

Burnfoot Hill Wind Farm



ENVIRONMENTAL STATEMENT

MARCH 2006

VOLUME 2: THE ENVIRONMENTAL STATEMENT TEXT



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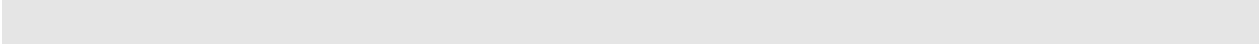
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I INTRODUCTION

1.1 FOREWORD

1.1.1 Wind Prospect Developments Ltd (Wind Prospect) is the developer of the Burnfoot Hill Wind Farm. Wind Prospect Developments Ltd proposes to erect thirteen wind turbines and ancillary structures on land within the Ochils, approximately 5 km north of Tillicoultry, for the purpose of generating electricity from wind energy. **Figure 1.1, Volume 3** shows the site location and regional context of the proposals.

1.1.2 This project is one of several wind power schemes currently being developed and/or constructed by Wind Prospect. **Table 1.1** refers to projects recently commissioned and currently under construction:

Table 1.1 Recent projects developed and constructed by Wind Prospect

Wind Farm	Location	Capacity	No. of turbines	Turbine capacity	Status
Walkway	Co. Durham, England	21 MW	7	3MW	Pre-construction works
Red House	Holbeach, England	12 MW	6	2MW	Under construction
Bicker Fen	Boston, England	26 MW	13	2MW	Under construction
Red Tile	Spalding, England	12 MW	6	2MW	Pre-construction works
Glass Moor	Whittlesey, England	16 MW	8	2MW	Under construction
Deeping St Nicholas	Spalding, England	16 MW	8	2MW	Under construction
Stags Holt	March, England	15 MW	9	1.75 MW	Pre-construction works
Winscales	Workington, England	6.8 MW	8	850 kW	Under construction
Llangwryfon	Aberystwyth, Wales	9 MW	11	850 kW	Commissioned September 2003
Tangy	Kintyre, Scotland	12 MW	15	850 kW	Commissioned February 2003
Bowbeat	Peebles, Scotland	31 MW	24	1.3 MW	Commissioned November 2002
Out Newton	Holderness, England	9 MW	7	1.3 MW	Commissioned February 2002

1.1.3 This Environmental Statement has been prepared to accompany the submission of a planning application for the Burnfoot Hill Wind Farm to Clackmannanshire Council.

1.2 APPROACH TO ENVIRONMENTAL ASSESSMENT

1.2.1 Wind Prospect and their consultants have worked together in the development of this proposal, reviewing alternative design solutions in the light of the various environmental issues identified as a result of their own work and in response to discussions with the local planning authority, the local community and other interested parties. These environmental considerations have been built into the design process throughout.

1.2.2 This Environmental Statement has been prepared in accordance with the Environmental Impact Assessment (Scotland) Regulations 1999. Its scope was discussed in advance with the local planning authority (Clackmannanshire Council), with letters relating to the scoping process being included in **Appendix 1.1, Volume 4**.

1.3 CONSULTATIONS

1.3.1 The relevant statutory consultees have been approached for information and guidance in the course of the development of this project and the preparation of this Environmental Statement. Responses to these consultations are in **Appendix 1.1, Volume 4**.

1.4 FORM AND CONTENT OF THE ENVIRONMENTAL STATEMENT

1.4.1 The Environmental Statement has been prepared in four volumes and its content is described in **Table 1.2** below:

Table 1.2 Environmental Statement Structure & Content

Volume 1 Non Technical Summary	The Non Technical Summary contains, in non-technical language, a summary of the Environmental Statement Main Text (Volume 2). It provides a brief description of the development and outlines the conclusions from the Environmental Impacts Assessments (EIA's) undertaken
Volume 2 ES Main Text (This Volume)	This Volume of the ES contains a detailed description of the proposal. It evaluates the existing environment and identifies and assesses the significant environmental effects that are likely to occur as a result of the development. It provides a detailed analysis of the design procedure and how mitigation measures have been incorporated into the design, where possible, to prevent, reduce or offset any environmental effects identified.

Volume 3 Figures	The Figures volume contains all the illustrative material referred to in the main text (Volume 2) of the ES, including regional and local maps, site design details, photomontages (simulated views of the wind farm) and technical diagrams.
Volume 4 Appendices	The Appendices hold details of assessment methodologies, assessment data, technical details and background information.

1.5 THE CONSULTANCY TEAM

1.5.1 This Environmental Statement has been prepared by the consultancy team as detailed in **Table 1.3** below.

Table 1.3 The Consultancy Team

SLR L. Guthrie MA Hons (<i>Geography</i>), <i>MPhil</i> (<i>Landscape Architecture</i>)	Landscape & Visual Assessment
Ecology Consulting Dr S Percival BSc <i>Biology (Ecology) PhD</i> <i>Zoology</i>	Ecological Assessment
CFA Archaeology Ltd G. Mudie MA AIFA	Cultural Heritage
EnviroCentre Ltd C. D. Baker BSc MSc	Hydrology Assessment
ACIA Engineering Acoustics I. Bennett BSc <i>CEng MIOA</i>	Noise Assessment
Halliday Fraser Munro H. Sears BSc (<i>Hons</i>), <i>Dip.TP., MRTPI</i>	Planning Policy Context

1.5.2 Specific details of each member of the consultancy team can be found within **Appendix 1.2, Volume 4.**

2 THE PROPOSED BURNFOOT HILL WIND FARM

2.1 INTRODUCTION

2.1.1 The proposed development consists of a wind farm of thirteen wind turbines, together with an underground cable network, access tracks, crane hardstandings, a wind monitoring mast, three borrow pits, a small switchgear building and appropriate site signs. The wind farm, which is designed to be monitored remotely, would have an installed capacity of approximately 26 megawatts.

2.2 LOCATION

2.2.1 The wind farm would be located within the Ochils, approximately 5km north of Tillicoultry. It is situated on land of Backhills Farm as shown in **Figure 2.1, Volume 3**, which also shows the site and associated works in a local context. A more detailed wind farm site plan is included in **Figure 2.2, Volume 3**.

2.2.2 The National Grid Reference for the wind turbines can be seen in **Table 2.1** below:

Table 2.1 Wind turbine locations

Turbine No	NGR	Turbine No	NGR
1	289916, 703792	8	290525, 702817
2	290234, 703743	9	290891, 702817
3	289835, 703467	10	290136, 702493
4	290282, 703314	11	290648, 702508
5	289970, 703090	12	290354, 702232
6	289924, 702705	13	290615, 702112
7	290216, 702948		

2.3 TURBINES

2.3.1 The turbines proposed for the development are the 2MW Vestas V80 or similar, a sample specification of which is included in **Appendix 2.1, Volume 4** and illustrated in **Figure 5.32, Volume 3**. They are three bladed variable speed pitch regulated wind turbines, with the rotor and nacelle mounted on a cylindrical steel tower. Each turbine is no more than 102 metres to tip height (when the blade is in the vertical position). The turbines start to generate at a

wind speed of 4 m/s and cut out in wind speeds greater than 25 m/s. The blades rotate at between 9 and 19 rpm, depending on wind conditions. The nacelles and rotors of the turbines rotate so as to be always facing the wind.

- 2.3.2 These are typical wind turbines of their type. Alternative turbines from other manufacturers would be very similar in appearance, size and in all major characteristics.

2.4 ACCESS

- 2.4.1 Access to the site during the construction period would be gained from the unclassified road leading from the A823 to Backhills Farm.

- 2.4.2 The access track would need upgrading works carried out to enable it to accommodate the turbine delivery lorries and other site traffic. This is discussed in detail in **Chapter 5, Construction**.

- 2.4.3 Although the wind farm application is predominantly within Clackmannanshire, the access to site is within Perth & Kinross as detailed in **Figure 2.3, Volume 3**.

2.5 ELECTRICAL GRID CONNECTION ROUTE

- 2.5.1 The most likely proposed underground electrical grid connection route is illustrated in **Figure 2.4, Volume 3**. This proposed route would follow the existing track between Burnfoot Hill and Alva, Clackmannanshire, via Ben Buck, Ben Ever and The Nebit.

- 2.5.2 From Alva the cable would be installed within the public highway, running south to a substation at NGR 289458, 695231. For this section the proposed route and construction details will comply with the New Roads and Street Works Act and all other highway legislation.

- 2.5.3 An underground electrical cable, like the one proposed for the grid connection at Burnfoot Hill, is the responsibility of the Distribution Network Operator (DNO), in this case Scottish Power. For cables such as this the DNO has 'permitted development rights' meaning that they have the ability to lay an underground cable without the need for an express grant of planning permission.

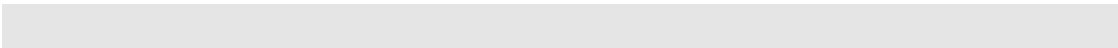
- 2.5.4 Although the underground electrical grid connection cable is not technically the developers responsibility it is an integral part of the wind farm proposal and therefore has been considered within the EIA process.

- 2.5.5 Where possible the export power line should follow the existing footpaths in the area. As part of the development it is proposed that upgrades to the existing tracks will be made when installing the underground cable.
- 2.5.6 The underground electrical grid connection cable and its route are described in greater detail in **Chapter 5, Construction**.

2.6 CONSTRUCTION WORKS

- 2.6.1 Details of the construction works including site access, internal access tracks, crane hardstandings, temporary construction compounds and borrow pits are included in **Chapter 5, Construction**.

2.7 MAINTENANCE REQUIREMENTS AND OPERATION

- 2.7.1 Once the turbines are in operation, they would be monitored remotely, and would not be staffed. Maintenance personnel would make routine visits by car approximately once a month, with intermediate visits as and when necessary.
 - 2.7.2 Major planned maintenance would be carried out approximately twice a year. This would involve one maintenance van visiting the site over a period of approximately three weeks.
- 

3 THE NEED FOR THE DEVELOPMENT

3.1 INTRODUCTION

- 3.1.1 Government policy provides for the encouragement of energy generation from renewable sources, in order to reduce harmful atmospheric emissions and to meet future demand for energy with diverse and secure supplies. This section examines the environmental consequences of fossil fuel energy generation, and the commitments made both nationally and internationally to limit damage to the environment, which together underpin the need for the development of the Burnfoot Hill Wind Farm.
- 3.1.2 **Chapter 15, Volume 2** entitled “Planning Policy Context” examines in detail the specific planning guidance and policies derived from these commitments.

3.2 ENERGY FROM FOSSIL FUELS AND GLOBAL CLIMATE CHANGE

- 3.2.1 The likelihood and consequences of Global Climate Change have been the subject of extensive research for three decades. As the work has progressed, models have improved and with them the understanding of the processes which bring about global climate change and its likely consequences.
- 3.2.2 The current consensus on Global Climate Change is summarised in the Government’s review paper Climate Change Scenarios for the United Kingdom: The UKCIP02 Briefing Report (DEFRA April 2002). It states:

The UK climate will become warmer. By the 2080s annual temperature...may rise by between 2 deg C...and 3.5 deg C....

High summer temperatures will become more frequent and very cold winters... increasingly rare...by the 2080s about two summers in three may be as hot as, or hotter than, the exceptionally warm summer of 1995.

Winters will become wetter and summers may become drier everywhere...In the south and east...summer precipitation may decrease by 50% or more by the 2080s and winter precipitation may increase by up to 30 %.

Snowfall amounts will decrease throughout the UK.

Heavy winter...rain and snow will become more frequent.

Relative sea level will continue to rise around most of the UK’s shoreline...by the 2080s, sea level may be...between 26 and 86 cm above the current level in southeast England.

Extreme sea levels will be experienced more frequently. For some east coast locations, extreme sea levels could occur between 10 and 20 times more frequently by the 2080s...

- 3.2.3 Reflecting increasing public and governmental concern, these issues are being addressed at all levels, from international treaties cascading down to EU policy, national policy, regional and local planning policy.

3.3 THE INTERNATIONAL CONTEXT

- 3.3.1 The United Nations “Earth Summit”, held in Rio de Janeiro in 1992, first established the need to control greenhouse gases and other emissions, in the light of rising levels of global warming and pollution referred to above.
- 3.3.2 At Kyoto in December 1997 the 174 parties to the convention considered what should be the next step. In an historic agreement a new Protocol was drawn up. This aims to reduce emissions by developed countries of a basket of the six principal man-made greenhouse gases overall to 5.2% below the 1990 levels over the period 2008-2012. The formal ratification of the Kyoto Protocol by the Russian Federation on 18 November 2004 enabled the Protocol to enter into international law for its 128 Parties on 16 February 2005. In contrast to 1992, this target is legally binding.
- 3.3.3 The Kyoto Protocol has had a number of significant policy consequences for most developed countries. In particular it has led to the widespread adoption of measures to encourage the generation of electricity from renewable resources. The result has been the rapid development of renewables, and in particular wind energy, throughout Europe and North America in particular.

3.4 THE EUROPEAN CONTEXT

- 3.4.1 The White Paper on Renewable Energy Sources published in 1998 by the Commission and endorsed by both the Council of Ministers and the European Parliament then called for a target of 12% of gross domestic energy consumption to be met by renewables by 2010.
- 3.4.2 In August 2001 EU policy took a significant step forward with the publication of a Directive of the Parliament and the Council of Ministers on the promotion of electricity produced from renewable resources. In its preamble, this states:

“The Community recognizes the need to promote renewable energy sources as a priority measure given that their exploitation contributes to environmental protection and sustainable development...and make it possible to meet Kyoto targets more quickly.”

- 3.4.3 The Directive sets the UK target at 10% of gross electricity consumption by 2010 (see below). It also requires the Commission to assess progress towards these national targets and if necessary submit proposals for mandatory targets should progress not be sufficient.

- 3.4.4 Meanwhile the development of wind energy throughout the world has accelerated dramatically. In 2004 alone, the installed wind energy capacity increased by 20% with the total installed capacity exceeding 47,000 MW at the start of 2005.

3.5 THE UK CONTEXT

- 3.5.1 Government Renewable Energy Policy was first defined in Energy Paper Number 55, "Renewable Energy in the UK: The Way Forward" (June 1988):

"The Government intends to stimulate the development and application of renewable sources of energy wherever they have prospects of being economically competitive and environmentally acceptable."

- 3.5.2 This was first quantified in the White Paper "This Common Inheritance" September 1990. It stated:

"...the Government will work towards a figure of renewable electricity generating capacity of 1000 MW in 2000."

- 3.5.3 In November 1992 the Renewable Energy Advisory Group (REAG) made a strong recommendation to increase the targets for renewable energy by underwriting a floor level of 1500 MW Declared Net Capacity (dnc)¹ for new projects by the year 2000. This was to be achieved through the Non Fossil Fuel Obligation (NFFO), established under the Electricity Act of 1989, which provided for premium prices to be paid by the regional electricity companies for the supply of contracted amounts of electricity from renewable sources. A parallel arrangement for Scotland, the Scottish Renewables Obligation (SRO) was also established.

- 3.5.4 The Government accepted this recommendation and Energy Paper Number 62 (March 1994) confirmed that Government policy was to work towards 1500MW declared net capacity of new electricity generating capacity from renewable sources for the UK by 2000.

- 3.5.5 Five rounds of competitive bidding for NFFO contracts and three rounds for SRO contracts then ensued.

¹ Declared Net Capacity (dnc) is an indicative measure of the capacity factor of renewable energy plant in comparison with conventional plant, recognising that an energy source such as wind is intermittent in nature. For wind, 1 MW installed = 0.43 MW (dnc) where installed capacity is the maximum output of the plant.

3.6 SUPPLIER OBLIGATION AND THE CLIMATE CHANGE LEVY

- 3.6.1 The present government has committed itself to a target of at least 10% of UK electricity supplies to come from renewable sources by 2010.
- 3.6.2 The advent in 2000 of a revised UK electricity market (the New Electricity Trading Arrangements) rendered further use of the NFFO/SRO mechanism impossible for structural reasons. The Government therefore embarked on extensive consultation on a successor mechanism and in August 2001 announced the final form of the new Renewables Obligation.
- 3.6.3 The Renewables Obligation, which came into force in April 2002, is an obligation on all UK electricity supply companies to source a certain percentage of electricity from renewable sources each year, or face a financial penalty (known as “buying out”). Starting at 3% of their total energy turnover in 2002/3, the required percentage will rise to 10.4% in 2010/11. In December 2003 the government increased the percentage by a further 50% to 15.4% by 2015 and this will remain at least at that level until 2026/7.
- 3.6.4 To achieve these obligations, and taking account of the predicted growth in UK electricity demand, the production of electricity from renewable sources will need to increase from 9.4 Terawatt hours (TWh) in 2002/3 to 33.6 TWh in 2010/11 and 49 TWh by 2015. Onshore and offshore wind are expected to account for about half of this increase, and this requires more than 680 MW of wind generation capacity to be installed each year for the next eleven years.
- 3.6.5 The Government recognises the magnitude of the task it has set itself. In June 2001 Brian Wilson, the then Minister for Energy, said:

“The Government is committed to bringing green energy from the margins into the mainstream. The Government is doing everything it can to help industry meet our target of supplying 10% of electricity from renewable resources by 2010”.

3.7 THE ENERGY WHITE PAPER

- 3.7.1 The latest Government thinking at the national level on renewables is embodied in the Energy White Paper, “Our Energy Future – Creating a Low Carbon Economy”, published in February 2003. This represents a radical development of UK energy policy and recognises three major challenges:
- Climate change
 - Decline of indigenous energy supplies
 - The need to update the energy infrastructure

- 3.7.2 The overriding new policy commitment is “that the UK should put itself on a path towards a reduction in carbon dioxide emissions of some 60% from current levels by about 2050”(1.10).
- 3.7.3 This represents a very substantial policy commitment beyond the existing requirements of the Kyoto Protocol.
- 3.7.4 Renewables are seen as a key part of the strategy. “If we are to achieve a 60% reduction in carbon emissions by 2050, we are likely to need renewables by then to be contributing at least 30% to 40% of our electricity generation and possibly more. We therefore need to develop a framework which encourages the development of a wide range of renewable options and to make significant changes to our institutions and systems” (4.5).
- 3.7.5 The current small contribution of renewables and the need for rapid deployment is highlighted. “We produce less electricity from renewables than a number of our European partners. In 2000, renewables (excluding large hydro plant and mixed waste incineration) supplied only 1.3% of our electricity, compared to 16.7% in Denmark...To hit the 10% target we will need to install approximately 10,000MW of renewables capacity by 2010, an annual build rate of over 1250MW” (4.9).
- 3.7.6 The current target of 10% by 2010 is restated (4.11) and the Government goes on to state that “our aspiration is by 2020 to double renewables’ share of electricity from our 2010 target and we will pursue policies to achieve this” (4.11).
- 3.7.7 The specific role of onshore wind energy within the market-based grid backbone of the electricity system is recognised in a vision of the energy system in 2020 (page 18). Onshore wind is also singled out as the one renewables technology that is already economic with support from the Renewables Obligation (4.43).
- 3.7.8 It is clear that this White Paper represents a step change in the Government’s commitment to renewables. In the short term, it reaffirms the target of 10% by 2010. In the medium term it aspires to 20% by 2020. In the longer term, it looks to a 30-40% contribution from renewables by 2050. It recognises onshore wind as an essential component of the future generation mix.
- 3.7.9 These targets and aims greatly reinforce the need for wind energy developments in suitable locations.

3.8 RENEWABLE ENERGY TARGETS

Scotland

- 3.8.1 In the Scottish Executive's Programme for Government 2 (2001), the Executive set a target of 18% of electricity generation in Scotland from renewables by 2010.
- 3.8.2 On 1st April, 2002, the Executive put in place the Renewables Obligation Scotland (ROS), which placed a legal obligation on every electricity supplier in Scotland to supply increasing amounts of electricity from renewable sources.
- 3.8.3 On 23rd August 2002, Ross Finnie, Minister for Environment and Rural Development, announced the Executive's intention to consult on a target of 40% of electricity being generated from renewable sources by 2020. Scotland's enormous potential renewable resources and the economic and environmental benefits of renewable energy were key influences on their decision to consult.
- 3.8.4 Following this consultation, in March 2003 Scottish Ministers announced that Scotland should aspire to generate 40% of its electricity from renewable sources by 2020. An action plan to achieve this target was laid out in the Executive's response to the consultation document "Securing a Renewable Future: Scotland's Renewable Energy."

3.9 ELECTRICITY PRODUCTION

- 3.9.1 The thirteen wind turbines at the Burnfoot Hill site would provide 26 MW of installed capacity. This installed capacity would make a significant contribution to the Scottish Executive target.
- 3.9.2 Based on the calculations shown below the thirteen turbines will generate, on average, enough electricity to meet the domestic needs of over 14,500 households.
- 3.9.3 The predicted site output per year (A) is calculated as follows:

$$A = C \times 0.3 \times 8760$$

where:

C is the rated capacity of the wind farm in MW, being the amount of electricity produced by the wind farm when each wind turbine is operating at

full power. In the case of the proposed development, assuming that thirteen V80 wind turbines are utilised, this is 26MW.

0.3 is a constant, the capacity factor, which takes into account the intermittent nature of the wind, the availability of the wind turbines and array losses.

8760 is the number of hours in a year

3.9.4 For the proposed development, this results in a predicted output of:

$$26 \times 0.3 \times 8760 = \mathbf{68,328} \text{ megawatt hours per year}$$

3.9.5 The average annual UK household electricity consumption is 4600 kilowatt hours², or 4.6 megawatt hours.

3.9.6 The proposed development would therefore generate, on average, enough electricity to meet the needs of $68,328 / 4.6 = \mathbf{14,854}$ homes.

3.10 REDUCTION OF GREENHOUSE GAS EMISSIONS

3.10.1 According to the Digest of United Kingdom Energy Statistics 2005, it is estimated that carbon dioxide (CO₂) emissions from power stations accounted for 30% of the UK's total CO₂ emissions in 2004.

3.10.2 For a given level of national electricity demand, every kilowatt-hour (KWh) produced from a non-polluting source such as a wind turbine replaces one produced by a fossil fuel power station.

3.10.3 The CO₂ emissions saved by using wind power instead of coal-fired power stations has been under debate over the last fifteen years as the energy mix has changed and cleaner fossil fuel technologies have been introduced.

3.10.4 A number of organisations including Ofgem, the DTI and the British Wind Energy Association (BWEA) have provided various figures for CO₂ emission saving over the last decade. In 1999 the New and Renewable Energy Prospects Paper published by the DTI included an annexe setting out the life cycle emissions of a range of generating technologies; a CO₂ average for the energy mix from 1993 was included as being 638g per kWh. The savings of a particular renewable energy technology was intended to be placed against that average to provide the CO₂ savings.

² Calculated using data from the Digest of United Kingdom Energy Statistics 2005 and confirmed by DTI

- 3.10.5 A more recent CO₂ savings figure of 430g/kWh has been given by Ofgem for wind against the current energy mix. However, this figure needs to be interpreted in the context of the current energy mix. The current energy mix includes about 17% nuclear which is allocated no emissions of CO₂ in most calculations. Since nuclear is the essential baseload plant which wind is never likely to displace, the actual emissions savings against the fossil fuels that wind will be displacing would be around 17% higher than the figure above, at about 520g/kWh.
- 3.10.6 The British Wind Energy Association (BWEA) has also produced its own figure for CO₂ emissions savings of 860g/kWh.
- 3.10.7 In order to best predict the CO₂ emission savings from the development, a range of figures has been used from a minimum of 520g/kWh as adapted from the Ofgem figure to a maximum of 860g/kWh as quoted by the BWEA. The SO₂ and NO₂ emission saving figures have also been provided by the BWEA. The figures used to predict the emission saving from the development are as follows:

CO ₂	520 - 860	grammes per kWh
SO ₂	10	grammes per kWh
NO _x	3	grammes per kWh

- 3.10.8 Since the proposed Burnfoot Hill wind farm would generate approximately 68,328 megawatt hours per year, using the above figures it can be calculated that it would result in the following reductions in levels of atmospheric emissions:

CO ₂	35,531 – 58,762	tonnes per annum
SO ₂	683	tonnes per annum
NO _x	205	tonnes per annum

- 3.10.9 It is estimated that the energy input required to manufacture and erect a wind turbine would be recovered from its output in approximately six months.

3.11 REDUCTION OF TRANSMISSION LOSSES

- 3.11.1 Electricity generated by the proposed wind farm will be fed into the 33kV electricity substation south of the village of Alva.
- 3.11.2 As a local provider of electricity, wind farm developments of the scale proposed here make a significant contribution to reducing losses associated

with transmitting and distributing electricity across the country from large centralised power generation plants.

3.11.3 The 2004 Digest of Energy Statistics (paragraph 5.64) states that:

"It is estimated that about 5,700 GWh (1.5% of the electricity available) were lost from the high voltage transmission system of the National Grid and 22,700 GWh (6%) between the grid supply point (the gateways to the public supply system's distribution network) and customers' meters."

3.11.4 Embedded generators such as this wind farm completely avoid the 1.5% high voltage transmission losses associated with traditional generation by offsetting imports from outside the local area. There may also be a reduction in the 6% distribution losses but this is more difficult to quantify and depends on the exact configuration of the local distribution network.

3.12 SUMMARY AND CONCLUSIONS

3.12.1 The need for generation of electricity from renewable resources stems from the need to combat global climate change. Renewables are internationally recognized as providing a direct and readily available means of reducing greenhouse gas emissions.

3.12.2 As a result, strong and effective policies to encourage the development of renewables have emerged at the European, UK and Scottish levels, cascading down through the planning system to specific targets at each level.

3.12.3 In this context the proposed development represents a significant contribution to Scottish Executive and UK targets. It would, on average, meet the equivalent domestic needs of over 14,500 households and avoid the emission of between approximately 35,000 and 59,000 tonnes of carbon dioxide per year.

4 PLANNING THE DEVELOPMENT

4.1 INTRODUCTION

- 4.1.1 This section describes the evolution of the Burnfoot Hill Wind Farm proposal, which has involved planning, design and appraisal work at two distinct levels or scales:
- 4.1.2 **Strategic Site Selection** at a broad scale, in order to identify, through the analysis of a wide range of technical and environmental criteria, a discrete study area within which proposals for the site could be developed.
- 4.1.3 **Detailed Site Design** of the wind farm, involving the design of the site layout, access arrangements, type and finish of the turbines and all ancillary structures, in order to best respond to various technical, operational and environmental constraints to development within the identified study area.
- 4.1.4 The development has been planned, consultations conducted and the environmental impact assessed in accordance with the Best Practice Guidelines for Wind Energy Development of the British and European Wind Energy Associations.

4.2 STRATEGIC SITE SELECTION

- 4.2.1 A range of factors have been considered, which affect the suitability of an area for a wind farm and which could potentially constrain development. These factors include the following technical, planning, land use and environmental considerations:
- Suitable wind resource
 - Capacity within, and ease of connection to, the electricity distribution network
 - Access and general ground conditions
 - Designated areas of national and local importance, and all aspects of landscape, nature conservation, archaeology and cultural heritage
 - Proximity to residential properties and nature of surrounding land uses
 - Potential impact on Ministry of Defence or Civil Aviation Authority operations
 - Potential impact on telecommunication signals
 - Availability of the land

- 4.2.2 Capacity within and ease of connection to the electricity grid is difficult to assess at an early strategic stage, given the complexity and variety of connection options which may be available. However, on a broad scale, areas remote from overhead transmission lines or from individual dwellings or settlements are unlikely to offer feasible opportunities for grid connection.
- 4.2.3 It was identified that the Ochils enjoy relatively large areas of land with open topography with a commercially viable wind resource. Furthermore the Tayside landscape character assessment (SNH, 1999) states "..., it is likely that, wind characteristics permitting, the Sidlaws and Ochils may be the most suitable areas for wind turbine development in Tayside." However the Central Region landscape character assessment (SNH, 1999), in relation to the Ochil Hills, states "the dominant feature of the hills is the striking contrast between the abrupt, extremely steep southern scarp, and the broad, level plain of the Devon River below.". Therefore a desk-based assessment was conducted to identify areas potentially suitable for wind energy development, primarily focusing on environmental constraints yet still giving due regard to other considerations.
- 4.2.4 Having identified the Ochil Hills escarpment as a key landscape component, and views of it as a key sensitivity, a visibility analysis of views of the Ochil Hills, from the settlements on the plain below, and relevant key viewpoints was undertaken. In addition the following constraints were also considered:
- Compliance with SNH's "Strategic Locational Guidance for Onshore Windfarms."
 - Ability of Landscape Type to absorb wind farm development, and proximity to landscape designations.
 - Proximity to nature conservation designations such as SPAs, SACs, SSSIs, or any site of local conservation interest such as RSPB reserves
 - Cultural heritage designations such as Scheduled Ancient Monuments and Listed Buildings
 - Proximity to residential properties
 - Proximity to sensitive habitats
 - Relevant Planning Policy
- 4.2.5 Details of the site selection process undertaken can be found in **Appendix 4.1, Volume 4.**
- 4.2.6 The area was analysed to find sites which would permit the erection of wind turbines at a distance no less than 800 metres from residential properties, to

minimise the visual impact of the turbines and the impact due to the sound from the turbines.

4.2.7 Following these initial studies, it became evident that, in terms of technical and environmental issues, the site at Burnfoot Hill could potentially be suitable for wind energy development because:

- Surrounding topography would provide a considerable level of visual screening of the site, especially when considering views of the Ochil Hills escarpment. In addition there would be a high degree of ‘back-clothing’ provided by the natural landform when viewed from the summits within the Ochils.
- The landscape around the site has already been man-modified by the creation of a large-scale dam, artificial reservoir and access tracks. As such, the site is in line with the SNH Policy Statement on Renewable Energy 01/02 which “seeks to steer development...towards areas where the landscape is already developed or visually man-modified”.
- The site is not within close proximity to sites with nature conservation designations
- Housing would be at least 800 metres from any turbines
- Suitable wind speed
- Electrical connection appeared to be feasible
- The site was accessible for the delivery of turbine components
- Consultees such as the Ministry of Defence (MoD), the Civil Aviation Authority (CAA) and telecoms groups responded positively
- The landowner made land available for the possibility of installing wind turbines

4.3 DETAILED SITE DESIGN

4.3.1 Having established the Burnfoot Hill site as being potentially suitable for a wind farm development, a design process reflecting specific design criteria was undertaken. A Design Statement, in accordance with Planning Advice Note 68, is provided in **Appendix 4.1, Volume 4**.

4.3.2 A description of the elements of the proposed development, which together comprise a wind farm, can be found in **Chapters 2 & 5** of this volume.

Operational Requirements

4.3.3 A number of the elements of a wind farm have operational requirements which influence their siting, as follows:

- The turbines should be placed with separation distances such that the best balance between total site area and minimal interference on wind resource between the turbines is obtained
- Switchgear building should be located adjacent to the point of export of the electricity from the site into the electricity distribution system
- Site Access should utilise existing tracks where possible. The access point should be approximately 5 metres wide with an appropriate splay (where required) in order to accommodate turbine deliveries and site construction vehicles
- Internal Access Tracks should interlink each turbine and be constructed to 5 metres in width, at a gradient suitable for use by heavy plant

Environmental Requirements

4.3.4 In addition to the strictly technical requirements of the wind farm, the following environmental requirements which bear directly on site design were identified:

- Separation from dwellings. The turbines should be located so that no dwelling could suffer unacceptable disturbance to amenity by reason of noise. Experience from mainland Europe has shown that there is unlikely to be a significant noise problem for any residential property situated further than 350-400 metres from the nearest turbine. In fact it proved possible to secure separation distances of more than 800 metres.
- Colour. An appropriate colour for the turbine towers and blades should be identified in light of the main views and backgrounds likely to be experienced.
- Visual amenity. The turbines should be located so that no dwelling could suffer shadow flicker effects. This is discussed in greater detail in **Appendix 4.2, Volume 4**.
- Other environmental issues. In particular, impact on landscape, archaeology, ecology and public amenity.

Consultee Responses

4.3.5 All statutory and non-statutory bodies consulted in relation to the proposed wind farm are listed in **Table 4.1** with their observations summarised.

Table 4.1 Statutory and non-statutory bodies consulted

Consultee	Observation	Response Date	Wind Prospect Comments
Clackmannanshire Council	Response to request for Scoping Opinion under Environmental Impact Assessment (Scotland) Regulations 1999.	7 th April 2004	Scoping Response from Clackmannanshire Council can be seen in Appendix 1.1, Volume 4
Ministry of Defence – Defence Estates	No objections raised to proposal.	9 th June 2003	Copy of letter can be seen in Appendix 1.1, Volume 4 (Referred to by the MoD as Backhills)
Civil Aviation Authority	No objections raised to proposal.	17 th March 2003	Copy of letter can be seen in Appendix 1.1, Volume 4
Scottish Executive (Environment Group)	Scoping Response received – comments relating to environmental designations, ecological assessment, access and hydrogeology.	8 th April 2004	Copy of letter can be seen in Appendix 1.1, Volume 4
Perth & Kinross Council	Scoping Response received – no comments to make at that time.	5 th April 2004	Copy of the letter can be seen in Appendix 1.1, Volume 4
Fife Council	Scoping Response received – expressed concern over landscape impacts.	10 th March 2004	Copy of letter can be seen in Appendix 1.1, Volume 4
Scottish Natural Heritage	Scoping Response received – detailing approach to assessing impacts on landscape, ecology and recreation.	25 th March 2004	Copy of letter can be seen in Appendix 1.1, Volume 4
Royal Society for Protection of Birds (RSPB)	RSPB hold no records for the specific area, recommended contacting BTO also recommended specific surveys to be undertaken.	10 th September 2003	Copy of letter can be seen in Appendix 1.1, Volume 4
Radio –	No objections raised to	1 st February	Further

communications Agency (now Ofcom)	proposal.	2005	responses from Electromagnetic Signal Operators can be found in Chapter 13, Volume 2
JMP Consulting (on behalf of the Scottish Executive TRNMD)	Scoping Response received – detailing expected ES content.	10 th March 2005	Copy of letter can be seen in Appendix 1.1, Volume 4
SEPA	Scoping Response received – comments relating to water quality, air quality and waste.	10 th March 2004	Copy of letter can be seen in Appendix 1.1, Volume 4
Scottish Water	Scoping Response received - believed not to directly affect Scottish Waters current activities.	15 th March 2004	Copy of letter can be seen in Appendix 1.1, Volume 4
Historic Scotland	Scoping Response received – comments relating to assessment of cultural heritage.	30 th April 2004	Copy of letter can be seen in Appendix 1.1, Volume 4

Public Consultation

4.3.6 Secretaries of the following Community Councils were informed of the proposed development in November 2005, and invited to attend a Public Exhibition held on the 1st December 2005:

- Alva Community Council
- Alloa Centre Community Council
- Alloa West Community Council
- Auchterarder & District Community Council
- Blackford Community Council
- Clackmannan Community Council
- Dollar Community Council
- Menstrie Community Council
- Muckhart Community Council
- Tillicoultry Community Council
- Tullibody, Cambus & Glenochil Community Council

4.3.7 In addition the following organisations were also informed of the proposal and invited to attend the Public Exhibition:

- Scottish Wildlife Trust
- RSPB (Central Scotland)
- Friends of the Ochils
- Clackmannanshire Field Studies Society
- Clackmannanshire Tourism Association
- Muckhart Heritage Society
- Ochil Hill Runners
- Ramblers Association

4.3.8 The Public Exhibition was held in Tillicoultry Community Centre on the 1st December 2005 from 2pm until 8pm. This gave members of the public the opportunity to discuss the proposal and wind energy in general with a variety of representatives from Wind Prospect.

