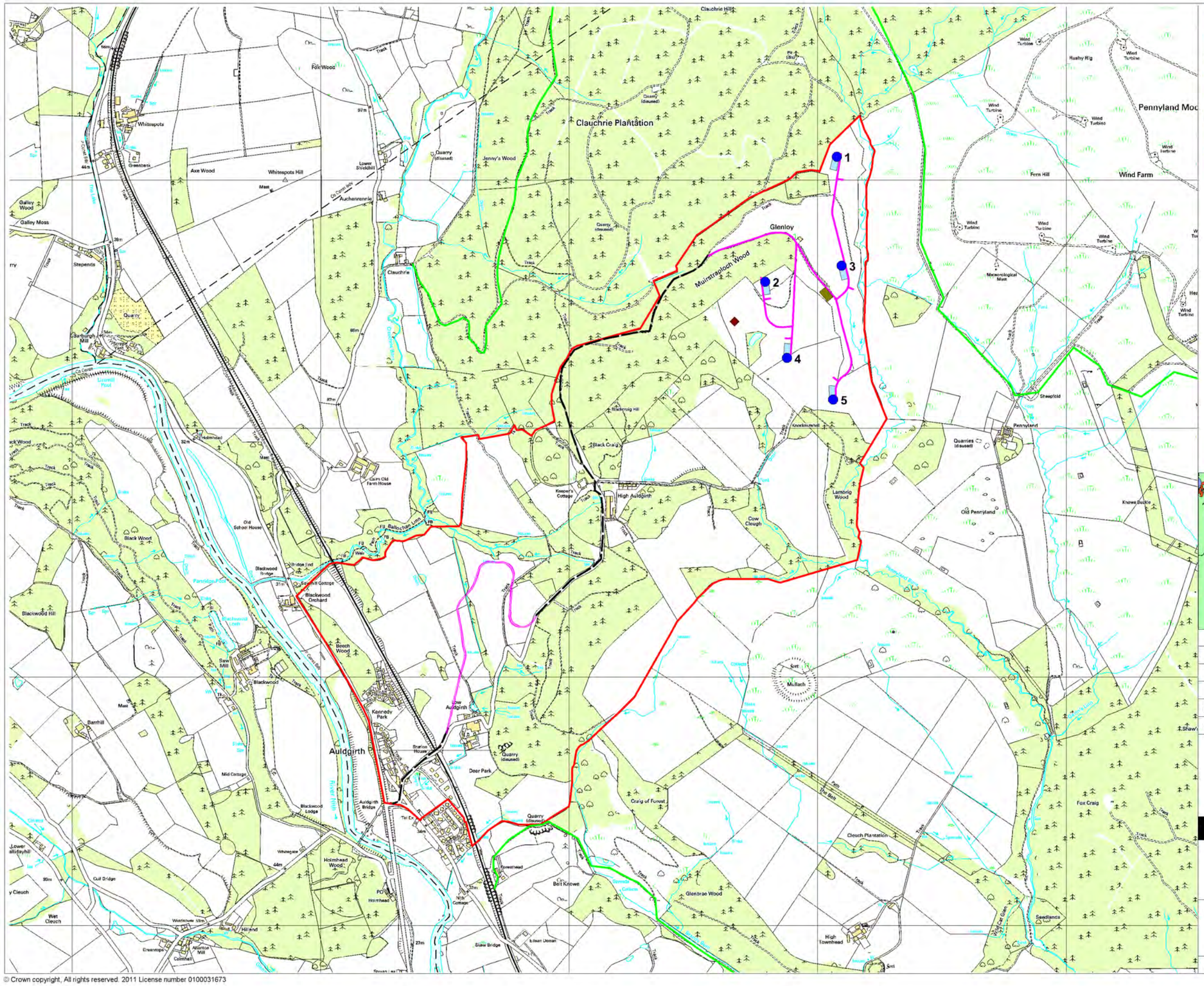

Rev	Date	Description	Drn	Chk	App
00	17.11.11	Public Rights of Way	BF	MK	MK

FORCE 9 ENERGY

Blackwood Wind Farm

RSK

Figure 13.1 - Public Rights of Way and other routes

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14 EMI, INFRASTRUCTURE, AVIATION AND SAFETY

Introduction

14.1 This chapter considers the potential impacts of the Development (including micro-siting the turbines by up to +/-30m) on existing infrastructure, telecommunications, utilities aviation infrastructure and public safety issues. These matters have been investigated through consultation with the relevant system operators and accounted for in the iterative wind farm design process. This design process ensures that wherever possible, turbines are located in areas where there would be no impacts on infrastructure, telecommunications, utilities or aviation safety. Where this is not possible, agreement is reached with the providers of such services for alternative arrangements to be made so that these services would not be affected by the Development.

14.2 This chapter has been written by The Wind Consultancy Service and Force 9 Energy.

Policy Context

14.3 Online Advice regarding Onshore Wind Turbines, published by the Scottish Government (formerly PAN45), notes that wind farms have the potential to disrupt lines of communication and radar, affect television reception and impact on existing infrastructure. The advice suggests applicants should make direct contact with the operators of such infrastructure to ensure their proposals do not impact on services adversely. The advice also deals with matters around public safety.

Method of Assessment

14.4 The infrastructure, telecommunications, utilities and aviation safety assessment is largely based on consultation by The Wind Consultancy Service (TWCS), Force 9 Energy LLP and RSK with a number of organisations known to have an interest in infrastructure, telecommunications, utilities and aviation safety in the proposed area of the Development.

14.5 During 2011, The Wind Consultancy Service (TWCS) and Force 9 Energy LLP undertook a desk-based consultation exercise to establish the baseline relating to infrastructure in and around the Site. The following organisations were consulted:

- British Broadcasting Corporation (BBC) (website only consulted);
- Civil Aviation Authority (CAA);
- Joint Radio Committee (JRC);
- Linesearch;
- Ministry of Defence (MOD); and

- Ofcom.

14.6 A qualitative assessment of the potential risks presented to the public from the construction, operation and decommissioning of the Development (due to public access to the Site and general health and safety issues) was completed. This used relevant guidance documents (web-based Planning Advice Note (PAN) on Onshore Wind Turbines[1], previously PAN45: *Renewable Energy Technologies*) and professional judgement obtained during work relating to a large number of previous wind farm projects.

14.7 A quantitative analysis of the impact of the Development on the wind resource likely to be captured by the existing Dalswinton wind farm is also presented.

14.8 This chapter concentrates on identifying impacts on existing infrastructure and promoting methods of mitigation so there are no significant residual impacts. There is no methodology or best practice guidance available about what constitutes a significant impact on any of the services considered within this chapter. If residual impacts are likely to occur post mitigation their potential significance is ultimately the subject of professional judgement.

Baseline Environment

Infrastructure

14.9 An enquiry was entered into the Linesearch facility which *"Provides a single point of contact for all initial enquiries relating to the apparatus owned and/or operated by our Members, which now totals some 7,900 kms of pipeline and fibre optic cable ducts".* The results of this enquiry showed that the Development was not in the zone of interest for any of the listed organisations.

14.10 The proposed turbines would be located within 20km of Eskdalemuir Seismic Array and less than 1km from the nearest turbines at the existing Dalswinton Wind Farm.

Telecommunications

14.11 Following consultation with Linesearch, Ofcom and the JRC, the following organisations provided detailed location information for their telecommunication links which have the potential to be affected by the Development:

- Atkins (on behalf on an unnamed client);
- BT;
- Vodafone;
- Orange;
- T-mobile; and
- Airwave Solutions.

14.12 The online BBC Windfarm Tool (which provides an estimate of the population numbers potentially affected by the installation of wind turbines) indicated in March 2011 there may be interference with local transmitters, with the result that up to 210 homes may be

affected for which an alternative off-air service may be available and a further six homes may be affected for which an alternative was not available.

Aviation Safety

14.13 Under the Civil Aviation Act, the CAA is responsible for providing advice about aviation safety. The Authority's Directorate of Airspace Policy (DAP) has the lead responsibility within the CAA for all wind turbine related issues. The Authority's policy on wind turbine development and related guidance to the UK civil aviation community is set out in CAP 764. The CAA changed its policy regarding pre-planning consultations in December 2010, stating that "*it will no longer process pre-planning enquiries unless submitted as a Scoping Opinion through a Local or National Planning Authority. As completion of the pre-planning process is not a statutory requirement, the CAA's decision will not affect the formal planning process.* "

14.14 No consultation has therefore been undertaken with the CAA.

14.15 Data published by the Department of the Environment and Climate Change[2] has been used to assess the likely impact of the Development on aviation interests. The Development:

- Lies outside any consultation zone for safeguarded aerodromes;
- Lies outside areas of concern for meteorological radars;
- Lies within an area where there may be impacts on the Secondary Surveillance Radar (SSR) at Lowther Hill; and
- Lies on the edge of an area where there may be impacts on the Primary Surveillance Radar.

14.16 Local planning authorities will consult local aerodromes as follows:

- Officially safeguarded aerodromes: Planning authorities must consult aerodromes on all matters relating to safeguarding (DfT / ODPM / NAFW Circular 1/2003 and Scottish Circular 2/2003 refers); and
- Non-officially safeguarded aerodromes: Aerodrome Operators are advised to establish a consultation process with local planning authorities.

14.17 The MOD was consulted on the original six turbine wind farm (refer to ES Chapter 2: Alternative and Design Evolution) by Force 9 Energy LLP in December 2010. The MoD responded by requesting confirmation of the turbine co-ordinates of the Development. The final co-ordinates of the five proposed turbines have subsequently been sent to the MoD and a response is currently awaited. Based on an understanding of MoD issues prevalent in the area there is expected to be concern by the MoD on impacts on its seismological recording station at Eskdalemuir (dealt with below under infrastructure). There are unlikely to be any aviation or radar issues raised by the MoD but this is currently unconfirmed.

Project Characteristics

14.18 The Development was designed with due consideration of telecommunication links and other elements of infrastructure understood to cross the area, based on the consultation responses from relevant organisations.

Predicted Impacts

Construction and Decommissioning

14.19 There would be no predicted impacts on infrastructure, telecommunications, or aviation safety during the construction and decommissioning of the Development.

Public Safety

14.20 Public safety and the safety of site workers is a concern during the construction period. Safety precautions for workers and the general public need to be considered under relevant legislation.

Operation

Infrastructure

14.21 Responses from all organisations listed on the Linesearch facility stated that the locations of the turbines as planned would not interfere with the operation of any of the utilities in question. There would therefore be no impact on utilities based on the submitted design.

14.22 A large proportion of the south of Scotland falls within a zone defined by the MoD where the vibrations caused by wind farm development across the zone may affect the Eskdalemuir Seismological Recording Station. The station provides the UK part of the international monitoring system of the Comprehensive Test Ban Treaty, which allows covert nuclear tests to be detected via their seismic signatures. Wind turbines create a background 'noise' (in effect vibration) signature which has the potential to affect the accuracy of the facility. Such vibration is harmless and imperceptible to humans but can be detected by the recording equipment which is highly sensitive.

14.23 The MoD agreed a 'budget' of up to 1.6GW of wind farm developments that could be built within a 31miles radius of the station without adversely affecting its operation. This budget limit has now been reached by wind farm schemes in operation, consented and in planning and the MoD typically objects to schemes within the zone of influence of the Eskdalemuir facility. It is expected that the MoD will object to the Development on this basis.

14.24 The Development would be located to the south west of the Dalswinton wind farm in the prevailing wind. Dalswinton has recorded outputs of 60.5, 63.8 and 51.8GWh in the last three complete years (April-March). Using the highest value of 63.8GWh as the basis for calculations and the candidate turbine details for the Development, it is possible to predict the impact of the Development on power production at the Dalswinton Wind

Farm using industry standard software[3]. It is predicted that the Development would cause a reduction of 1GWh per annum or 1.6% of the current energy potential at the Dalswinton Wind Farm, based on the candidate turbine for the Development. Such an impact on the operation of Dalswinton Wind Farm is not considered to be significant.

Telecommunications

14.25 Like any large structure, wind turbines have the potential to interfere with electromagnetic signals, a process which can affect communication networks, television reception and the telemetry systems used by utilities providers.

14.26 The web based Planning Advice Note (PAN) on Onshore Wind Turbines, previously PAN45: *Renewable Energy Technologies*, describes how wind turbines produce electro-magnetic radiation and this can interfere with broadcast communications and signals. Turbines affect electromagnetic transmissions in two ways: by blocking or diverting line of sight transmissions, or by scattering signals. These effects can result in the degradation of television reception with a loss of picture quality or acoustic interference. Microwave links and local radio communication systems can be disrupted.

14.27 It is known that wind farms have the potential to adversely affect terrestrial television reception up to a maximum distance of 5km (BBC *et. al.*1999). As there are a number of dwellings within 5km of the proposed turbine locations, this is a matter for further consideration.

14.28 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' impacts and 'reflection'/or 'scattering' impacts.

14.29 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 wind 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 cyclic manner related to the rotor frequency. The 'shadow' zone will decrease in overall impact with distance up to a maximum of 5km.

14.30 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.

14.31 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. This will help reduce the likelihood and severity of any interference.

14.32 Development design iterations have aimed to maximise the distance between turbines and residential dwellings and this has resulted in a minimum separation distance to properties of more than 500m. If a reduction in television reception quality occurs in the surrounding area, it is most likely to be noticed when the Development becomes operational.

Aviation

14.33 Like any large structure, wind turbines have the potential to interfere with electromagnetic signals, a process which can affect various systems concerned with civil and military aviation and radar. The web-based Planning Advice Note (PAN) on Onshore Wind Turbines, previously PAN45: *Renewable Energy Technologies*, describes how the rotating blades of wind turbines can create electromagnetic effects, which can degrade the performance of aeronautical systems and cause incorrect information to be received. These effects can cause turbines to appear as returns on radar systems representing 'clutter' for air traffic control services and degrading the signal when tracking aircraft through an area of a wind farm.

14.34 The South West Scotland Regional Aviation Solution Group, Final Radar Feasibility Study 2010 (the SW Scotland Study)[4] notes of Secondary Surveillance Radar (SSR) that:

"SSR requires active two□way communication between radar and aircraft. A transponder onboard the aircraft is interrogated by a series of pulses transmitted by the radar. The spacing of these interrogation pulses represents a question and the aircraft transmits a series of pulses in response.