4.3.9 The Public Exhibition was advertised by posting a newsletter (included in **Appendix 4.3, Volume 4**) to 5477 local households within 7km of the proposed site location. This included houses in villages such as Alva, Blackford, Gleneagles and Tillicoultry. Over 100 people attended throughout the day.


4.3.10 During the Public Exhibition, there was an opportunity to fill in a questionnaire about wind energy, government targets and the specific proposal for the site at Burnfoot Hill. Forty nine people completed the questionnaire, a copy of which can be found in **Appendix 4.4, Volume 4**. The full questionnaire responses are shown in **Appendix 4.5, Volume 4**.

4.3.11 Following the Information Day, a number of individuals, including both those who attended the Public Exhibition and those who did not, contacted Wind Prospect to obtain further information about the project. Wind Prospect responded to all of these and provided a range of information suitable to each request.

4.3.12 Following the submission of this Environmental Statement to accompany the planning application to Clackmannanshire Council further newsletters will be distributed to notify residents within 7km of the proposed development.

4.3.13 These newsletters will further inform residents of the submission of the application as well as give details as to where copies of this Environmental Statement can be publicly viewed.

4.4 CONCLUSIONS

- 4.4.1 All information and consultation responses were analysed in relation to the operational, environmental and safety requirements of each element of the potential wind farm development. This led to a process of design development as the relevant factors were taken fully into account; as detailed knowledge of the site was accumulated; and as the results of public consultation became clear. The final location and design is submitted in the planning application.
- 

5 CONSTRUCTION

5.1 INTRODUCTION

5.1.1 This section describes the likely environmental impacts of construction. Anticipated impacts arising from the works undertaken in the development of the wind farm have, where possible, been identified and suitable mitigation measures proposed.

5.1.2 Impacts on the following are dealt with in greater detail in the relevant chapters:

- Landscape (**Chapter 8**)
- Ecology (**Chapter 9**)
- Cultural Heritage (**Chapter 10**)
- Hydrology and Hydrogeology (**Chapter 11**)

5.1.3 It is anticipated that the wind farm would take approximately twelve months to construct.

5.2 PRE-CONSTRUCTION

5.2.1 Prior to the main construction contract commencing, a number of enabling works would be undertaken, including:

- Geotechnical investigations on the private road and across the proposed development site sufficient to allow the development of design details for the proposed development and production of a detailed construction method statement.
- Modification of site access points (discussed in detail in **Section 5.51** of this volume)

5.3 CONSTRUCTION WORKS

5.3.1 The principal components of the construction activity on site would be as follows:

- Access Track
- Road Upgrades
- Passing Places & Lay-Bys

- Bridges
- Slope Stability & Road Widening
- Culvert
- Site Roads
- Crane Hardstandings
- Foundations
- Construction Compound
- Borrow Pits
- Drainage & Dams
- Wind Turbine Installation
- Site Traffic
- Switchgear House
- Distribution Cable
- Electrical Connection

5.3.2 All of these construction components are discussed within this chapter, along with potential impacts and where necessary, proposed mitigation strategies, unless dealt with in each individual chapter as mentioned above in **Section 1.1.2**.

5.4 ACCESS

5.4.1 Access to the site during the construction period would be gained from the unclassified road leading from the A823 to Backhills Farm. From Backhills Farm the access route would bypass the farm buildings to the north and then lead south to the wind farm site, as illustrated in **Figure 5.1, Volume 3**. The exit route would utilise the same tracks.

5.5 ROAD UPGRADES

Junction with the A823 and Private Road to Backhills Farm

5.5.1 Modifications are required at the junction of the A823 and the private road to Backhills Farm. In principle, verge strengthening works will allow the wheels of the abnormal vehicles and overhanging bodywork to negotiate the corner unhindered. The work will be contained within the existing verge and adjacent fields. The proposals and swept path analysis are illustrated on **Figures 5.7 to Figure 5.10, Volume 3**.

Private Road

- 5.5.2 A number of modifications are required along the private road, and are likely to include creation of passing places and lay bys, the addition of a new bridge at Frandy Farm, slope stability works and road widening adjacent to the Upper Glendevon Reservoir, and the replacement of an existing culvert and associated earthworks below Backhills Farm.
- 5.5.3 These modifications are discussed in detail in the following sections.

5.6 PASSING PLACES AND LAY BYS

- 5.6.1 A number of areas have been identified for the construction of passing places or lay bys. These are to be constructed adjacent to the existing private road and will allow the construction traffic associated with the wind farm development to pull in and allow the passage of the other vehicles using the private road. The location and extent of these passing places and lay bys are indicated on **Figure 5.2 to Figure 5.6, Volume 3**.
- 5.6.2 The typical details to be used in the construction of the passing places, lay bys and verge strengthening works are illustrated on **Figure 5.26, Volume 3**.

5.7 BRIDGES

Bridge at Frandy Farm

- 5.7.1 The existing masonry arch bridge located adjacent to Frandy Farm has a very limited geometry and cannot accommodate the vehicles required to deliver the abnormal length loads.
- 5.7.2 In addition to the geometric restriction, it is considered that the bridge would be unable to support the sustained loads that it would be subjected to during the construction process given its current condition. The abutments of the bridge are poorly founded and have a significant loss of structural integrity as a result of mortar loss and block movement within the arch barrel.
- 5.7.3 Irrespective of its inability to support the abnormal loads of the blade and nacelle delivery vehicles, it is considered that the bridge adjacent to Frandy Farm should not be used by general construction traffic associated with the wind farm construction. The bridge's condition is likely to deteriorate if subjected to the size, weight and anticipated frequency of general construction traffic required for such a development.
- 5.7.4 A pre-fabricated bridge erected immediately to the east of the existing bridge would serve the needs during construction of both the general and abnormal

vehicular loads. A modular unit type bridge would be sufficient to carry the required loads. A bridge erected parallel to the existing masonry arch bridge will provide the necessary area required by the swept path of both the nacelle and blade delivery vehicles. Verge widening will also be required on both sides of the bridge to allow the safe passage of the vehicles. The proposed layout and relevant swept path areas are illustrated on **Figures 5.11 to 5.14, Volume 3**.

- 5.7.5 The proposed bridge, as shown in **Figure 5.27, Volume 3**, would be required to have support from abutments constructed adjacent to the River Devon. These would be constructed from reinforced concrete with brick or locally quarried stone protection. The abutments would incorporate bearings or other movement devices to allow the bridge to expand and contract with seasonal variations.
- 5.7.6 The constructed bridge would remain in place during the lifespan of the wind farm development and would be retained for the sole use of maintaining and decommissioning the wind farm. It would not be for the use of other private road users unless authorised so by the developer.
- 5.7.7 The existing masonry arch bridge would remain in place for use by private road users.

5.8 SLOPE STABILITY AND ROAD WIDENING

- 5.8.1 Road widening would be required near Corim Hill, as shown on **Figure 5.04, Volume 3**. The specifics of this road widening can be seen in **Figures 5.15 to 5.18**, where details of swept path analysis are shown.
- 5.8.2 The road widening along the eastern flanks of the upper Glen Devon reservoir is constrained by the presence of steep gradients, limited separation distances to the edge of the reservoir and a shallow rock profile.
- 5.8.3 It is proposed that the existing rock slope cutting is widened to accommodate the increased road width and provision of any surface water catchment. The rock slope cutting would also allow for any stabilisation of the existing rock cuttings and prevent any further slips occurring. Details of the proposals are illustrated on **Figure 5.28, Volume 3**.
- 5.8.4 Generally, the existing road along the length of the public highway varies in width of between 2.5m and 4.0m wide. Widening the carriageway would generally be as a result of :
- allowing the safe passage of loads and vehicles with a wheel track width in excess of 2.5 metres,

- where sight lines are not achieved for lengths for oncoming traffic less than 250m,
- and where edge widening shall increase the structural stability of the existing carriageway to safeguard its existing condition and prevent further slips.

5.9 CULVERT

Proposed Culvert at Backhills Farm

- 5.9.1 The existing bridge which carries the road across Broich Burn up to Backhills Farm is in very poor condition with little capacity in strength or geometry. The mass concrete abutments are in poor condition with open joints, cracking and significant scour. The steel bridge deck displays signs of stress and imminent failure. Replacement of the bridge is required imminently irrespective of the proposed development, however due to the proposed development the location/alignment and load capacity of the structure would need to be increased and/or changed to cater for the movement of all construction traffic up to the site.
- 5.9.2 It is possible for the nacelle delivery vehicle to negotiate the tight corner at Backhills Farm with minimal verge widening and replacement of the existing Burn crossing. A new crossing in the form of a 3m wide box or piped culvert approximately 10m in length would be sufficient to cater for the anticipated loads and swept path areas produced by both general construction traffic and nacelle delivery vehicles. Although this option involves verge widening on the northeast side of the road, it is considered that a gabion wall or sheet pile structure will be able to accommodate the steep slope of Craig Bran.
- 5.9.3 The utilisation of a double handling scheme to manoeuvre the blades would prevent excessive slope cuttings and stability issues associated with Craig Bran.
- 5.9.4 A crane positioned immediately to the southeast of the existing crossing would be able to lift blades from trailers approaching from the north. Trailers would park 'nose to nose' with the crane, whilst a second trailer parked alongside the west of the crane would receive the blade. The second trailer would then drive over a new culvert crossing, the length of crossing required would be approximately 15m.
- 5.9.5 Once the second trailer was loaded and travelling towards the site, the first trailer would retract its extended trailer length to that of a standard articulated vehicle. Once retracted the vehicle would be able to comfortably negotiate the corner and reverse into the original position of the second trailer extending ready for the next blade.

- 5.9.6 A crane with an approximate size of 150t would suffice for these lifting operations.
- 5.9.7 The starting position of the second trailer is adjacent to the east bank of Broich Burn, due to the relatively low loads involved it is felt that bank stabilisation will not pose a problem. However should the need arise, a sheet piling wall or gabion baskets should provide sufficient retention.
- 5.9.8 The proposed culvert would comprise of a precast box culvert, as illustrated in **Figure 5.25, Volume 3**. Details of the proposed box culvert and other associated works are illustrated on **Figures 5.19 & 5.20, Volume 3** along with swept path analysis on **Figures 5.21 to 5.23**.
- 5.9.9 As a result of the culvert replacement, as well as a requirement to reduce vertical gradients on the access route to the site, it is also proposed to realign the private access road between the culvert crossing on Broich Burn and Backhills Farm.
- 5.9.10 The proposed alignment would allow suitable gradients to be constructed which would allow access to be suitable for the construction traffic and the turbine delivery vehicles.
- 5.9.11 The proposed works are illustrated on **Figure 5.24, Volume 3**.

5.10 INTERNAL ACCESS ROADS

- 5.10.1 The primary objectives for the road designs are:
- Requirements to maintain water flows across roads and minimise disruption to the peat hydrology.
 - Minimisation of peat spoil.
 - Maintaining and/or improving stability of soft unstable areas of peat.
 - Serviceability requirements for construction and wind turbine delivery vehicles.
 - Build-ability considerations.
- 5.10.2 Each track would be approximately 5 metres wide. The tracks, a cross section of which is illustrated in **Figure 5.30 Volume 3**, would be surfaced with between 250 - 1500 mm depth of stone, depending on the type of road. Approximately 5.92 km of new internal access track would be constructed between turbines, as shown in **Figure 2.2, Volume 3**.

- 5.10.3 The design of a particular length of site road will depend on local geological, topographical and drainage conditions. To achieve a road structure that traverses the site conditions whilst meeting the primary road design objectives, two different designs each with associated construction techniques will be adopted.
- 5.10.4 Floating roads minimise impacts on peat land hydrology because peat excavation is not required and therefore no peat spoil is generated. Floating roads are preferred over excavated and rock fill roads.
- 5.10.5 A peat depth survey undertaken on the site showed peat depth to range between 0m and 4.0 metres (as shown in **Figure 11.1** and discussed in detail in **Chapter 11, Volume 3, Hydrology & Hydrogeology**), however peat depth for most of the site is between 0.5 and 1m.
- 5.10.6 The on site tracks to access the turbines, have been laid out to avoid deep peat. However, one length of track between turbines 5 and 7 crosses an area of deeper blanket bog.
- 5.10.7 In some other locations peat may not have enough bearing capacity in the short term to support a floating road structure. In these situations rock fill roads will be constructed. An example of both an excavated road and a floating road are shown in **Figure 5.30, Volume 3**.
- 5.10.8 It is proposed that the stone required for the road would be sourced from borrow pits within the wind farm site. This would exploit the local rock, which has been identified as a suitable road stone material. Using such local stone would avoid the adverse impacts of introducing an alien material into the environment, for example, the use of imported carbonaceous material, such as limestone, which may change the pH of the adjacent bog, or encourage the growth of grasses at the expense of the existing acid-tolerant bog flora.
- 5.10.9 The layout of site roads has been designed so as to minimise gradients and requirements for cuttings and embankments. There are, however, some areas where minor cuttings are unavoidable. Where this is necessary profiling work and restoration work will be undertaken minimising the visual impact and restoring any disturbed mire surfaces. Exposed areas of substrate will be covered with recovered peat and turfs from adjacent areas of the site.
- 5.10.10 The tracks would be retained throughout the operational life of the wind farm to allow periodic maintenance of the turbines.

The Observational Method

5.10.11 Site roads will be designed, constructed and monitored using the observational method:

5.10.12 *“The Observational Method in ground engineering is a continuous, managed, integrated, process of design, construction control, monitoring and review that enables previously defined modifications to be incorporated during or after construction as appropriate. All these aspects have to be demonstrably robust. The objective is to achieve greater overall economy without compromising safety.”* CIRIA Report 185.

5.11 CRANE HARD STANDINGS

5.11.1 At the site of each wind turbine hard standing areas for wind turbine erection and foundations will be constructed. Detail of a crane hard standing can be seen in **Figure 5.29, Volume 3**.

5.11.2 Hard standing areas will be constructed from locally sourced rock. All hard standing areas will be taken down to hard competent strata (Bedrock or Glacial Till) and will not be floated on the peat. All peat will be removed and replaced with rock.

5.11.3 The hard standing areas will be covered with a layer of recovered peat or turfs on completion of the turbine erection.

5.11.4 As with the tracks, the crane hardstandings would be retained throughout the operational life of the wind farm to allow maintenance to take place when necessary.

5.11.5 The crane hard standings would be designed, constructed and monitored using the Observational Method, as detailed in **Section 5.10.9**.

5.12 WIND TURBINE FOUNDATIONS

5.12.1 The construction methodology for wind turbine foundations will depend on strength and depth for peat specific to each location. Foundations will need to be taken down to competent bearing strata, excavating through the peat and founding on either bedrock or glacial till. In general if peat is shallow and stable standard excavation techniques will be adopted. However, if peat is deep or unstable a rock cofferdam will be installed around the perimeter of the foundation to retain the peat and prevent it from flowing back into the excavation.

5.12.2 Foundation construction will be carried out in conjunction with the crane hard standing construction.

5.12.3 A typical method of construction for foundation in deep peat is described below:

- Install temporary drainage around perimeter of excavation.
- Construct cofferdam round perimeter of foundation, to be left in place.
- Excavate remaining peat from inside of cofferdam down to top of glacial till or bedrock.
- Form a level working area to build foundation upon using crushed rock.
- Install formwork and reinforcement.
- Pour concrete.
- Once concrete has set and earthing system is in place the foundation will be backfilled with either rock or glacial till imported from rock source areas.

5.12.4 A typical method of construction for foundation in shallow peat or topsoil is also described below:

- Excavate peat or topsoil and store to one side.
- Excavate substrata (rock or till) to sufficient depth to generate enough material to back fill the foundation.
- Form a level working area to build foundation upon.
- Install formwork and reinforcement.
- Pour concrete.
- Once concrete has set and the earthing system is in place the foundation will be backfilled with suitable fill material.

5.12.5 An example of a typical cross section through a turbine foundation is shown in **Figure 5.31, Volume 3**.

5.13 EARTHWORKS

5.13.1 Three principal methods will be adopted to recreate vegetation cover. The precise combination of these methods may vary according to the feature being reinstated (access track, crane hardstanding or turbine foundation). The three reinstatement techniques are:

- **Turfing** using material cut along the road route. Turfs will be cut by a mechanical excavator and laid upright in bucket sized blocks along the route. It is essential to minimise disruption to the main rooting zone (0-250mm), especially the upper 25mm that contains most of the seed bank.
- **Natural Regeneration** relies on invasion of bare ground by native species colonization from adjacent habitats. Providing a roughened surface, which can trap seeds and soil to provide initial regeneration niches, can assist this process.
- **Reseeding** using hydraulic technology, the seed mix is made up of sterile short-lived grasses, which will be replaced by heather and other heath and blanket bog species. The seed mix will be confirmed by the developer in consultation with relevant statutory consultees. The re-seeded areas will be visible for one or two years, but fast growing species will reduce in cover as soil nutrients are reduced by vegetation growth and as slower growing heather starts to invade, based on published experience at Novar Wind Farm, near Dingwall (BWEA 19, P.C. McLellan, R Nicolson & T.C.D. Dargie, 1997)

5.14 CONSTRUCTION COMPOUNDS

- 5.14.1 Two temporary construction compounds approximately 50 x 25m in area would be constructed to the same standards as the access tracks, lay bys or crane hard standings. These are illustrated on **Figure 2.2, Volume 3**.
- 5.14.2 These compounds would be used for the storage of materials, plant and equipment, as well as providing welfare and office facilities for the staff engaged in constructing the wind farm.
- 5.14.3 Once the construction of the wind farm was completed the construction compounds would be removed and land returned to its former use.

5.15 BORROW PITS

- 5.15.1 Investigations by suitably qualified engineers have identified three areas for the proposed removal of rock to construct the wind farm infrastructure. These areas are shown on **Figure 2.2, Volume 3**.
- 5.15.2 Borrow pits would be excavated in order to source stone for the construction of the construction compound, access tracks and turbine hardstandings.
- 5.15.3 Approximately 15,000m³ of rock would be excavated from one or two on-site borrow-pits.

- 5.15.4 An additional 5,000m³ would also potentially be excavated from the borrow pit to the east of the site. The location of all three potential borrow pits are shown in **Figure 2.2, Volume 3**.
- 5.15.5 Scottish Executive Planning Advice Note 50 (Annex D) – Controlling the Environmental Effects of Surface Mineral Working will be used as a guide to developing borrow pits.
- 5.15.6 The exact quantities and quality of rock to be extracted at each location will be determined by the geotechnical investigations to be conducted during the preconstruction phase of the works.
- 5.15.7 Following construction, the borrow pits would be landscaped with stored topsoil and reseeded.

5.16 DRAINAGE & DAMS

Site Drainage

- 5.16.1 Excavated roads will have the following drainage features.
- *Drainage ditches* – on both sides of the road depending on side slope.
 - *Cross drains* – There will be regular cross drains under the road. The spacing of these cross drains will depend on a number of factors discussed later in this chapter.
 - *Check dams* – Check dams will ensure that any potential/accidental silt and pollutant are stopped as near to their source as possible and will ensure that the cross drains work as intended. These are also discussed in more detail later in this chapter.

Drainage Ditches

- 5.16.2 Drainage ditches will be required alongside excavated roads. An excavated road cuts off the natural drainage across it, so the ditches will be part of the replacement. It is anticipated that at times the water in the ditches will contain high concentrations of sediment with excavations, road construction and possible other accidental pollutants from construction activities. No water from a drainage ditch will be discharged directly to a watercourse. Instead it will pass through a sand filter, filter strip, silt trap or other best practice pollution control feature. Drains will not be ended directly into natural channels, ephemeral streams or old ditches.

Cross Drains

5.16.3 Cross drains are required to maintain the natural flow of water across the road. The spacing of the cross drains will depend on the following factors:

- Area draining to cross drain
- Gradient
- Choice of material for drain
- The choice of design condition of the drainage system

5.16.4 Forestry Commission guidelines (2003) suggest that a maximum spacing should be 200m, although it is likely that the spacing will be nearer to 50m over most of the site as 200m assumes that the hydraulic gradients in the drainage system are in excess of 1 in 40.

Check Dams

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

- The gradient of the road
- The spacing of cross-drains
- The depth of excavation

5.17 SITE TRAFFIC

5.17.1 The vehicles likely to be involved in construction activities include:

- Articulated trailer lorries - to bring initial establishment equipment (port-a-cabins etc.) on to site and later to bring turbine components
- Low loaders - to transport the civil construction equipment to and from the site
- Tracked back hoe excavators - for excavation of borrow pits
- Dump trucks - to move stone from the borrow pits for the temporary construction compound, access tracks and crane hard standings, and to remove spoil
- Concrete mixer wagons - to deliver concrete for the turbine bases
- Cranes - one 150 tonne crane for assembling the turbines on the ground and one 800 or 1000 tonne maximum lifting capacity crane plus three support vehicles for the short period required for erecting the turbines

- Miscellaneous vehicles and handling equipment, including cars belonging to the construction workforce

5.17.2 Anticipated vehicle movements throughout the 12 month construction period are shown in **Table 5.1**.

Table 5.1 Anticipated return vehicle movements entering and leaving the site during the construction period

Month number	<i>Number of return vehicle movements in each month</i>									
	1 - 3	4	5	6	7	8	9	10	11-12	TOTAL
Articulated trailer lorries										
Site de/mobilisation	20								20	40
Cables						13				13
Foundation reinforcement		11	11							22
Towers				8	8	8	8	8		40
Nacelles				3	3	3	2	2		3
Blades				3	3	3	2	2		3
Transformer				1						1
Switchgear House	2	8								10
Tipper Trucks										
Track material #	507	507	507	507	253	127	127			2535#
Concrete Mixers										
Foundations		203	203	203	203					812
Cranes										
Main crane			1							1
Crane ballast	1		2							2
150t Auxiliary crane			2							2
TOTAL	20	225	214	218	217	27	14	14	20	973
Average truck trips per day*	2	12	11	11	11	2	1	1	1	

once on site, these trucks will move only between the borrow pit areas and the site and are not included in the Totals

* based on a five day working week

5.18 WIND TURBINES

5.18.1 The turbines proposed for the development are the 2MW Vestas V80 or similar, a sample specification of which is included in **Appendix 3, Volume 4** and illustrated in **Figure 5.32, Volume 3**. They are three bladed variable speed pitch regulated wind turbines, with the rotor and nacelle mounted on a cylindrical steel tower. Each turbine is no more than 102 metres to tip height (when the blade is in the vertical position).

Delivery of Component Parts

- 5.18.2 Wind turbine installation work will not start until a suitable weather window is available.
- 5.18.3 Turbine blades are the most difficult turbine component to transport to site due to their size. A typical turbine blade delivery lorry is shown in **Figure 5.34, Volume 3**.
- 5.18.4 The towers will be delivered in sections, probably three. **Figures 5.35 and 5.36, Volume 3**, present the specifications of a generic wind turbine tower delivery lorry.
- 5.18.5 **Figure 5.36, Volume 3**, also indicates the specifications of a generic nacelle delivery lorry.

Turbine Erection

- 5.18.6 Three methods can be used to attach the blades:
- The blades can be attached to the hub on the ground. The hub and blades are then lifted as one. This is the quickest method and can be used in higher winds than the other methods. However, this method requires a large lay down area and light vehicles have to move in this area.
 - The hub can be attached to the nacelle and the two blades attached to the hub while the nacelle is on the ground – the “bunny lift”. The nacelle is then lifted into position and the third blade lifted into place separately. This requires manoeuvring of several components on the ground and usually the repositioning of cranes.
 - Lifting the nacelle and hub as one unit, as described above and then attaching the blades one at a time, rotating the hub between lifts. The blade lifting operations do not require repositioning of crane.
- 5.18.7 The first is less likely to be acceptable due to the differing extents of surrounding peat which could be disturbed and thus this method was rejected. The second method may be used for certain locations. The third method is the likely method to be used for this project.

5.19 SWITCHGEAR BUILDING

- 5.19.1 The switchgear building would be a single storey building measuring approximately 12 x 8 metres, located as shown in **Figure 2.2, Volume 3**.

5.19.2 The area for the building will be prepared by removing the peat down to competent bearing strata on either bedrock or glacial till. Concrete foundations will be required, founded on rock or glacial till, to take the weight of the components and the building. An electrical earth network will be buried around the building.

5.19.3 The underground cables from the distribution system bringing electricity from the wind turbines will be brought in underground to ducts. The ducts will guide the cables to the appropriate switchgear inside the building. Communication cables will enter in similar manner.

5.19.4 A typical switchgear building is shown in **Figure 5.37, Volume 3**.

5.20 DISTRIBUTION CABLE

5.20.1 The distribution cable will be XLPE (cross linked polyethylene) insulated with copper or aluminium conductors. The cable may incorporate fibre optic cores for communications, or a separate fibre optic cable will be laid alongside for communications. A bare copper earth cable will be laid alongside the cable. The majority of the route will be alongside the road to minimise peat or topsoil disturbance.

5.20.2 Generally the distribution cable is installed adjacent to the site road in a trench normally between 1.0m and 1.5m wide and at a depth of 1.2m. As shown in **Figure 5.30**. Where depths less than 1.2m are to be adopted, possibly as a result of rock head or groundwater, then the cables would be installed in a cable duct, and backfilled with the material from the trench.

5.21 ELECTRICAL GRID CONNECTION

5.21.1 The most likely proposed electrical grid connection route is illustrated in **Figure 2.4, Volume 3**. This proposed route follows the existing track between Burnfoot Hill and Alva, Clackmannanshire, via Ben Buck, Ben Ever and The Nesbit.

5.21.2 The proposed grid connection will comprise of a cable similar to that of the distribution cable and shall be installed in a trench running as far as possible adjacent to the existing track.

5.21.3 The off site connection route shall be constructed using appropriate equipment to access, excavate, install and reinstate. The excavation, cable pulling and reinstatement works shall be conducted using a Kaiser 3t walking excavator, used extensively in pipeline construction, forestry work and other excavation work in sensitive areas. Other plant, equipment and personnel

shall access the proposed route using quad bikes or other similar vehicles used in these types of terrain.

5.21.4 Where possible the export power line should follow the existing footpaths in the area. As part of the development it is proposed that upgrades to the existing tracks will be made when installing the underground cable.

5.21.5 Where the cable is to be installed within the public highway, then the proposed route and construction details will comply with the New Roads and Street Works Act and all other highway legislation.

5.22 OTHER ANCILLARY WORKS

Site Signs

5.22.1 A site sign would be located at the operational entrance to the site. This would provide both information about the turbines and the companies involved in the project together with essential safety information and telephone numbers.

Wind Monitoring

5.22.2 A 60m wind anemometry mast would be located on the site at NGR 290078, 702924. This would replace the current temporary 50m anemometry mast as shown in **Figures 2.1 and 2.2, Volume 3**.

5.22.3 The anemometry mast will provide necessary information for the control and monitoring of the site. The specification of the mast is illustrated in **Figure 5.33 Volume 3**.

5.23 POTENTIAL IMPACTS

5.23.1 The likely impacts of any construction activity lie in noise and vehicle traffic, which are generally temporary and intermittent in nature, drainage and water quality and air quality. These impacts are considered as follows:

Construction Plant Noise

5.23.2 The impacts due to noise during construction would be minimal. The equipment used would include road going tippers, dump trucks, ready-mix concrete trucks, tracked excavators and vibratory compaction equipment.

5.23.3 Lorry-based equipment, either construction dump trucks or road going vehicles, would conform to the relevant Road Traffic Acts and the

Construction Regulations, and would all be fitted with effective diesel exhaust silencers.

5.23.4 The civil excavation equipment would be powered by conventional turbocharged diesel engines of outputs comparable to those for agricultural purposes. In the UK the noise emissions from these machines are controlled by European Directives and the maximum permissible sound power output is 104dBA. This will be further tightened over the next few years and new equipment will become quieter in anticipation of the new regulations.

5.23.5 The guidelines laid down in BS5228 on noise from construction activities would readily be met, because construction of the wind farm and its infrastructure would only require the use of a very few machines at any given time.

Site Traffic & Access

5.23.6 All construction traffic would be routed from the A823, from which they will gain direct access to the site, as shown in **Figure 5.1, Volume 3**. Impacts are likely to occur during the construction of the access roads and turbine bases, when there would be an increase in traffic entering the site, traffic noise and possible mud deposited on the carriageway. If the concrete foundations and access tracks are laid on the same day, then a maximum of 40 truck trips to site per day would be expected on no more than twelve days distributed over the construction duration.

5.23.7 During the two-month delivery period when the turbine components would be entering the site, the long loads approaching and exiting the A823 may intermittently inconvenience the flow of traffic along this road. These loads will be moved under full consultation with the requirements of the abnormal load movement regulations.

Air Quality

5.23.8 Local air quality could be affected due to emissions from site traffic and the generation of dust, primarily during extractions from the borrow pits.

Drainage & Water Quality

5.23.9 Upgrades of access tracks particularly where they cross existing watercourses, could result in a disturbance to the natural flow of water.

5.23.10 There is a potential for runoff from stockpiled and excavated soils.

5.23.11 Construction of access tracks, turbine foundations, hard standings and the construction compound could increase levels of silt-laden runoff entering watercourses due to the, introduction of impermeable surfaces. The potential environmental impact of this is to increase flow rates, leading to increases in channel erosion, sediment loading reaching watercourses and downstream flood risk.

5.23.12 The access tracks site cabling and turbine bases have the potential to affect local flows within the peat, potentially leading to barriers or preferential pathways. If excavations for turbine bases or borrow pits encounter groundwater, it may require to be pumped, resulting in localised drawdown of the water table.

5.23.13 The use of machinery during the construction phase presents a risk of pollution from spills or leaks of fuel, oil and construction materials.

5.23.14 Excavation of material from borrow pits could cause additional silt to enter existing watercourses, around the proposed extraction points.

Storage and Disposal of Materials

5.23.15 There is a potential for runoff from stockpiled and excavated soils.

5.23.16 There is potential for cross contamination of materials during storage and disposal including the potential for topsoil and peat stocks to be contaminated with other sub surface materials.

5.23.17 There is potential for leachates, liquids and other materials introduced during construction to pollute the existing environment and watercourses.

Other Impacts

5.23.18 As previously stated impacts on the following are dealt in greater detail in their respective chapters:

- Landscape (**Chapter 8**)
- Ecology (**Chapter 9**)
- Cultural Heritage (**Chapter 10**)
- Hydrology and Hydrogeology (**Chapter 11**)

5.24 MITIGATION MEASURES

Construction Plant Noise

5.24.1 It is considered unlikely that specific measures, other than the use of modern machinery with the manufacturers' standard noise control devices in place and in good repair, would be required in mitigation of the effects of construction noise. Noise from the site will be similar in character to noise from conventional agricultural machinery, due to the use of diesel engines. In fact, the levels of sound emitted by the construction machinery would be rather lower than present-day tractors and combine harvesters, which are allowed to operate on agricultural land without time restrictions as to days of the week, or working hours.

Site Traffic & Access

5.24.2 The impacts of construction traffic would be mitigated through adoption of the following measures:

- The use of borrow pits adjacent to the site for the sourcing of material will very substantially reduce the volume of traffic entering and leaving the site which would have resulted had material been sourced from an external quarry.
- All construction vehicles on and off site will be via the approved route to the site entrance (**Figure 5.1, Volume 3**), at times to be agreed with Perth & Kinross Council, Clackmannanshire Council and the Scottish Executive's Transport Scotland (who have jurisdiction over the A9 Trunk Road).
- Statutory warning road signs will be erected as agreed with the highways department on all roads leading up to the site entrances and at the site entrances
- The use of only one site entrance
- Vehicles transporting long loads will be subject to movement orders and will be escorted onto the site as required by the local Police
- The use of temporary lighting at the site entrance if required by the local highways authority
- Wheel washers would be used when necessary for all vehicles exiting the site to minimise the potential for mud and debris to be transferred from the site to the public highway during the construction period
- Excess sub-soil, concrete, used oils and other chemicals to be disposed of off-site at an approved licensed tip

5.24.3 Procedures would be agreed between all landowners, tenants and road users of the private road for the issue and communication of information. Procedures which would address the project phases, provide timescales and contacts for the parties involved would be drawn up prior to commencement of construction works once their full extent has been finalised. Information regarding the ongoing activities for the forthcoming week would be published and posted to all parties involved and displayed on site. The developer would also employ a site agent who is directly responsible for distributing the information and providing a one point of contact for landowners, tenants and road users.

Air Quality

5.24.4 Even though emissions from vehicles during the construction phase would be negligible, any emissions will be minimised through the reduction of vehicle movements by excavating material from adjacent borrow pits in preference to transporting material from an external quarries to the site.

5.24.5 During dry weather, and if necessary, the levels of airborne contamination generated during the excavation of borrow pits and the construction of access tracks, hard standings and the construction compound would be minimised by spraying water on to site tracks in order to suppress dust.

Drainage & Water Quality

5.24.6 Where tracks are excavated to bedrock/rock (in areas of peat of <1m thickness) the fill material imported will be local stone with sufficient permeability to allow cross drainage and not provide a barrier to flow in areas where the access track is on fairly level ground (less than 1:50 gradient approximately).

5.24.7 Floating access tracks are to be used in areas of deeper peat where possible, although careful site design has been undertaken in order to minimise such areas. This will result in a negligible impact on groundwater flow or level as such tracks are constructed on the ground surface. The design and drainage details for such tracks would be based on the findings of a detailed geotechnical investigation.

5.24.8 In areas of normal track (not floating track) material will be used that when placed has a permeability/transmissivity lower than the surrounding peat. This will prevent the track acting as a conduit for groundwater flow in areas of steeper gradient.

5.24.9 An accident management plan will be developed as part of the Construction Method Statement (as detailed below in **Sections 5.24.18** and **5.24.19**) that takes full consideration of best practice, statutory requirements and

identification of areas of highest sensitivity. This will provide site spill response procedures, emergency contact details and equipment inventories and their location. All staff will be made aware of this document, and its content, during site induction and it will be available in the site office.

5.24.10 Baseline water quality monitoring will be undertaken at the site prior to any construction works commencing. This will include an invertebrate study and monitoring of suspended solids including identifying areas where possible sedimentation from construction activities can be measured, such as on the Muckle Burn and the Greenhorn Burn. This will allow any change in water quality as result of the construction phase to be actively managed.

5.24.11 Other mitigation strategies are proposed for the following:

- Runoff from stockpiles and excavated soils
- Upgrading and construction of access tracks
- Construction of construction compound
- Fuel, oil and vehicle storage
- Erection of turbines
- Concrete pouring
- Site cabling, including the offsite underground cable route
- Borrow pits

5.24.12 These mitigation strategies are covered in detail in **Chapter 11**, Hydrology and Hydrogeology.

Storage and Disposal of Materials

5.24.13 All residual materials (cable off cuts, housings, containers etc.) would be collected in appropriate containers for removal from the site at the end of the construction period and disposed at an appropriate licensed tip.