The time delay between interrogation and the arrival of the response coupled with the radar's antenna direction at the time of reception allow the radar to calculate a 2□dimensional position. From information encoded within the responses the radar can add the third dimension and an identity code.

The newest generation of SSRs are known as Mode□Select (Mode□S) radar. Mode□S radar operate using the same principles as SSR however rather than repetitively broadcasting two questions; "how high are you?", and "what is your ID code?", Mode□S radar have the ability to selectively interrogate individual aircraft and request specific information. Mode□S relies on aircraft being equipped with Mode□S compliant transponders. All SSR should be Mode□S by 2012.

The reliance of SSR on onboard equipment means that aircraft without transponders or those whose transponders are either switched off or faulty will not appear at all on the controllers display unless the aircraft is detected by a supporting PSR."

14.35 It goes on to note that:

At short ranges large objects such as turbines have the potential to disrupt the operation of an SSR; however as turbines do not carry transponders SSRs are not as

susceptible as PSR to wind turbine generated false detections and there are very few wind turbine objections raised on SSR grounds.

14.36 There are therefore no predicted impacts on the SSR. As the turbines are located immediately adjacent to the existing Dalswinton Wind Farm and on the edge of an area where there may be impacts on the Primary Surveillance Radar, there are not expected to be any significant impacts on radar infrastructure in the area.

Public Safety

14.37 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. 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.

Mitigation

Infrastructure

14.38 A micro-siting provision has been requested such that any turbine can be moved up to 30m taking into account known environmental constraints. This provision would be used to respond to any additional unforeseen infrastructure constraint.

14.39 As the perceived limit for wind farm development has been reached within the Eskdalemuir Zone (the area within which the MoD consider there to be the potential for a significant impact on the efficient operation of the Seismological Station at Eskdalemuir) it would only be possible to develop the Blackwood Wind Farm if one of three things happen:

- The MoD no longer requires the Eskdalemuir facility (not currently considered likely);
- 'Budget' becomes available to allow the development to proceed. This would happen if a site that had been allocated budget with the zone were not to be developed (e.g. if it did not receive planning consent) or was only partially developed. At present no management is provided by a competent body to determine precisely the level of budget that may or may not be available to allow development to proceed; or
- On the assumption that there is no budget available, mitigation is employed to allow the Development to proceed within budget.

14.40 Mitigation would take the form of 'dampening' the vibration of the turbines so they make less vibration against the overall budget. Dampening involved the installation of a suspended weight inside turbine towers which counteracts the swaying of turbine which creates the vibrations in the ground which can be detected by the Seismological Station. However, on the assumption that the budget for vibration in the area is already at capacity, budget must be 'bought back' from another wind farm site to create a budget against the total allocation. In other words dampening must be implemented at another existing or to be constructed wind farm site that has a vibration budget within

the total allocation within the Eskdalemuir Zone, to free up allocation for the Development.

14.41 The beneficial owners of the Development (EDF ER) own the Longpark Wind Farm in the Scottish Borders, an existing 19 turbine wind farm with vibration budget against the Eskdalemuir Zone. It is proposed to free up vibration budget against the Eskdalemuir facility for the Development by installing dampening at both Longpark and Blackwood. With dampening in place the Development would fall within the budget for background vibration stated by the MoD to be tolerable for the Eskdalemuir Seismic array to continue to operate effectively and any impact on the array would be fully mitigated.

14.42 It is not proposed to mitigate any impact on the existing Dalswinton Wind Farm as such impacts are not considered to be significant.

Telecommunications

14.43 To mitigate any problems with television reception, Force 9 Energy and EDF would accept a planning condition to assess current television signals in advance of the Development and mitigate any post-development problems with television reception arising where impacts are attributable to the Development. Consultation suggests that only six properties may be affected where there is no terrestrial solution to the issue. In the unlikely event that interference does occur, this would be localised.

14.44 The planning condition would require Force 9 Energy LLP and EDF 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, would arise in the first year of operation of the Development and any remedial work would be limited to this period only.

14.45 Viewing quality could be improved by considering each or a combination of the following mitigation techniques:

- Replace or upgrade the receiving aerials (e.g. with directional receiving aerials) for affected households;
- Re-tune the television receivers at affected households;
- Re-align the television aerial to an alternative transmitter and re-tune the receiver at affected households;
- Provision of digital television for affected households (this could be achieved by terrestrial, cable or satellite receivers); and/or
- 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).

14.46 By using a solution based around these techniques, any impacts from the Development on television reception quality for existing viewers during its operational life would be fully mitigated.

Aviation Safety

14.47 There are no expected impacts on aviation safety and therefore no requirement for mitigation.

Public Safety

Construction

14.48 In order to ensure the risk to public safety is minimised during the construction phase of the proposed development, EDF ER and their Contractors will adhere to the Construction (Design and Management) Regulations 2007[5] and other relevant UK health and safety legislation including:

- Health and Safety at Work Act 1974;
- Management of Health and Safety at Work Regulations 1999;
- Construction (Health, Safety and Welfare) Regulations 2007;
- Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (1995); and
- British Wind Energy Association (BWEA) Health and Safety Guidelines (2007).

14.49 All potentially hazardous areas such as excavations and electrical installation works would be fenced off and all unattended machinery would be stored in the site compound or immobilised to prevent unauthorised use.

14.50 Appropriate warning signage would be installed concerning any hazards, areas where access is restricted or prohibited such as transformers, switchgear and metering systems and to alert any site users to the potential for increased risks under certain meteorological and operating conditions.

Operation

14.51 Wind turbines installed would comply with the BS EN 61400 series which provides the design requirements for onshore wind turbines.

14.52 Wind farms have a proven good public safety track record. 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. 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.

14.53 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 considered 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.

14.54 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.

Residual Impacts

14.55 All potential impacts in respect of infrastructure, telecommunications, utilities, aviation and safety would be mitigated, therefore no significant residual impacts are predicted.

Cumulative Impacts

14.56 As all impacts are mitigated, there are not expected to be any cumulative impacts with other existing or planned wind farms.

Chapter 14 References

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[2] https://restats.decc.gov.uk/cms/aviation-safeguarding-maps

[3] http://www.emd.dk/windpro

[4] South West Scotland Regional Aviation Solution Group, Final Radar Feasibility Study: The Scottish Government Feb 2010

[5] In accordance with UK health and safety legislation Force 9 Energy LLP will undertake a quantitative risk assessment for construction, operation and decommissioning of the proposed Mull Hill Wind Farm.

15 SHADOW FLICKER

Introduction

15.1 This chapter presents an assessment of the potential shadow flicker impacts of the Development. Shadow flicker (sometimes referred to as light flicker) is the term used to describe the impact on residential amenity caused by the intermittent reduction in the intensity of light at a particular location by the rotating blades of a wind turbine, seen in the form of a shadow. A more detailed explanation is provided below.

15.2 This chapter quantifies the geographical area over which shadow flicker could potentially occur, sets out an assessment of the duration and timing of these impacts and demonstrates the "worst case" circumstances under which shadow flicker could occur in the vicinity of the Development. It also identifies the measures that could be employed to mitigate any impacts as necessary.

Policy Context

15.3 Scottish Online Planning Advice[1] refers to shadow flicker in relation to wind turbines and states the following:

"Where this could be a problem, developers should provide calculations to quantify the effect. In most cases however, where separation is provided between wind turbines and nearby dwellings (as a general rule 10 rotor diameters), "shadow flicker" should not be a problem. However, there is scope to vary layout / reduce the height of turbines in extreme cases."