5.24.14 No waste materials of any sort would be left on site.

5.24.15 All topsoil would be moved and stored in accordance with the SEERAD good practice guidance.

5.24.16 All diesels would be either delivered daily to site using licensed diesel tankers or stored in bunded tanks.

5.24.17 Refuelling operations, oil storage and any other activity involving liquid with the potential to pollute, would be carried out on the site under agreed procedures with Scottish Water and all other statutory authorities. Health,

Safety and Environmental Auditing would be carried out on the site to an agreed programme of monitoring both during the construction period and the operational lifespan of the wind farm.

5.24.18 During the construction of the wind farm best practice methodologies contained in the Pollution Prevention Guidelines published by SEPA would be adopted on site.

Construction Method Statement

5.24.19 A Construction Method Statement will be agreed in advance with the Scottish Environment Protection Agency, Scottish Natural Heritage and other relevant statutory authorities. This will contain further details of the proposed and agreed working practices which will be adopted on the site for all construction activities.

5.24.20 The construction method statement shall address in greater detail environmental management and further assess the following :

- Drainage
- Peat movement
- Ecology and
- Cultural Heritage

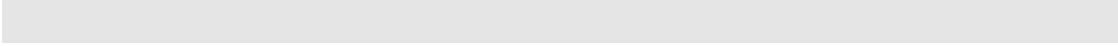
5.25 RESIDUAL IMPACTS

5.25.1 Due to the mitigation measures to be adopted, as outlined both above and in the following specific chapters, the activities required to construct the wind farm would not result in any significant residual effects on the site or in its vicinity.

5.26 SUMMARY AND CONCLUSIONS

5.26.1 The construction of the wind farm would be completed over a period of approximately twelve months. Prior to construction, a number of works would be undertaken, including geotechnical investigations, development of the construction method statements.

5.26.2 Construction of access road modifications, site access roads, the temporary construction compounds, turbine bases, crane hard standings, switchgear building, the installation of electrical cabling and the assembly and erection of the turbines would lead to a number of impacts, principally due to construction noise, site traffic and the potential to pollute the surrounding environment.

- 5.26.3 Noise impacts would not be significant during the construction phase of the development and special mitigation measures other than good site management practice will not be necessary.
- 5.26.4 The impact of construction traffic would be mitigated through the adoption of specific routing and control measures. It would also be mitigated through the sourcing of material for the construction of access tracks and hard standings from onsite borrow pits as an alternative to sourcing this material from an external quarry.
- 5.26.5 Any effects on drainage would be minimised by adopting measures to control levels of silt in watercourses, to be agreed in advance with relevant statutory authorities in a Construction Method Statement (Chapter 11 assesses more fully the potential hydrological impacts associated with the development).
- 5.26.6 A Construction Method Statement will identify the risks to the environment, and provide details of the proposed and agreed working practices to be adopted on the site for all construction activities.
- 5.26.7 The construction activities required to develop the wind farm would not result in any residual effects on site or in the vicinity, other than those considered in the subsequent sections of this Environmental Statement.
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6 DECOMMISSIONING

6.1 INTRODUCTION

- 6.1.1 This section considers the works that would be involved in the decommissioning of the wind farm at the end of its operational life (which is anticipated at some twenty-five years duration) in order to restore the site to its present use. It is anticipated that decommissioning of the wind farm would take no more than two months to complete.
- 6.1.2 The **turbines** would be dismantled and removed from site for scrap. The bases and hardstandings would be cut back to below ploughing level, topsoil reinstated and the land returned to its former use.
- 6.1.3 The **access tracks**, if not required for farming purposes, would be removed. As they are to be constructed on a geotextile layer, this operation would be straightforward. Topsoil would then be replaced and reinstated and the land returned to its former use.
- 6.1.4 The **underground cables** are typically located one metre below the surface and contain no harmful substances. They can be recovered if economically attractive or left in the ground. Terminal connections would be cut back to below ploughing levels.
- 6.1.5 The **switchgear building** would be dismantled, all equipment removed, topsoil re-spread and the land returned to its previous use.
- 6.1.6 All such decommissioning work would be the responsibility of the owner of the wind farm at the time decommissioning takes place. Experience in Europe shows that scrap and other value of the turbines and electrical components would more than meet the cost of decommissioning.

6.2 POTENTIAL IMPACTS

Noise

- 6.2.1 Noise created as a result of decommissioning would be minimal. The dismantling and removal of the turbines and switchgear building and the reinstatement of access tracks would create noise primarily as a result of the use of machinery.
- 6.2.2 Lorry-based equipment would conform to the relevant Road Traffic Acts and the Construction Regulations, and would all be fitted with effective diesel exhaust silencers.

Site Traffic

- 6.2.3 Turbine components would be removed from the site using the same route as that used during the construction period.
- 6.2.4 During the period when the turbine components would be exiting the site, the slow and long loads exiting and travelling away from the site could interrupt the flow of traffic along the A823.

Drainage and water quality

- 6.2.5 Decommissioning activities could cause additional silt to enter existing watercourses.
- 6.2.6 The use of machinery during the decommissioning phase presents a risk of pollution from spills or leaks of fuel or oil.

6.3 MITIGATION MEASURES

Noise

- 6.3.1 It is considered unlikely that specific measures, other than the use of modern machinery with the manufacturers' standard noise control devices in place and in good repair, would be required in mitigation of the effects of noise during decommissioning. Noise from the site will be similar in character to noise from conventional agricultural machinery, due to the use of diesel engines. In fact, the levels of sound emitted by the machinery would be rather lower than present-day tractors and combine harvesters, which are allowed to operate on agricultural land without time restrictions as to days of the week, or working hours.

Site Traffic

- 6.3.2 The impacts of traffic during decommissioning would be mitigated through adoption of the following measures:
 - All construction vehicles on and off site will be via the approved route to the site entrance (**Figure 5.1, Volume 3**), at times to be agreed with Perth & Kinross Council, Clackmannanshire Council and the Scottish Executive's Transport Scotland (who have jurisdiction over the A9 Trunk Road).
 - Statutory warning road signs will be erected as agreed with the highways department
 - The use of only one site exit

- Vehicles transporting long loads will be subject to movement orders and will be escorted from the site as required by the local police
- The use of temporary lighting at the site entrance if required by the local highways authority
- Wheel washers would be used when necessary for all vehicles exiting the site to minimise the potential for mud and debris to be transferred from the site to the public highway during the decommissioning period

Drainage and water quality

- 6.3.3 In order to capture suspended solids which might result from decommissioning activities, temporary silt-traps would be used at various points in drainage ditches, natural water courses on site, and within and down stream of the borrow pits. The effectiveness of these silt traps would be monitored on a regular basis and during periods of heavy rainfall, and the frequency of silt traps increased as necessary.
- 6.3.4 All diesel would be either delivered daily to site using licensed diesel tankers or stored in bundied tanks.

6.4 SUMMARY AND CONCLUSIONS

- 6.4.1 Noise impacts would be very slight during the decommissioning phase and special mitigation measures other than good site management practice are unlikely to be necessary.
- 6.4.2 The impact of traffic during the decommissioning phase would be mitigated through the adoption of specific routing and control measures.
- 6.4.3 The Burnfoot Hill Wind Farm is likely to have an operational life of approximately 25 years. After this time, the development would be decommissioned in order to return the site to its former use. There will be no residual environmental effects arising from the decommissioning of the wind farm.

7 LAND USE & RECREATIONAL ACCESS

7.1 INTRODUCTION

7.1.1 This chapter considers the likely effects on land-use and recreational access interests of the construction and operation of the proposed wind farm at Burnfoot Hill.

7.2 LAND USE

Agricultural Land Use

7.2.1 All of the application area is currently by livestock used for rough grazing.

7.2.2 According to the Land Capability Map for Agriculture (Macaulay Institute for Soil Research, Aberdeen 1982) all of the land within the application area is described as Class 6.1, 6.2 or 6.3, 'Land capable of use only as rough grazings'. The land is therefore not suited to arable cropping.

7.3 THE IMPACT OF THE WIND FARM ON LAND USE

7.3.1 The thirteen turbines and associated infrastructure of the Burnfoot Hill Wind Farm would extend over a total area of approximately 152 hectares. The area of land-take would consist only of that required for the footprints of each of the thirteen turbines, the crane hardstandings, the new access tracks, the wind monitoring mast and for the switchgear building and construction compounds. Together these amount to approximately 6.2 hectares of land, or approximately 4% of the site area.

7.4 MITIGATION

7.4.1 Land disturbed in the course of construction of the turbine bases would be reinstated. The turbine foundations would be reinstated and revegetation would be encouraged so that rough grazing would be possible right up to the turbine towers during the operation phase.

7.4.2 After re-instatement, any remaining spoil would be distributed over agricultural land in agreement with the landowner or removed from site.

7.5 RESIDUAL IMPACTS

7.5.1 Following re-instatement, residual loss of land use would be confined to the areas occupied by the thirteen turbines, the crane hardstandings, the new access tracks, the wind monitoring masts and the switchgear building. This

would amount to approximately 6.2 hectares. The magnitude of loss of land would not be significant, with approximately 96% of land within the site boundary available for normal use.

- 7.5.2 The land required for the proposed wind farm would be restricted to the duration of its 25-year life, following which the development would be decommissioned (as detailed in **Chapter 6**) and the land would once again be available for its previous land use.

7.6 RECREATIONAL ACCESS

- 7.6.1 The specific objectives of the recreation study were to:

- Identify the recreational access resource baseline within the assessment area and key receptors in the vicinity;
- Assess the potential and predicted effects of the construction and operation of the proposed development on the recreational access resource;
- Propose measures, where appropriate, to mitigate any predicted adverse effects.

- 7.6.2 **Figure 7.1, Volume 3**, depicts the proposed turbine locations, along with the locations of recreational access resources identified by the study.

- 7.6.3 The full methodology for the recreational access assessment can be found in **Appendix 7.1 and 7.2, Volume 4**. Specifically direct and indirect effects are being assessed:

- **Direct:** only possible within the application boundary where there will be a physical effect on facilities or infrastructure used to take access or the practice of recreation caused by the proposed development. Direct effects may result in restriction of access to facilities, barriers, physical restrictions or limitations on the use of the site or the facility, or even its loss.
- **Indirect:** where the intrinsic qualities of the resources as enjoyed by people may be affected. Indirect effects may relate to new development reducing visual amenity from recreational access facilities with important landscape settings or may result from increased noise. Such effects are likely to remain through the operational phase of the development. Indirect effects are assessed with particular reference to resources within 5km of the proposal, following guidance contained in Planning Advice Note 45, Renewable Energy Technologies, relating to the general perception of a wind farm in an open landscape, which states that at distances between 5-15 km it will be 'only prominent in clear visibility – seen as part of the wider landscape', and greater than

15 km a wind farm will generally be 'only seen in very clear visibility [as] a minor element in the landscape'.

- 7.6.4 Assessment of visual effects is not covered in this chapter, which can be found in **Chapter 8, Landscape & Visual Assessment**. A number of the viewpoints were selected for assessment as they provide representative views for the recreational receptor, including viewpoints 1-5 (the nearest viewpoints).

7.7 LEGISLATIVE BACKGROUND

Context - Recreational Rights

- 7.7.1 The Land Reform (Scotland) Act 2003 establishes a statutory right of responsible access to land and inland waters, with a few restrictions, such as:

- Travel by motorised vehicles;
- The acts of un-permitted hunting, shooting, fishing;
- Access to land around houses to allow for a reasonable measure of privacy;
- Access to land containing works, machinery or plant.

- 7.7.2 A Scottish Outdoor Access Code has been produced to disseminate the implications of the Act to all involved parties. Local authorities have a number of statutory responsibilities under the Land Reform Act relating to access, including an obligation to draw up a plan for a system of paths (Core Path Plan) within 3 years. The Act came into effect on 9 February 2005.

Public Rights of Way

- 7.7.3 A public right of way is a road or path (a route) which can be used by any member of the public as a matter of right. Local Authorities have a duty to assert and keep open any public right of way within its area. The Council also has the power to repair and maintain any public right of way. All public rights of way will continue to exist and are unaffected by the Land Reform Act.

- 7.7.4 The three different types of route are detailed below:

- Vindicated - All routes declared to be rights of way by the courts.

- Asserted - All routes where either the landowner accepts the route as a right of way, or the local authority has indicated that it would be willing to take court action if required.
- Claimed - Routes which are considered to meet the conditions for being rights of way, but which have not been vindicated or asserted.

7.8 BASELINE CONDITIONS

- 7.8.1 The Burnfoot Hill proposal itself is situated in the Clackmannanshire Council Area, the Perth and Kinross Council Area is immediately north of the turbine site. In addition a number of enabling works to allow site access fall in Perth and Kinross Council area.
- 7.8.2 VisitScotland has a statutory responsibility to promote tourist and visitor interests for the different areas of Scotland and supports a network of 14 regional offices. The VisitScotland Area responsible for promoting tourism in Clackmannanshire is Argyll, the Isles, Loch Lomond, Stirling and the Trossachs, whereas VisitScotland Perthshire has responsibility for Perth and Kinross. In addition VisitScotland promotes information for a number of special interests in a national basis, such as walking and cycling.
- 7.8.3 The Clackmannanshire Outdoor Access Strategy states that: “A range of recreational access opportunities already exist within Clackmannanshire including: The Ochils; The Glens at Menstrie, Alva, Tillicoultry and Dollar; Managed recreational resources including parks and green spaces; Formal and informal local routes within and linking settlements; River courses leading to, and including, the Forth; A network of multi-user routes which include the Clackmannanshire Countryside Path Network (CCPN) and the Alloa to Dunfermline Cycle Route (National Cycle Route 75).”
- 7.8.4 The proposed development is situated within the Ochil Hills. The Ochils account for approximately a third of the whole of the land area of Clackmannanshire, and accounts for the total upland area found in the Local Authority area. In comparison the Ochils constitute a far smaller percentage of the land areas of Perth and Kinross Council, Stirling Council and Fife Council Local Authority areas. The majority of the points providing access into the Ochils close to the proposal are found within Clackmannanshire, as illustrated on **Figure 7.1**.
- 7.8.5 The Clackmannanshire Outdoor Access Strategy states in relation to the Ochils: “The area already provides an important recreational resource for both local people and visitors to the area.”

- 7.8.6 SNH states in their scoping response: “The Ochil Hills provide an important access opportunity within close proximity of some of Scotland’s most densely populated areas.”

7.9 LAND-BASED RECREATION

Area Based Recreational Access Resources

- 7.9.1 The nearest National Park is the Loch Lomond and the Trossachs National Park which is approximately 25km west from the wind farm proposal (See **Figure 8.7, Volume 3** and **Figure 8.26, Volume 3**). There would be very distant and limited visibility from the National Park. As is illustrated in **Chapter 8, Landscape & Visual Assessment**. This limited visibility have been classified as having Minor or Negligible impacts on both Landscape Character and Visual Amenity
- 7.9.2 The nearest Regional Park is the Lomond Hills Regional Park in Fife which is approximately 25km east from the wind farm proposal. As is illustrated in **Chapter 8, Landscape & Visual Assessment** this limited visibility has been classified as having Minor or Negligible impacts on both Landscape Character and Visual Amenity.
- 7.9.3 The nearest Country Park is Gartmore Park, approximately 8km south from the wind farm proposal. In addition Townhill Country Park and Lochore Meadows Country Park (also part if the Lomond Hills Regional Park), both in Fife, are approximately 23km and 25km south east. There would be no visibility from any of these locations, as can be seen from the Zone of Theoretical Visibility in **Figure 8.2a, Volume 3**.
- 7.9.4 A number of open-access areas managed by different organisations are located relatively nearby:
- The Woodland Trust owns in excess of 1230 hectares of land in eastern Glendevon, managed in 3 areas - Glen Sherup (605 ha), Glen Quey (383 ha) and Geordie's Wood (245 ha). As part of a New Native Woodland Creation scheme 65-70% of the total land area (850 hectares) has been planted and with the intention of providing complete woodland canopy cover, a process that is expected to take 10-15 years. There are limited areas of potential visibility from the higher ground at Glen Sherup and the top of the ridge at Glen Quey (See **Figure 8.14, Volume 3**). There would be no visibility from Geordie’s Wood. In addition the Woodland Trust owns Ochils Hills Woodland Park comprising of 80 hectares, between Alva and Tillicoultry. There would be no visibility from this location.

- Forestry Commission owns approximately 460 hectares at Glen Sherup, which is largely established conifer plantation up to about 550m contour. There would be potential visibility from the higher ground at Glen Sherup, (See **Figure 8.14, Volume 3**).
- The National Trust of Scotland owns Dollar Glen that contains Castle Campbell which comprises of approximately 20 hectares. There would be no visibility from Dollar Glen, as illustrated in **Figure 8.2a, Volume 3**.

7.9.5 In Scotland a major attraction to the hillwalker is the 284 peaks greater than 3,000ft in height ('Munros'). In addition other peaks of lesser height can also be a focus for attraction, for example, the 'Corbetts' - 221 peaks between 2,500ft and 2,999ft, and 'Grahams' - 234 peaks which are between 2,000ft and 2,499ft (Visit Scotland – Mountains in Scotland). One peak in the Ochils is regarded as a 'Graham', Ben Cleuch at a height 2365ft (721m). Ben Cleuch is approximately 1.5km south from the wind farm proposal (See Chapter 8, Viewpoint 3 – Ben Cleuch, **Figure 8.12, Volume 3**). In addition there are a number of lower hill tops that can serve as a focus for hillwalkers.

Linear Recreational Access Resources

7.9.6 It is estimated that 50,000km of tracks and paths exist in Scotland. About 47% are likely to be farm & forest tracks, with 15,000 km recorded as rights of way. Perth & Kinross has some 626 kilometres of signposted or waymarked paths (PKCT 2003-04 Annual Report).

Rights of Way

7.9.7 The Land Reform Act established a right for non-motorised, responsible access and therefore you can now also ride a bike or horse wherever rights of access apply.

Table 7.1. Rights of Way in Scotland (SNH 2001, Rights Of Way in Scotland).

	Number of rights of way	% of total	Total length (km)	% of total	Average length (km)
Clackmannanshire	51	0.7	78	0.5	1.5
Perth & Kinross	386	5.6	935	6.2	2.4
Scotland Total	6956		15152		1.9

7.9.8 ScotWays provided copies of excerpts from the Catalogue of Rights of Way (CROW) which identified a number of rights of way in the area (see Appendix 7.3, Volume 4). Routes near to the proposal are illustrated on **Figure 7.1, Volume 3**. One route, an asserted Right of Way runs from Tillicoultry to Blackford via Maddy Moss, where the route crosses Local Authority boundary (see Appendix 7.4, Volume 4).

- 7.9.9 ScotWays records this route as CC 3 (in Clackmannanshire) and TP193 (in Perth and Kinross), and the Perth and Kinross Access Office record it as 29/1. The route passes approximately 580m from the nearest turbine location (grid reference NN 897044). In addition the route crosses Broich Burn at the bridge (grid reference NN 914036) and the existing entrance track to Backhills Farm for a distance of approximately 100m.
- 7.9.10 There would be theoretical visibility from this route, (See **Figure 8.10, Volume 3** which illustrates a view from Glen Bee and summarised in **Table 7.2** below). There is a route variation that is known for travelling around the Upper Glendevon Reservoir where walkers pass round the northern edge of the reservoir instead of the southern edge below Backhills Farm, crossing the dam on the grassed embankment supporting the dam wall. This route variation is a deviation from the route of the right of way.
- 7.9.11 No other rights of way within 5km were identified with theoretical visibility, therefore in the local authority context a negligible length of Right of Way in Clackmannanshire could provide visibility (approximately 100m) and 7.5km out of 935km (less than 1%) in Perth and Kinross.

Other Walking Routes Identified

- 7.9.12 A map and guide to walks entitled “The Ochil Hills & Clackmannanshire” published in association with Argyll, the Isles, Loch Lomond, Stirling and the Trossachs Tourist Board contains 8 easy to follow walks, 4 of which are in the Ochils and Hill Foothills including Mill Glen Trail (by Tillicoultry), Alva Glen, Dollar Glen, and Dollar to Glendevon. There would be no visibility from any of these walks.
- 7.9.13 A leaflet entitled “Clackmannanshire Biodiversity Trails” shows twelve walks within Clackmannanshire of varying length and difficulty, introducing six new walks that are not covered in the earlier publication. Of these only one, a return loop to Ben Cleuch from Tillicoultry would have any potential visibility (See **Figure 8.12, Volume 3** which illustrates a view from Ben Cleuch and summarised in **Table 7.2** below). The routes into the Ochils from the south are characterised by steep gradients, and although walks can be completed in half a day they still represent a considerable undertaking, and as such only those in a suitable physical condition and with the relevant equipment are likely to undertake them.
- 7.9.14 Ordnance Survey Explorer Map 366 indicates a number of paths and locations where Walks/trails start in the Ochils and Hillfoots, all of which have previously been included from other sources, with the exception of a path that leads out of Dollar and climbs to the summit of Kings Seat Hill. There would be potential visibility from the summit of Kings Seat Hill (summarised in **Table 7.2** below).

7.9.15 The complex of Woodland Trust sites in eastern Glen Devon has few formal access routes other than the Dollar to Glen Devon former drove road through Glen Quey, which is the only partially surfaced and signposted route, which is over 6km from the nearest turbine and would have no visibility. A network of "desire lines" (grass paths) is reportedly used by hillwalkers and fit walkers (Woodland Trust (2006)). These routes are unmarked and not signposted and connect hills and valleys with local settlements and roads. Specifically a 'back-bone' route that has been noted by Woodland Trust, from Glen Sherup up to Innerdownie Hill, Whitewisp Hill, and Tarmangie Hill with a possible return by Cairnmorris Hill and Ben Shee would provide potential visibility (summarised in **Table 7.2** below).

7.9.16 The VisitScotland Walking Scotland database which hosts 844 walks was searched and did not list any routes that have not already been mentioned above. Additionally VisitScotland Perthshire lists 12 walking routes, none of which are located in the Ochils. The official community portal of Perthshire and Kinross-shire and Perth & Kinross Council makes reference 9 separate walk networks, to which leaflets are available, and to a further 5 areas where there are popular walks which are signed, all of which are maintained by the Countryside Rangers. None of these areas and walks are located in the Ochils, however one area "Rumbling Bridge Gorge and Crook of Devon", is approximately 2km south of the edge of Ochils, and approximately 11km east of the proposal. In the western Ochils additional routes up to the Dumyat memorial from Blairlogie, and a route up to Sheriff Muir from Dunblane were identified. All these routes would have no visibility.

Cycling Routes

National Cycle Network Routes

7.9.17 NCN Regional Route 75 Alloa to Dunfermline run west to east about 10km south of the proposed wind farm. There would be no visibility from this route.

7.9.18 VisitScotland Perthshire listed 22 road and 5 off-road Cycle Routes, none of which are located in the Ochils. In addition it produces a series of 8 Cycling leaflets available and a map/guide each showing multiple routes. One of which is 'Cycling & Mountain Biking around Auchterarder and the Ochils' lists 5 routes, 2 of which 'In the Heart of Strathearn' and 'Through the Rolling Countryside to Crieff' theoretically provide very distant views of the development. One route 'Scenic Glen Devon and Dollar' is summarised in **Table 7.2** below (See **Figure 8.13, Volume 3**, which illustrates a view from the A823 Glendevon).

Principal Points of Access

7.9.19 A number of locations provide 'entrance' points to the Ochils, as illustrated on **Figure 7.1**. In Clackmannanshire, Alva Glen, Mill Glen at Tillicoultry and Dollar Glen provide access points to the Ochils, as do the public lay-by on the A823 beside Castlehill Reservoir and the new joint Forestry Commission/Woodland Trust Scotland car park at the entrance to Glen Sherup from Glen Devon in Perth and Kinross. Blackford provides an access point from the north. Menstrie (Clackmannanshire) and Blairlogie (Stirling) provide access from the west up to Dumyat, and from Dunblane there is access up to Sheriffmuir, although there are no identified or obvious routes from these locations further east. There would be no visibility from these points.

Inland Water-based recreation

Fishing

7.9.20 VisitScotland websites providing information of fishing in the Auchterarder Area of Tayside (Perthshire, Angus & Dundee) and Stirling, Falkirk Clackmannanshire and the Campsies, listing 13 and 17 locations to fish respectively. In total 3 are located within the Ochils, of which only one has theoretical visibility Frandy Fishery (See **Figure 8.11, Volume 3**, which illustrates a view from the Lower Glendevon Reservoir and summarised in **Table 7.2** below).

Table 7.2. Summary of Visibility on Recreational Access Resources Identified within Zone of Theoretical Visibility, within 5km

Resource Name	Type of Resource	Total Length / Area of Resource	Length / Distance within ZTV	Distance Range to Proposal within ZTV	Summary of Visibility
Tillicoultry to Blackford Route	Asserted Public Right of Way	14.5km (10.3km in P&K - 4.2km in Clacks)	7.5km (all in P&K except approx 100m)	1-3.5km	Views of up to all turbines may be seen for a length of 7.5km when travelling on this route from distances of up to 3km away from the proposal. Visibility may be available for a distance of 5km when travelling in a northern direction and 3km in a southern direction.
Ben Cleuch	Summit with return footpath (and footpath loop)	3.7km (10km)	100m	1.5km	Visibility of all turbines available from the summit of Ben Cleuch, and only the final hundred metres or so of approach when looking north towards the proposal.
Lower Glendevon Reservoir (Frandy Fishery)	Commercial Fishing (Open to the paying Public)	0.4km ²	0.2km ²	2-3.7km	Visibility of at least some turbines may be available for approximately half of the surface of the reservoir, roughly equating to the western end of the reservoir, and would increase the further west travelled. No views are available from the fishery office and compound, or for over 500m east or west along the southern bank.
Kings Seat Hill	Summit with return footpath	3.3km	200m	3.7km	Visibility of all turbines may be available only from the very top of the summit of Kings Seat Hill when looking north west towards the proposal.

Table 7.2 . (Contd.)

Resource Name	Type of Resource	Total Length / Area of Resource	Length / Distance within ZTV	Distance Range to Proposal within ZTV	Summary of Visibility
Glen Sherup Ridge Route	Footpath with Summits	11.5km	5.2km	3.7-6.4km	Visibility of up to all turbines may be available from the summit ridge, on approach, at distances from 3.5km to 6.5km from the proposal. Travelling north may provide visibility for up to 4km on the length of travel while travelling south will provide a view for only a few hundred metres. Much of the area from which the visibility of turbines may be available has been planted with woodland. Once closed canopy is achieved it is predicted that, for receptors travelling in southerly direction, visibility will be reduced for 3.7km of the route.
Scenic Glen Devon and Dollar Cycle Route	Public Road Used by Cyclists	24km	1.9km & 3 km (total 4.9km)	5-7km; 7.3-10km	A limited view of up to 6 turbines can be seen when travelling for up to 1.9km in an easterly direction along the A823 on Glendevon, at a distance of 5-7km away from the proposal. Additional partial views may be available then 7.3-10km away, when travelling south but these will be almost entirely obstructed by roadside vegetation and buildings

7.10 LEVELS & TRENDS OF USAGE OF RECREATIONAL ACCESS RESOURCES

National Context

7.10.1 The latest Scottish Recreation Survey predicted that around 189 million person visits took place to the outdoors in Scotland during the year July 2003–June 2004, equating to on average each member of the adult population of Scotland (4.2 million) undertaking 45 outdoor visits a year. Of the total number of trips estimated 104 million (54%) were to the countryside as opposed to town and cities or to the seaside. Walking was by far the most popular activity with 71% of participants taking part in walking, although 31% undertook walks of less than 2 miles, 38% undertook walks of 2-8 miles and only 5% undertook walks greater than 8 miles. There is a distinct category of “hillwalking/mountaineering” in addition to the “walkers” and the results showed that only 5% partook in this activity, equating to 9.5 million person visits year at the national level, or 2.3 trips per member of the population per year. Others activities were Cycling/ Mountain biking accounting for 8%, and Fishing for 5%. When location types were looked at it was reported that for 8% of visits the main destination was “Mountain, hill or moorland”, equating to 15 million person visits to this destination type per year at the national level, or 3.6 trips per member of the population per year. It is also estimated that 1.9 million person day visits outdoors take place in Clackmannanshire per annum for all destination types (representing 1% of national total) while Perth and Kinross accounts for 7.5million (5%).

7.10.2 The SNH Information and Advisory Note “Hill-walking in Scotland” (1997) referred to survey work that reported that of those who had gone for a walk in a mountain or moorland setting in the past twelve months, an average of 24 trips were made annually by each person. The most popular areas for these walkers were reported as Perthshire or Stirlingshire hills (20%), Grampians/Cairngorms (17%) Lochaber/Argyll (13%), Pentlands (11%) and the North West Highland (8%). It also referred to work that found that Ben Lomond was the most frequently climbed mountain, out of a selection of the 10 of the most iconic and popular mountains. The Loch Lomond & the Trossachs National Park 2005 Report states that Ben Lomond attracts over 50,000 walkers a year. These findings suggest that a highly active, yet small, proportion of the population undertake multiple trips to upland environments, and most frequently to destinations further north than the Ochils.

Levels of Recreational Access Usage near the Proposal

7.10.3 Anecdotal evidence provided by the residents at Backhills Farm suggests that the Tillicoultry – Blackford route is not heavily utilised, with many periods of consecutive days when no users being observed. It was estimated that

approximately 500 -1000 people visits a year on this route, with half using the variation route passing around the reservoir along the north shore and crossing next to the dam.

7.10.4 A Visitor Survey undertaken at the entrance of Mill Glen, Tillicoultry by Clackmannanshire Council Countryside Team, on Saturday 17 August 2003, between the times of 9am - 5pm. This date was selected to provide a snapshot of peak numbers of users visiting the Glen, as the survey took place at the height of summer, on a weekend, during school summer holidays. 116 people were recorded, comprising of 103 walkers, 13 dog walkers, 1 jogger and 1 cyclist. A high percentage of those were expected to climb the summit.

7.10.5 Stirling Council's Countryside Service have been maintaining a network of 40 people counters since 1996, placed on recreational routes to monitor numbers of users. The data collected provides the most comprehensive of its kind in Scotland. During consultations it was suggested that a the data set collected at Ben A'an in Trossachs would be the most suitable proxy in terms of representing trends associated with relatively short upland hill-walks. Data was supplied for most recent 22 months (January 2004 – October 2005 inclusive; Sample size = 37,769 extrapolated counts total, 100% counter availability. See **Appendix 7.5, Volume 4**). This was analysed for trends for periodicity of usage, finding:

- 52% of weekly usage occurred on weekends* of which 23.5% on a Saturday (96 week mean).
- 38% of annual usage occurred in the Summer (July, August, September) of which 14.3% August (12 month mean, 2004).
- 96.5% (22 month mean) or 94.6% (August 2004, 2005 mean) of the hourly usage occurred between the hours of 9h – 17h.

* This figure is consistent with SNH-commissioned research that found in a study that 54% of walks took place at weekends (SNH 2001, Natural Heritage Zones: Recreation and Access).

7.10.6 Although it is not statistically valid, using these usage figures it could be assumed that if 80 – 100% of the 103 people climbed Ben Cleuch on the Saturday in August, this may equate to approximately 11,000-14,000 people visits by this route annually. There is no degree of confidence associated with this estimate and, with many different assumptions used in these calculations of this figure, but it does have some use as a broadly representative figure.

7.10.7 Survey work was also conducted on behalf of the Woodland Trust to establish level of usage in, and near, their land holdings in eastern Glen Devon. It was discovered that the Glenquey drove route attracts approximately 9000 visitors per year, with at least 50% of all users of the

drove route starting and ending their walk at Dollar. Interviews were conducted and it was found that:

“30% of these people take in at least part of the Innerdownie-Whitewisp-Tamangie hill ridge. An unknown and smaller, but still significant number of enthusiastic hill walkers, use this hill ridge heading to or from the higher central Ochil tops to the west.”

“Many visitors to the area come as part of a walking, rambling or other outdoor group, the area being readily accessible to population centres to the south, and providing an outdoor experience less challenging than the more distant Grampians and Highlands.”

7.10.8 It also found that the majority of visitors come from towns south of the Ochils, and not from Perthshire and areas to the north.

7.10.9 A new low-level riverside path between Crook of Devon and Rumbling Bridge attracted about 8000 visits in the year May '03- April '04, showing much heavier usage in the summer months, with August and September alone receiving 37% of the annual visits (P&K Council Countryside Ranger Service, Annual Report 2003-04).

7.10.10 The 2004 Clackmannanshire Visitor Survey estimated (based on accommodation nights) that a total of 11,950 annual trips in the Clackmannanshire area were made, of which 5,100 were leisure related (as opposed to business or wedding). Overnight trips to Clackmannanshire account for £2.3 million, or 0.6% of total for the Argyll, The Isles, Loch Lomond, Stirling and the Trossachs area (£461million). VisitScotland records that the total spend for the whole of Scotland is £4,484 million in 2003, and therefore spending in Clackmannanshire accounts for a very small percentage of the national total. Results from surveys undertaken at visitor attractions and Tourist Information Centres revealed that 88% of visitors to Clackmannanshire were on day trips from home (outwith the area).

7.10.11 The Frandy Fishery is open March to October each year. During the 2004 season the proprietors estimate that roughly 5000 customers used the Lower Glendevon reservoir. Of these customers approximately 2,500 users used boats to fish, as opposed to bank-side fishing. As there is only theoretical visibility for approximately half of the surface of the reservoir, and none from fishery office and compound, or for over 500m east or west along the southern bank, it is likely that numbers of bank fishers being in positions of visibility will be low in the context of total users of the fishery. In addition a significant proportion of the boat fishers will not be in a position of theoretical visibility, as the eastern half of the reservoir, closest to the launch area, is outwith the visual envelope.

7.10.12 For all the usage figures above there will be a degree of duplication, where repeat users are using the same resources multiple times. No data exists to quantify what percentage of 'day visits' will equate to visits by different individuals, other than the national trends identified by SNH and the Scottish Recreational Survey, yet in the light of this it is likely that a considerable numbers of trips will be undertaken by repeat visitors. When reviewed in the wider context, the numbers of recreational users that will view the proposal within 5km is relatively modest.

7.10.13 **Table 7.3.** below summarises the relative importance (and therefore sensitivity) of the recreational access resources identified including consideration of level of designation and usage.

Table 7.3 Summary of Sensitivity/Importance of Recreational Access Resources Identified

Feature Name	Type Of Resource	Estimated Annual Numbers Of Visits	Sensitivity Of Receptor
Tillicoultry to Blackford Route	Asserted Public Right of Way	500-1,000	Local
Ben Cleuch	Summit with return footpath and footpath loop	11,000 -14,000 (rough approximation)	Regional
Lower Glendevon Reservoir (Frandy Fishery)	Commercial Fishing (Open to the paying Public)	2,000	Local
Kings Seat Hill	Lesser Summit with return footpath	none available	Lesser
Glen Sherup ridge route	Footpath in Open Access Area	3,000	Local
Scenic Glen Devon and Dollar	Public Road promoted for use by road cyclists	none available	Local

7.11 RECENT RECREATIONAL ACCESS DEVELOPMENTS

Alva Glen Restoration

7.11.1 The Alva Glen Heritage Trust was set up in 2004 with a view to regenerating and restoring Alva Glen and acquired charitable status 2005. The Trust is run by volunteers and holds regular clean up days and similar activities. A management plan for McArthur Braes (the area at the bottom of the glen) was published in September 2005 and details a programme of nature conservation and amenity enhancements for over the period of 2005 to 2010.

Glen Sherup Car Park

- 7.11.2 A new car park and landscaped picnic area constructed in Glen Sherup in 2005 by Forestry Commission and The Woodland Trust, approximately 7km east of the proposal. Interpretation boards are due to be installed imminently. The Perth and Kinross Countryside Trust made a contribution to this work.

7.12 FUTURE POTENTIAL ACCESS DEVELOPMENTS

Glen Sherup

- 7.12.1 The Woodland Trust has developed an internal report “the Glen Devon Visitor Management, Access and Audience Development Plan” to guide their provision of public access. Actions to remove barriers to access by way of promotion of the site, waymarking, interpretation and information, and access upgrades are proposed to commence in 2006, to be completed by 2010. The initial phase aims to focus on creating connections to an existing framework of largely longer access "through" routes that go beyond the site boundary. Some of the actions are dependant on the cooperation of neighbours in undertaking work on access routes outwith the property boundary. Reassessment in the future may lead to second phase of further works, subject to demand being demonstrated.

7.13 ASSESSMENT OF POTENTIAL EFFECTS

Direct Effects on Access Facilities

- 7.13.1 The only direct effects identified on existing resources were in relation to the Tillicoultry – Blackford Right of Way route. The modifications of the crossing at Broich Burn will result in a temporary, closure of the current bridge, due to Health and Safety restrictions. Prior to mitigation this will be a short-term, temporary, reversible, medium adverse effect.
- 7.13.2 The construction of 5km of onsite tracks will provide an additional resource that can be utilised by recreational users. Tracks not needed for future agricultural purposes will be soiled over at decommissioning of the wind farm, providing a long-term, temporary and reversible effect, or a permanent beneficial effect which could continue to be used indefinitely.

Indirect Effects on Recreational Users

- 7.13.3 Potential indirect effects of the wind farm proposal on recreational users were identified for resources detailed in **Table 7.2** and **7.3** above. The magnitude of effect was assessed considering longevity, reversibility and nature of the proposal (see Methodology in **Appendix A.7.1, Volume 4** for more detail).

The application is for 25 years, and following this time decommissioning and reinstatement work will be under taken (see **Chapter 6, Volume 2** for more detail) and as such effects are predicted as long-term and reversible. The nature of the effects will be determined by the perception of the individual who is observing the proposal, and as such has been considered in the light of research into public attitudes towards wind energy in general. More than 50 public opinion surveys have been carried out since the UK's first commercial wind farm opened in 1991 to determine public opinion of wind farms. The Sustainable Development Commission, UK Government's independent watchdog on sustainable development, summarised the position in its report 'Wind Power in the UK':

"Consistently, a majority of survey respondents - often 70-90% - say they support wind power both in principle and in practice, locally and nationally. Many fears about wind developments tend to subside after the rotor blades start turning, as people's views are shaped by their actual experiences rather than any pre-conceptions they may have had."

7.13.4 Research does show that some members of the public do perceive wind energy developments negatively, and that a development will have both attractor and detractor effects when considered by different members of the general public. These findings are considered when establishing the nature of indirect effects on the recreational user as part of the Environmental Impact Assessment process. Using the precautionary principle, the nature of effect has been classified as 'adverse – low' when considering recreational receptors within 5km (see **Appendix A.7.2, Volume 4** for more detail).

Table 7.4 Summary of Magnitude of Indirect Effects Recreational Access Resources Identified

Feature Name	Longevity	Reversibility	Nature	Magnitude of Effect
Tillicoultry to Blackford Route	Long-term	Reversible	Adverse (Low)	High
Ben Cleuch	Long-term	Reversible	Adverse (Low)	High
Lower Glendevon Reservoir (Frandy Fishery)	Long-term	Reversible	Adverse (Low)	Low
Kings Seat Hill	Long-term	Reversible	Adverse (Low)	Low
Glen Sherup ridge route	Long-term	Reversible	Adverse (Low)	Low

Scenic Glen Devon and Dollar	Long-term	Reversible	Adverse (Low)	Imperceptible
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7.14 MITIGATION

7.14.1 The following mitigation measures are proposed to avoid, reduce or offset the adverse effects where appropriate.

Mitigation of Direct effects

7.14.2 Consultation with Perth and Kinross Countryside Access Officer offered the following recommendations relating to temporary short-term closure of the bridge (as shown in **Appendix 7.6, Volume 4**):

“If the bridge is to be closed to pedestrians for any length of time (over one week) a suitable alternative route should be created and signposted. Should it be necessary to close the Right of Way this should be for the minimum length of time and information concerning any closures should be posted at both ends of the Right of Way and in the local press. Should the right of way be diverted permanently a suitable and equivalent path and bridge should be created, and adequate signage put in place. It may not be necessary to use a formal Diversion Order, if the original course of the Right of Way remains available, albeit on the ‘road’ to the windfarm.”

7.14.3 This advice is entirely consistent with guidance provided in the SNH EIA Handbook: “Realignment of access - This can be a simple and very acceptable measure, provided that major diversion of use is not proposed.”

7.14.4 The following measures will be put in place. Signage will be placed at the following locations:

- Entrance to Mill Glen, Tillicoultry;
- Route at crosses fence boundary at Maddy Moss;
- Entrance south of A9 at Blackford.

7.14.5 Ground investigation has shown that the worn route of the path coming down from Craig Bran does not precisely follow the route of the Right of Way as recorded by the plan supplied by Perth and Kinross Council (See **Appendix 7.3**) and Ordnance Survey Explorer Map 366, but actually follows a far less steep shoulder about 100m further south.

7.14.6 A temporary re-routing of a short section of route is proposed, for the period of the modifications to the Broich Burn crossing and access track below Backhills Farm, approximately a few weeks, due to health and safety considerations. A new footbridge will be located approximately 20m south of the current Broich Burn Crossing, with a self closing gate in the current fence,

and adequate waymarking and sign posting to mark the minor diversion around the works. The exact details will be agreed with Perth and Kinross Countryside Team, and other required parties, prior to construction.

Mitigation of Indirect effects

- 7.14.7 SNH guidance states that; “enhanced management provision for the recreational use of the area or site [is] likely to provide beneficial mitigation, especially where recreation management was absent or weakly provided for, ...”.

Improvements to Right of Way TP193 (Maddy Moss to Blackford)

- 7.14.8 Following advice from Perth and Kinross Council specific mitigation relating to the TP193 route will be provided in the form of upgrading the path from the crossing of Broich Burn to the crossing of the River Devon by the provision of waymarking and where necessary the replacement of stiles with self closing gates, and similar apparatus to be finalised with Perth and Kinross Council Countryside Team, prior to construction.

Funding for the general enhancement of recreational access resources in the area

- 7.14.9 To inform the process of Core Path Planning, the Clackmannanshire Access Forum has been formed, and has published a draft strategy in 2005. The strategy identifies 5 Action Areas. The proposal is situated entirely within ‘Action Area A: The Ochils’. The following issues and opportunities were identified:

“...scope which the hills provide for enhanced facilities and access opportunities.”

“...whilst some of the Glens provide important ‘entrances’ to the hills, they are not realising their full potential. In particular, there may be a need for physical improvements in the Menstrie, Alva and Tillicoultry Glens and the routes over the hills, which link to neighbouring council areas.”

“Priorities within this area should therefore focus on the ways in which access points into the Ochils via the Glens can be improved and promoted. Whilst these opportunities extend beyond the boundary of Clackmannanshire itself, there are numerous local issues which could be addressed. Clackmannanshire Council should focus on providing more interpretation materials such as signage and leaflets for users within this area.

The profile of the area as a destination for recreation could be raised further by the development and prioritised management of a longer distance network of routes. ”

- 7.14.10 Perth and Kinross Countryside Access Officer made the following comment:

“We would welcome mitigation work and would expect a development of this sort to make a positive contribution to the development of the core path network.” (See Appendix 7.6, Volume 4).

7.14.11 It has been identified that enhanced recreational access can provide significant benefits to the local area, and therefore in line with existing guidance, additional funding for access enhancement will provide mitigation. Wind Prospect has undertaken to set up to a local trust fund (See **Chapter 14, Section 14.2.3**). Funds established by Wind Prospect have been set up to support eligible charitable projects that have an environmental, community, or social focus. It is likely that the majority of receptors who would observe the development within 5km will be recreational access users, therefore a core objective of the trust fund will be to promote or support initiatives that enhance, maintain, and regenerate recreational access resources, or supporting services that increase enjoyment or safety of recreational users. Trips into the Ochils are considered as hill-walking and therefore by their very nature are likely to be self-restricting for many members of the public. Therefore there will not be any restrictions placed on initiatives outwith the visibility of the proposal. In general, priority will be placed on applications closest to the proposal. At least 25% (but without a limit) of the local trust fund will be reserved for such applications, allowing for a minimum of £6,500 to be used each year for enhancement of recreational access and the like. It would be expected that longer term priorities in the area will be identified at the conclusion of the core path planning process, and once these are established then a more strategic approach can be adopted to promoting recreational access in the area, but it is highly likely that initial priorities will include funding for interpretation and maintenance and repair of routes into the Ochils where appropriate, partially as identified in the draft Clackmannanshire Outdoor Access Strategy. In addition, a number of organisations have been identified that are progressing initiatives that would clearly look to enhance recreational opportunities. The enhancement of recreational access resources is predicted to provide an overall attractor effect in relation to the general public.

7.15 SUMMARY OF EFFECTS

7.15.1 A summary of potential effects due to the development of the Burnfoot Hill Wind Farm can be seen below in **Table 7.5**.

Table 7.5. Summary of Effects on Recreational Access Resources Identified.

Feature Name	Magnitude of Effect	Sensitivity Of Receptor	Assessment of Effect prior to mitigation	Mitigation Measures	Residual Effects	Significance
Direct Effects						
Tillicoultry to Blackford Route	Medium	Local	Moderate	Specific temporary re-routing provision	Negligible	Non-Significant
Indirect Effects						
Tillicoultry to Blackford Route	High	Local	Moderate	Specific upgrades. Wider Opportunities for enhancement	Slight	Non-Significant
Ben Cleuch	High	Regional	Major	Wider Opportunities for enhancement	Moderate	Significant
Lower Glendevon Reservoir (Frandy Fishery)	Low	Local	Negligible	None proposed	Negligible	Non-Significant
Kings Seat Hill	Low	Lesser	Negligible	Wider Opportunities for enhancement	Negligible	Non-Significant
Scenic Glen Devon and Dollar	Imperceptible	Local	Negligible	None proposed	Negligible	Non-Significant
Glen Sherup ridge route	Low	Local	Negligible	Wider Opportunities for enhancement	Negligible	Non-Significant

7.16 CONCLUSIONS

- 7.16.1 Following the construction period, land surrounding each of the turbine towers would be reinstated to allow natural regeneration of vegetation.
- 7.16.2 Approximately 6.2 hectares of land would be lost for the duration of the life of the wind farm. This magnitude of loss of rough grazing land would not significantly affect productivity. The wind farm would not therefore have a significant adverse impact on land use.
- 7.16.3 The development proposals have been assessed against the recreational access baseline as identified. The level of recreational usage of resources within theoretical visibility and within 5km is modest in a national context. No significant direct residual effects have been predicted, although short term, temporary mitigation measures are proposed the Tillicoultry to Blackford right of way at the crossing of Broich Burn. A residual significant adverse effect has been identified from the summit of Ben Cleuch. The enhancement of recreational access resources, through ongoing charitable funding for the life time of the project, is predicted to provide an overall attractor effect for recreational access use by the general public. It is predicted that upgraded resources would lead to a net increase in users to the wider area, with associated beneficial affects.

7.17 REFERENCES

- Access Forum, published by Clackmannanshire Council (2005)
“Clackmannanshire Outdoor Access Strategy Consultative Draft February 2005”.
- Clackmannanshire Biodiversity Partnership, supported by Clackmannanshire Council and Scottish Natural Heritage (2005) “Clackmannanshire Biodiversity Trails”.
- Critchlow-Watton, N. (September 2005) McArthur Braes’ Management Plan 2005-2010. On behalf of: The Alva Glen Heritage Trust. Available at http://www.alvaglen.org.uk/Downloads/pdfs/McArthur_Braes_management_plan_v1.pdf
- Footprint in association with Argyll, the Isles, Loch Lomond, Stirling and the Trossachs Tourist Board (2001) “The Ochil Hills & Clackmannanshire – A map/guide to eight easy to follow walks”
- Loch Lomond & The Trossachs National Park (2005) State of the Park Report 2005. Available at <http://www.lochlomond-trossachs.org/park/default.asp?p=109>
- Market Specialists, The (2005) Falkirk and Clackmannanshire 2004 Visitor Survey. Commissioned by Argyll, The Isles, Loch Lomond, Stirling and the Trossachs Tourist Board.
- Ordnance Survey (2001) Explorer 366 Stirling & Ochil Hills West; 1:25,000 Scale Map.
- Perth & Kinross Council. The official community portal of Perthshire and Kinross-shire and Perth & Kinross Council (www.perthshire.com accessed 23.02.06). Sports and Activities Section.
- Perth & Kinross Council Countryside Ranger Service, Annual Report 2003-04
- Perth and Kinross Countryside Trust 2003-04 Annual Report.
- Scottish Executive (2002) Planning Advice Note 45: Renewable Energy.
- Scottish Executive (2005) Part 1 Land Reform (Scotland) Act 2003: Guidance for Local Authorities and National Park Authorities
- Scottish Natural Heritage (1997) Hill-walking in Scotland. SNH Information and Advisory Note No. 80.
- Scottish Natural Heritage (2001) Rights Of Way in Scotland. (<http://www.snh.org.uk/pdfs/access/sr-sprow.pdf>)
- Scottish Natural Heritage (2001) The Provision of Paths in Scotland (<http://www.snh.org.uk/pdfs/access/sr-sppp.pdf>)
- Scottish National Heritage (2001) “Guidelines on the Environmental Impacts of Windfarms and Small Scale Hydroelectric Schemes”; Section 2.6. The Impact of Windfarms on Land Use, Access and Recreation.

Scottish Natural Heritage (December 2001) Natural Heritage Zones: Recreation and Access (http://www.snh.org.uk/futures/Data/pdfdocs/RECREATION_Access.pdf)

Scottish National Heritage (2002) "A Handbook on Environmental Impact Assessment"; Appendix 5: Countryside Access Impact Assessment.

Sustainable Development Commission (2005) 'Wind Power - Your Questions Answered' (<http://www.sd-commission.org.uk/publications/downloads/Wind%20Power%20-%20your%20questions%20answered%20FINAL.pdf>)

TNS (2005). Scottish Recreation Survey: annual summary report 2003/04. Scottish Natural Heritage Commissioned Report No. 105 (ROAME No. F02AA614/2). Carried out by TNS Travel and Tourism on behalf of SNH and the Forestry Commission Scotland.

VisitScotland - Angling in Tayside website (www.anglingintayside.co.uk accessed 23.02.06) Angling in Tayside.

VisitScotland - Argyll, the Isles, Loch Lomond, Stirling and the Trossachs Area Website; Stirling, Falkirk, Clackmannanshire and the Campsie Section (<http://www.visitscotishheartlands.com/areas/stirling/index.cfm> accessed 23.02.06)

VisitScotland - Mountains in Scotland. (<http://www.visitscotland.com/aboutscotland/Geography/Mountains> accessed on 06.03.06)

VisitScotland - Perthshire Area Website (www.perthshire.co.uk accessed 23.02.06) "Active Perthshire".

VisitScotland (2004) "Tourism in Argyll, The Isles, Loch Lomond, Stirling and the Trossachs (AILLST) 2003" (available from www.scotexchange.net)

VisitScotland (2004) "Tourism in Perthshire 2003" (available from www.scotexchange.net)

VisitScotland Perthshire (2005) "Cycling & Mountain Biking around Auchterarder and the Ochils"

VisitScotland Walkingwild.com. The Official walking site of VisitScotland.

Woodland Trust Scotland (2006) "Glen Sherup Management Plan 5507; Plan period: 2006 to 2011; 22 February 2006" Available at <http://www.wt-woods.org.uk/pdf/mgmtplan-5507.pdf>

8 LANDSCAPE & VISUAL ASSESSMENT

8.1 INTRODUCTION

8.1.1 This assessment examines the potential effects of the proposed Burnfoot Hill wind farm on the landscape and visual amenity of the surrounding area. The assessment is based on a study area with a 30km radius, centred on the application site, and concentrates on the key landscape and visual issues identified during the scoping stage of the assessment. These issues include potential landscape and visual effects on:

- Residential areas;
- Main roads and tourist routes; and
- Popular walking routes and recreational areas.

8.1.2 The assessment is described in the following sections:

- Method of assessment – a brief explanation of how the assessment has been carried out, with reference to standard methodologies and guidelines.
- Design and mitigation – a description of the aspects of the proposed wind farm development which have a potential to cause a landscape and/or visual effect, and the measures which have been incorporated into the project design to mitigate these effects.
- Landscape and visual context – a description, classification and evaluation of the existing landscape character of the study area and an assessment of the baseline visual amenity.
- Assessment of the residual effects – an assessment of the magnitude and significance of the residual landscape and visual effects, including consideration of cumulative effects in relation to other existing or proposed wind farms in the area.
- Summary and conclusions – a summary of the assessment results and their magnitude of significance accompanied by a concluding on the effects of the proposed wind farm in landscape and visual terms.

8.1.3 Specific details of the methodologies and criteria used to carry out the assessment are detailed in **Appendix 8.1, Volume 4**. These include the following;

- Evaluation Criteria
- Landscape Sensitivity

- Visual Amenity
- Magnitude of Change
- Cumulative Landscape Effects
- Significance of Effects

8.1.4 The assessment is illustrated by plans, wire-line and photomontages that are included in **Volume 3** of the ES.

8.2 LANDSCAPE AND VISUAL CONTEXT

Regional & Local Context

8.2.1 The proposed Burnfoot Hill Wind Farm site is located within the Ochil Hills approximately 5km North of Tillicoultry, Glendevon, Clackmannanshire. The Ochil Hills rise to a maximum 721m OD at Ben Cleuch just to the South of the proposed development site. The site itself is less elevated at 526 m OD. Land cover within the Ochil Hills is dominated by rough grassland, though there are significant areas covered by coniferous and broadleaf woodland. The Ochil Hills are within easy reach of a number of conurbations, and offer an important recreational resource to the local population and visitors alike. A large part of the Ochil Hills, including the area in which the Burnfoot Hill Wind Farm is located, is covered by an Area of Great Landscape Value (AGLV) designation, as secured through local development plans. A broader description of landuse, landcover, and recreation within the wider region is provided below.

Geology, Landform & Hydrology

8.2.2 The study area has a diverse geology which contributes to the variety of landscape character. The West Highlands and Mounth Highlands fall within the most northern reach of the study area. These highland areas are formed from Limestone and Schist and, within the study area, are traversed by east to west orientated glens.

8.2.3 Immediately to the south east of these highlands, lies the Highland Boundary Fault. Beyond the fault lies a rift valley – the Midland Valley – whose varied landscape dominates the study area. The Midland Valley features both broad straths and contrasting lowland hill ranges (such as the Ochils and Lomonds).

8.2.4 The straths are formed from soft sedimentary rocks created through the deposition of alluvial material sourced from the aforementioned Highlands. This material has been subsequently reworked through glaciation, and the study area features frequent eskers, kames and drumlins.

- 8.2.5 The lowland hills within the study area are formed from igneous rock which has been extruded over the sedimentary rock, and has largely resisted subsequent reworking by glacial activity.
- 8.2.6 The proposed wind farm development lies within one of these igneous hill ranges – the Ochil Hills.
- 8.2.7 The principal rivers draining the study area are the Rivers Tay, Almond, Earn and Forth, which flow generally eastwards or southeastwards.

Landcover, Landuse & Landscape Elements

- 8.2.8 The key landuses in the study area are agriculture (predominantly arable and grazing), forestry, industry and human settlement. Agricultural policy and practice have played an important part in forming the study area's landscapes; for example loss of traditional features through field amalgamation and large-scale drainage in the 1970s. Nevertheless, more sympathetic policies could see agriculture take a more positive role in the management of the landscape resource. There has been significant contemporary afforestation within the study area, which, unfortunately, may have masked much of the subtle variation within the landscape. However, in contrast, older semi-natural woodlands within gorges (between areas of hill grazing), established estate woodlands, and smaller-scale tree plantings within more open areas and along riparian corridors have become harmonious elements.
- 8.2.9 Areas of Fife have been subject to extensive mineral working (coal, limestone and aggregates), and factories and other industrial developments have become common around the Forth estuary in the southern region of the study area. These increases in industrialisation have been matched, in places, by expansion of towns and villages through suburban development. In fact there are now settlements of a variety of scales and histories throughout the study area, such as Perth, which has grown around the lowest crossing point of the River Tay; Alloa, Dunfermline and Grangemouth in the Forth carselands; and Stirling, Dunblane and Tillicoultry within the more landward river valleys. Away from the lowlands, Crieff lies within a relatively hospitable lower Highland Glen area, just to the South East of Glen Turret. The study area also includes prolific evidence of earlier settlement (from Neolithic times onwards) including earthworks, cairns, barrows and stone monuments.
- 8.2.10 The road network is concentrated within the lower lying parts of the study area, connecting the aforementioned principal settlements. The main roads within the study area include the M90, M80, M9, A9, A84, A85 and A907. In addition to these primary routes there are a numerous other minor roads that criss-cross the entire study area serving villages, hamlets and farmsteads.

Much of the rail network, particularly within the rural areas, is now disused, though remaining routes serve Cowdenbeath, and Perth in the East of the area, and Stirling in the West.

Recreation

8.2.11 Recreation and tourism play an important part in the economy of the study area. The quality and diversity of the area's landscape character draws in visitors and forms the setting for both formal and informal pursuits. There are opportunities for these activities to contribute to the preservation or enhancement of landscape character – thus sustaining the relationship between people and landscape – or conversely, contribute to landscape degradation, thus jeopardising its future enjoyment. Recreational pursuits and associated development within the study area are as follows:

- Hill walking;
- Golf courses;
- Caravan sites and holiday chalets;
- Visitor centres;
- Sailing and fishing;
- Touring and
- Visiting castles, monuments and designed or designated landscapes.

8.2.12 Recreation is discussed in greater detail in **Chapter 7 Land Use & Recreational Access**.

8.2.13 **Figure 8.7, Volume 3**, identifies the designed/designated landscapes within the study area. The following section lists the designated landscapes within the study area which (according the ZTV as shown in **Figure 8.8, Volume 3**) may potentially have views of the proposed wind farm.

Landscape Designations

National Parks

- The Loch Lomond and Trossachs National Park.

National Scenic Area (NSA)

- River Earn (Comrie to St Fillans).

Areas of Great Landscape Value (AGLV)

- Ochil Hills;
- Sma' Glen;
- Perth;
- Loch Leven;
- Cleish Hills;
- Avon Valley;
- Gartmorn;
- Fintry Hills; and
- Trossachs

8.2.14 Within the Scottish Executive's Glossary of Natural Heritage Designations (<http://www.scotland.gov.uk/library/documents-w4/nhd-13.htm>) Areas of Great Landscape Value (AGLVs) are classified as follows:

"The requirement to designate AGLVs is set out in Circular 2/1962. They are defined by local authorities in development plans with a view to safeguarding areas of regional or local landscape importance from inappropriate developments."

8.2.15 There is no national overview or standard criteria for adopting an area as an AGLV.

8.2.16 AGLVs are a Local Landscape Designation and do not preclude wind energy development per se. A number of consented and operational wind energy developments in Scotland lie within AGLVs. These include Crystal Rig (East Lothian & Scottish Borders) and Earlsburn (Stirling).

Regional Parks

- Fife Regional Park East.

Historic Gardens and Designed Landscapes (HGDLs)

8.2.17 The Inventory of Historic Gardens and Designed Landscapes (HGDLs) in Scotland compiled by SNH and Historic Scotland, identifies 30 listed properties in the area. From this list 6 properties are identified on the ZTVs as having possible views of the proposed wind farm from within the 30 km study area, as shown in **Figure 8.8**. These are listed in **Table 8.1** below.

Table 8.1 Historic Gardens and Designed Landscapes Potentially Having Views of the Proposed Wind Farm

HGDL	Grid Reference (Easting/Northing)	Approximate Distance to Site (km)
Gleneagles Hotel	291501/711041	8
Drummond Castle	285150/718594	16
Abercairny	291026/721844	19
Ochertyre	284270/723629	21
Methven Castle	305025/726028	27
Dunira	273259/723694	27

8.2.18 Most of these properties have extensive wooded policies and nearly all occur over 15km from Burnfoot Hill. The closest Inventory site to the Burnfoot Hill is Gleneagles and Viewpoints 6 and 7 which are included in the detailed viewpoint analysis which follows, are located in the grounds and on an upper floor terrace at the hotel respectively.

8.2.19 The next closest property is Drummond Castle which has extensive woods around the perimeter of the grounds and within the policies. Additionally the main formal gardens are located to the west of the Castle on land that slopes steeply away from the property in this direction and it is not considered that there would be any views from here of the Burnfoot turbines.

8.2.20 Abercairny is located at approximately 19km from the Burnfoot Hill site and again there are woods around the main property. Viewpoint 11 on the minor road to the east of Crieff is very close to the southern edge of Abercairny and the effects on landscape and visual amenity at this location are discussed in further detail below.

8.3 LANDSCAPE PLANNING & LEGISLATIVE BACKGROUND

8.3.1 This section summarises the landscape planning policy within Structure Plans, Local Plans and Supplementary Planning Advice which is relevant to the proposed development. The policies consistently encourage wind farm development, but only where it can be shown that there will be no significant adverse impact on landscape character and visual receptors.

Clackmannanshire & Stirling Structure Plan (2002)

8.3.2 The Clackmannanshire & Stirling Structure Plan (2002) states the following:

- *“... priority must be given to landscape quality, and any new developments will require to be sensitively sited and designed.”*
- *“... particular care will be taken to conserve features that contribute to local distinctiveness, including the setting of settlements, the pattern of woodland, trees, fields and hedgerows, the special qualities of rivers, burns, valleys and glens and skyline and hill features including prominent views.”*

8.3.3 Policy ENV3 - Development in the Countryside states that *“All development in the Countryside should, both in function, siting and design, be suitable for its particular location, and should respect and preserve features contributing to local character.”*

8.3.4 The Clackmannanshire and Stirling Structure Plan – finalised first alteration goes on to state:

- *“The generally supportive approach [of the Council towards renewable energy developments] will not be at the expense of the environment... The Structure Plan supports and encourages wind energy production but also recognises that it is important to guide developments to locations where adverse environmental and amenity effects can be minimised.”*
- *“Policy ENV 16: Wind Energy: the... Structure Plan Area [apart from Exclusion Areas which does not include the proposed location of the Burnfoot Hill Wind Farm] will be regarded as an ‘area of search’ for [wind farm] development opportunities. [However] proposals will not normally be acceptable where they would result in an adverse effect upon amenity, or features of scenic and/or heritage value, by reason of cumulative impact.”*

Perth & Kinross Structure Plan (2003)

8.3.5 The Perth & Kinross Structure Plan (2003) states that:

- *“... all landscapes in Perth and Kinross are considered to be... of value to their local communities.”*
- *“Environment and Resources Policy 4: The Tayside Landscape Character Assessment will be a material consideration in the assessment of development proposals [and] Environment and Resources Policy 7: the Council will work with the Loch Lomond and Trossachs Park Authority... to implement the objectives of the National Park.”*

Loch Lomond & The Trossachs National Park Plan Consultative Draft (2005)

8.3.6 The Consultative Draft of the Loch Lomond & The Trossachs National Park Plan (2005) goes on to state the following:

- *“Guiding Principal 1: Conserving & Enhancing the Special Qualities. All policies... promoted in the plan must contribute positively to the long-term conservation and enhancement of the... Special Qualities of the park.”*
- *“The long-term aim for the National Park’s landscapes... is to protect and enhance the landscape resource of the park, ensuring that it is not adversely affected by change...”*

Clackmannanshire Local Plan (2004)

8.3.7 The Clackmannanshire Local Plan (2004) states the following:

- *“The local plan’s strategy promotes development opportunities so that the social and economic priorities of Clackmannanshire can be realised within the context of caring for the environment”*

8.3.8 The proposed Burnfoot Hill wind farm is situated within the Ochil Hills Area of Great Landscape Value. Policy EN2 notes that within these areas development will only be permitted:

- *“Where the landscape character and scenic interest would not be adversely affected.”*

Stirling Council Local Plan (1999)

8.3.9 The Stirling Council Local Plan (1999) states that:

- *“Stirling Council... has always shown a strong commitment in its planning policies for land use, development and management to maintaining and enhancing the quality of the environment... inherent in the Council’s Planning and Development Policies is a general concern to ensure that the complete environment where local people live and work and take their leisure should be of the highest quality.”*
- *“In relation to renewable energy developments, the Council strongly supports the principle of exploiting... renewable energy resources... Whilst inherently sustainable, renewable energy developments can have an adverse environmental impact on the landscape, heritage features and neighbours and therefore require to be carefully assessed.”*

Strathearn Area Local Plan (2001)

8.3.10 The Strathearn Local Plan (2001) states the following:

- *“The Plan... builds on the Tayside Landscape Character Assessment... the principles set out in this assessment will be used to assess development that is viewed as having a significant landscape impact... Overall the Plan presents a framework that seeks to ensure that new developments contribute positively to the conservation of... landscapes of Strathearn.”*
- *“The Council will encourage, in appropriate locations, renewable energy projects [provided that] the development will not result in an unacceptable intrusion into the landscape character of the area.”*

Clackmannanshire Council Renewable Energy & Efficiency Final Report (2003)

8.3.11 The Clackmannanshire Council Renewable Energy & Efficiency Final Report (2003) is specific in stating:

- *“Model Policy (Structure Plan). For over-riding environmental reasons proposals for wind energy developments would not be considered except in exceptional circumstances either in or affecting:*
 - *The Ochil Escarpment*
 - *The setting of Stirling*
 - *National Scenic Areas*
 - *Special Protection Areas and Special Areas of Conservation.”*
- *“Model Policy (Local Plan). Proposals for wind energy developments will be encouraged in appropriate locations... provided the development will not have a significant adverse effect on... landscape character.”*
- *“Supplementary Advice Note: Renewable Energy: The main potential for wind energy development lies in the Ochil Hills... [however, they are] especially the south-facing slopes, are... visually sensitive. The key landscape and visual issues which would need to be addressed would be:*
 - *The potential impact on the main south-facing escarpment;*
 - *The potential impact on the setting of Stirling;*
 - *The visual envelope of specific proposals and the extent of visibility in the wider landscape.*
 - *The views of the Ochils from important viewpoints;*
 - *The visual amenity issues in relation to main walking routes.”*

Supplementary Planning Guidance For Wind Energy Proposals In Perth & Kinross (2005)

8.3.12 The Supplementary Planning Guidance for Wind Energy Proposals in Perth & Kinross (2005) states the following:

- *“Guideline 1 – Landscape Impact. Objective: To avoid significant adverse impacts on landscape character in Perth and Kinross.”*
- *“Wind energy proposals will be encouraged except in locations where they will have a substantial or moderate adverse impact on landscape character which cannot be mitigated. [Developments are] unlikely to be acceptable on prominent ridges, hills or sensitive skyline locations in or within 5km of any sensitive locations... unless it is demonstrated that... the impact will be slight or not significant.”*
- *“Guideline 2 – Visual Impact. Objective: To avoid significant visual impacts on houses or settlements, locally prominent or valued landforms and locally prominent buildings or Scheduled Ancient Monuments.”*
- *“In some locations, aspects of local visual effects may be as important as wider landscape considerations, and wind energy developments should not dominate significant surrounding features... Wind energy proposals will be encouraged except in locations where they will have a substantial or moderate adverse visual impact which cannot be mitigated. [Developments] are unlikely to be acceptable within 20 times the height to blade tip of: houses and settlements, locally prominent landforms, Scheduled Ancient Monuments, significant archaeological sites and their settings, Conservation Areas and Listed Buildings... where it has not been demonstrated, to the satisfaction of the Council, that the visual impact will be slight or not significant.”*

8.4 LANDSCAPE CHARACTER AND QUALITY

8.4.1 The assessment of landscape character covers a 30 km radius study area (as measured from the outermost turbines of the proposed wind farm). Landscape Character Assessments (LCAs) for the study area have been undertaken by SNH in partnership with local authorities and other agencies. The LCAs are as follows:

- Central Region (ASH, 1999);
- Clackmannanshire (ASH, 1998);
- Fife (David Tyldesley & Associates, 1999);
- Glasgow and the Clyde Valley (LUC, 1999);
- Kinross Local Plan Area (David Tyldesley & Associates, 1995);
- Loch Lomond and the Trossachs (Environmental Resource Management, 2005); and
- Tayside (Land Use Consultants, 1999)

8.4.2 Field survey work has been carried out to verify the character types described within these LCAs, and assess their appropriateness in relation to providing the landscape baseline of this study.

8.4.3 Within this section, general landscape characteristics are described for all landscape character types within the 30 km study area, which have potential visibility of the proposed development. A more detailed description of landscape characteristics is then provided for the five character areas within a 10 km radius area of the wind farm. These more detailed descriptions allow a fuller assessment of the potential impacts of the proposed development on landscape character within 10 km of the site (this being considered the extent at which significant changes to landscape character are most likely to occur).

Landscape Character Receptors – Regional Overview

8.4.4 All landscape character types lying within the ZTV of the 30 km radius study area are identified as landscape receptors. These receptors are shown in **Figure 8.1, Volume 3**. Potential views of the proposed wind farm tend to be found in: landscape character areas in close proximity to the site; from character areas with relatively flat, open and expansive landscapes; and from localised areas of distant, upland character areas with elevated views. The following landscape character areas all show potential visibility of the proposed wind farm from the ZTVs. It should be noted that the ZTVs do not take into account the screening effects of vegetation, localised landform and built structures.

Landscape Character Areas within SNH Central Region/Clackmannanshire

- CTR1 Lowland Hills;
- CTR2 Lowland Hill Fringes;
- CTR4 Lowland River Valleys

Landscape Character Areas within SNH Fife

- FFE1 The Uplands
- FFE2 The Upland Slopes
- FFE3 Upland Foothills
- FFE4 Pronounced Volcanic Hills and Craggs
- FFE5 Lowland Hills and Valleys
- FFE10 Lowland Loch Basins

Landscape Character Areas within SNH Glasgow and the Clyde Valley

- STC20 Rugged Moorland Hills

Landscape Character Areas within SNH Loch Lomond and the Trossachs

8.4.5 The Landscape Character Assessment for Loch Lomond and the Trossachs is currently undergoing a substantial revision. The names, boundaries and character descriptions of the following landscape character types are therefore correct at the present time, but may be altered significantly following consultation. SNH have confirmed that the revised LCA will be published in summer 2006 at the earliest.