15.4 Other than the recommendation noted above, there is no national, regional or local policy in respect of limits or standards for shadow flicker, simply a requirement that applicants provide an analysis. Such an analysis is provided in this chapter.

Method of Assessment

Introduction

15.5 Shadow flicker can occur under certain combinations of geographical position, time of day and wind conditions (speed and direction) when the sun passes behind the rotating blades of a wind turbine and casts a shadow over neighbouring properties. As the blades rotate, the shadow flicks on and off when viewed from specific locations; this produces an effect known as "shadow flicker" for the observer. Shadow flicker can occur inside buildings where the flicker appears through a narrow window opening. The likelihood and duration of the impact depends upon:

- Orientation of the property relative to the turbine(s) - in the UK only properties within 130° either side of true north, relative to any turbine can be affected as turbines do not cast long shadows on their southern side;

- Distance from turbine(s) – flicker effects have been shown to only occur within ten rotor diameters of a turbine[2];
- Turbine height and rotor diameter.
- Time of year and day.
- Weather conditions (i.e. cloudy days reduce the likelihood of shadow flicker occurring).
- Wind speed and wind direction – the wind speed at any particular turbine would need to be greater than 3-4 m/s (depending on turbine model) and less than 25 m/s in order for the blades to rotate. In addition, the shape of the shadow will be determined by the position of the sun relative to the blades (which will be rotated to face into the wind).

15.6 A study into the health related impacts of shadow flicker[3] showed that the frequencies which produce disturbance and nuisance to the majority of the population lie above 2.5 Hertz (Hz, the unit of frequency, in this case relating to the frequency of the turbine blade rotation). This is true both of the general population and for the 2% who suffer from epilepsy, 5% of whom i.e. 0.1% of the general population, have exhibited an adverse reaction to flicker effects above 2.5 to 3Hz. This rotational frequency is well above the maximum frequency from turbines within the 80m rotor range as are proposed for the Development, which is typically less than 1Hz and is therefore well below that considered to be the cause of nuisance[4]. In addition the same reference considered that no adverse health impacts will occur as a result of shadow flicker. Even though no adverse health impacts would result from any shadow flicker created by the Development, it is nevertheless important to assess the shadow flicker impacts to ensure that any potential for nuisance is identified and minimised or eliminated from the Development.

Methodology

15.7 Shadow flicker is only a consideration in the operational phase of a wind farm development, as clearly, in both the construction and decommissioning phases, no turbines are installed and no shadow flicker can occur. This chapter is only therefore concerned with the operational phase of the Development.

15.8 The established methodology[4] assesses properties within a ten rotor diameter distance, which normally provides sufficient protection of amenity. Residential properties were identified within this zone, and which lie within 130° either side of true north relative to the proposed turbine locations and within the theoretical shadow of the Development. These are the properties in which shadow flicker could potentially occur under the perfect conditions.

15.9 The assessment has been predominantly desk-based with assumptions made about the location and sizes of windows for individual residential properties. These have been confirmed, as far as reasonably practical, during a site visit. It was not possible to gain access to all properties and reasonable assumptions have been made in those cases.

15.10 The date, times and durations of shadow flicker have been predicted for assumed or confirmed windows of each property using the Shadow Flicker module of EMD's WindPRO software[5]. The software, which is typical of those in use in the wind energy

industry, creates a mathematical model of the Development, its location (in terms of longitude and latitude for sun trajectory calculations), the surrounding terrain and the locations of properties. The following factors are taken into account in the calculation:

- Turbine locations, rotor diameter and hub height;
- Topography;
- Locations of houses/buildings;
- Position, size and orientation of windows on buildings; and
- Latitude and longitude of the Site (used in calculating the position of the sun at any given time during any given day).

"Worst Case" Conditions

15.11 WindPRO's Shadow module calculates the dates and times when the shadow of a wind turbine's rotor would fall on to a window. The following 'worst-case' assumptions are made in the calculation:

- Weather conditions are such that shadows are always cast (i.e. conditions are always bright/clear/sunny at all times of day when the sun is above the horizon and throughout the year);
- There is no vegetation or other structures screening the line of sight from the shadow receptor (i.e. the windows of the properties) to the turbine(s) which would potentially reduce the impacts of shadow flicker events;
- The turbine is always operating such that shadows are cast during the entire length of the day (in reality, wind turbines operate for 80-85% of the time depending on the wind regime at the site); and
- At all times, the turbine is facing directly towards the receptor and therefore the shadow is its maximum possible size and circularity rather than elliptical as would be the case if the turbine were orientated at an angle to the receptor (in reality, the wind direction will vary and the turbine will not be facing the receptor for the majority of the time).

Quantification of the Potential Impacts

15.12 The shadow flicker potential impacts have been quantified as follows:

- Duration of impact on each occasion that it occurs (date, start time, end time, turbine causing the shadow);
- Number of impacts occurring per year (days per year); and
- Total number of shadow hours per year.

Assessment Criteria

15.13 Shadow flicker has rarely been a problem in connection with wind farms in the UK and there are currently no guidelines available on what frequency/duration of exposure is acceptable. In order to provide a framework for the acceptability of the Development, in terms of shadow flicker, the figure of thirty hours per year and thirty minutes per day, under 'worst case' conditions is used as an acknowledged acceptable level[67].

Information Gaps

15.14 In the case of the majority of properties, orientation, number of windows and dimensions were based on observations made during site visits. On certain properties, it was necessary to make assumption on window numbers, dimensions, and/or orientation. Windows were assumed to be 1m wide by 1.5m high at ground floor and first floor heights, dimensions of windows are based on observations made during the site visit.

15.15 This information was used in the Shadow Flicker module of EMD's WindPRO software[5] to assess the worst-case scenario of potential shadow flicker events. A recent study has confirmed the suitability of the model[8].

Baseline Environment

15.16 Figure 15.1 and Table 15.1 describe the properties included in the assessment and further details on the specific properties are provided in Appendix 15.1.

Table 15.1 Residential Property Shadow Flicker Assessment Locations

Property name	Easting	Northing	Nearest Turbine	Distance to nearest turbine
Pennyland	293745	587980	#5	683m
High Auldgirth (easternmost cottage)	292255	587775	#4	794m

Project Characteristics

15.17 The Development would comprise five wind turbines with a hub height of up to 100m (three turbines) and 80m (two turbines) and a rotor diameter of 80m, such that maximum height to the tip of the blade would be 120-140m.

15.18 A standard design practice to prevent shadow flicker impacts would be to avoid siting turbines within ten times the rotor diameter of any property (800 m). Only two properties (Pennyland and the easternmost cottage at High Auldgirth) lie within this distance. Aside from these, the next nearest properties are over 800m away, and so it is less likely that there would be any shadow flicker impacts at any other properties.

Predicted Impacts

15.19 Results of the modelling of the properties are summarised in Table 15.2 and Figure 15.2. Appendix 15.1 provides a more detailed review of the particular results for each window assessed on each named property, in the form of a 'Shadow Flicker Calendar'.

15.20 It should be noted that the results listed below are based on a "bare earth" model with no intervening vegetation. Given this, and the reduction in the probability of shadow flicker as a result of wind speed, wind direction and sunshine variability, the actual values at the properties are likely to be considerably less in reality. A more realistic

case, taking into account weather conditions and operational probabilities could be expected to be between 60 to 70% less than the worst case scenario as assessed below.