- LLT1 Open Upland Hills
- LLT5 Forested Upland Glen
- LLT6 Wooded Upland Glen
- LLT8 Open Glen Side
- LLT9 Open Parallel Ridges
- LLT10 Forested Parallel Ridges
- LLT16 Open Moorland Hills
- LLT17 Forested Moorland Hills and Pastures
- LLT18 Farmed Moorland Hills

Landscape Character Areas within SNH Tayside

- TAY1 Highland Glens
- TAY3 Highland Summits and Plateaux
- TAY6 Lowland Hills
- TAY7 Lowland River Corridor
- TAY8 Igneous Hills
- TAY9 Dolerite Hills
- TAY10 Broad Valley Lowland
- TAY15 Lowland Basins

Table 8.2 Key Characteristics of Landscape Character Areas (30km Study Area)

LCA	Name	Key Characteristics
CTR1	Lowland Hills	<ul style="list-style-type: none"> • Open, large scale. • In places, dramatic contrast between scarp slopes and adjoining carselands. • Elsewhere, gently rounded, uniform landform.

CTR2	Lowland Hill Fringes	<ul style="list-style-type: none"> • Transitional landscape between open hill ground and settled valleys. • Intimate landscapes with diversity resulting from a mix of farmsteads, vegetation, water-bodies and buildings.
CTR4	Lowland River Valleys	<ul style="list-style-type: none"> • A landscape of varying enclosure and views. In places strong contrast between flat valley floor and enclosing adjacent hills. • Evidence of well-tended settlement, such as clipped hedges, tree avenues, stone boundary walls.
FFE1	The Uplands	<ul style="list-style-type: none"> • Massive, pronounced landform with distinctive skylines. <ul style="list-style-type: none"> • Variety in colours and textures. • Vast, exposed landscape with extensive, panoramic and elevated views.
FFE2	The Upland Slopes	<ul style="list-style-type: none"> • Conspicuous slopes and skylines. • Pronounced steep, vertical landform. • Some afforestation, but generally a lack of man-made features. <ul style="list-style-type: none"> • Extensive, panoramic and elevated views.
FFE3	Upland Foothills	<ul style="list-style-type: none"> • Gentler and less pronounced landform than the Upland Slopes, but steeper and higher than the lowland hills. • Lack of settlement but general abundance of farmsteads. • Medium to large scale landscape, open, simple, balanced landscape.
FFE4	Pronounced Volcanic Hills and Crags	<ul style="list-style-type: none"> • Distinctive shapes, silhouettes and skylines. • A combination of steep sided rugged landform on upper slopes, with smoother more vegetated lower slopes. • Medium to large scale, open, simple landscape.
FFE5	Lowland Hills and Valleys	<ul style="list-style-type: none"> • Diverse and subtle landform. • A long history of settlement, and obvious human influence. • A variety of interrelated middle and long distance views of, from and across the low hills.
FFE10	Lowland Loch Basins	<ul style="list-style-type: none"> • Flat, relatively low-lying landform with strong horizontal lines.

		<ul style="list-style-type: none"> • Open, large scale field patterns. • Dominance and enclosure of the distinctive upland skylines and slopes.
STC20	Rugged Moorland Hills	<ul style="list-style-type: none"> • Distinctive upland character created by elevation, exposure, rugged landform and, generally, lack of modern development. • Apparently natural with a sense of remoteness.
LLT1	Open Upland Hills	<ul style="list-style-type: none"> • Diverse landform of peaks, smooth moorland, gullies and screes. • A landscape of fast flowing burns, heather moorland and small areas of native woodland. <ul style="list-style-type: none"> • An open landscape with sparse settlement.
LLT5	Forested Upland Glen	<ul style="list-style-type: none"> • Dense commercial forestry plantations, with small amounts of native woodland along water courses. • Forest edges are sometime straight, and plantations mask the subtle underlying landform.
LLT6	Wooded Upland Glen	<ul style="list-style-type: none"> • Upland glens with semi-natural woodland typically following burns. Low density trees become more scattered and stunted with increased altitude. • Some regeneration of woodland where fencing and management has been introduced. • Traditional management is being encouraged in places (coppicing and re-planting).
LLT8	Open Glen Side	<ul style="list-style-type: none"> • Steep open glen/strath/loch-sides, often craggy with scree and rock outcrops rising form the glen floor to the hill tops. • Scattered woody vegetation, burns and waterfalls. <ul style="list-style-type: none"> • Sparse settlement and infrastructure.
LLT9	Open Parallel Ridges	<ul style="list-style-type: none"> • Diverse landform of smooth moorland, rocky outcrops, gullies and screes, strongly orientated in a North East to South West direction. <ul style="list-style-type: none"> • Scattered trees on lower slopes. • Open landscape with sparse settlement and infrastructure.
LLT10	Forested Parallel Ridges	<ul style="list-style-type: none"> • Some semi-natural native woodland, but dominated by dense, commercial plantations. • Forest edges sometimes straight, and woodland masks the subtle underlying landform.
LLT16	Open Moorland	<ul style="list-style-type: none"> • Open moorland with generally smooth landform

	Hills	<p>punctuated by rocky outcrops.</p> <ul style="list-style-type: none"> Scattered native trees and a branched burn system. Open landscape with little enclosure, settlement or infrastructure.
LLT17	Forested Moorland Hills and Pastures	<ul style="list-style-type: none"> A mosaic of commercial forest, deciduous woodland and rough moorland. <ul style="list-style-type: none"> Branched burn system and lochs. Designed estate landscapes and infrastructure on lower slopes.
LLT18	Farmed Moorland Hills	<ul style="list-style-type: none"> Dominated by rolling grazed moorland and pastures. Boundary patterns of degraded hedges, tree lines, and drystone dykes. <ul style="list-style-type: none"> Scattered farms and cottages. Commercial forest plantations of various scales, and some small deciduous woodland.
TAY1	Highland Glens	<ul style="list-style-type: none"> Upper reaches are narrow and dominated by the enclosing mountains; mid-reaches are slightly broader with distinct valley floor; lower reaches are relatively large-scale landscapes. Upper reaches are sparsely populated, with remote, upland character; mid-reaches are moderately settled with forestry, forts and castles, and concentration of agriculture in valley floor; lower reaches are well settled and feature broad, farmed flood-plain
TAY3	Highland Summits and Plateaux	<ul style="list-style-type: none"> Separate the principal glens. Have distinct summits and ranges which are often craggy. <ul style="list-style-type: none"> Vegetation patterns closely reflect altitude and exposure. Most of the area managed as moorland with little human settlement.
TAY6	Lowland Hills	<ul style="list-style-type: none"> Low ridges and hills separating lowland straths. Transitional character, with pasture on lower slopes, giving way to rough grazing and even, open moorland. <ul style="list-style-type: none"> Extensive forestry plantations evident.
TAY7	Lowland River Corridor	<ul style="list-style-type: none"> Well-defined, meandering river corridors in broader lowland landscapes. <ul style="list-style-type: none"> Semi-natural woodland on steeper slopes.
TAY8	Igneous Hills	<ul style="list-style-type: none"> Distinct scarp and dipslope.

		<ul style="list-style-type: none"> • Some modern influences and extensive forestry. • Generally open landscape dominated by grass moorland.
TAY9	Dolerite Hills	<ul style="list-style-type: none"> • Steep slopes with views to the North and South. • Some coniferous forestry but predominance of rough grazing.
TAY10	Broad Valley Lowlands	<ul style="list-style-type: none"> • Broad straths. • Complex local topography caused by glacial deposition. • Large estates.
TAY15	Lowland Basins	<ul style="list-style-type: none"> • Broad basins and extensive mudflats. • Dominance of water, sky and distant shores.

Local Landscape Receptors

8.4.6 The following five landscape character areas occur within 10 km of the proposed wind farm:

Landscape Character Areas within SNH Central Region/Clackmannanshire

- CTR1 Lowland Hills;
- CTR4 Lowland River Valleys

Landscape Character Areas within SNH Tayside

- TAY6 Lowland Hills
- TAY8 Igneous Hills
- TAY10 Broad Valley Lowland

8.4.7 Each of these five LCAs are described in detail below:

Landscape Character Type CTR1: Lowland Hills

8.4.8 This is the landscape character type in which the proposed wind farm will be located – specifically within the Ochil Hills.

Topography

8.4.9 The lowland hills rise to over 700m OD (as noted above, the specific location in which the wind farm is proposed is slightly lower). Generally these hills have rounded tops, though they are also associated with spectacular scarps, which contrast strongly with the adjacent, flat carseland.

Landcover, land use and landscape elements

8.4.10 The hill tops are generally blanketed with peat and heather moorland, though these grade into rough grassland on the lower slopes. The generally uniform and distinctive topography has been masked in places by coniferous plantations. The rounded hill tops are frequently incised by minor watercourses, and are occasionally broken by rocky outcrops and edges. The hills, particularly towards the tops, are mainly uninhabited, and as a result, they have a sense of remoteness and grandeur.

Designated landscape

8.4.11 The proposed wind farm site lies within the Ochil Hills Area of Great Landscape Value (AGLV) which covers much of the LCA.

Scale of landscape

- 8.4.12 This is a large-scale landscape relatively free of perceivable point focus, boundaries and delineation, save for occasional dry stone walls.

Nature of views

- 8.4.13 Views from upper slopes take in rolling hill-tops; panoramic vistas downward, and along carselands (from within the adjacent carselands, the hills form spectacular backdrops); and extensive panoramas across valleys to more remote hills and mountains. However, views within the lower slopes are tightly enclosed by the topography.

Landscape quality and sensitivity to change

- 8.4.14 As noted above, much of the LCA is designated as an AGLV. This landscape has, variously, an open nature with long range views from the hill tops and slopes, and enclosed views from the lower slopes. The landscape has a generally uniform, rolling, distinctive character, and in places there is a spectacular contrast between scarps and carseland. This landscape can therefore be described as being of a high quality. As a result of its remoteness, large scale and often extensive views, this landscape is considered to be of medium sensitivity to the type of change associated with wind farm development within the area. In some locations, such as valleys and scarps where the hills enclose views and the scale of the landscape is reduced, it is considered to be of high sensitivity to change.

Landscape Character Type CTR4: Lowland River Valleys

Topography

- 8.4.15 This landscape features varied topography. The river channels themselves vary from gently meandering courses to a more tortuous pattern. Similarly, the valleys in which the rivers are contained are narrow and enclosed in some areas, but broad and open in others. The part of this LCA within 10km, and with potential views, of the proposed wind farm is broad and open. There is topographic variation at a finer level of detail, where the generally flat floodplain is marked with ridges and knolls of moraine.

Landcover, land use and landscape elements

- 8.4.16 The fertile valley floor and lower valley sides support agricultural fields, and farmsteads, as well as numerous estates, settlements and infrastructure. Although some of the valleys covered by this LCA have extensive tree cover, the area within 10km of the proposed wind farm, and with potential views to the wind farm, has more modest cover (associated with policy woodland of estates and coniferous plantations on the upper valley sides).

Scale of landscape

8.4.17 As noted above, the topography within this LCA varies widely. Where broad valleys are encountered, the landscape is open, and the scale therefore tends to be medium to large – and this includes the specific area described here. The scale of the landscape is emphasised through medium to large arable fields, and the busy, uninterrupted, and widely visible flows of traffic along the major infrastructure corridors.

Nature of views

8.4.18 Views within this area are enclosed by landform and channelled along the valley. However, the broadness of the valley means that these cover medium rather than short distances.

Landscape quality and sensitivity to change

8.4.19 The part of this LCA within 10km, and with a potential view of, the proposed wind farm does not contain any landscape designations. Nevertheless, there is a great deal of small-scale interest and visual focus. Although there is much of high quality in this area – particularly the striking views to the adjacent hills across the sweeping valley, negative attributes associated particularly with infrastructure lower the overall quality to medium. Taking these factors into account, this landscape can be described as being of medium sensitivity to the type of change associated with wind farm development outwith its borders.

Landscape Character Type TAY6: Lowland Hills

Topography

8.4.20 These, predominantly sandstone, lowland hills form the transition between the Highlands to the north west and the lowlands to the south east. They vary in height between 150 and 600m AOD. The hills are generally well rounded and smooth. In places, small valleys are incised into the sandstone, creating a series of smooth ridges and valleys.

Landcover, land use and landscape elements

8.4.21 The LCA features extensive areas of coniferous woodland plantation, as well as smaller scale, predominantly linear, deciduous woodland along burns, roads and within farmland. Agriculture is the other key land use – predominantly pasture, but with rough grazing and moorland on upper slopes (some gentler upper slopes include arable land). Development is limited, generally comprising scattered farmsteads and small settlements.

Scale of landscape

- 8.4.22 This landscape type is open to semi-enclosed. The agricultural fields are medium scale. Overall this landscape can be describes as being of medium scale.

Nature of views

- 8.4.23 Depending on the viewer's location in relation to hills, ridges and valleys, as well as the frequent mature tree planting, the views within this landscape are either extensive and panoramic or enclosed and framed.

Landscape quality and sensitivity to change

- 8.4.24 The area of this LCA within 10km, and with potential views, of the proposed wind farm does not contain any landscape designations. This is a landscape of transition, with associated diversity and interest. Nevertheless there is little of high or exceptional quality, and landscape quality has been reduced through insensitive coniferous plantations. Overall, this is a landscape of medium quality, with frequent strong vertical features and for-shortening of views. It can therefore be described as having a medium sensitivity to the type of change associated with wind farm development outwith its borders.

Landscape Character Type TAY8: Igneous Hills

- 8.4.25 The border between this LCA and CTR1: Lowland Hills, described above, is entirely due to local authority boundaries. The description of CTR1: Lowland Hills provided above, can therefore be applied to the TAY8 LCA also. However, the sensitivity of this LCA to the proposed wind farm will be related to sensitivity to change outwith its borders. Therefore, this LCA is of medium sensitivity in elevated areas with extensive views, yet of low sensitivity on lower slopes with enclosed views and limited views to adjacent areas.

Landscape Character Type TAY10: Broad Valley Lowland

Topography

- 8.4.26 The landform consists of wide, deep valleys formed through glacial erosion. Retreating ice sheets deposited glacial drift within the carved valleys, much of which was then re-worked by melt-waters to form distinctive localised topography.

Landcover, land use and landscape elements

- 8.4.27 This landscape features a number of settlements, including small market towns and villages and some larger market towns. The valley sides feature

coniferous woodland plantations, whereas notable broad-leaf woodland is largely limited to policy woodland associated with estates, and scattered along road-sides and hedgerows. The valley bottoms, historically improved through drainage, accommodate predominantly arable agriculture, arranged into rectilinear fields with hedgerow boundaries. Localised quarrying of glacial sands and gravels from the valley bottoms has resulted in a network of small lochs.

Scale of landscape

- 8.4.28 The valley within 10km of the proposed wind farm at Burnfoot Hill (Strathallan) is open and shallow, forming a large-scale landscape.

Nature of views

- 8.4.29 Within this LCA, views are confined along the river valleys. In the case of the Strathallan valley within 10km of the proposed development, these views, however, extend to long distances.

Landscape quality and sensitivity to change

- 8.4.30 The area of this LCA within 10km of the proposed wind farm does not contain any landscape designations. The landscape quality of the Strathallan valley is medium; though it has rich diversity (large estates, woodlands, and arable fields) it also includes the busy A9 corridor. Given the scale of this landscape and its associated views, this LCA is considered to be of medium sensitivity to the type of change associated with wind farm development outwith its borders.

8.5 PROJECT DESCRIPTION

- 8.5.1 This section should be read in conjunction with the full project description of the proposed wind farm in Chapters 2 and 5 of this volume. The text which follows summarises the main aspects of the development which may cause an effect on the landscape and visual amenity of the area and describes mitigation measures which have been incorporated through the iterative design of the wind farm in order to prevent, reduce or offset potentially adverse landscape and visual effects where possible.

Layout Design

- 8.5.2 The layout of the wind farm went through several iterations which took account of technical and other environmental constraints identified during the baseline survey and early design work on the project. The key principles for designing a visually acceptable array which were applied are summarised in The Design Statement, **Appendix 4.1, Volume 4**. The aim of this process

from a landscape and visual amenity perspective was to achieve a layout which relates to the landform of the hill where the turbines would be located particularly when viewed from close proximity. Accordingly, Ben Cleuch and viewpoint locations in Glen Bee as well as other elevated locations in close proximity to the site were chosen and used for design purposes. Wireframes were generated from these locations and the layout adjusted to achieve the most coherent and legible grouping of turbines that respects the other identified constraints.

Main Visible Elements

- 8.5.3 The following text summarises the main characteristics of the visible elements of the development, including design features which afford a degree of mitigation.
- 8.5.4 The 13 turbines will have a hub height of 60m and an overall height to blade tip to 102m. It is recommended that all the turbines are light grey in colour with a semi-matt finish, to attenuate visibility both against the sky from low lying viewpoints and against the landscape from more elevated positions. Final colour selection would be agreed with Clackmannanshire Council.
- 8.5.5 Access to the site from the public road system will make use of an existing track from the A823 to Backhills Farm, which would be widened where necessary to accommodate the construction traffic. The on-site access track will be 5m width and will deploy different construction methods depending on the specific ground conditions. Approximately 5.9km of the new access road will be needed. The layout of site roads has been designed so as to minimise gradients and requirements for cuttings and embankments. At some locations cuttings will be necessary, but these will be restored by profiling to minimise visual impact.
- 8.5.6 One 60m anemometry mast of lattice construction will be located on the site to provide information for the control and monitoring of the site.
- 8.5.7 A single storey switchgear building would be located to the south of Turbine 10 as shown in **Figure 2.2, Volume 3**.
- 8.5.8 There would be two construction compounds, one located where the access track rounds the shoulder adjacent to the Upper Glendevon Reservoir and one located to the north west of Backhills Farm.
- 8.5.9 It is anticipated that up to three borrow pits may be required to source approximately 20,000m³ of stone required for the construction compound, access tracks, crane hardstandings and turbine foundations. The proposed locations for these are shown on **Figure 2.2, Volume 3**.

8.5.10 The expected operation life of the wind farm is 25 years. At the end of this period a decision will be made whether to refurbish, remove or replace the turbines. If it is decided to decommission the wind farm this would entail the removal of all turbine components and switchgear building. A decision would be made on whether to leave the access tracks in situ or reinstate.

8.5.11 It is proposed that the grid connection be underground cable from the switchgear building via Ben Buck, Ben Ever and The Nebit to Alva using methods which minimise intrusion. Excavation work will be reinstated when the cable trench is back filled. The grid connection will be subject to a separate application and related detailed assessment. However, given that it is intended for the connection to be underground, long term effects on landscape character and visual amenity would be minimised and are therefore not considered any further within this assessment.

Development Characteristics

8.5.12 The key elements and characteristics of the proposed wind farm development which may give rise to landscape and visual impacts are as follows:

- Turbine layout
- Turbine dimensions
- On-site access tracks
- Borrow pit locations and layout
- Switchgear building

Construction Phase

8.5.13 The following elements and activities associated with the 12 month construction phase of the proposed development have the potential to result in impacts on the landscape and visual amenity of the study area:

- Upgrade of existing access and construction of new site access tracks;
- Borrow pit excavations;
- Erection of turbines and anemometry masts;
- Construction of switch gear building;
- Lay down areas;
- Temporary site compound;
- Excavation and construction of turbine foundations and crane pads;
- Excavation for underground cables;

- HGV and abnormal load deliveries to site and movement of vehicles on site;
- Reinstatement work, including removal of temporary accommodation.

8.5.14 The construction phase is described in Chapters 2 and 5 of this volume. The location and management of the construction phase elements have been carefully considered to minimise environmental effects including potential landscape and visual effects during the construction phase. The first four items would result in development components that would be present for the duration of the operational phase of the wind farm and the related impacts are considered in the detailed assessment which follows.

8.5.15 The other components of the construction phase would all give rise to temporary impacts on landscape and visual amenity. All disturbed areas would be restricted as far as practicable to the specified areas and the layout down and temporary site compound areas would be reinstated. Similarly excavations for turbine foundations, crane pads and underground cables would be reinstated as described in Chapter 5. The borrow pits would be re-profiled to stabilise the cut faces and aid integration with the existing landform.

8.5.16 The relatively limited extent of disturbance together with the short duration of the effects and related reinstatement of working areas would ensure that the effects of the construction phase on the landscape and visual amenity of the locality are limited. However, it is anticipated that there would be a substantial magnitude of change and accordingly a major effect on landscape and visual amenity on the summits of the Ochils in the immediate vicinity of the site, occurring in the Lowland Hills landscape character area. It is not anticipated that there would be significant effects at distances of over 3km from the site during the construction phase.

Operational Phase

8.5.17 The operational life of the wind farm would be approximately 25 years. The elements of the wind farm with the potential to affect the landscape and visual amenity of the study area comprise:

- Wind turbine generators and anemometer masts
- Access tracks
- Borrow pits
- Switchgear building

8.5.18 The nature of these components is described in Chapter 5. The location of the access track utilises the existing access track to Backhills Farm, as far as possible, although this will require modification to accommodate the

construction phase traffic, in particular where the road crosses the Broich Burn. The tracks will also require some cut and fill to accommodate the running surface within the landform. The extent of cut and fill has been minimised but will result in cut faces being apparent in the landscape from the area around Upper Glendevon Reservoir and from adjacent summit areas. Predicted effects are described for Viewpoint 2nad 3 where views of the tracks are anticipated.

- 8.5.19 The location of the borrow pits has been considered in relation to availability of suitable quality stone in proximity to the site, as well as landscape and visual considerations. The borrow pit on the east side of the site would be visible from areas around Upper Glendevon Reservoir, whilst the borrow pit on the west side of the site may be visible from summits immediately to the west of the site as well as Ben Cleuch. This is described further for Viewpoint 3.
- 8.5.20 Following construction, the borrow pits would be landscaped with stored topsoil and reseeded.

8.6 EVALUATION OF EFFECTS

- 8.6.1 This section provides an assessment of the landscape and visual impacts arising from the proposed wind farm during its operational phase. The potential landscape and visual impacts arising during the operational phase of the proposed wind farm have been assessed in two ways:
- Analysis of the ZTVs to provide a general overview of the predicted visibility of the wind farm from within the study area; and
 - Assessment of the potential landscape and visual effects at 19 viewpoints.
- 8.6.2 The second of these analyses is presented in **Section 8.7**. The following discusses the predicted visibility shown within the ZTVs.

8.7 ZONES OF THEORETICAL VISIBILITY (ZTVS)

- 8.7.1 A blade tip ZTV has been prepared and is shown in **Figures 8.2a, 8.2b, 8.2c, 8.2d, 8.2e and 8.3, Volume 3**. A hub-height ZTV has also been prepared, and this is shown in **Figures 8.4a, 8.4b, 8.4c, 8.4d, 8.4e and 8.5, Volume 3**. These figures show the parts of the study area from where there may be views of the proposed development. The ZTVs show areas predicted to have views of the turbines based on bare ground analysis, i.e. the OS 1:50,000 digital terrain model which does not take account of local landform, vegetation or buildings. The blade tip ZTV shows areas from where any part of the turbines up to

their overall height of 102 m may be visible, whilst the hub height ZTV shows areas from where any part of the turbines up to the hub height of 60 m may be visible.

Blade Tip ZTV

- 8.7.2 The blade tip ZTV shows that there are extensive parts of the study area with no visibility of the wind farm, particularly to the south of the Ochil Hills including the hill foot towns. To the north and northwest of the proposed wind farm there is an area showing theoretical visibility which lies beyond Strathearn and Strathallan to the north of the Ochils, and is composed of the lowland hills of Glen Almond, the broad lowland valleys between these hills, and further to the north still, parts of the Highlands. The area of theoretical visibility includes Crieff (approximately 25km to the north of the proposed wind farm), Auchterarder (approximately 9.5 km to the northeast) and the western fringe of Perth and surrounding villages such as Methven (approximately 25 km to the northeast). There is also a concentrated area of theoretical blade-tip visibility around the proposed wind farm itself. This rough elliptical area does not contain any large settlements. There are further, isolated areas of the theoretical blade tip visibility: to the east the ZTV predicts visibility beyond the M90 corridor, taking in the very west of the Lomond Hills; to the southeast there is a fragmented area which includes the north-western edge of Cowdenbeath; and to the southwest there is a larger, though equally fragmented, area of theoretical visibility which runs from Kippen to Carron Bridge. Although there may be some visibility of the proposed wind turbines' blade tips from a number of towns and settlements, the ZTV suggests that there is no visibility from all of the major settlements within the Forth Carse area to the south of the proposed wind farm including Stirling, Alloa, Tillicoultry, Dollar and Kinross, as well as Dunblane and Dunfermline.
- 8.7.3 The ZTV predicts that there will be sequential visibility of turbine blade tips from the A9 running approximately southwest to northeast between Perth and Dunblane along the very northern edge of the Strathallan valley. The visibility is not predicted to be continuous, and different numbers of turbines will be visible at different points. For example, the stretch of the A9 north of Dunning is predicted to experience blade-tip visibility of between 7 and 9 turbines, whilst near the village of Dalreoch, the predicted visibility from the A9 is predicted to be only between 1 and 3 turbines. Within the adjacent lowland hills there are more prolonged sequential views when travelling east – west along the section of the A85 between Perth and Crieff. Road users in the lowland hills will also experience more fragmented views travelling north to south between and Crieff and Auchterarder. Although the ZVT predicts that there will not be visibility from within the town of Callander, there will be views for road users travelling south from Callander along the A81.

Finally, the blade-tip ZTV predicts that there will be views of the proposed site from the A823 approximately 8 km north of Dunfermline.

- 8.7.4 The Ochil Hills, in which the development is proposed, is extensively used by tourists and local residents. These lowland igneous hills offer opportunities for walking and cycling, as do the more distant hills of Glen Almond. The Ochil Hills also include water bodies used as a recreational resource; for example the Glendevon Reservoir lies within close proximity of the proposed Burnfoot Hill wind farm. Visibility of the proposed Burnfoot Hill wind farm would be limited to a relatively confined area close to the site, as shown on the ZTV. Viewpoints 1, 2, 3 and 5 are located in these hills.
- 8.7.5 Yet more distant areas within the Fintry Fells and the Lomond Hills (to the southwest and east respectively) are further examples of lowland hills enjoyed by walkers and with predicted blade-tip visibility of the proposed wind-farm. Here, the ZTVs predict limited and fragmented views from the eastern edge of the Fintry Hills and views from summit areas in the Lomond Hills. Viewpoint 19 is located on the summit of West Lomond.
- 8.7.6 Of particular interest to visitors to the area are historic gardens and designed landscapes. As noted at 3.5 above, at the 6 such designated areas within the blade-tip ZTV, it is not anticipated that there would be extensive visibility at any of these locations. Viewpoint 6 and 7 describe anticipated views from Gleneagles, the closest of these properties, in greater detail below.

Hub Height ZTV

- 8.7.7 The hub height ZTV illustrates areas from where any of the proposed turbines may be seen to hub height. Comparison of the blade tip and hub height ZTVs indicates the areas from where only blade tips may potentially be seen. The ZTV to hub-height covers roughly the same pattern as that to blade-tip. However, this ZTV predicts that the sequential views along the A9 will be of blade tips only.

Cumulative ZTVs

- 8.7.8 A series of cumulative ZTVs has been prepared to show areas from where the proposed wind farm at Burnfoot Hill may be seen together with consented and proposed wind farms within the study area.

Table 8.3 Wind Farms Included in the Cumulative Assessment

Wind Farm Site	Height of Turbines to Blade Tip (m)	Approximate distance from proposed Burnfoot Hill Wind Farm (km)
<i>Consented Developments</i>		
Braes of Doune	100	19 (NW)
Earlsburn	115	25 (SW)
<i>Developments at Application</i>		
Abercairny	104	25 (N)
Greenknowes	95	8 (NE)
Littlelaw	112	11 (NE)
Snowgoat Glen	91	12.5 (NE)
Lochelbank	91	27 (NE)
Knowehead	100	15 (NE)
Mellock Hill	82	13 (NE)
Tillyrie	76	20 (NE)

8.7.9 From **Figures 8.31a** and **8.32a**, the following can be observed:

- When considering the cumulative effect of the above developments, there is an extensive simultaneous visibility within the southern portion of the study area. This takes in all of the major settlements within the Forth Carse: Dunblane, Stirling, Alloa, Dunfermline, Tillicoultry, Dollar and Kinross. However, as discussed above, Burnfoot Hill will not be visible from these settlements. In other words, the proposed development at Burnfoot Hill will not contribute to the introduction of wind turbines into views from these sensitive locations.
- Similarly, Burnfoot Hill does not contribute to the cumulative effect predicted within Strathallan and Strathearn to the north of the Ochils.

- As noted above, the proposed Burnfoot Hill development is visible to various extents from the lowland hills of Glen Almond. Given the elevated nature of this area, it is unsurprising that views of up to 11 proposed or consented wind farms will be experienced (if all are built). However, in views over to the Ochil Hills, Burnfoot Hill will be relatively distant from any given viewpoint in comparison with the other wind farms, and is therefore unlikely to affect a significant cumulative change to landscape character and visual amenity over and above that associated with the cumulative effect of the other turbines.
- Once the cumulative effect of all the proposed wind farms is considered, there will be continuous, cumulative views of turbines along a number of roads within the study area, including the M80, M876, A907 and A91 which do not fall within the ZTV of Burnfoot Hill. In other words, Burnfoot Hill will not contribute to the potential impacts of wind farm development in these areas. Where Burnfoot Hill can be seen from roads, for example from the A9, the A85 and very limited areas of the A823, once the cumulative effect of the other proposed developments are considered, its contribution to impacts on landscape character and visual amenity is not likely to be significant. This is either because Burnfoot Hill will contribute only a small number of distant blade-tips to the view, or because it will be one of only a number of wind farms which are visible.

8.8 VIEWPOINT ANALYSIS

8.8.1 A preliminary blade tip ZTV for the initial site layout was prepared which showed the general areas of potential visibility within 30 km of the proposed wind farm. Following analysis of this initial ZTV, 19 viewpoint locations were selected for inclusion in the detailed assessment to include representative coverage in respect of the following parameters:

- Types of receptor: to include memorials and gathering spots, settlements, roads and railways, marked viewpoints, and outdoor passive recreational locations;
- Distance from the proposed development;
- Direction from the proposed development with the aim of achieving a distribution from different compass points around the site; and
- Altitude.

8.8.2 The location of these 19 viewpoints is shown in **Figure 8.9, Volume 3**. These viewpoints were agreed with Clackmannanshire Council at the scoping stage of the development.

- 8.8.3 The detailed assessment of the potential landscape and visual impacts at each of the viewpoint locations follows.

Viewpoint 1: Glen Bee. Grid Reference 290207, 705055

Location

- 8.8.4 This viewpoint is located on the footpath from Blackford through to Tillicoultry, at the north end of Glen Bee, overlooking Upper Glendevon Reservoir and is representative of views obtained by walkers.

Current View

- 8.8.5 The existing view towards the site is illustrated in the photo on **Figure 8.10, Volume 3**. The foreground, mid-ground and far-ground form a unified, restful scene of gently rolling topography, consistent in colour, texture and relief. Contrast and therefore much of the focus in the view is provided by the northern tip of the Upper Glendevon Reservoir, which nestles at the base of the adjacent hills. Furthermore, from this particular viewpoint, the subtleties of the landform are not obscured by conifer plantations (which are frequent in this particular landscape character type) and these too add small scale visual interest.

Predicted View

- 8.8.6 As demonstrated by the wireframe and photomontage illustrations (also on **Figure 8.10**), there will be a close view of the proposed wind farm (1.3km to the nearest turbine). The array will occupy the central portion of the scene and present a mixture of nacelle and blade tip views along the skyline. It is likely that the access tracks around the northern side of Burnfoot Hill and two of the borrow pits would also be visible from this location.
- 8.8.7 From such elevated locations, there are relatively extensive views of a large scale landscape. Nevertheless, the relatively high quality of the landscape with its pastoral and restful qualities means that the landscape character, as experienced from this viewpoint, is of a medium sensitivity to the proposed wind farm. The wind farm would introduce a series of prominent vertical and moving elements at a close proximity into an otherwise still landscape without strong vertical emphasis. The magnitude of change would therefore be substantial. The impact on the landscape character at this viewpoint is considered to be **Major/Moderate**.

Impact on Visual Amenity

- 8.8.8 This view is representative of views obtained by walkers within this area of the Ochil Hills. These receptors are considered to be highly sensitive to

change in views of the landscape, particularly from viewpoints such as this where the landscape quality at the viewpoint and the intervening landscape is high. Given the substantial magnitude of change associated with the proposed wind farm, the impact on visual amenity from this viewpoint is considered to be **Major**, and as such represents a significant effect.

Viewpoint 2: Lower Glendevon Reservoir. Grid Reference 292792, 704967

Location

- 8.8.9 This viewpoint is located on the reservoir and is representative of views obtained by solely by anglers as it was taken from a boat on the reservoir.

Existing View

- 8.8.10 The existing view towards the site is illustrated on **Figure 8.11, Volume 3**. The foreground is dominated by the waters of the reservoir. Gently sloping hills form the mid-ground and meet the water's edge, and their mass limits views of the far-ground to a single domed hill top located in the centre of the view. The hill sides are largely uniform in terms of colour and texture, and though there is some limited undercutting of the very lowest slopes at the water's edge, there is otherwise no dramatic change in topography. The water in the foreground will play a large part in determining the visual interest of the scene: still sunny conditions will allow strong reflections of the surrounding hills, and therefore provide high visual interest, overcast and windy conditions less so.

Predicted View

- 8.8.11 As demonstrated by the wireframe and photomontage illustrations (also on **Figure 8.11**), there will be a relatively close view of the proposed wind farm (2.8km to the nearest turbine). The array will be framed by adjacent hill slopes surrounding the reservoir, and presents a mixture of nacelle and blade tip views, forming a relatively simple grouping consisting mainly of pairs of turbines in the centre and left hand side of the array, with single turbines on the right hand side of the array. This revised skyline will be subject to varying levels of reflection in the reservoir, depending on weather conditions.

Impact on Landscape Character

- 8.8.12 This viewpoint is, again, located within the Igneous Hills landscape character type. However, unlike the relatively elevated Viewpoint 1, this view is fore-shortened to a medium distance by the surrounding hill masses. This view comprises a medium quality landscape of open water and uniform landform which is large in scale, and the landscape character is considered to be of medium sensitivity to the proposed wind farm. The wind farm would introduce, in close proximity, a series of prominent vertical elements into the

landscape which, although contained by the surrounding topography, break the skyline, with associated blade movement clearly visible. Although the surface of the water in the view's fore-ground may introduce movement into the landscape this is unlikely to be of the same emphasis as rotating turbines. The magnitude of change would therefore be substantial. The impact on the landscape character at this viewpoint is considered to be **Major/Moderate**, and is therefore a significant effect.

Impact on Visual Amenity

- 8.8.13 This view is representative of views obtained by anglers on the reservoir. Angling receptors are of medium sensitivity to changes to views of the landscape. Given the substantial magnitude of change associated with the proposed wind farm, the impact on the visual amenity enjoyed by anglers at this location is considered to be **Major/Moderate** and also represents a significant effect.

Viewpoint 3: Ben Cleuch. Grid Reference 290275, 700646

Location

- 8.8.14 This viewpoint is located at the summit of Ben Cleuch which is at 721m AOD and is the highest point within the Ochil Hills. Being located close to the dramatic escarpment of the Ochils above the well populated Midland Valley, it is a well climbed hill with a footpath leading directly to the summit from Tillicoultry.

Existing View

- 8.8.15 The existing view northwards from this summit is shown as a photograph in **Figure 8.12, Volume 3**. The scene presents a fore-ground and mid-ground of gently rolling lowland hills, with subtleties in landform and vegetation cover offering variety and interest through changes in colour, texture and shadow. The far-ground offers a contrastingly flat plain of carseland, as well as further distant hills – thus adding further to landscape distinctiveness and interest. The panoramic extent of the view, together with the lack of strong verticality and extensive sky emphasises the expansive scale of the scene. The view to the south, which is not illustrated, comprises the steep drop to the flat land that flanks the Firth of Forth, with extensive residential, commercial and industrial development evident.

Predicted View

- 8.8.16 As demonstrated by the wireframe and photomontage illustrations (also on **Figure 8.12**), there will be a close view of the proposed wind farm (1.5km to the nearest turbine). The wind farm occupies turbines break the immediate skyline formed by the adjacent hills. However, the turbines are back-clothed

by the more distant horizon formed by the remote hills in the far-ground. The extent to which the turbines are back-clothed by this distant horizon is likely to be determined by climatic conditions: on a clear day the turbines may be back-clothed, in hazy conditions or in low cloud this may not be the case. It is likely that the access tracks on Burnfoot Hill and the summit to the south, the switchgear building as well as the edge of one of the borrow pits may be visible from the summit.

8.8.17 The predicted cumulative view is illustrated in the predicted photomontage views presented in **Figures 8.34a, 8.34b and 8.34c, Volume 3**. At this viewpoint, the photomontages predict that, if all were built, the following constructed, consented and proposed wind farms would be visible: Earlsburn and Braes of Doune as well as the proposed Abercairny, Snowgoat Glen, Lochelbank, Mellock Hill, Greenknowes, Tillyrie, Knowehead, Littlelaw.

8.8.18 Abercairny, Lochelbank, Tillyrie, Earlsburn and Braes of Doune are all located approximately between 20 and 25 km away from the viewpoint. At this distance the photomontages suggest that these wind farms are unlikely to be prominent in the landscape. However, Snowgoat Glen, Greenknowes, Littlelaw, Knowehead, Mellock Hill are all located at distances of between 9 and 15 km. The photomontage at **Figure 8.34b** shows that this collection of wind farms would be clearly visible, and occupy a significant subtended angle of the view to the northeast to the east/northeast.

Impact on Landscape Character

8.8.19 This viewpoint is located within the Lowland Hills landscape character type in part of the Ochil Hills AGLV. From an elevated location such as this summit, there are extensive views of a large scale landscape consisting of the rounded summits of the Ochils in the foreground with the distinctive pattern of agriculture on the rich, lower lying valley to the north with the edge of the Highlands visible in the distance. Though large in scale the landscape is of a high quality given its sense of remoteness and drama as well as the variety it offers. However, this landscape is considered to be of a medium sensitivity to wind farm development due to its open, large scale. The proposed Burnfoot Hill development would result in a substantial change to landscape character from this viewpoint, because of proximity of the turbines and related movement. The impact on landscape character at this viewpoint is considered to be **Major/Moderate** and is considered to be a significant effect.

8.8.20 It is likely that the main visible cumulative wind farms would be seen as a single, though extensive, grouping with different spacing and layouts apparent, particularly at the left hand edge of the turbine array. Although the turbines break the intermediate horizon of lowland hills, they do not generally stand proud of the far-horizon. Furthermore, the large scale of the lowland hills, and the back-clothing of the far-horizon means that these wind

farms do not dominate the landscape. Therefore, this landscape, when the cumulative base-line of all the proposed developments is taken into consideration, remains of medium sensitivity to the type of change arising from further wind farm development.

- 8.8.21 The cumulative impact on landscape character at this viewpoint arising from Burnfoot Hill together with Braes of Doune and Earlsburn which would only be distantly visible would be **Moderate**. The cumulative impact on landscape character of Burnfoot Hill together with the consented developments and all of the proposed wind farms would be **Major/Moderate**.

Impact on Visual Amenity

- 8.8.22 This view is representative of views obtained by walkers on the summit of Ben Cleuch. These visual receptors are highly sensitive to changes in the landscape, particularly in such an elevated area where the change is proximal and within a high quality landscape. As a result of the substantial magnitude of change associated with the proposed wind farm, the impact on visual amenity from this viewpoint is considered to be **Major**, and as such represents a significant effect.
- 8.8.23 Given the limited extent to which the consented wind farms would be visible, the cumulative impact on the visual amenity for walkers at this viewpoint arising from Burnfoot Hill with the consented wind farms is considered to be Moderate. The cumulative impact from Burnfoot Hill with the consented wind farms and all of the proposed wind farms would be **Major** and represents a significant cumulative effect.

Viewpoint 4: A823 Glendevon. Grid Reference 295832, 705213

Location

- 8.8.24 This viewpoint is located on the A823 through Glendevon to the east of the access route to the site.

Existing View

- 8.8.25 The existing view is presented as a photograph in **Figure 8.13, Volume 3**. The foreground of the scene is made up of the main road set at the base of the steep sided valley with little variety in colour or texture. In the mid-ground, the distinctive rounded hills flank the valley sides. The mass of these mid-ground hills largely hides the far-ground, limiting the view to a tightly framed glimpse towards the application site.

Predicted View

- 8.8.26 The wireframe and photomontage illustrations on **Figure 8.13** demonstrate that there will be a close to mid-range view of the proposed wind farm (5.5km to the nearest turbine). However, the visible extent of the proposed wind farm is predicted to be limited to 4 blade tips. Nevertheless these turbines will break the horizon, and introduce movement within a tightly framed area of the horizon.
- 8.8.27 The predicted cumulative view is illustrated on **Figure 8.35, Volume 3**. This shows that 5 turbines at Greenknowes would be visible with the closest turbine at 2km distance and the turbines appearing as a single row receding over the hill away from the viewpoint.

Impact on Landscape Character

- 8.8.28 This viewpoint is located within the Igneous Hills landscape character type and in part of the Ochil Hills AGLV. Views at this location are contained by the steep sided hills which flank Glen Devon. This landscape is medium in scale and quality, with high interest topography balanced by the presence of the road corridor and simple vegetation cover. The Igneous Hills landscape character is generally considered to be of medium sensitivity to wind farm development in the area due to its large scale and open, elevated nature. However, at this location in the distinctive valley of Glen Devon, the scale of the landscape is reduced by the steep, enclosing valley sides and it is considered to be of high sensitivity to wind farm development on the adjacent higher ground. Despite the limited extent of visible turbines, the proposed Burnfoot Hill development would result in a moderate change to landscape character from this viewpoint, due to its proximity and the introduction of movement on the skyline. This is because of the strong framing of the location where the moving blades break the horizon. However, the location where the wind farm would be visible is strongly contained by adjacent valley sides and therefore does not compromise the main ridges defining the valley. The resulting impact on landscape character at this viewpoint is therefore considered to be **Moderate**.
- 8.8.29 As shown in **Figure 8.35**, five turbines at Greenknowes would be visible in the opposite direction from Burnfoot Hill. The Greenknowes turbines would be apparent above the horizon of the ridge line defining the edge of the valley to the north of the road. The cumulative magnitude of change arising from Burnfoot Hill with Greenknowes is considered to be slight and the impact on landscape character would be **Moderate**.

Impact on Visual Amenity

- 8.8.30 This view is representative of views obtained by road users driving west through this area of the Ochil Hills, considered to be of medium sensitivity to change in views of the landscape. As noted above, the potential change in landscape character occurs at a location which is strongly framed, and at a point where there is likely to be strong visual focus for road users. The impact on visual amenity from this viewpoint is considered to be **Moderate**.
- 8.8.31 The slight magnitude of cumulative change arising from Burnfoot Hill with Greenknowes would give rise to a **Moderate** cumulative effect on visual amenity.

Viewpoint 5: Innerdownie Hill. Grid Reference 296600, 703148

Location

- 8.8.32 This viewpoint is located on the summit of Innerdownie Hill, at 611m AOD due east of Burnfoot Hill. It is representative of views obtained by walkers in the area.

Existing View

- 8.8.33 A photograph of the existing view is presented in **Figure 8.14, Volume 3**. Like Viewpoint 3, the scene presents a fore-ground and mid-ground of gently rolling lowland hills, with subtleties in landform and vegetation offering variety and interest in colour, texture and shadow. However, this view also contains focal points such as distant water bodies and the obviously man-made, geometric edges of coniferous plantations. The dramatic landform of the southern Highlands is visible on far-distant horizon. The extent of the view, together with the lack of strong verticality, and extensive sky emphasises the horizontal aspects of the scene.

Predicted View

- 8.8.34 The wireframe and photomontage illustrations included within **Figure 8.14** show that that there would be a close to mid-range view of the proposed wind farm (5.8km to the nearest turbine). All of the turbines would be visible, some to their full height. The location of the array means that only some of the turbines will be seen above the skyline.
- 8.8.35 The predicted cumulative view is illustrated in the predicted photomontage views presented in **Figures 8.36a, 8.36b and 8.36c, Volume 3**. At this viewpoint, the photomontages predict that the consented wind farm at Braes of Doune would be visible, as well as, (if they were all built), the following

wind farms would be visible: Abercairny, Littlelaw, Snowgoat Glen, Greenknowes, Mellock Hill, Lochelbank, Knowehead and Tillyrie.

Impact on Landscape Character

- 8.8.36 This viewpoint is located within the Igneous Hills landscape character type. Although the views from this location are extensive, include obviously man-made woodland edges, encompassing a large scale landscape, the seeming remoteness and drama of the scene conveys a fairly high quality landscape. This landscape is considered to be of medium sensitivity to change associated with wind farm development, largely due to the sheer scale of this landscape and the existing presence of linear man-made elements. The proposed Burnfoot Hill development will give rise to a moderate change in the landscape from this viewpoint. Given the medium sensitivity of the landscape this will result in a **Moderate** effect.
- 8.8.37 Braes of Doune, Abercairny, Lochelbank and Tillyrie are located, respectively, 24, 23, 17 and 14.3 km away from the viewer. The photomontages presented in **Figures 8.36a, 8.36b** and **8.36c** suggest that these developments have little presence in the landscape from this viewpoint through distance and back-clothing. However, the remaining five proposed developments are more prominent. Littlelaw, Snowgoat Glen and Greenknowes wind farms appear as one group in north-easterly views from this viewpoint, with the nearest turbine at Greenknowes at 3.7km. There is a significant degree of overlapping turbines and the adjacent, intermediate horizon is frequently broken. Looking further to the east, Mellock Hill and Knowehead form a more distant (4.6 and 8.7 km from the viewer) collection of turbines. Again, these developments appear as a single entity in the landscape. The relationship between the turbines in this apparent grouping is not particularly strong – with turbines straddling two adjacent peaks. Again, these turbines break the immediate, but not the far horizon.
- 8.8.38 Once the cumulative effect of these developments is taken into consideration, the landscape from this viewpoint would be one where wind farms play a significant part – with prominent turbines located across the northwest to east portion of the view. This would lower the sensitivity of the landscape to wind farm development from medium to low. The proposed wind farm at Burnfoot Hill would not introduce a new element into this landscape, nor increase the dominance of wind farm developments in terms of proximity to the viewer. It will, however, extend the horizontal extent of turbines westwards. Therefore the resulting additional magnitude of change (over and above that associated with the other built, consented or proposed wind farms) is considered to be slight.
- 8.8.39 The cumulative impact on landscape character at this viewpoint arising from Burnfoot Hill in conjunction with the consented Braes of Doune wind farm is

considered to be **Minor**. The cumulative impact of Burnfoot Hill with Braes of Doune and all of the other proposed developments is considered to be Moderate. It would introduce a group of turbines at relatively close proximity to the west of the hill, with the other main grouping occurring to the east.

Impact on Visual Amenity

- 8.8.40 This view is representative of views obtained by walkers in this area of the Ochil Hills, considered to be of high sensitivity. The moderate magnitude of change arising from Burnfoot Hill on its own in the landscape is therefore considered to give rise to a **Major/Moderate** impact on visual amenity and represents a significant effect.
- 8.8.41 As discussed, the additional presence of Burnfoot Hill would result in a slight magnitude of change with the consented Braes of Doune wind farm and would result in a Minor cumulative impact on visual amenity. With all of the other proposed developments, it would give rise to a moderate magnitude of cumulative change to the landscape character at this viewpoint (over and above the change to the landscape arising from all of the other wind farms). The cumulative impact on the visual amenity of the walkers at this viewpoint is therefore considered to be **Moderate**.

Viewpoint 6: Gleneagles Hotel Grounds. Grid Reference 291919, 711165

Location

- 8.8.42 This viewpoint is located at Gleneagles Hotel and is representative of views obtained by visitors to the hotel and golfers making use of the well known courses at the Hotel.

Existing View

- 8.8.43 The existing view is presented in **Figure 8.15, Volume 3**. The scene is dominated by a highly manicured fore-ground and mid-ground composed of closely mown grass and intensely managed groups of shrubs. However, the view also takes in a far-ground of dramatic ridge-lines and north facing slopes of the Ochil Hills. The view is therefore composed of two highly contrasting landscape components which in the main results in high interest.

Predicted View

- 8.8.44 The wireframe and photomontage illustrations also shown in **Figure 8.15** demonstrate that that there would be a mid-range view of the proposed wind farm (7.6 km to the nearest turbine). However, although the wireframe suggests that the blade-tips of four of the turbines will just break the horizon,

the photomontage suggests these are likely to be screened at this location by intervening evergreen vegetation.

- 8.8.45 The predicted cumulative view is illustrated as photomontages presented in **Figures 8.37a, 8.37b and 8.37c, Volume 3**. At this viewpoint, if all the proposed developments were built, Snowgoat Glen, Littlelaw, Greenknowes and Abercairny, as well as the proposed development at Burnfoot Hill would all be visible.

Impact on Landscape Character

- 8.8.46 Although this viewpoint is located within the Lowland Hills landscape character type, the landscape at this location is highly modified through design and management of the hotel grounds and adjacent golf courses and is therefore far from typical of the area. The grounds are listed in the Inventory of Historic Gardens and Designed Landscapes. There is an obvious sense of man-made intervention within this view with the laid out grounds of the hotel surrounds and adjacent golf courses, which in contrast to the untamed far-ground which adds value. This landscape is considered to be of high sensitivity to wind farm development. Due to the limited blade tip visibility of a few turbines which are likely to be partially screened by intervening vegetation, the proposed Burnfoot Hill development will only give rise to a slight magnitude of change on the landscape, and therefore the impact is considered to be **Moderate/Minor**.
- 8.8.47 Although Greenknowes is located 6.2 km from the viewpoint, the figures suggest that the blade tips of 4 of the turbines would barely break the horizon. Further to the northwest, Abercairny would occupy a moderately extensive portion of the horizon, and would be more obvious in the landscape despite its greater distance from the viewer (some 14 km) as several turbines would stand proud of the horizon. However, it is to the south east of the viewpoint where wind farm development would have the most obvious presence with Snowgoat Glen and Littlelaw appearing as a continuous line of turbines along the horizon. The extent to which these developments would be visible would be limited by tree cover within the grounds.
- 8.8.48 At locations from where the developments would be seen, these arrays would appear as a well balanced, regularly spaced whole they would include a significant number of turbines appearing above the horizon. Once the cumulative effect of these developments is taken into consideration, the landscape from this viewpoint would be one where wind farms play a significant part, albeit in a limited extent of the scene. Burnfoot Hill would introduce glimpsed views of moving blade-tips in a portion of the landscape otherwise free of turbines. The cumulative impact on landscape character at this viewpoint is therefore considered to be **Moderate/Minor**.

Impact on Visual Amenity

- 8.8.49 Visitors to the Gleneagles Hotel are likely to be of high sensitivity to changes in the landscape. Golfers are generally considered to be of medium sensitivity as their attention is less likely to be on the surrounding scenery than on the game. However, the setting of Gleneagles is a particularly important part of its attraction and golfers are therefore also considered to be of high sensitivity in this instance. Given the slight magnitude of change resulting from the Burnfoot Hill proposal with related limited visibility due to vegetation screening, the impact on visual amenity for visitors and golfers is considered to be **Moderate/Minor**.
- 8.8.50 As discussed, the additional presence of Burnfoot Hill would result in a slight magnitude of cumulative change to the landscape character at this viewpoint (over and above the change to the landscape affected through other wind farms). The cumulative impact on the visual amenity of the visitors and golfers at this viewpoint is therefore also considered to be **Moderate/Minor**.

Viewpoint 7: Gleneagles Hotel Roof. Grid Reference 291661, 711415

Location

- 8.8.51 This viewpoint is located on the roof top balcony at Gleneagles Hotel.

Existing View

- 8.8.52 The existing view is presented in **Figure 8.16, Volume 3**. From this elevated position, the relationship between the landscapes components discussed for Viewpoint 6 is slightly altered. The fore-ground appears slightly less manicured as the intense management is less obvious, with shrubs forming a broader structural mass. Concurrently, the more dramatic topography of the far-ground is slightly offset by more gentle and undulating hills on the horizon. Although the basic components of this view echo those of Viewpoint 6, the contrast is reduced. Nevertheless, the view contains considerable visual diversity and interest.

Predicted View

- 8.8.53 The wireframe and photomontage also shown in **Figure 8.16** demonstrate that that there would be a close to mid-range view of the proposed wind farm (7.8 km to the nearest turbine). The wireframe suggests that the blade-tips of up to 6 of the turbines will just break the far-horizon.
- 8.8.54 The predicted cumulative view is illustrated in the wireframes and predicted photomontage views presented in **Figure 8.38a, 8.38b 8.38c and 8.38d, Volume 3**.

Impact on Landscape Character

- 8.8.55 Again, man-made intervention within this view is apparent in terms of built elements (the hotel itself and the car-park) and small areas of intensive planting close to the building. The scale of this landscape varies between the small (hotel boundaries, ancillary buildings, car park, pockets of clear ground between vegetation) to the large (the sweep of the Ochil hills along the horizon). As noted above, this designed landscape which is Inventory listed is considered to be of high quality and high sensitivity to the type of change associated with wind farms. The occurrence of blade tips on the broad far-horizon will only result in a slight magnitude of change to the landscape, and the impact would therefore be **Moderate/Minor**.
- 8.8.56 At this viewpoint, the photomontages predict that Greenknowes, Abercairny, Snowgoat Glen, Littlelaw and the Braes of Doune together with the proposal for Burnfoot Hill would all be visible from this viewpoint. The photomontage of the predicted view included at **Figures 8.38a – 8.38d** indicate that many of the developments to the east would be screened from this location by the hotel's chimneys. Part of Greenknowes may be visible, and would be seen from the edge of the balcony, with the nearest turbine at 6.6km distance. Given that the baseline context of the part of the Ochil ridge seen from this location would have limited other wind farm development visible due to the screening provided by the building, and would therefore be changed only to the extent that Greenknowes would be visible, the sensitivity is considered to remain high. However, the proposed development at Burnfoot Hill would not greatly increase the obvious presence of wind turbines in this landscape, due to the limited number and extent of turbines that would be visible and the cumulative change is considered to be slight. The cumulative impact on landscape character at this viewpoint is therefore considered to be **Moderate/Minor**.

Impact on Visual Amenity

- 8.8.57 As noted in the discussion for Viewpoint 6, visitors to the Gleneagles Hotel are likely to be of high sensitivity to changes in the landscape. However, given the slight magnitude of change resulting from the Burnfoot Hill proposal, the impact on visual amenity for visitors is considered to be **Moderate/Minor**.
- 8.8.58 As noted above, the additional presence of Burnfoot Hill would result in a slight magnitude of cumulative change to the landscape character at this viewpoint (over and above the change to the landscape affected through other wind farms) and the cumulative impact on the visual amenity of the highly sensitive visitors at this viewpoint is considered to be **Moderate/Minor**.

Viewpoint 8: View from Greenloaning. Grid Reference 283021, 706914

Location

- 8.8.59 This viewpoint is located on the A9 just to the south of Greenloaning. It is considered to be representative of the views obtained by road users using the A9 at this point.

Existing View

- 8.8.60 The existing view is presented as a photograph in **Figure 8.17, Volume 3**. The fore-ground is composed of pasture and (just outside the frame) a road corridor – neither of which are of notable landscape quality. Although the mid-ground is enlivened by mature copse of trees and hedgerows, it also contains utilitarian buildings of low quality. The far-ground, however, is of higher quality and interest, with a horizon composed of the distinctive rounded topography of the Ochil Hills, contrasted by linear structural vegetation.

Predicted View

- 8.8.61 The wireframe and photomontage illustrations in **Figure 8.17** suggest that there would be mid-range views of the proposed wind farm (7.6 km to the nearest turbine). The wireframe predicts that the blade-tips of two of the turbines will just break the horizon. However, the photograph suggests that these turbines may be screened by foreground deciduous vegetation. Given the limited amount of blade-tip breaking the horizon and the viewing distance, even in winter it is likely that the bare crowns of this vegetation may obscure the turbines from this location.
- 8.8.62 The predicted cumulative view is illustrated in the predicted views presented in **Figures 8.39a, 8.39b, 3.8c and 8.37d, Volume 3**. These predict that wind farm developments at Braes of Doune, Abercairny, and Earlsburn, as well as the proposed development at Burnfoot Hill will be visible from this viewpoint. Together these result in 49 visible turbines. Abercairny and Earlsburn are located 19.5 and 25 km from the viewer respectively. The figures predict that as these developments are a substantial distance from the viewer, they have little presence in the landscape. Braes of Doune however, is only 10km from the viewer, and a number of the turbines appear above a prominent ridgeline. These wind farms would only be taken in by the viewer turning around.

Impact on Landscape Character

- 8.8.63 This landscape is made up of components of varying quality, including man-made features and overall can be considered of medium quality. This large scale, broad valley landscape affords long distance views and is considered to

be of medium sensitivity to change associated with wind farms. The occurrence of blade-tips on the horizon, which may be partially obscured/screened by vegetation, will result in a negligible magnitude of change and a **Minor** impact on landscape character.

8.8.64 Once the cumulative effect of all the visible developments is taken into consideration, wind farms are not prominent features in the landscape from this viewpoint. The consented development at Braes of Doune will be the most apparent. The sensitivity of the landscape to change through wind farm development is therefore unaffected, and remains medium. The additional magnitude of landscape change arising from the Burnfoot Hill proposal is considered to be negligible and the cumulative impact on landscape character at this location arising from Burnfoot Hill is therefore considered to be **Minor**, both for Burnfoot Hill with Braes of Doune, and with Braes of Doune and the other proposed developments.

Impact on Visual Amenity

8.8.65 The visual receptors from this viewpoint will be road-users, considered to be of medium sensitivity to landscape change. Given the negligible magnitude of change predicted above, the impact on visual amenity will be **Minor**.

8.8.66 Similarly, the cumulative impact on visual amenity arising from Burnfoot Hill with both the consented Braes of Doune development and with Braes of Doune and the other proposed wind farms is considered to be **Minor**.

Viewpoint 9: B827. Grid Reference 281844, 712182

Location

8.8.67 This viewpoint is located on the B827 Comrie to Braco road and is representative of views obtained by road users.

Existing View

8.8.68 The existing view is presented in the photograph in **Figure 8.18, Volume 3**. The fore-ground is composed of a grassy slope, containing a road and fencing, which drops away to the River Knaik valley bottom in the mid-ground. The mid-ground contains the toe of the slope, which is marked by a burn and linear riparian vegetation, with a well-vegetated, gently undulating valley sides beyond, with localised subtleties in topography. Although some buildings are visible in the mid-ground, these are not visually prominent. The far-ground is composed of the opposite side of the valley with large fields and several rectangular blocks of coniferous planting leading to far igneous hills, which form a distinctive rolling horizon. In this view, the landscape has a high level of diversity and interest.

Predicted View

- 8.8.69 The wireframe and photomontage included in **Figure 8.18** suggest that there would be a mid-range view of the proposed wind farm (11.6 km to the nearest turbine) with the blade-tips of up to twelve of the turbines just breaking the horizon to the left of the summit of Ben Cleuch.
- 8.8.70 The predicted cumulative view is illustrated on the on **Figure 8.40, Volume 3**, which shows that the proposed wind farms at Greenknowes, Mellock Hill and Littlelaw may be visible from this location at distances over 16km. As shown in the photograph of the existing view it is likely that these other proposed wind farms may be partially obscured by roadside trees in the mid ground of the view.

Impact on Landscape Character

- 8.8.71 This view is from a transitional point in that it is taken from the edge of the Lowland Hills character type, looking over the Broad Valley type to Igneous Hills beyond. This is therefore an expansive view of a large-scale landscape, which takes in considerable variety and interest. There are obvious signs of man-made intervention (roads, boundaries and buildings) as well as more subtle indicators (distant, geometrical conifer plantations). This landscape is considered to be of medium sensitivity to the type of change associated with wind farm development. The magnitude of change predicted is considered to be moderate with the introduction of moving turbine blades on the extensive ridge line formed by the Ochil Hills, and the effect on landscape character would be **Moderate**.
- 8.8.72 The developments considered in the cumulative assessment would not be prominent in the landscape from this viewpoint, and therefore the sensitivity of the landscape remains medium. The proposed development at Burnfoot Hill has an effect on the landscape over and above that of the other wind farms which is considered to be moderate, and therefore the cumulative effect on landscape character at this location would also be **Moderate**.

Impact on Visual Amenity

- 8.8.73 The visual receptors from this viewpoint will be road-users, considered to be of medium sensitivity to landscape change. Given the moderate magnitude of change predicted above, the impact on visual amenity will be **Moderate**.
- 8.8.74 The cumulative magnitude of change as noted above would be moderate and the effect on landscape character arising from Burnfoot Hill together with the other proposed wind farms would also be **Moderate**.

Viewpoint 10: View from Dalreoch. Grid Reference 300007, 717097

Location

8.8.75 This viewpoint is located on the A9 to the south west of Dalreoch and is representative of views obtained by road users.

Existing View

8.8.76 The existing view is presented in the photograph in **Figure 8.19, Volume 3**. The fore-ground and mid-ground of this view are flat and homogenous comprising a flat valley bottom which includes a major road corridor and agricultural fields. Although there is some textural and colour interest along the headland at the edge of the fields directly abutting the road, there is little else of interest. However, the far ground and horizon features the distinctive rolling topography of the igneous hills on the south side of the valley, visible on the left hand side of the photograph and the distinctive summits of the southern edge of the Highlands are also visible to the right hand side of the view. The form of these hills provides interest and their contrast with the flat intervening ground increases the interest of the overall composition.

Predicted View

8.8.77 The wireframe illustration presented as part of **Figure 8.19** suggests that there would be a long-range view of the proposed wind farm (16.5 km to the nearest turbine). The wireframe also suggests that the blade-tips of up to four of the turbines will just break the horizon.

8.8.78 The predicted cumulative view is illustrated in the photomontage views presented in **Figures 8.41a, 8.41b, 8.41c and 8.41d, Volume 3** which show that the proposed wind farms at Lochelbank, Knowehead, Mellock Hill, Snowgoat Glen, Littlelaw, Braes of Doune and Abercairny may all be visible from this location at distances ranging from 7.2km at Knowehead to 27km at Braes of Doune. The wireframes predict that these developments would result in 82 visible turbines from this viewpoint.

Impact on Landscape Character

8.8.79 This landscape is very open and large in scale. The dominant visual features are the A9 in the foreground, and the igneous hills which form the far-ground and horizon to the left of the view with the southern edge of the Highlands visible in the distance to the right side of the view. Although the road is busy and detracts from the landscape character, the hills, through forming a distinct horizon and providing contrast with the valley, contribute to the quality of the landscape. In isolation, this skyline is sensitive to change associated with wind farm development. However, the overall scene – featuring the busy road – is less so. Therefore, overall, the landscape character at this viewpoint is considered to be of medium quality and medium sensitivity to change. The magnitude of change is negligible and the

impact on landscape character which would already be altered by the presence of the other wind farms is therefore considered to be **Minor**.

8.8.80 Braes of Doune is located some 27 km from the viewer, and the blade-tips of Littlelaw barely break the horizon, and therefore they are unlikely to have a significant presence in the landscape. Furthermore, Abercairny and Lochelbank are likely to be screened from the viewpoint by intervening vegetation. Knowehead, Mellock Hill and Snowgoat Glen, however, are relatively close to the viewer (7.2 km, 11 km and 13.5 km respectively) and are positioned above a prominent ridgeline. Knowehead and Mellock Hill overlap and may be read as a single feature in the landscape. These three developments result in the obvious presence of wind turbines – though in a limited extent of the south to southeast portion of the view. The sensitivity of this landscape is not considered to be effected by the presence of these developments, and is therefore considered to be medium. As discussed, the proposed Burnfoot Hill wind farm has a negligible scale of impact on the landscape from this viewpoint. It is considered that Burnfoot Hill has a **Minor** impact on the landscape in conjunction with both the consented Braes of Doune development and the all the other proposals.

Impact on Visual Amenity

8.8.81 The visual receptors at this viewpoint will be road-users, considered to be of medium sensitivity to landscape change. Given the negligible magnitude of change predicted above, the impact on visual amenity will be **Minor**.

8.8.82 Likewise the cumulative impact on visual amenity arising from Burnfoot Hill together with the consented Braes of Doune development and with all the other wind farms proposals would be **Minor**.

Viewpoint 11: Minor road on east side of Crieff. Grid Reference 188037, 721630

Location

8.8.83 This viewpoint is located on the minor road to the east of Crieff and is representative of views obtained from the edge of the town and related minor road network.

Existing View

8.8.84 The existing view is included as a photograph in **Figure 8.20, Volume 3**. The fore-ground and mid-ground of this view are flat, homogenous and largely indistinct from one another. There are few point features to draw the eye, because although the fields include hedgerow boundaries, these are largely devoid of mature trees. The far-ground and horizon are formed by a broad

valley slope and distant Ochil hills. However, at this viewing distance the undulations in the horizon are indistinct and this is therefore a fairly flat landscape.

Predicted View

- 8.8.85 The wireframe illustration presented as part of **Figure 8.20** suggests that there would be a long-range view of the proposed wind farm (17.9 km to the nearest turbine). The wireframe suggests that 13 turbines would be visible presenting a mixture of blade-tips and full turbines. However, the turbines are grouped together and many would be back-clothed by the landform.
- 8.8.86 The predicted cumulative view is shown on the s on **Figures 8.42a, 8.42b and 8.42c, Volume 3**, which indicate that theoretically the proposed wind farms at Lochelbank, Knowehead, Snowgoat Glen, Mellock Hill, Littlelaw, Greenknowes, Braes of Doune and Abercairny may be visible from this location. As seen in the photography of the existing view on these Figures, a combination of buildings and vegetation in the immediate foreground mean that visibility of Abercairny is likely to be limited.

Impact on Landscape Character

- 8.8.87 This landscape is very open and large in scale, with few distinct features and the majority of the scene is managed for agriculture. Despite the man-modified land-use there are relatively few built elements within the distant view or vertical point features. Given the broad sweep and scale of the landform, and medium quality of the landscape at this viewpoint, it is considered to be of medium sensitivity to the introduction of vertical features. However, the magnitude of change predicted by the wireframe illustration is considered to be slight and the impact on landscape character from this viewpoint is considered to be **Moderate/Minor**.
- 8.8.88 The proposed wind farms associated with the Ochil Hills would be visible with Littlelaw the closest development at 15.6km. These wind farms would extend from the eastern edge of the Ochils at Lochelbank some 23km distant, to Greenknowes at over 16km distant, introducing what would appear as two isolated groups at either end with an agglomeration of turbines associated with the other sites between them, all of which would substantially alter the appearance of the ridge line defining the south side of the valley. Burnfoot Hill would be mainly back-clothed by Ben Cleuch and would not therefore break the skyline of this ridge. The edge of the Braes of Doune wind farm may be visible at the right hand edge of the view in **Figure 8.42b** at over 18km distant. The magnitude of cumulative change arising from Burnfoot Hill at over 17km and back-clothed by landform in the context of both the consented Braes of Doune wind farm and with Braes of Doune and all of the other

proposed wind farms is considered to be negligible and the cumulative impact on landscape character would be **Minor**.

Impact on Visual Amenity

- 8.8.89 The visual receptors at this viewpoint will be road-users, considered to be of medium sensitivity to landscape change, and residents on the outskirts of Crieff who are considered to be of high sensitivity. Given the slight magnitude of change predicted above, the impact on visual amenity for the road users will be Moderate/minor, and for the residents at properties with open views as illustrated, the impact on visual amenity would be **Moderate**.
- 8.8.90 As noted above, the cumulative magnitude of change arising from Burnfoot Hill in addition to the consented and with the other proposed wind farms would be negligible and the cumulative impact on visual amenity would be **Moderate/Minor** for residents and **Minor** for road users.

Viewpoint 12: Knockhill turnoff, Lethans Muir. Grid Reference 306217, 694332

Location

- 8.8.91 This viewpoint is located on the A832 at the entrance to Knockhill Racing Circuit, near Lethans Muir and is representative of views obtained by road users as well as those visiting the racing circuit.

Existing View

- 8.8.92 The existing view is presented in a photograph in **Figure 8.21, Volume 3**. The view is orientated along a shallow valley bound by generally concave slopes – although there is subtle variation in their form. The slopes, like the intervening valley bottom, are predominantly grassed on their lower reaches, with limited woody vegetation cover. Some of the upper slopes however, feature coniferous forestry. The valley floor and slopes form the fore to mid-ground of the view. The ground immediately adjacent to the view is dominated by a car park, surfaced with crushed stone, and similarly constructed tracks passing through newly planted trees and shrubs and regenerating scrub. These elements have a low visual quality, and detract from the value of the mid-ground valley landscape. This is offset somewhat by the spectacular scarp and ridge of the southern edge of the Ochil Hills visible in the far-ground.

Predicted View

- 8.8.93 The wireframe illustration presented as part of **Figure 8.21** suggests that there would be a long-range view of the proposed wind farm (17.5 km to the

nearest turbine). This is shown to include 4 turbines with blade-tips just breaking a central portion of the far horizon formed by the distant upland areas.

- 8.8.94 The predicted cumulative view is illustrated on **Figure 8.43, Volume 3**, which shows that the consented wind farm at Earlsburn may be visible on the left hand edge of the view in clear weather at a distance of over 36km, and the proposed wind farm at Greenknowes may be visible at the right hand side of the view at over 14km distant.

Impact on Landscape Character

- 8.8.95 This landscape is very open and large in scale. There is variety in landform, colour and texture and it is potentially of high value, although there are some discordant man-made elements in the foreground. The landscape is generally considered to be of high quality and the viewpoint location is within the Cleish Hills AGLV and of high sensitivity to the type of change that would be associated with a wind farm development. The magnitude of change to the landscape will be negligible and the impact on landscape character at this viewpoint is considered to be **Moderate/Minor**.

- 8.8.96 The cumulative magnitude of change arising from the Burnfoot Hill wind farm with the consented wind farm at Earlsburn and the proposed development at Greenknowes is considered to be negligible in view of the distance to the turbines and the limited extent to which they will be visible, although they will introduce a third group of turbines potentially visible from this location. The cumulative impact on landscape character is considered to be **Moderate/Minor**.