15.21 In addition, the location of some of the blocks of forestry on the Site may further reduce shadow flicker impacts. Any such reduction in impact may increase over the operational lifetime of the Development, as the plantation blocks continue to grow.

Table 15.2 Results for Property Locations Assessed for Shadow Flicker

Property name	Total potential shadow flicker hours per year (hrs:mins)	Days per year on which shadow flicker may occur	Maximum potential shadow flicker hours in any one day (hrs:mins)
Pennyland - rear	25:24	97	0:21
Pennyland - front	15:40	42	0:30
High Auldgirth	10:40	37	0:22

15.22 There are no accepted guidelines for the acceptability of levels of shadow flicker, however in Germany, the figure of thirty hours per year and thirty minutes per day, under 'worst case' conditions is an acknowledged acceptable level[6,7]. The results show that none of the properties studied would experience high levels of shadow flicker, even under "worst case" conditions. All properties show total theoretical shadow flicker hours of less than thirty hours per year and no more than thirty minutes on any day on which shadow flicker might occur.

15.23 At Pennyland the worst case scenario is that the property could experience shadow flicker for 25 hours and 24 minutes over the year (rear façade) or 15 hours and 40 minutes (front façade). Turbines 2, 4 and 5 could cause the shadows here between April and August, typically between 19:00 - 21:00 local time.

15.24 At High Auldgirth the worst case scenario is that the property could experience shadow flicker for 10 hours and 40 minutes over the year. Turbine 5 could cause the shadows here in April and May and again in July and August, typically between 06:00 and 07:00 local time.

Mitigation

15.25 The results of the assessment indicate that no mitigation would be required.

Residual Impacts

15.26 The modelled impacts show that in the properties assessed, the maximum potential for shadow flicker falls below the limit used in Germany (no specific limit is set in Great Britain) and therefore there would be no significant impact.

Cumulative Impacts

15.27 Due to the localised nature of potential shadow flicker impacts, only the existing Dalswinton wind farm would have the potential to create shadow flicker impacts in combination with that of the Development on the property at Pennyland, of those properties assessed above.

15.28 Calculations using the turbine locations at Dalswinton in addition to those proposed for the Development suggest there would be no cumulative shadow flicker impacts at the properties previously assessed. Results are presented in Appendix 15.2.

Chapter 15 References

[1] Scottish Government (SG). *Online Planning Advice - Onshore Wind Energy*. [Online] Available from: http://www.scotland.gov.uk/Topics/Built-Environment/planning/National-Planning-Policy/themes/renewables/Onshore [Accessed 01/11/2011].

[2] Great Britain. Department of Communities and Local Government (DCLG). *Planning Policy Statement 22: Planning for Renewable Energy*. A Companion Guide to PPS22, ODPM, 2004. [Online] Available from: http://www.communities.gov.uk/documents/planningandbuilding/pdf/147444.pdf [Accessed 01/11/2011].

[3] Verkuijlen & Westra, 1984 *Shadow Hindrance by Wind Turbines* (University of Amsterdam).

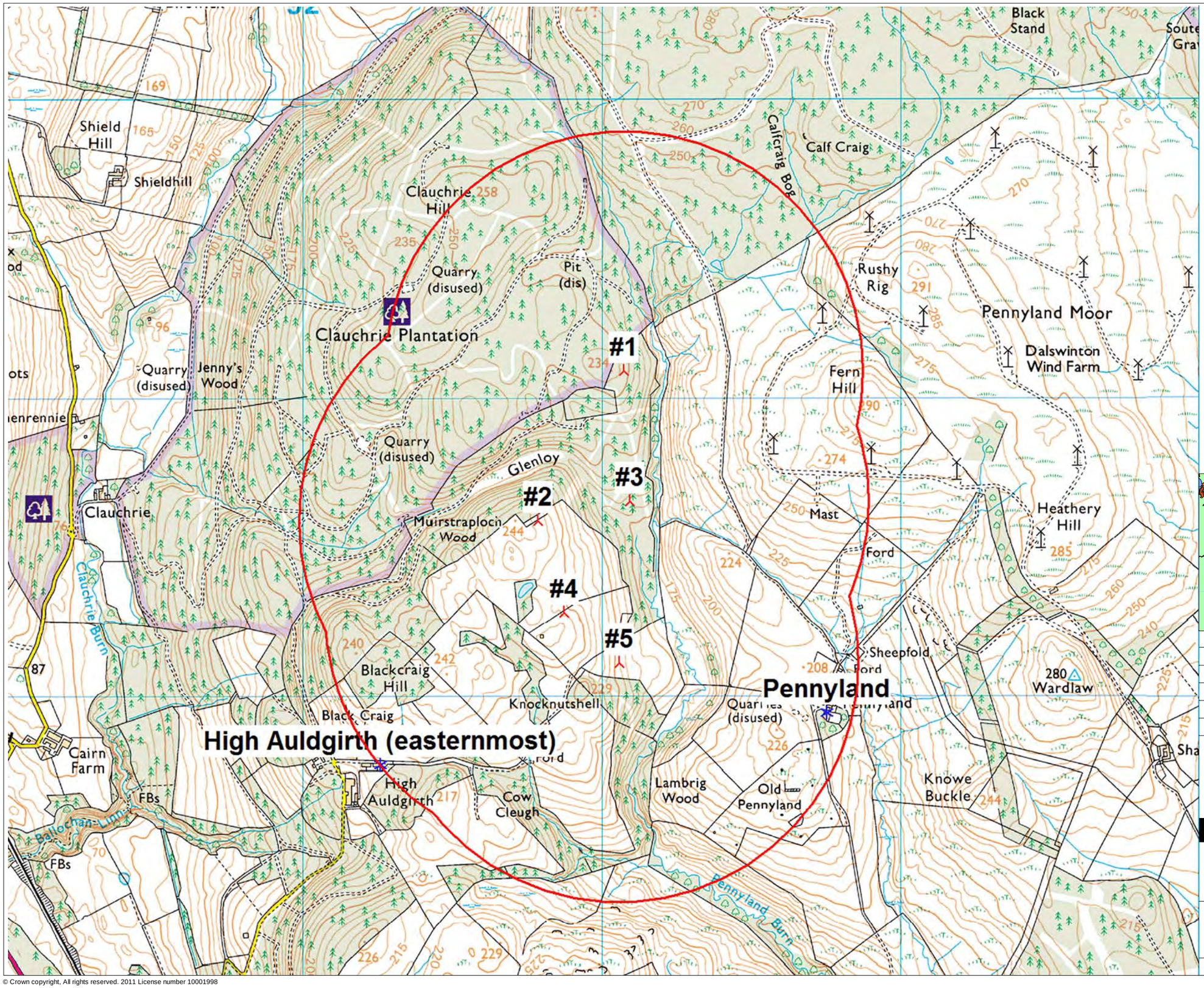
[4] BIS. [Online] Available from: http://www.berr.gov.uk/energy/sources/renewables/planning/onshore-wind/shadow-flicker/page18736.html [Accessed 01/11/11].

[5] EMD International A/S. [Online] Available from: http://www.emd.dk/windpro [Accessed 01/11/2011].