Impact on Visual Amenity

- 8.8.97 The visual receptors at this viewpoint will be road users, of medium sensitivity and visitors to the motor-circuit, who are considered to be of low sensitivity, as their attention will be focused on the racing activity. Considering the negligible change discussed above, the impact on these receptors' visual amenity will be **Minor** for the road users, and **Minor/Negligible** for the motor enthusiasts.

- 8.8.98 The cumulative impact on visual amenity will be similarly **Minor** for road users and Minor/negligible for those taking part or watching the racing at Knockhill.

Viewpoint 13: Knock of Crieff. Grid Reference 286807, 722886

Location

8.8.99 This viewpoint is located at Knock of Crieff, the hill immediately to the north of the town which is a well used open area with footpaths to the ridge and summit from the town. It is therefore representative of views obtained by residents and visitors enjoying this open, elevated ground close to the town.

Existing View

8.8.100 A photograph of the existing view is shown in **Figure 8.22, Volume 3**. The viewpoint is located on an elevated ridge within the mid-reaches of a highland glen. The fore to mid-ground of the view is composed of a mosaic of structural vegetation some of which is associated with a golf course, open pasture and the edges of Crieff. Beyond the town lies a flat, open strath – itself a mosaic of agricultural fields and woodland, and beyond that still, the Ochil Hills. This is a landscape of great contrast and variety in terms of colours, textures, topography and habitation, and is therefore of high interest.

Predicted View

8.8.101 The wireframe illustration presented as part of **Figure 8.22** suggests that there would be a long-range view of the proposed wind farm (19.3 km to the nearest turbine). The wireframe predicts visibility of 13 turbines, tightly grouped in the central area of the view, but back-clothed by the lowland hills.

8.8.102 The predicted cumulative view is shown on the wireframes on **Figure 8.44a, 8.44b and 8.44c, Volume 3**, which illustrate that the consented wind farm at Braes of Doune and the proposed wind farms at Lochelbank, Knowehead, Snowgoat Glen, Mellock Hill, Littlelaw, Greenknowes and Abercairny may be visible from this location, at distances varying between 4km at Abercairny to 25km at Lochelbank. The latter would be visible at the eastern end of the Ochils, separated from the other developments, with a central grouping comprising Knowehead, Snowgoat Glen, Mellock Hill and Little Law, with these developments appearing as an agglomeration of turbines with varying layouts apparent, followed by a more coherent grouping at Greenknowes. The Burnfoot Hill turbines would be largely back-clothed by landform. A limited number of turbines at Braes of Doune would be visible, with most of the Abercairny turbines visible occupying an extensive horizontal angle of view to the north east.

Impact on Landscape Character

8.8.103 This landscape is very open and vast in scale. There is a great deal of interest to draw the eye in both the fore, mid and far-ground. Given its scale and visual complexity, change in this landscape from this viewpoint could

potentially be accommodated. Nevertheless, this is a landscape of mosaics rather than single points of focus with few obvious vertical elements. The landscape at this viewpoint is therefore considered to be of high sensitivity to landscape change associated with wind farms. At this distant vantage point, it is considered that the magnitude of change from Burnfoot Hill would be slight and the impact on landscape character would be **Moderate/Minor** given the distance to the turbines and the fact that they would be back-clothed by landform.

8.8.104 The cumulative magnitude of change arising from Burnfoot Hill in addition to the consented wind farm at Braes of Doune and the other proposed wind farms which would be visible from this location is considered to be negligible. In view of the distance and back-clothed appearance of the proposed turbines at Burnfoot Hill, the cumulative impact on landscape character both for the baseline with the consented Braes of Doune development and with all of the proposed wind farms would be **Minor**.

Impact on Visual Amenity

8.8.105 The visual receptors from this viewpoint will be walkers including local residents and visitors to Crieff, who are considered to be of high sensitivity to landscape change – particularly when experiencing a high quality landscape such as this. However, with only a slight magnitude of change in landscape predicted from this viewpoint, the impact on the walkers' visual amenity is considered to be **Moderate/Minor** in view of the distance to the development and its back-clothed appearance.

8.8.106 Likewise, the cumulative magnitude of change arising from Burnfoot Hill in addition to the consented development at Braes of Doune and all of the other proposed wind farm developments which would be seen from this location is considered to be negligible and the cumulative impact on visual amenity would be **Minor**.

Viewpoint 14: A9 near Dunning. Grid Reference 303162, 718989

Location

8.8.107 This viewpoint is located on the A9 near Dunning and is representative of views obtained by road users.

Existing View

8.8.108 The existing view is presented in the photograph in **Figure 8.23, Volume 3**. The fore-ground and mid-ground of this view form a gentle slope towards the centre of a broad strath. The slight elevation of the road side viewpoint above the adjacent landscape, allows an appreciation of landmark features and scale

(particularly field boundaries and copse of woody vegetation) and of the mosaic of colours in the fields. As with Viewpoint 10, the foreground also includes a major road corridor, and the far-ground and horizon features the distinctive rolling topography of the Ochil Hills on the south side of the strath.

Predicted View

8.8.109 The wireframe illustration also presented as part of **Figure 8.23** indicates that there would be a long-range view of the proposed wind farm (20 km to the nearest turbine). The wireframe shows that the blade-tips of up to eight of the turbines will just break the far horizon.

8.8.110 The predicted cumulative view is presented in the wireframes on **Figures 8.45a, 8.45b and 8.45c, Volume 3**, which show that the proposed wind farms at Lochelbank, Tillyrie, Knowehead, Mellock Hill, Snowgoat Glen, Littlelaw, Greenknowes and the consented wind farm at Braes of Doune would all be visible from this location, at distances of between 7.7km in the case of Knowehead and over 30km at Braes of Doune. The wind farm proposals in the Ochil Hills would extend from Lochelbank at the left hand side of the view, on the eastern end of the Ochils to Greenknowes to the right hand side of the central panel in the sequence. The turbines at these various developments would appear as three main groupings with the central largest agglomeration of turbines.

Impact on Landscape Character

8.8.111 This landscape is very open and large in scale. Despite the relatively gentle visual transition between mid-ground strath and the hills in the far ground, the latter remains a dominant feature within the landscape at this viewpoint. This ridge of hills is sensitive to change associated with wind farm development, but the overall scene – including the busy road – is not. Overall the landscape from this viewpoint is considered to be of medium quality, and have a medium sensitivity to change. However, the magnitude of change is considered to be negligible given the limited number of blade tips that would be visible at a distance of over 20km, and the impact on landscape character from this viewpoint is therefore considered to be **Minor**.

8.8.112 Similarly, the additional magnitude of cumulative change arising from the proposed wind farm at Burnfoot in conjunction with the other consented and proposed developments is considered to be negligible and the cumulative impact on landscape character would also be **Minor**.

Impact on Visual Amenity

8.8.113 The visual receptors from this viewpoint will be road-users, considered to be of medium sensitivity to landscape change. Given the negligible magnitude of change predicted above, the impact on visual amenity will be **Minor**.

8.8.114 Likewise, as noted above, the negligible magnitude of cumulative change will give rise to a **Minor** cumulative impact on visual amenity attributable to Burnfoot Hill at this location.

Viewpoint 15: Methven, A85. Grid Reference 302099, 725801

Location

8.8.115 This viewpoint is located on the A85 on the west side of Methven.

Existing View

8.8.116 The existing view is presented in the photograph in **Figure 8.24, Volume 3**. The immediate fore-ground of the view is formed by the A85 road corridor and adjacent hedgerow. The fore-ground and mid-ground take the form of gently rolling pasture punctuated by low agricultural buildings and occasional hedgerow trees. There is little variation in colour or texture, and this emphasises the rolling, predominantly horizontal nature of the landscape. Although there is a far horizon formed by a ridge of hills, this is too distant to allow differentiation of detail, and again this emphasises the horizontality of the scene.

Predicted View

8.8.117 The wireframe illustration also presented as part of **Figure 8.24** predicts that there would be a long-range view of the proposed wind farm (25 km to the nearest turbine). The wireframe also predicts that thirteen turbines will be visible on the distant hill-sides, but mostly back-clothed by the landform.

8.8.118 The predicted cumulative view is illustrated on **Figures 8.46a and 8.46b, Volume 3**, which show that the proposed wind farms at Lochelbank, Tillyrie, Knowhead, Mellock Hill, Snowgoat Glen, Littlelaw and Greenknowes as well as the consented development at Braes of Doune and the proposed Burnfoot Hill development may be visible from this location. The nearest of these would be Lochelbank at just over 14km to the south east and Braes of Doune would be over 37km to the west south west and therefore only likely to be visible in clear weather conditions.

Impact on Landscape Character

8.8.119 The landscape at this viewpoint is open and of a large scale. However, long-distance views are partly obscured by the intervening, rolling pastures. This is a working, agricultural landscape, and there is obvious evidence of human influence with the road and (at the very edge of the frame) farm buildings, although there are few strong vertical elements within the view. This landscape is considered to be of medium sensitivity to the type of change associated with wind farm development. However, the magnitude of change predicted by the wireframe illustration is slight, and the impact on landscape character from this viewpoint is therefore considered to be **Moderate/Minor**.

8.8.120 The cumulative magnitude of change arising from Burnfoot Hill together with all the other consented or proposed wind farms is also considered to be slight, in view of its distance from the viewpoint location and the closer proximity of the other proposals in the Ochil Hills. The cumulative impact on landscape character would be **Moderate/Minor**.

Impact on Visual Amenity

8.8.121 The visual receptors from this viewpoint will be residents on the western edge of Methven, of high sensitivity and road-users, considered to be of medium sensitivity to landscape change. As the magnitude of landscape change is predicted above to be slight, and given the distance to the Burnfoot turbines, the impact on residents' visual amenity will be **Moderate/Minor** and **Minor** for road users.

8.8.122 Similarly, the slight magnitude of cumulative change would give rise to a **Moderate/Minor** cumulative effect on visual amenity for residents, and **Minor** for road users.

Viewpoint 16: Kippen. Grid Reference 265428, 694507

Location

8.8.123 This viewpoint is located just to the south of Kippen, and is considered to be representative of views experienced by road users and residents in the area.

Existing View

8.8.124 The existing view is presented in the photograph in **Figure 8.25, Volume 3**. The foreground is composed of gently rolling pasture and a minor road separated by a field boundary (post and wire stock-proof fencing). The mid-ground is formed by an oblique view of agricultural fields and structure planting within a strath. Further in the distance, the landscape features the distinctive mass of the Ochil Hills, including the spectacular southern scarp.

This is therefore a landscape composition where contrast and interest is mainly through topography, rather than colour and texture.

Predicted View

8.8.125 The wireframe illustration also presented as part of **Figure 8.25** suggests that there would be a long-range view of the proposed wind farm (25.8 km to the nearest turbine). The wireframe predicts that the blade-tips of two turbines will just break the horizon of the distant Ochil Hills.

8.8.126 The predicted cumulative view is illustrated in the view presented in **Figure 8.47, Volume 3**.

Impact on Landscape Character

8.8.127 The landscape at this viewpoint is open and of a large scale. Again, this is a working agricultural landscape with obvious evidence of human influence – the road, boundaries and electricity poles. The southern escarpment of the distant hills provides the key point of landscape interest, and is therefore highly sensitive to change. However, overall the composition is heavily influenced by man, and there are some vertical point features. Overall, this landscape is considered to be of medium sensitivity to the type of change associated with wind farm development. The magnitude of change is considered to be negligible, and therefore the impact on landscape character from this viewpoint is considered to be **Minor**.

8.8.128 At this viewpoint, the cumulative illustration at **Figure 8.47** predicts that, in addition to the proposed Burnfoot Hill wind farm, a further development – Braes of Doune – will also be visible. Braes of Doune will be located on the distant horizon some 16.5 km from the viewer and will not alter on the essential character or sensitivity of the landscape to further wind farm development at this viewpoint. The proposed development at Burnfoot Hill would result in a negligible additional change in the landscape character at this viewpoint. The cumulative impact on landscape character is therefore considered to be **Minor**.

Impact on Visual Amenity

8.8.129 The visual receptors from this viewpoint will be residents on the outskirts of Kippen and road-users, considered to be of high and medium sensitivity respectively to landscape change. As the magnitude of landscape change is predicted to be negligible, the impact on these receptors' visual amenity will be **Moderate/Minor** for residents and **Minor** for users of the local road network.

8.8.130 The additional presence of Burnfoot Hill to the consented Braes of Doune wind farm would result in a negligible cumulative magnitude of change to the landscape character at this viewpoint. The cumulative impact on visual amenity would be: **Moderate/Minor**, for residents and Minor for road users.

Viewpoint 17: A81 South of Callander. Grid Reference 263404, 705845

Location

8.8.131 This viewpoint is located on the A81 just to the south of Callander. It is considered to be representative of views experienced by road users from this point.

Existing View

8.8.1 The existing view is shown in the photograph in **Figure 8.26, Volume 3**. The foreground is composed of flat pasture and a road separated by a field boundary (wire fence and un-mown verge). The mid-ground is dominated by mature deciduous vegetation and conifer plantation with glimpsed views of a farmhouse and the A84 road corridor. Views to the far-ground are limited: although the southern edge of the Highlands is visible, the Ochil Hills are screened through the conifer plantations. The landscape is mainly composed of horizontals, generally lacking vertical features.

Predicted View

8.8.1 The wireframe illustration in **Figure 8.26** predicts that there would be a long-range view of the proposed wind farm (26.5 km to the nearest turbine) with blade-tips of 10 turbines just breaking the horizon of the distant Ochil Hills. However, the photograph of the existing view suggests that these turbines will be screened by coniferous vegetation.

8.8.2 The predicted cumulative view is illustrated in the view presented in **Figure 8.48, Volume 3**, which shows that Braes of Doune would be visible at 9.2 km from the viewer.

Impact on Landscape Character

8.8.3 The viewpoint lies within the Trossachs AGLV, as well as the Loch Lomond and Trossachs National Park. The landscape at this viewpoint is dissected by linear features, particularly mature lines and edges of vegetation. These features effectively foreshorten the view and reduce the scale of the landscape, which is considered to be medium. The emphasis of horizontals will obviously be altered through the introduction of wind turbines. This landscape is judged to be of high sensitivity to change associated with wind farms. However, the magnitude of change is considered to be negligible – the wind farm has a minimal presence in the bare-ground figure, and would be

screened by existing conifers. Given the negligible magnitude of change and the medium sensitivity of this landscape, the proposed wind farm is considered to have a **Moderate/Minor** effect on landscape character.

- 8.8.4 From this viewpoint, it is predicted that 36 turbines at Braes of Doune will be clearly visible and prominent on the far horizon at just over 9km distance. Although prominent, its limited horizontal extent means that, overall, the essential character and sensitivity of the landscape at this viewpoint remains high. The proposed Burnfoot Hill development would give rise to a negligible cumulative magnitude of change on the character of this landscape over and above that associated with Braes of Doune and the cumulative impact on landscape character is therefore considered to be, **Moderate/Minor**.

Impact on Visual Amenity

- 8.8.1 The visual receptors at this viewpoint will be road-users, considered to be of medium sensitivity to landscape change. As the magnitude of landscape change is predicted to be negligible, the impact on the visual amenity of the road users will be **Minor**.
- 8.8.2 As the additional presence of Burnfoot Hill would result in only a negligible magnitude of change to the landscape character at this viewpoint, the cumulative impact on the visual amenity with the consented Braes of Doune wind farm is considered to be **Minor**.

Viewpoint 18: Cowdenbeath. Grid Reference 263404, 705845

- 8.8.3 This viewpoint is located on the western edge of Cowdenbeath, and is considered to be representative of views experienced on this urban edge by residents, road users and farm workers.

Existing View

- 8.8.1 The existing view is shown in the photograph in **Figure 8.27, Volume 3**. The foreground is composed of predominantly flat pasture bound by a mature hedgerow boundary and (nearest the point of view) a post and wire stock-proof fence. The fore-ground also includes agricultural buildings and storage (just out of frame) as well as electricity poles. The mid-ground is largely obscured by hedgerow, though high-voltage electricity pylons beyond the hedgerows tower above the vegetation. The far-ground features a mosaic of agricultural fields and conifer plantations and forms a gently undulating ridge horizon.

Predicted View

- 8.8.1 The wireframe illustration in **Figure 8.27** indicates that there would be a long-range view of the proposed wind farm (26.3 km to the nearest turbine). The wireframe predicts that the blade-tips of 2 turbines will just break the

horizon. However, the photograph of the existing view shows that these turbines would be screened by the deciduous hedgerow vegetation. Because of the highly limited extent of visible turbines, and their distance from the point of view, it is likely that they will be screened by the bare branches of this vegetation in the winter.

- 8.8.2 The predicted cumulative view is illustrated in the views presented in **Figures 8.49a and 8.49b, Volume 3**, which show that Mellock Hill, Knowehead and Tillyrie would be visible from this location at distances over 16km.

Impact on Landscape Character

- 8.8.1 This is a landscape of little visual interest. The scene from this viewpoint is medium to large scale, and the views semi-enclosed to open, depending upon the extent of intervening vegetation. The landscape features a number of man-made elements which are utilitarian but of low visual quality. The high voltage pylons are a key component – introducing strong verticality into a predominantly horizontal scene. Overall this landscape is considered to be of low sensitivity to the type of change associated with wind farm development. The change to the landscape is considered to be negligible. The impact on landscape character from this viewpoint is therefore considered to be **Minor/Negligible**.
- 8.8.2 The photography of the existing view suggests that all of the cumulative wind farms will be screened by intervening vegetation or, in the case of Tillyrie, buildings. Given that these wind farms are unlikely to be prominent in the landscape, the sensitivity of the landscape is unaltered and Burnfoot Hill will have **Minor/Negligible** cumulative impact on landscape character at this viewpoint.

Impact on Visual Amenity

- 8.8.1 The visual receptors from this viewpoint will be: residents considered to be of high sensitivity, road-users, considered to be of medium sensitivity to landscape change; and agricultural workers, considered to be of low sensitivity to landscape change. As the magnitude of landscape change is predicted to be negligible, the impact on the visual amenity of the residents, road users, and workers will be **Minor, Minor/Negligible** and **Negligible** respectively.
- 8.8.2 As the additional presence of Burnfoot Hill would result in negligible magnitude of cumulative change to the landscape character at this viewpoint, the cumulative impact on the visual amenity will be: **Minor** for residents, **Minor/Negligible** for road users and **Negligible** for agricultural workers.

Viewpoint 19: West Lomond Trig Point. Grid Reference 319665, 706653

Location

- 8.8.3 This viewpoint is located at the western edge of the Lomond Hills to the east of the M90 corridor. This view is considered to be representative of those experienced by walkers in this area.

Existing View

- 8.8.1 The existing view is shown in the photograph in **Figure 8.28, Volume 3**. The foreground is composed of gently undulating pasture, but this quickly gives way to dramatic views over a broader strath landscape of fields, woodland and Loch Leven. The flat expanse of the loch and strath-lands gradually give way to the distant Ochil Hills. However at the centre of the view, the transition from Strath to igneous hills is not gradual but dramatic – the distinct scarp forming a visual counterpoint to the loch. This is a landscape of high diversity and interest, with a sense of remoteness and drama.

Predicted View

- 8.8.1 The wireframe illustration in **Figure 8.28** suggests that up to 13 of the turbines just break the horizon along the ridge of the Ochils in the centre of the view. This is a long-distance view of the wind farm (the closest turbine is 29km from the viewpoint).
- 8.8.2 The predicted cumulative view is illustrated in presented in **Figure 8.50, Volume 3**, which shows that theoretically the consented wind farms at Braes of Doune and Earlsburn would be visible together with the proposed developments at Abercairny, Greenknowes, Littlelaw, Lochelbank, Mellock Hill, Knowehead, Snowgoat Glen, and Tillyrie would be visible from this location. Both Braes of Doune and Earlsburn would be over 40km distant and would therefore only be seen under very clear weather conditions. Similarly Abercairny would be over 34km distant, with the other proposed developments between 9km (Lochelbank and Tillyrie) and 20km (Greenknowes).

Impact on Landscape Character

- 8.8.1 This is a landscape of high quality and visual interest. It is also a landscape of very large scale with extensive views and occurs within the Loch Leven AGLV. From this viewpoint, this landscape is therefore considered to be of high sensitivity to change associated with wind farm development. However, the negligible magnitude of change at almost 30km distance is considered to result in a **Minor** impact on landscape character.
- 8.8.2 The two consented developments are at such considerable distance as to be of negligible visibility from this location. The four proposed developments

within 15 km (Lochelbank, Knowehead, Snowgoat Glen and Tillyrie) are scattered across a landscape of very large scale and with extensive views. Only Tillyrie and Lochelbank (at 9.5 and 9.7 km distance respectively) are likely to form distinct features in the landscape. Even here these developments are back-clothed and dominated by the surrounding higher ground that would be visible in clear weather conditions. Furthermore, all the cumulative developments fall within a limited portion of the view from this viewpoint (west/south west to northwest) and therefore are limited in horizontal extent. The sensitivity of this landscape is not considered to be affected by these developments due to the massive scale of the landscape, and the limited extent of turbines in the overall scene. Burnfoot Hill is located some 29 km from the viewer, and would only be visible in clear weather conditions, compared to the much closer proposals at the east end of the Ochil Hills and therefore will have **Minor/Negligible** cumulative impact on landscape character at this viewpoint.

Impact on Visual Amenity

8.8.1 The visual receptors from this viewpoint will be walkers, considered to be of high sensitivity to landscape change. As the magnitude of landscape change is predicted to be negligible, the impact on the visual amenity of the walkers is considered to be **Minor**.

8.8.2 As the additional presence of Burnfoot Hill would result in a negligible magnitude of change to the landscape character at this viewpoint, the cumulative impact on the visual amenity will be **Minor/Negligible** for high sensitivity walkers.

8.9 SUMMARY OF IMPACTS

8.9.1 A summary of the impacts of the Burnfoot Hill Wind Farm with regard to landscape can be found below in **Table 8.4, Table 8.5** and **Table 8.6**.

Table 8.4 Summary of Effects on Landscape Character

View-point number	Viewpoint	Landscape Sensitivity	Magnitude of Change	Effect on Landscape Character
1	Glen Bee	Medium	Substantial	Major/Moderate
2	Lower Glendevon Reservoir	Medium	Substantial	Major/Moderate
3	Ben Cleuch	Medium	Substantial	Major/Moderate
4	A823 Glendevon	High	Moderate	Moderate
5	Innerdownie Hill	Medium	Moderate	Moderate

6	Gleneagles Hotel Grounds	High	Slight	Moderate/Minor
7	Gleneagles Hotel Roof	High	Slight	Moderate/Minor
8	Greenloaning	Medium	Negligible	Minor
9	B827	Medium	Moderate	Moderate
10	Dalreoch	Medium	Negligible	Minor
11	Minor road on east side of Crieff	Medium	Slight	Moderate/Minor
12	Knockhill turnoff, Lethans Muir	High	Negligible	Moderate/Minor
13	Knock of Crieff	High	Slight	Moderate/Minor
14	A9 near Dunning	Medium	Negligible	Minor
15	Methven, A85	Medium	Slight	Moderate/Minor
16	Kippen	Medium	Negligible	Minor
17	A81 South of Callander	High	Negligible	Moderate/Minor
18	Cowdenbeath	Low	Negligible	Minor/Negligible
19	West Lomond Trig Point	High	Negligible	Minor

Table 8.5 Summary of Effects on Visual Amenity

View-point number	Viewpoint	Visual Receptor Sensitivity	Magnitude of Change	Effect on Visual Amenity
1	Glen Bee	Walkers: High	Substantial	Major
2	Lower Glendevon Reservoir	Anglers: Medium	Substantial	Major/Moderate
3	Ben Cleuch	Walkers: High	Substantial	Major
4	A823 Glendevon	Road Users: Medium	Moderate	Moderate
5	Innerdownie Hill	Walkers:	Moderate	Major/Moderate

		High		
6	Gleneagles Hotel Grounds	Visitors: High Golfers: High	Slight	Moderate/Minor
7	Gleneagles Hotel Roof	Visitors: High	Slight	Moderate/Minor
8	Greenloaning	Road Users: Medium	Negligible	Minor
9	B827	Road Users: Medium	Moderate	Moderate
10	Dalreoch	Road Users: Medium	Negligible	Minor
11	Minor road on east side of Crieff	Residents: High Road Users: Medium	Slight	Moderate Moderate/Minor
12	Knockhill turnoff, Lethans Muir	Road Users: Medium Motor-Circuit Visitors: Low	Negligible	Minor Minor/Negligible
13	Knock of Crieff	Walkers: High	Slight	Moderate/Minor
14	A9 near Dunning	Road Users: Medium	Negligible	Minor
15	Metven, A85	Residents: High Road Users: Medium	Slight	Moderate/Minor Minor
16	Kippen	Residents: High Road Users: Medium	Negligible	Moderate/Minor Minor
17	A81 South of Callander	Road Users: Medium	Negligible	Minor
18	Cowdenbeath	Residents: High	Negligible	Minor

		Road Users: Medium Agricultural Workers: Low		Minor/Negligible Negligible
19	West Lomond Trig Point	Walkers: High	Negligible	Minor

Table 8.6 Cumulative Viewpoint Analysis

Vpt Number	Viewpoint	Wind farms visible	Direction to the wind farm	Distance to the wind farm (km)	Cumulative magnitude of change attributed to Burnfoot Hill and other wind farms	Landscape Character Sensitivity at the Viewpoint	Cumulative effect on landscape character	Visual receptor sensitivity	Cumulative effect on visual amenity	
3	Ben Cleuch	Braes of Doune	N/W	19.3	Substantial	Medium	Moderate	Walkers - High	Moderate	
		Earlsburn	W/SW	23.5						
		Abercairny	N	25						
		Greenknowes	NE	9.1						
		Knowehead	NE	15.4						
		Littlelaw	NE	11.9						
		Lochelbank	NE	24						
		Mellock Hill	NE	11.2						
		Snowgoat Glen	NE	13.6						
		Tillyrie	E/NE	21						
									Major/Moderate	Major

4	A823 Glendevon	Greenknowes	NE	2	Slight	High	Moderate	Road Users – Medium	Moderate
5	Innerdownie Hill	Braes of Doune	N/NW	24.2	Slight	Medium	Moderate	Walkers - High	Moderate
		Abercairny	NW	23.1	Moderate				
		Greenknowes	E/NE	3.7					
		Mellock Hill	NE	4.6					
		Knowehead	NE	8.7					
		Littlelaw	N	6.2					
		Lochelbank	NE	17.1					
		Snowgoat Glen	NE	7.5					
		Tillyrie	NE	14.3					
		Abercairny	N	25					
Gleneagles Hotel Grounds	NE	9.1	High	Moderate/Minor	Visitors – High Golfers - High	Moderate/Minor			
Littlelaw	NE	11.9							
Snowgoat Glen	NE	13.6							
7	Gleneagles Hotel Roof	Braes of Doune	NW	18.1	Slight	High	Moderate/Minor	Visitors – High	Moderate/Minor
		Abercairny	N	13.9	Slight				

8	Greenloaning A9	Greenknowes	SE	6.6	Medium	Minor	Road Users - Medium	Minor	Moderate	Minor
		Littlelaw	E/SE	6.6						
		Snowgoat Glen	E	8.6						
9	B827	Braes of Doune	W/NW	10	Medium	Moderate	Road Users - Medium	Minor	Moderate	Minor
		Earlsburn	SW	24.7						
		Abercairny	N/NE	19.6						
10	A9 Dalreloch	Snowgoat Glen	E/NE	17.5	Medium	Negligible	Road Users - Medium	Minor	Moderate	Minor
		Greenknowes	E/SE	15.8						
		Littlelaw	E/SE	16.4						
10	A9 Dalreloch	Mellock Hill	E/SE	18.8	Medium	Negligible	Road Users - Medium	Minor	Moderate	Minor
		Braes of Doune	W/SW	27.3						
		Abercairny	NW	12.1						
10	A9 Dalreloch	Knowehead	SE	7.2	Medium	Negligible	Road Users - Medium	Minor	Moderate	Minor
		Littlelaw	SE	7.5						
		Lochelbank	E/SE	10.7						
10	A9 Dalreloch	Mellock Hill	SE	9.1	Medium	Negligible	Road Users - Medium	Minor	Moderate	Minor
		Snowgoat Glen	SE	6.2						

11	Minor road east of Crieff	Braes of Doune	SW	18.4	Negligible	Medium	Minor	Residents - High Road Users - Medium	Moderate/Minor
		Abercairny	NE	4.1	Negligible		Minor		Moderate/Minor
		Greenknowes	SE	16.6					
		Knowehead	SE	18.9					
		Littlelaw	SE	15.6					
		Lochelbank	SE	23.5					
		Mellock Hill	SE	19.1					
		Snowgoat Glen	SE	16.6					
		12	Knockhill turnoff, Lethans Muir	Earlsburn					
Greenknowes	NW			14	Negligible	Moderate/Minor	Visitors To The Motor Circuit - Low	Minor	
Braes of Doune	SW			18.2	Negligible	Minor	Walkers - High	Minor	
13	Knock of Crieff	Abercairny	SE	3.9	Negligible	High			Minor
									Minor

14	A9 near Dunning	Greenknowes	SE	18.4	Negligible	Medium	Minor	Road Users – Medium	Minor
		Knowehead	SE	20.6					
		Littlelaw	SE	17.4					
		Lochelbank	SE	25.1					
		Mellock Hill	SE	20.9					
		Snowgoat Glen	SE	18.3					
		Braes of Doune	W/SW	30.9					
Greenknowes	SE	12.7	Slight	Medium	Moderate/Minor	Residents – High	Moderate/Minor		
Knowehead	SE	7.7							
Littlelaw	SE	9.9							
Lochelbank	SE	8.8							
Mellock Hill	SE	10.5							
Snowgoat Glen	SE	8.4							
Tillyrie	SE	12.3							
15	Methven A85	Braes of Doune	SW	37					

	Greenknowes	S/SE	18.7	Slight		Moderate/Minor	Road Users – Medium	Moderate/Minor	Minor
	Knowhead	S/SE	14.6						
	Littlelaw	S/SE	16.3						
	Lochelbank	S/SE	14.4						
	Mellock Hill	S/SE	17.3						
	Snowgoat Glen	S/SE	14.9						
	Tillyrie	S/SE	18.7						
16	Kippen	SW	16.5	Negligible	Medium	Minor	Residents – High Road Users – Medium	Moderate/Minor Minor	
17	A81 south of Callander	NE	9.2	Negligible	High	Moderate/Minor	Road Users – Medium	Moderate/Minor	
18	Cowden- beath	W	45	Negligible	Low	Minor/Negligible	Residents – High Road Users – Medium	Minor	

19	West Lomond Trig Point	Knowehead	NW	18.4	Negligible	High	Minor/Negligible	Agricultural Workers - Low	Negligible	Minor/Negligible
		Mellock Hill	NW	16.5						
		Tillyrie	NW	17						
		Braes of Doune	W	46	Negligible	High	Minor/Negligible	Walkers - High	Minor/Negligible	
		Earlsburn	SW	52.8						
		Abercairny	NW	34	Negligible	High	Minor/Negligible	Walkers - High	Minor/Negligible	
		Greenknowes	W	20.8						
		Knowehead	W	14.3						
		Littlelaw	W	19.6						
		Lochelbank	NW	9.7						
		Mellock Hill	W	15.4						
		Snowgoat Glen	W	13.5						
		Tillyrie	W	9.5						

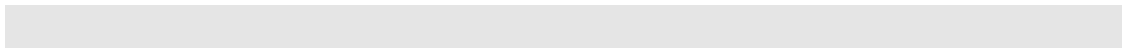
8.10 SUMMARY AND CONCLUSIONS

- 8.10.1 The landscape and visual assessment has established that the proposed Burnfoot Hill wind farm will change the landscape and visual baseline conditions during its construction and operational phases. The proposed wind farm will introduce a group of 13 turbines of 102m to blade tip into the Lowland Hills associated with Ochils in Clackmannanshire.
- 8.10.2 The construction phase of the development will be relatively short, lasting approximately 12 months, and will have mainly temporary effects on the landscape and visual amenity of the study area.
- 8.10.3 The direct effects to the landscape fabric within the application site boundary will be limited with the main affected areas arising from approximately 5.9km of new on site access track and related crane hardstandings; up to three borrow pits and construction of the main components of the wind farm, namely the turbines, anemometer mast and switchgear building.
- 8.10.4 Attention to potential landscape and visual effects was given in the design layout optimisation process, including considering the sensitivity of the main southerly escarpment of the Ochils and related hill foot towns to minimise visibility of the turbines, and the more general effects on the Ochil Hills AGLV. In addition the layout was optimised to respond to the landform of the site itself whilst taking account of key technical and other environmental constraints, such as sensitive habitats (as detailed in the Design Statement, **Appendix 4.1, Volume 4**).
- 8.10.5 Within the study area, there are 27 landscape character areas. Significant effects on landscape character would be limited to 5 of these, comprising: CTR1 Lowland Hills; CTR4 Lowland River Valleys; TAY6 Lowland Hills; TAY8 Igneous Hills and TAY10 Broad Valley Lowland – in other words the lowland hills and intervening broad valleys of the Midlands Valley that form the immediate context (i.e. within 10km radius) of the site.
- 8.10.6 There would be no significant effects at any statutory designated landscape including the Lomond and the Trossachs National Park, the River Earn NSA to the west of the study area. Nor would there be any significant effects on landscape character on the locally designated Fife Regional Park at the eastern edge of the study area. There would be no significant effects on landscape character at 8 of the 9 AGLVs in the study area, with significant effects confined to limited parts of the Ochils AGLV in close proximity to the site (Viewpoint 3 is 1.5km from the proposed wind farm).

- 8.10.7 There would be no significant effects on landscape character at any of the sites included in the Inventory of Historic Gardens and Designed Landscapes in the study area.
- 8.10.8 The ZTV analysis has identified that there would be an area of visibility immediately surrounding the site extending for approximately 3 km to the north and south, approximately 5 km to the west and 10 km to the east. Beyond this, due to the topography of the Ochils, there is an extensive area where the wind farm would not be seen, both on the south side of the Ochil escarpment and to the north. Most of the main settlements close to the site would have no views of the turbines including Stirling, Alloa, Tillicoultry, Dollar and Kinross as well as the slightly more distant Dunblane and Dunfermline. Settlements on the north side of the Strathallan valley would have some visibility, including Crieff (approximately 25km to the north of the proposed wind farm), Auchterarder (approximately 9.5 km to the northeast) and the western fringe of Perth and surrounding villages such as Methven (approximately 25 km to the northeast). The detailed viewpoint assessment has identified that there would be significant effects on visual amenity close to the site, at distances up to 6km, but beyond this the wind farm would not have any significant effects on visual amenity.
- 8.10.9 As illustrated in **Table 8.6**, the cumulative assessment has identified that simultaneous and sequential cumulative effects will occur as a result of the Burnfoot Hill wind farm with the consented developments at Braes of Doune and Earlsburn as well as with the proposed wind farms at Abercairny, Greenknowes, Knowhead, Littlelaw, Lochelbank, Mellock Hill, Snowgoat Glen and Tillyrie.
- 8.10.10 Due to the limited intervisibility of Burnfoot Hill with Braes of Doune and Earlsburn and the distance between these developments, it is not predicted that there would be any significant cumulative effects arising from Burnfoot with the consented wind farms.
- 8.10.11 Although all of the proposed wind farms together with the consented developments would give rise to extensive cumulative visibility, Burnfoot Hill has limited visibility, most of which occurs at considerable distance from the site. Accordingly, significant cumulative effects on landscape character and visual amenity are only predicted at one location, Ben Cleuch, which is at 1.5km from the nearest turbine at Burnfoot Hill, arising from Burnfoot Hill with the consented developments at Braes of Doune and Earlsburn as well as all of the proposed developments. At all other 16 viewpoints with predicted visibility of more than one of the above developments, Burnfoot Hill would not give rise to significant cumulative effects on landscape character or visual amenity.