[6] Hinweise zur Ermittlung und Beurteilung der optischen Immissionen von Windenergieanlagen, Länderausschuss für Immissionsschutz, 2002 (in German).

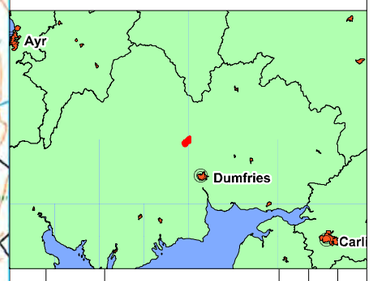
[7] Cirkulære om planlægning for og landzonetilladelse til opstilling af vindmøller, Miljø- og Energiministeriet, den 10. juni 1999 (in Danish).

[8] PB Power: Update of UK Shadow Flicker Evidence, 2011 [Online]. Available from: http://www.decc.gov.uk/en/content/cms/meeting_energy/renewable_ener/ored_news/ored_news/uk_shad_flick/uk_shad_flick.aspx [Accessed 01/11/11]



Proposed Turbine

800 m Study Area



Rev	Date	Description	Drn	Chk	App
00	12.01.11	Shadow Flicker	BF	MK	MK

FORCE 9 ENERGY

Blackwood Wind Farm

RSK

Figure 15.1: Identified Properties for Shadow Flicker Assessment

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Proposed Turbine

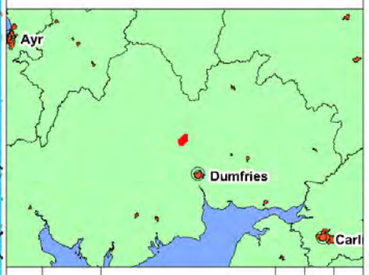
800 m Study Area

Total Number of Shadow Hours Per Year

- 0.0 - 10.0
- 10.0 - 30.0
- 30.0 - 50.0
- 50.0 - 100.0
- 100.0 - 200.0
- 200.0 - 300.0
- 300.0 - 400.0
- 400.0 - 500.0
- 500.0 - 600.0
- 600.0 - 800.0
- 800.0 - 1,000.0
- 1,000.0 - 1,200.0

#1 #2 #3 #4 #5

Shield Hill
Shieldhill
Clauchrie Hill
Quarry (disused)
Pit (dis)
Clauchrie Plantation
Quarry (disused)
Jenny's Wood
Quarry (disused)
Glenloy
Muirstraploch Wood
Clauchrie
Clauchrie Burn
Blackcraig Hill
Black Craig
Knocknutshell
Cairn Farm
FBs
High Auldgirth
Cow Cleugh
Ballochan Linn
FBs
Lambrig Wood
Old Pennyland
Quarries (disused)
Pennyland
Ford
Sheepfold
Ford
Knowe Buckle
Pennyland Burn
Calfcraig Bog
Calf Craig
Black Stand
Rushy Rig
Fern Hill
Pennyland Moor
Dalswinton Wind Farm
Mast
Ford
Heathery Hill
280 Wardlaw



Rev	Date	Description	Drn	Chk	App
00	12.01.11	Shadow Flicker	BF	MK	MK

FORCE 9 ENERGY

Blackwood Wind Farm

RSK

Figure 15.2: Shadow Flicker Modelling Results

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FILE NAME: P:\ENVIRONMENT\190000 - EIA Glasgow\P190282 Blackwood Wind Farm\08 GIS\ES Figure 15.Wor

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16 ENVIRONMENTAL MANAGEMENT

Introduction

16.1 It is the intention of the Agent and Applicant to conduct their activities in such a way that the impact on the environment during construction, operation and eventual decommissioning of the Development is minimised.

16.2 This chapter summarises the commitments for the management of the construction, operation and decommissioning of the Development, as described in this Environmental Statement (ES), in order that legislative and contractual requirements and environmental best practice are implemented.

Embedded Mitigation

Environmental Management during Construction

16.3 From the outset, the project has been designed to limit its environmental impact as far as possible, and all contractors associated with the project would be expected to conduct their activities in such a way that the impact on the environment during construction is minimised.

16.4 This section describes the construction procedures and practices that are typically employed by Force 9 and EDF during construction of a wind farm. Should the Development be consented, these 'embedded' mitigation measures would be developed and agreed with DGC and put into practice throughout the Development, through a planning condition attached to any consent for the Development.

Best Practice Guidance

16.5 The following best practice guidance would be adhered to:

- Forestry Commission: The Forests and Water Guidelines, 4th Edition;
- CIRIA: Report C532 Control of Water Pollution from Construction Sites: Guidance for Consultants and Contractors;
- CIRIA Handbook C650 Environmental Good Practice on Site;
- Scottish Government and SEPA (2010), Engineering in the Water Environment: Good Practice Guide, River Crossings;
- Scottish Renewables, Scottish Natural Heritage (SNH), SEPA and Forestry Commission Scotland (FCS), Good Practice During Windfarm Construction, version 1, October 2010;
- SEPA Pollution Prevention Guidelines (PPG);
- CIRIA (2007), The SUDS Manual C69;
- SEPA (2000), Watercourses in the Community, a Guide to Sustainable Watercourse Management in the Urban Environment; and
- SEPA (2000), Ponds, Pools and Lochens, Guidance on Good Practice in the Management and Creation of Small Waterbodies in Scotland.

Pre Construction

16.6 In advance of the construction works, a targeted geotechnical ground investigation would be undertaken in the turbine and borrow pit locations to determine local ground conditions e.g. depth to rock head and quality of stone.

Management Plans

16.7 The following management plans would be prepared and applied for the duration of the construction and decommissioning works:

- Construction Environmental Management Plan (CEMP);
- Site Waste Management Plan (SWMP);
- Traffic Management Plan (TMP);
- Habitat Management Plan; and
- Reinstatement and Restoration Plan.

16.8 In line with Scottish Government policy in relation to tree felling[1], there would be no net loss of woodland habitats. The habitat management and restoration plans will include detail on the native tree planting, to be undertaken with species of local provenance within or adjacent to the Blackwood Estate. This would mitigate for the loss of woodland and shelterbelt habitats and would provide suitable shelter and foraging for faunal species including bats, red squirrel and reptiles

16.9 Further detail on the CEMP, SWMP and TMP is provided below.

Construction Environmental Management Plan

16.10 Construction works can cause significant environmental impacts and disruption to neighbours if they are not properly managed. The appointed Principal Contractor(s) would be required to develop and implement a CEMP for both the construction and decommissioning works. The requirement to work in accordance with the CEMP would be included as part of the contract conditions for each element of the Development. As a minimum the CEMP would include the following requirements:

Watercourse Protection/Sediment control

- Use of Sustainable Drainage Systems where appropriate in the construction of the Development e.g. for the construction compound and access tracks;
- Sediment transport control measures (geotextiles/straw bales/brash) to be employed within the drainage network with an appropriate inspection scheme put in place to maintain these measures;
- Appropriate sediment control measures (silt traps, geotextile matting, settlement lagoons, etc) to be used in the vicinity of watercourses, issues or drains where natural features e.g. hollows do not provide adequate protection;
- Watercourses to be monitored throughout construction period for sedimentation;
- Where practicable, vegetation over the width of the cable trenches to be lifted as turfs, and replaced after trenching operations, to reduce disturbance;
- Access track drains to be kept clear of blockages;
- The movement of construction traffic to be controlled to minimise soil compaction and disturbance. Vehicle movements off the defined tracks and

hardstanding areas to be avoided. Where tracks cross soils which are sensitive to erosion, or on steep gradients, the use of a protective surface layer to be considered;

- Refuelling of vehicles and plant to be confined to the construction compound, for mobile plant, and carefully controlled. Where it is not possible or practical to track vehicles back to the construction compound for refuelling, appropriate control measures shall be put in place for refuelling of the static and/or remote plant;
- Only emergency maintenance to construction plant would be carried out on-site, in a designated area and on an impermeable surface well away from any watercourse or drainage.
- Drip trays to be placed under standing machinery;
- The stripping of established surface vegetation to be kept to a minimum;
- The extent of all excavations to be kept to a minimum. During excavation works, cut-off drains would be used to control water levels, rather than pumping. If dewatering of excavations is required, pumped discharges to be passed through silt traps or over land to capture sediments before release into receiving waters;
- Trenching or excavation activities in open land to be restricted during periods of intense rainfall and temporary bunding to be provided to reduce the risk of oil or chemical spills to the natural drainage system as required;
- Use of wet concrete in the vicinity of watercourses would be avoided; and
- Any wash water would be adequately treated to deal with suspended solids and high alkalinity before discharge into lined settlement ponds to prevent direct runoff into watercourses or ditches or infiltration to groundwater.

Chemicals

- Equipment, materials and chemicals not to be stored within or near watercourses;
- Equipment to contain and clean up any chemical spills would be provided, in order to minimise the risk of pollutants entering watercourses, lakes or flush areas; and
- All fuels, lubricants and chemicals storage would be contained within a bunded area with sufficient capacity to contain a spill in accordance with SEPA Pollution Prevention Guidelines (PPGs).

Air quality/Dust management

- Stored soils would be placed so as to minimise the potential for erosion and creation of dust;
- Temporary stockpiles would be covered and permanent storage would be re-instated with vegetation as soon as practicable;
- All vehicles would undergo wheel washing to prevent the transport of mud and debris on the surrounding roads. This would be monitored on a daily basis to ensure that it is effective;
- Site vehicles would not be over revved, or left with engines idling;
- All plant brought on to the site would be properly maintained and operated in accordance with manufacturers' recommendations; and
- Routine maintenance of vehicles to be carried out off site.

Noise control

- Implementation of a blasting noise and vibration management plan for all blasting activities at the borrow pits;
- All plant and machinery would be properly maintained and silenced in accordance with manufacturer's instructions;
- All on site vehicles would be subject to speed restrictions;
- Relevant local residents would be duly warned of noisy activities that could give rise to temporary nuisance e.g. blasting; and
- Hours of working would be restricted to between 7am-7pm Monday to Friday, 7am to 1pm on Saturdays, with no work on Sundays without prior notification to the DGC and local residents.

Effluent Wastes

- Sanitary facilities would be provided and methods of disposal of all waste would be approved by SEPA;
- All solid and liquid waste materials, including any contaminated soils, would be properly disposed of to controlled landfill sites away from the Site;
- A long term pollution prevention and emergency response plan would be established to address the potential significant long term impact of sediment and chemical pollution; and
- No unapproved discharge of foul or contaminated drainage from the site should go to either groundwater or any surface waters, whether direct or via soakaway.

Public Protection/Consultation

- Appropriate signage and fences would be put in place to inform and protect the public during the construction of the Development; and
- Communication would be maintained with the local community throughout the life of the Development.

Waste Management

16.11 A site waste management plan (SWMP) would be implemented as part of the CEMP. The SWMP would include, as a minimum, the following requirements:

- Segregation of wastes in order to prevent co-storage of incompatible materials and the mixing of non-hazardous and hazardous wastes;
- Identification of the type of wastes likely to be generated during construction and decommissioning, to allow early planning of opportunities to re-use or recycle wastes; to gauge the expected quantities, and to allow monitoring;
- Storage of wastes in appropriately labelled containers suitable for the nature of the waste material, on an impermeable surface to minimise the potential for contamination;
- Disposal of any hazardous waste in accordance with the Hazardous Waste Regulations 2005;
- Prohibition of the burning of any waste;
- Covering of waste storage areas to prevent the generation of dust, the spreading of litter and the ingress of rain water;
- All waste carriers to be appropriately licensed; and

- Disposal of waste only at sites licensed to receive and dispose of such wastes in accordance with the relevant legislation.

Traffic Management Plan

16.12 The TMP would be prepared in accordance with guidance such as that found in the Scottish Natural Heritage document 'Good Practice During Windfarm Construction'[2] and would include details such as:

- Confirmation on any local public roads not to be used by construction vehicles;
- The agreed access route for abnormal loads;
- The permitted maximum number of abnormal loads per day;
- Permitted delivery hours;
- The vehicle speeds to be adhered to within the Site;
- Temporary traffic management procedures to be implemented for abnormal loads;
- The procedure to be followed to notify the local community, residents and the Burntkettle Shooting Ground well in advance of abnormal load deliveries;
- Potential constraints within the Site;
- Agreed parking areas;
- Agreed pedestrian crossing points and routes; and
- A commitment to undertaking a pavement condition survey prior to and on completion of the construction works. The survey would focus on the junction of the A76 with the U492n. Any deterioration resulting from the construction works would be rectified, with reinstatement to a standard to be agreed with Transport Scotland and DGC.

16.13 As noted in Chapter 5: Physical Environment, there is potential risk of local flooding from the River Nith, which could have an effect on A76, the main access route to the Site. The TMP would include details of an alternative access route from the existing minor road towards Dalswinton to the southeast.

Environmental Management during Operation

16.14 There would be an operational environmental management plan for the Development.

16.15 During the operation of the Development, any lubricants or other petrochemical products at the Site would be stored on hardstanding areas within the substation / control building. Proper containment procedures would be employed during routine servicing to prevent spillages of lubricants or hydraulic fluid.

16.16 Vehicles visiting sites would be equipped with sand trays to place below any oil/ diesel filling activities and would also be equipped with emergency oil spillage kits. During the course of the operation of the Development, any relevant new legislation and guidance relevant to the protection of the local environment would be complied with.

16.17 In addition, EDF is committed to after-care and monitoring of sensitive habitats as would be reasonably expected of a developer and in accordance with their stated Environment Policy.

Environmental Management during Decommissioning

16.18 It is considered that the environmental management procedures to be followed during decommissioning would follow the principles of those implemented during the construction phase of the Development. Any such procedures would be in accordance with the relevant legislation and best practice at the time of decommissioning and approved by the relevant statutory authorities.

16.19 EDF would retain responsibility for environmental management during the decommissioning phase of the Development.

Further Mitigation

16.20 The additional project specific mitigation measures identified through the EIA process and described in the ES technical chapters are summarised in the tables below, as Construction (Table 16.1) and Post Construction (Table 16.2).

Table 16.1. Mitigation – Construction Phase

ES Chapter	Proposed Mitigation
Ecology	All activity would be limited to clearly defined working areas.
	An Ecological Clerk of Works (ECoW) would be appointed to ensure compliance with the CEMP and Habitat Management Plans
	Badgers: A pre-construction badger survey would be conducted to identify all Badger setts which may be directly affected. All contractors would be briefed regarding the badgers at the site and the locations of any setts to avoid any accidental damage or disturbance A suitable means of escape (e.g. a long wooden or metal plank) from any exposed trenches and other excavations would be provided. Deeper excavations would be fenced off to prevent wildlife access
	Bats: Wind turbines would be constructed with a minimum stand-off distance of 50m between the rotor-swept area of each wind turbine and features which are used by bats (tree lines, woodland edges and linear features) in accordance with guidance[3] to minimise collision risk to bats. In advance of any tree works, an appraisal of the potential to support bat roosts would be undertaken up to a minimum of 50m from the proposed development. Tree felling/pruning work would be undertaken at suitable times of year to reduce the potential for adverse effects upon bats. A bat protection plan would be prepared which identifies measures to protect bat roosts which would not be directly affected by construction works in order to prevent an offence from being committed. If bat roosts become established in the future, all contractors would be briefed regarding their locations to avoid any accidental damage, disturbance or obstruction to roosts. New bat roost habitat would be provided for any bat roosts which would be disturbed, lost, damaged or obstructed, in proportion to the roost type, size and species of bat using the feature to be affected, in accordance with the bat mitigation guidelines

ES Chapter	Proposed Mitigation
	Otters: Pre-construction otter survey would be carried out within 6 months prior to works beginning. Disturbance during development works can be minimised by declaring an area within at least 30m of an otter shelter, out of bounds to all site users at all times. Artificial lighting, where used during construction, would be directed away from watercourses, so that it does not disturb otter activity during the hours of darkness. Should evidence of otters be found on site during construction, a suitable means of escape from any exposed trenches and other excavations would be provided
	A pre-construction survey would be undertaken of woodland areas up to 50m around proposed site infrastructure
	Reptiles: Targeted pre-construction surveys for reptile would be undertaken to identify habitats which are of particular value to reptiles Site preparation work requiring the clearance of reptile habitats (Common lizards, adder, grass snake) should ideally avoid the winter period Removal of any existing piles of spoil (brash, logs or rocks) should take place prior to hibernation (i.e. end of October) Areas of suitable reptile habitat within the development footprint (particularly tufted grasses) should be mown short outwith the winter period under the supervision of a suitably qualified ecologist and thereafter maintained at a short sward in order to discourage reptiles from these areas for the duration of the construction period. Any scrub clearance should be undertaken outside of the breeding bird season (March to August inclusive) and the scrub must only be cut low to the ground during this period, not removed by the roots as this has the potential to impact upon hibernating reptiles. For the duration of any earthworks, any trenches or excavations which are left open overnight should be inspected for lizards prior to in-filling, if dug during the lizards' active period (generally accepted as being late March until the end of October). Any reptiles found should be removed from the trench and placed in suitable reptile habitat away from the construction works.
Ornithology	Pre-construction breeding bird surveys would be undertaken
	All electric cables connecting the development site with the local network would be underground, thus avoiding the potential for bird strike
	Permanent anemometry mast would be of lattice design rather than a guyed structure, reducing the risk of collision.
	Removing or making other suitable nesting sites within the working area during April to July inclusive.

ES Chapter	Proposed Mitigation
Archaeology	Strategies for archaeological mitigation against physical impacts typically consider two options, these are: • Preservation in situ: the preservation without disturbance of sensitive archaeological remains, this can be achieved through engineering solutions (e.g. foundation design) or amendments to the Development layout; • Preservation by record (excavation): where preservation in situ is not feasible or desirable an alternative mitigation is pre-construction archaeological excavation. This consists of a detailed programme of archaeological fieldwork to preserve, by record, the archaeological value of the heritage asset. The archaeological mitigation strategy to be undertaken for the Development would be agreed with the DGC archaeologist in advance of construction works commencing.
Noise	A suitable member of the construction team would be nominated to deal with noise and other matters (such as advertising when blasting would be taking place).
Traffic and Transport	Completion of a further consultation exercise by the appointed transport consultant for the Development: • The route to be used for abnormal load deliveries would require agreement with BEAR Scotland, Dumfries and Galloway Council and Dumfries and Galloway Constabulary. Details of the route, frequency and number of vehicles and their dimensions and weights would be presented. The appointed haulier would be involved in these discussions and in arrangements made with the police; and • The DGC Bridges section of Architectural Engineering Design Services would be consulted, to check bridge carrying capacities and any restrictions.
	Once the turbine to be used at the Development had been finalised, further detailed assessment to be undertaken of the public access route within the Site, notably for the sections of existing road adjacent to the Dunduff property. Further assessment would also be completed of the railway bridge within the Site, to ensure delivery vehicles could safely negotiate the vertical alignment of the bridge. Further assessment of the agreed abnormal load route would be undertaken to confirm any improvement/ remedial works required e.g. temporary removal of street furniture, additional signage and road markings;
	Carriageway widening and road improvement works. Some carriageway widening would be required to the west verge of the A76(T) and the south side of the access slip road. Carriageway widening works would be required within the existing verge of the railway bridge. Should a turbine delivery vehicle of 45m be used, some carriageway widening would also be required adjacent to the Auldgirth Inn.
	A pavement condition survey, focusing on the junction of the A76 with the U492n, would be undertaken prior to commencement of construction works. Any deterioration resulting from the construction works would be rectified, with reinstatement to a standard to be agreed with Transport Scotland and DGC.
EMI, Infrastructure, Safety and Aviation	To mitigate any problems with television reception, Force 9 Energy and EDF would accept a planning condition to assess current television signals in advance of Development and mitigate any post-development problems with television reception arising where impacts are attributable to the Development.

Table 16.2. Environmental Management Commitments – Post Construction Phase

Section of ES	Proposed Mitigation
Ecology	Native tree planting with species of local provenance would be undertaken within or adjacent to the Blackwood Estate, and managed according to the Habitat Creation and Management Plan
	Bats: Additional bat roosting opportunities (bat boxes) at mature trees in High Auldgirth and Lambrig Wood would be created within the site to compensate for the loss of potential roosts and reduced suitability of potential roosting features as a result of the development Whilst it is not mandatory to undertake post-construction monitoring for bats, in light of the District value population of *Nyctalus* bats which are present on the site it is recommended that post-construction monitoring of bat activity is undertaken.
	Otters: If holts/rest areas become established in the future, all contractors would be briefed regarding their locations to avoid any accidental damage or disturbance.
	Red Squirrel: If dreys become established in the future, all contractors would be briefed regarding their locations to avoid any accidental damage or disturbance
Ecology and Ornithology	Reptiles and Birds: The establishment of rough grassland strips along boundaries of improved pasture fields. Such strips could be fenced off from stock in order to develop longer sward structure, thus helping to provide habitat for invertebrates, small mammals and nesting and foraging bird species, such as skylark, meadow pipit and reed bunting.
Socio-economics	The shooting ground would be re-orientated and landscaped within the terms of its existing planning permission, so that both the ground and the Development can co-exist within the terms of the SCTA code of practice and technical guidance.

Chapter 16 References

[1] Scottish Government policy on control of woodland removal: http://www.forestry.gov.uk/pdf/fcfc125.pdf/$FILE/fcfc125.pdf. Accessed November 2011.

[2] http://www.snh.org.uk/pdfs/strategy/renewables/Good%20practice%20during%20windfarm%20construction.pdf

[3] Natural England (2009). Technical Information Note 051 – Bats and Onshore Wind Turbines.