8.10.12 Significant cumulative effects on landscape character would therefore be confined to limited parts of the Lowland Hills and Broad Valley Lowland LCAs with visibility of the site and one or more of the other developments. Similarly, significant cumulative effects on visual amenity would be confined to a small part of the Ochil Hills, including Ben Cleuch and the hills to the north towards Glen Bee and eastwards to Innerdownie Hill.

8.10.13 Any new wind farm development may result in potentially significant effects on landscape and visual amenity. In the case of the Burnfoot Hill proposal, these are very limited and confined to a relatively small area, in close proximity to the site.



9 ECOLOGICAL ASSESSMENT

9.1 INTRODUCTION

9.1.1 The specific objectives of the ecological and ornithological assessments were to:

- Undertake breeding bird surveys of the Burnfoot Hill proposed wind farm site, to determine the numbers of birds present, and approximate breeding locations.
- Undertake wintering bird studies to determine the birds that may be affected by the proposed development at that time of year.
- Undertake a Phase 1 vegetation survey and identify the National Vegetation Classification (NVC) communities present.
- Undertake appropriate protected species surveys.
- Collate appropriate additional information on the site's ecological interests.
- Evaluate the conservation importance of the site, assess the likely significant effects of the development on the site's ecology and recommend mitigation measures if necessary.

9.1.2 The SNH guidelines on surveys methods to assess wind farm impacts on bird communities (Whitfield *et al.* 2005) have been followed during the ornithological work where appropriate. The assessment methodology used is that drafted by SNH and BWEA (Percival *et al.* 1999, SNH/BWEA 2002).

9.2 THE STUDY AREA

9.2.1 The site is located 5km north of Tillicoultry, in Clackmannanshire. The ecological study areas were chosen to include all areas within the potential zone of ecological influence of the proposed wind farm. This was defined to include the area within at least 500m of the proposed turbine locations for the bird studies (covering an area of 5.9km²), and within 100m for the other surveys (covering an area of 2.8km²). The wintering bird studies were extended to cover the Upper Glendevon Reservoir and its surrounds, as this was likely to hold the main key wintering bird interest.

9.2.2 The study area is predominantly open upland habitat, including extensive acid grassland and smaller areas of blanket bog. The Upper Glendevon reservoir lies to the north-east of the site.

9.3 CONSERVATION DESIGNATIONS IN THE VICINITY OF THE STUDY AREA

9.3.1 There are two statutorily protected sites within 5km of the proposed wind farm site, as shown in **Figure 9.1, Volume 3**. These are:

- Dollar Glen SSSI – 3km south-east;
- Mill Glen SSSI – 3.8km south.

9.3.2 Neither of these would be affected by the proposed development.

9.3.3 In addition there is one important site just outside 5km from the proposed wind farm, also shown in **Figure 9.1, Volume 3**:

- South Tayside Goose Roost Ramsar Site, SAC, SPA, SSSI – 6km N - details of its qualifying interests are given in **Table 9.1**. The main potential for an effect on this site would be if the Upper Glendevon reservoir were used as an alternative roost site by the geese and they over-flew the wind farm site in large numbers. There is no suitable goose feeding habitat within 1km of the proposal site, so disturbance to feeding birds would not be an issue.

Table 9.1. Citation species for the South Tayside Goose Roosts SPA.

Species	5-year mean peak count (SPA Review)	% flyway population
Pink-footed Goose	43,300	19.2%
Greylag Goose	3,667	3.7%

All are cited for their wintering populations in excess of 1% of the relevant flyway population (i.e. internationally important numbers)

9.4 BREEDING BIRD SURVEY

9.4.1 The main breeding bird survey was carried out in 2004 using the standardised upland bird survey technique (Brown and Shepherd 1993), but with an additional third survey visit. The three survey visits were made on: 27th April, the second on 18th May and the third on 18th June. Two observers were used on each visit.

9.4.2 During the surveys all bird locations and behaviour were mapped to 1:10,000 scale, using the standard Common Birds Census notation. Supplementary behavioural observations and notes were made to determine breeding locations as accurately as possible. Surveys were undertaken at a standardised rate of 20-25 minutes per half-kilometre square. The surveys were carried out between 0830 and 1800 hours, avoiding strong winds, heavy rain, fog and low cloud. Birds were located by walking, listening and scanning by eye and with binoculars. Birds were considered to be breeding if singing, displaying, carrying nest material, nests or young found, repetitively alarmed adults, disturbance displaying, carrying food or in territorial dispute.

9.4.3 The survey data were used to obtain population estimates for all of the bird species breeding on the site (**Table 9.2**). Maps were produced of the breeding pairs recorded during each visit and these were combined to produce an estimate of the overall breeding population for each species. Pairs were considered separate from each other if greater than 1km (waterfowl and raptors), 500m (pigeons, gamebirds and crows) or 200m (all other species) apart, with this distance reflecting the relative distance that birds might move between survey visits.

9.4.4 Initial consultations with SNH and RSPB, and an initial assessment of the habitats present indicated that the area may be used by black grouse, so specific survey work was undertaken for this species following the standard methodology of Gilbert et al. (1998). These were carried out on 27th and 28th April 2004, No other additional species-specific surveys were identified as likely to be required. In particular, the lack of any substantial heather cover meant that the site was very unlikely to be used by nesting hen harrier, merlin or short-eared owl.

Table 9.2. Breeding bird population estimates in the Burnfoot Hill breeding bird study area, 2004.

Species	Map symbol	Number of pairs	Density (pairs per km ²)
Mallard	MA	2	0.3
Goosander	GD	1	0.2
Kestrel	K	1	0.2
Red Grouse	RG	1	0.2
Black Grouse	BK	1	0.2
Oystercatcher	OC	2	0.3
Lapwing	L	1	0.2
Snipe	SN	2	0.3
Curlew	CU	5	0.9
Common Sandpiper	CS	1	0.2
Woodpigeon	WP	11	1.9
Skylark	S	71	12.2
Swallow	SL	9	1.6
House Martin	HM	6	1.0
Meadow Pipit	MP	210	36.2
Grey Wagtail	GL	3	0.5
Pied Wagtail	PW	8	1.4
Dipper	DI	3	0.5
Wren	WR	4	0.7
Robin	R	1	0.2
Wheatear	W	20	3.4
Blackbird	B	1	0.2
Whitethroat	WH	1	0.2
Carrion Crow	C	15	2.6
Chaffinch	CH	2	0.3

Species	Map symbol	Number of pairs	Density (pairs per km ²)
Reed Bunting	RB	2	0.3
Additional species seen over-flying/using the site:		<i>Peak count</i>	
Buzzard		2	
Black-headed gull		3	
Common gull		4	
Lesser black-backed gull		2	
Herring gull		5	
Swift		9	
Jackdaw		12	

- 9.4.5 The distribution of the breeding birds within the study area is shown within **Appendix 9.2, Volume 4** on **Figures A.9.2.1 to A.9.2.5**. The more abundant species (those with more than 10 pairs) have been presented separately for clarity.
- 9.4.6 Skylarks and carrion crows were widely distributed across most of the study area, as illustrated in **Figures A.9.2.1 and A.9.2.2, Volume 4**.
- 9.4.7 Meadow pipits were found to be abundant across the whole study area, as illustrated **Figure A.9.2.3, Volume 4** shows.
- 9.4.8 Wheatears were frequent in the northern and southern edges of the study area but less so in the central part, as illustrated in **Figure A.9.2.4, Volume 4**.
- 9.4.9 Of the less abundant species, as **Figure A.9.2.5, Volume 4** shows, most were associated with the lower ground within the study area, particularly Backhills farm, the fringes of the Upper Glendevon reservoir and the streams draining into it. The higher open ground in which the wind farm would be located held few of these species.
- 9.4.10 No black grouse were recorded during the specific surveys, indicating a lack of any important lek sites. However a single male was seen during the Brown and Shepherd survey on the lower ground to the north of Burnfoot Hill (as shown on **Figure A.9.2.5, Volume 4**), so this species may have been breeding within the study area (and has been assumed to be such for the purposes of this assessment).
- 9.4.11 None of the species identified by SNH as key considerations for a wind farm development were recorded during the surveys, with the exception of one red-listed UK BAP priority species, black grouse. No evidence was found of any breeding activity of any species protected under Schedule 1 of the

Wildlife and Countryside Act, any species listed on Annex 1 of the EU Birds Directive or any red-listed non-passerine (other than black grouse).

9.5 WINTERING BIRDS

- 9.5.1 An initial desk study indicated that the Upper Glendevon reservoir has held a large night roost of pink-footed geese at times in the past, with a peak count of 7,360 (Bell et al. 1998, Mitchell and Hearn 2004). It appears to have been used mainly as an alternative roost to Carsebreak Loch when that site was disturbed by shooting. There was a frequent occurrence in the 1960s and 70s but from the information available appears now to be rather less common, probably as a result of increased protection of Carsebreck Loch (which is now part of the South Tayside Goose Roosts SPA). No recent counts were found of any large flocks roosting on the Upper Glendevon reservoir (Pollitt et al. 2003, Mitchell and Hearn 2004, Rowell 2005).
- 9.5.2 As a result, a programme of winter fieldwork was carried out. The main issues for which baseline data were required were goose numbers roosting on the Upper Glendevon reservoir and their flight routes to/from their feeding grounds (likely to be lowland agricultural land in Strathallan to the north-west of the study area; Mitchell and Hearn 2004). The wintering bird study focussed on these species potential issues. Twelve survey visits were carried out at approximately fortnightly intervals during October 2003 – April 2004, with each visit timed to include either a dawn or dusk survey when the geese would be likely to be moving between roosting and feeding areas. In addition to the geese any other species of conservation interest were also recorded (including all waterfowl and birds of prey).
- 9.5.3 The main survey was undertaken using the standard vantage point methodology (Whitfield et al. 2005), from a vantage point at NN914042 overlooking the main areas of potential interest, the Upper Glendevon Reservoir and the proposed wind farm site. All of the goose flights and those of other species of conservation interest noted over-flying were recorded, including their direction and height of flight, and position in relation to the proposed wind farm. These observations were made during standard 30-minute periods (Morrison 1998), with a total of 48 of these carried out in total. This was in line with current SNH guidance at the time (Whitfield 2003). Though this is less than the current recommendation (36 hours) it was still clearly sufficient in this instance given that the main potential issue, geese, were not observed at all.
- 9.5.4 The counts for each species are summarised in **Table 9.3**. The Table gives the peak count for each species, its importance based on this peak, and the mean over-flying rate observed (a) across the whole study area and (b) across the potential collision risk zone (taken, as per current SNH guidance and the wind farm plus a 200m buffer). Overall only low numbers of wintering birds

were encountered during the field surveys, and no important concentrations of birds were noted. In particular no geese at all were seen.

9.5.5 The overall status of each of the key species of conservation interest noted during the 2003/04 winter fieldwork has been summarised in **Table 9.3**. There were no records of any goose species. Three species were seen in regionally important numbers, goosander, hen harrier and peregrine. Of these, only peregrine was seen within the proposed wind farm site (a single over-flying bird). Other records of target species seen over-flying the proposed wind farm site comprised single records of curlew, and two records of kestrel and raven. The raw data are given in **Appendix 9.3, Volume 4**.

Table 9.3. Wintering bird populations of target species recorded in the study area during October 2003-April 2004, and observed over-flying.

Species	Mean over-flying rate (whole study area): no/hr	Mean over-flying rate (WF + 200m): no/hr	Peak count	Importance (based on peak count)	Comments on occurrence in the study area winter 2003/04
Mallard	0.75	0	4		
Goldeneye	0.13	0	2		
Goosander	0.83	0	27	Regional	Peak count regionally important.
Hen Harrier	0.08	0	1	Regional	Single bird sufficient to reach regional importance. Only seen on one date (Oct 03).
Buzzard	0.25	0	2		
Kestrel	0.13	0.08	1		
Peregrine	0.04	0.04	1	Regional	Single bird sufficient to reach regional importance. Only seen on one date (Dec 03).
Snipe	0.04	0	1		
Curlew	0.38	0.04	7		
Raven	0.13	0.08	2		

Conservation Evaluation: Breeding Birds

- 9.5.6 The breeding bird survey data were evaluated to determine the conservation value of the birds breeding in the study area. This was based on the criteria adopted by SNH in Guidelines for Selection of Biological SSSIs (JNCC 1995), using 1% of the resource to define national and regional importance. The national and regional breeding populations were taken from Gibbons *et al.* (1993). A further category of 'local importance' was used for species that did not reach regional importance but were still of some ecological value. For bird species this included all species on the red or amber lists of the RSPB' *et al.*'s (2002) 'Birds of Conservation Concern' that did not reach national or regional importance at the site.
- 9.5.7 The conservation importance of the breeding bird populations using the study area is summarised in **Table 9.4**. This table includes all the species noted during the surveys that have at least low conservation value (i.e. at least low sensitivity using the criteria in **Appendix 9.1**). The species included in the table are those that occurred within the possible zone of impact of the proposed wind farm. For the purposes of the assessment, this was taken 300m for breeding birds and 600m (the maximum distances at which birds have been shown in reliable studies to have been affected at existing wind farms in the breeding and non-breeding seasons respectively; Langston and Pullan 2003). Additional species that were only observed over-flying the study area, rather than specifically using it, have also been considered.
- 9.5.8 The breeding bird community within the study area was not particularly notable, with no species listed on Schedule 1 of the Wildlife and Countryside Act, no EU Birds Directive Annex 1 species, and only 3 UK BAP priority species (black grouse, skylark and reed bunting; all 3 are also on the RSPB *et al.*'s 2002 Red List) and a further 10 amber-listed species (see **Table 9.4**). The only species identified by SNH in their current guidance as a target species for wind farm assessments was black grouse, though this related only to a single record of a single male and no leks were found within the study area.
- 9.5.9 The value of the overall breeding bird assemblage was evaluated using the standard JNCC (1995) scheme. Each species listed for the main habitat within the study area (upland moorland and grassland with water bodies) was scored according to the order of magnitude of its British population and these scores were summed to give a total for the site. This overall score was then compared with the threshold for consideration as a SSSI for this habitat category, as a reference for judging its importance. If it reached the SSSI threshold then it would be deemed to be nationally important, if it reached 50% of that threshold then it would be deemed to be regionally important. The breeding bird assemblage score was 19.5. The contribution from each species is shown in **Table 9.4** below. This value is below the threshold for national importance (34) but exceeds the threshold for regional importance

(17) for this habitat, upland moorland and grassland with water bodies (JNCC 1995). The score for the potential impact zone of the proposed wind farm (i.e. within 300m) was only 9, well below the threshold for regional importance.

Conservation Evaluation: wintering birds

9.5.10 The conservation importance of the wintering bird populations using the study area is summarised in **Table 9.4**. The wintering bird study area did not support any wintering bird populations with any link to an SPA. Two high sensitivity species were recorded, hen harrier and peregrine, but both records were only of single birds on one date. The study area was clearly not important to either of these species. A further medium sensitivity species was also recorded, goosander, but this species was restricted to the reservoir outside the area that could possibly be affected by the wind farm.

Table 9.4 Conservation evaluation of the bird populations in the Burnfoot Hill wintering and breeding bird study areas.

Species		SPA species	>1% regional population	EU Birds Directive Annex 1	Red List	Amber List	UK BAP priority species	Sensitivity
Breeding species:	Breeding pairs within 300m							
Goosander ^{3.5}	0							None
Kestrel	0					✓		Low
Red grouse ¹	0					✓		Low
Black grouse ³	1				✓		✓	Medium
Oystercatcher	0					✓		Low
Lapwing	0					✓		Low
Snipe ²	1					✓		Low
Curlew ²	1					✓		Low
Common sandpiper ²	0							None
Skylark	29				✓		✓	Medium
Swallow	0					✓		Low
House martin	0					✓		Low
Meadow pipit	76					✓		Low
Grey wagtail ²	0					✓		Low
Dipper ²	0							None
Wheatear ²	2							None

Species		SPA species	>1% regional pop-ulation	EU Birds Directive Annex 1	Red List	Amber List	UK BAP priority species	Sensitivity
Reed Bunting	0				✓		✓	Medium
Wintering species:	Peak count within 600m							
Goldeneye	0					✓		Low
Goosander	0		✓					Medium
Hen harrier	0		✓	✓	✓			High
Kestrel	2					✓		Low
Peregrine	1		✓	✓		✓		High
Snipe	0					✓		Low
Curlew	1					✓		Low

Note: superscript numbers refer to contribution to the breeding bird assemblage score

9.6 HABITAT SURVEY

9.6.1 An extended Phase 1 survey of the study area was carried out during July 2004, with additional notes made to identify the National Vegetation Classification (NVC) communities present, following English Nature guidelines (JNCC 1993). The survey route was planned to ensure that all visually distinct habitats within the survey boundary were visited. The habitats were recorded as both Phase 1 habitat definitions (for the purpose of mapping) and NVC category (where appropriate within the proposed wind farm site). A species list was compiled for each habitat to assist with this (see **Appendix 9.4, Volume 4**) and a series of representative quadrats were sampled in each (following the standard NVC method of Rodwell *et al.* 1992a, 1992b). Specific searches were made for rare, uncommon and local plants.

9.6.2 The following criteria were used to determine national rarity. All follow the English Nature procedural recommendations (1) nationally rare; found in no more than fifteen 10x10km squares in Great Britain, and (2) nationally scarce; found in between sixteen and one hundred 10x10km squares in Great Britain (data on national distribution from Preston *et al.* 2002). In addition a species or community was considered important at the national scale if more than 1% of the national resource was found at the site, or if it was protected under Schedule 8 of the Wildlife and Countryside Act (1981). Regional value was defined as more than 1% of the county resource, and local value as noteworthy ecological value but not sufficient to reach regional importance. Any priority species/habitat under the EU Habitats Directive and/or the UK or local BAP was attributed medium sensitivity.

9.6.3 The Phase 1 survey map is shown in **Figure 9.2, Volume 3**, and the NVC map in **Figure 9.3, Volume 3**. Each of the Phase 1 habitats and the National Vegetation Classification communities that were recorded at the site are described in **Table 9.5**. Details of all the vegetation data collected from each of the main habitats are given in **Appendix 9.4, Volume 4**.

Table 9.5. Phase 1 habitats and NVC communities recorded in the Burnfoot Hill ecology study area

Phase 1 class	NVC category	Dominant species, comments and status.
Acid grassland	U2a	Wavy hair-grass dominant, with heath bedstraw. Fairly widespread but local distribution through lowlands and upland fringe. Local BAP habitat.
""	U4a	Sweet vernal and wavy hair-grass abundant. Virtually ubiquitous in sub-montane zone in Britain. Local BAP habitat.
Blanket bog	M17c	Deergrass abundant, with hare's tail cotton grass, wavy hair-grass and <i>Sphagnum</i> bog mosses. Widespread in W. Britain. EU Priority Habitat and UK BAP priority habitat.
""	M20a	Cotton grasses abundant, with good cover of <i>Sphagnum</i> bog mosses. Found locally throughout northern Britain. EU Priority Habitat and UK BAP priority habitat.
""	M20b	Abundant hare's-tail cotton grass and wavy hair-grass, with good cover of <i>Sphagnum</i> bog mosses. Found locally throughout northern Britain. EU Priority Habitat and UK BAP priority habitat.
Acid flush	M4	Bottle sedge swamp, with <i>Sphagnum</i> bog mosses. Widespread but local throughout north-west Britain. EU Priority Habitat and UK BAP priority habitat.
Marshy grassland	MG10a	Soft rush abundant, with wavy hair-grass and sweet vernal grass. Ubiquitous throughout the British lowlands. UK BAP priority habitat.
""	M23b	Soft rush dominant with abundant star moss. UK BAP priority habitat.
Improved grassland	MG7b	Perennial ryegrass dominant, with white clover. Ubiquitous through Britain.
Conifer plantation	n/a	Sitka spruce plantation devoid of under-story vegetation.

9.6.4 **Rare species:** No plant species were found that are nationally rare or scarce. Generally the habitats were species-poor. One species was found that was determined to be regionally important:

- Mossy saxifrage *Saxifraga hypnoides* on rocky sections of the Grodwell Burn (at NGR NN911017).

9.6.5 Species found that were classed as locally important were:

- *Sphagnum* bog mosses – frequent and widespread in acid flush and blanket bog habitats.
- Heath spotted orchid *Dactylorhiza maculata* - found at NGR NN913032
- Mountain pansy *Viola lutea* - found occasionally along the Greenholm, Grodwell and Brioch Burns;
- Common butterwort *Pinguicula vulgaris* – found occasionally beside the Grodwell Burn;
- Marsh lousewort *Pedicularis palustris* - found occasionally beside the Grodwell Burn;
- Aspen *Populus tremula* on the crags at White Craig (at NGR NN895036);

9.6.6 **Community evaluation:** most of the vegetation communities found in the study area are common and widespread both within the region and across Scotland as a whole (Rodwell et al. 1992a and 1992b). The status of each is summarised in **Table 9.5** above. All have a widespread distribution. The blanket bog is important as a priority habitat requiring special conservation measures in the Habitats Directive (EU 1992), and is a UK and local BAP priority habitat. Therefore its take by the development has been minimised, though as it is found extensively across the site some take has been inevitable. However it should also be noted that the quality of bog within the site is generally low, with very little cover of heather or any other dwarf shrubs, probably as a result of heavy sheep grazing and drainage.

9.6.7 Two further habitats also reach medium sensitivity through their listing as UK and local BAP priority habitats; rush pasture (marshy grassland) and acid flush. These have been treated as caution areas and avoided as much as possible. Acid grassland is a local BAP habitat.

9.7 PROTECTED SPECIES

9.7.1 This section of the ecological assessment reviews the information available on other protected species that may be affected by the proposed wind farm. A range of additional protected species surveys were undertaken by Young Associates (Environmental Consultants) Limited [YA], covering the proposed wind farm site plus a 500m buffer zone, and the proposed site access route. Details of the findings are illustrated in **Figure 9.4, Volume 3**. Full details of the report are given in **Appendix 9.5, Volume 4**. These surveys were undertaken during 16-18 June 2004 and included:

- Carrying out an evaluation of the habitats present, how they are managed and their potential to provide a suitable environment for a protected species;

- Searching for physical evidence of a protected faunal species such as footprints, hairs, droppings, spraints, latrines, pellets; nests, roosts, holts, burrows, setts; vocal noises; feeding stations and food remains.
- Recording all signs of protected or notable faunal or floral species of fauna and flora; and
- Assessing the level of use of the site by a protected species based on any evidence discovered.

9.7.2 The protected species survey searched for protected species of plant, mammal (i.e. badger, otter, water vole, red squirrel and bats), amphibian, reptile, and butterflies.

Badgers

9.7.3 Badgers are protected under the Protection of Badgers Act 1992, which makes it illegal to kill or injure the animals themselves and to damage their setts. English Nature (2002) state in their guidelines that heavy machinery should not be used within 30m of a sett, and similar restrictions would be applicable in Scotland.

9.7.4 Detailed searches were made for badger setts, foraging signs, latrines, tracks (including breach points at fences), footprints and hairs. There was no evidence of badger activity within the study area. In general, there was a lack of suitable habitat for badger in the study area as the soils were too wet and peaty or too thin and stony to make them suitable for sett construction.

9.7.5 The only potential area for badger appear to be Silver Glen woodland on the southern edge of the survey area (on the lower parts of the Ochil Hills scarp slope), where there are areas with deep soft soil (often vegetated by bracken) that are well suited to the construction of deep burrows by badgers.

Bats

9.7.6 All bat species are included on Schedule 5 of the Wildlife and Countryside Act 1981 (as amended) and Schedule 2 of the Conservation (Natural Habitats and Countryside) Regulations 1994. Britain is also a signatory to the Agreement on the Conservation of Bats in Europe (Bonn Convention), which extends the responsibility to the protection of their key feeding areas.

9.7.7 Bats are generally dependent on the presence of either man-made structures or mature trees with suitable crevices for summer roosting. They prefer sheltered areas for foraging at the edges of woodland and by watercourses and waterbodies. Hence, the majority of the survey area with its open, exposed hillsides does not provide suitable bat habitat.

- 9.7.8 However, there are some specific locations that do have good bat potential. At the northern edge of the study area there are buildings (such as Backhills Farm, NN913035) and mature conifers planted beside Upper Glendevon Reservoir (NN910042) that have good bat potential for roosting, hibernation and for foraging. The southern part of the study area on the scarp slope of the Ochil Hills also has very good bat habitat potential.
- 9.7.9 There are many large old buildings (some disused) at the northern edge of Alva that have both bat roost and hibernation potential. Moreover, the Silver Glen woodland has potential bat roosts in the form of mature trees with crevices. But what is especially notable about the area are several long disused mine workings by the Silver Burn (NS892976) that are securely protected from human access. Thus, they have excellent potential to form bat hibernacula.

Otter

- 9.7.10 The otter is protected in the UK by Schedules 5 and 6 of the Wildlife and Countryside Act 1981 and it is illegal to intentionally kill, take or injure an otter, intentionally disturb an otter in its place of shelter and intentionally damage, destroy or obstruct access to a place of shelter.
- 9.7.11 The otter is also a European protected species, protected by the EC Habitats Directive and the Conservation (Natural Habitats &c) Regulations 1994. This means it is illegal to damage or destroy an otter shelter, whether intentionally or not, and to deliberately disturb an otter.
- 9.7.12 A detailed survey for otter on the main watercourses in the survey area was carried out. These include the Silver Burn on the Ochils scarp slope, and the Greenhorn, Muckle and Grodwell Burns that drain the Burnfoot Hill area. No evidence of otter, such as the presence of spraints, holts, slides and footprints, was encountered. Nevertheless, the watercourses that drain the central and northern parts of the survey area provide potentially good otter habitat for the creation of holts and foraging ground. Most notably, the watercourses drain into the Upper and Lower Glendevon Reservoirs, which are artificially stocked with fish, which makes them highly attractive to otters.

Water Vole

- 9.7.13 Water voles are protected under Schedule 5 of the 1981 Wildlife and Countryside Act and is a priority species for conservation in the UK Biodiversity Action Plan. This protection covers damage/destruction of their place of shelter/protection and disturbance to the animals whilst they are in these shelters. They have been reported to have declined widely in Britain but are still widespread in their distribution. They live primarily in close (within

1m) proximity to water, along ditches and riverbanks (Corbet and Harris 1991, Lawton and Woodruffe 1991).

- 9.7.14 A detailed survey was carried out for water vole in the main and minor watercourses and man-made ditches in the survey area, looking for burrows, runs, latrines, feeding lawns and other feeding signs.
- 9.7.15 No evidence of water vole activity was discovered and the majority of the water courses in the area were unsuited to water vole burrow construction with their banks composed of compacted boulder clay.
- 9.7.16 Nevertheless, it is pertinent to point out that water vole populations have been recently recorded in watercourses in locations in the Eastern Highlands of Scotland (Raynor, 2004) where upland habitats are typified by rough acid grassland and blanket bog. These habitats are generally comparable with those of the survey area.

Red Squirrel

- 9.7.17 The red squirrel is listed on Schedule 5 and 6 of the Wildlife and Countryside Act 1981 (as amended). Schedule 5 listing makes it an offence to kill, injure, take or sell the animal or parts of it, or to damage, destroy or obstruct access to their resting places. Schedule 6 listing restricts certain methods of killing, taking or injuring. The red squirrel is also listed on Appendix III of the Bern Convention; however, it is not listed on the Annexes of the EC Habitats Directive.
- 9.7.18 No evidence was found of red squirrel in the survey area. Grey squirrels are common in the Silver Glen woodlands to the eastern margin at the southern part of the cable route. Hence, it is possible to conclude that there is a very low likelihood of red squirrels also being present in the woodland, as they rarely co-exist with greys.

Amphibians and Reptiles

- 9.7.19 Specifically protected amphibian and reptile species include great crested newt and adder. The great crested newt is an internationally important species and is listed on Annexes II and IV of the EC Habitats Directive and Appendix II of the Bern Convention. It is also listed under schedule two of the Conservation (Natural Habitats and Countryside) Regulations 1994 and schedule five of the Wildlife and Countryside Act 1981 (as amended).
- 9.7.20 Adders are listed under Schedule 5 of the Wildlife and Countryside Act 1981 (as amended) meaning that it is illegal to deliberately kill, injure, take from the wild or trade adders.

- 9.7.21 Close inspection was made for all species of amphibians and reptiles throughout the survey area, including wet grassland and bog areas for amphibians (including bog pools) and south facing well-drained areas for reptiles. No evidence was collected for either group.

Butterflies

- 9.7.22 The large heath butterfly is a partially statutory protected species of butterfly known to be present in localised sites in the Ochil Hills (Kirkland, 2004). Hence, the species was specifically surveyed during the survey, and the weather during much of the survey was suitable conditions for flying butterflies. No indications were found to that could directly indicate its presence in the area. Nevertheless, suitable habitat within the survey area comprises the fringes of blanket bog areas.

Other Species

- 9.7.23 There is a small population of mountain hare within the survey area and individuals were noted to the south of Ben Buck (NN899012) and at the very northern edge of the area on the road to the east of Upper Glendevon Reservoir dam. Clackmannanshire Council's mountain hare action plan (Hulbert et al, 2004) highlights that the species is locally rare in the Ochil Hills compared with populations in the more extensive Scottish highlands. Hence, their conservation is actively encouraged in the area, but they are not statutorily protected.

9.8 ASSESSMENT OF ORNITHOLOGICAL EFFECTS

- 9.8.1 The methodology on which this ecological assessment is based is given in full in **Appendix 9.1, Volume 4**.
- 9.8.2 There are three ways in which the proposed wind farm might have an adverse effect on birds: direct loss of habitat, increased mortality rate through collision with the turbines and loss of habitat through disturbance. Each is discussed in turn.

Direct habitat loss

- 9.8.3 There would be a very small loss of habitat resulting from the construction of the wind farm. Full details of the loss of each habitat are given in the habitat assessment section below. Overall, in terms of loss of ornithological habitat, this loss would be an effect of negligible magnitude, with only a very small area taken up by the turbine bases, access tracks and other associated works. The site design process has ensured that such effects on the local bird populations would be of negligible magnitude, and would therefore not be significant.

Collision risk

- 9.8.4 There have been some examples of wind farms with particular characteristics that have caused bird mortalities through collision but their characteristics are very different from those at the proposed Burnfoot Hill site.
- 9.8.5 Most notably, at Altamont Pass in California and Tarifa in southern Spain, large numbers of raptors have been killed (Thelander et al. 2003, SEO/Birdlife 1996, Janss 1998). Both of these wind farms are characterised by very large numbers of wind turbines (about 7,000 at Altamont and about 700 at Tarifa), which are predominantly of an old design (small turbines with a fast rotational speed rotors relatively close to the ground and with turbines often packed close together). Many also have lattice towers, which can provide a perch particularly for raptors, attracting them into the collision risk zone. Both areas support high densities of bird species that are susceptible to collisions with wind turbines, and species for which a small additional mortality has the potential to result in an impact at the population level. At Altamont the wind turbine bases themselves have proved to be ideal for burrowing small mammals such as gophers, attracting birds of prey to feed within the collision risk zone (Thelander et al. 2003).
- 9.8.6 In upland wind farm sites in the UK, in circumstances more similar to the Burnfoot Hill site, collision rates have generally been very low (Meek et al. 1993, Tyler 1995, Dulas 1995, EAS 1997, Bioscan 2001). No overhead power lines will be needed in order to make the grid connection (the whole route will be under-grounded), so these would not be a further source of collision risk
- 9.8.7 The very low level of bird flight activity recorded and lack of importance of the area for any species likely to be vulnerable to collision meant that it was not necessary to undertake any collision risk modelling to inform this assessment. The results were clear without needing to use this tool.
- 9.8.8 No very high sensitivity bird species were recorded during any of the baseline studies, but there are past records of flocks of pink-footed geese roosting on the Upper Glendevon reservoir. This species has therefore been treated as very high sensitivity in this assessment, as these birds could be ecologically linked to the South Tayside Goose Roosts SPA. It was however concluded that even if such flocks did use the reservoir to roost in the future, the risk of collision would be only negligible because:
- The Upper Glendevon reservoir is not a particularly important or regularly used roost site. There are only a small number of records, and it was not selected for inclusion in the South Tayside Goose Roosts SPA;

- The main goose feeding area in the region is to the north-west of the study area. If geese did roost on the Upper Glendevon reservoir then this is where they would be most likely to feed. Their most likely flight route would follow the valleys in order to minimise their energy expenditure. There would be no need to fly over the higher ridges when these – including the proposed wind farm site – are not on their route to their feeding areas. Therefore even if did use Upper Glendevon reservoir as a roost, would be very unlikely that would over-fly the wind farm site in sufficient numbers to be at significant risk of collision.
- The evidence from existing wind farms on goose collision risk suggests that the numbers of these birds that would need to be passing regularly through a wind farm would need to be very high in order for significant mortality to occur. Only 4 goose collisions have been documented in monitoring studies from any wind farms anywhere in the world (1 brent goose, in the Netherlands, Musters et al. 1996, and 3 Canada geese in the United States, Erickson et al. 2001, Kingsley and Whittam 2003). Thus very low numbers of actual goose collisions have been recorded, despite geese being abundant in areas where several wind farms have been constructed and where they are subject to high exposure to collision risk (such as Buffalo Ridge – Johnson et al. 2000 - and the Klondike wind farms in the US – Johnson et al. 2003, Kreekrak in the Netherlands – Musters et al. 1995, Urk in the Netherlands – Winkelman 1989 and on Gotland in Sweden – Percival 1998).

9.8.9 Two high sensitivity species, hen harrier and peregrine, were recorded over-flying the study area in winter, though only single birds on single occasions. With such a low level of use of the area it is clear that the collision risk to these species would be negligible and not significant.

9.8.10 A further high sensitivity species could potentially breed within the study area, barn owl. If this species were present only very small numbers would be involved (given the habitat present), and this species has not been shown to be particularly prone to collision risk with wind turbines (e.g. Erickson *et al.* 2001). Therefore the magnitude of the collision risk would be at most low and there would not, therefore, be a likelihood of any significant collision impact.

9.8.11 Three medium sensitivity species were found breeding within the study area, black grouse, skylark and reed bunting. Of these, black grouse is the only one that could potentially be affected by a wind farm (Langston and Pullan 2003, Whitfield et al. 2005). With the very low densities of black grouse recorded in the study area, the fact that the turbines will be widely spaced, their rotation speed will be relatively slow and the towers will be tubular and not guyed, it is very unlikely that collision would be a problem. It was concluded therefore that the risk of collision would be negligible. This conclusion is further supported by evidence from existing upland wind farms in Britain with similar bird densities and habitats, at Bryn Tytli, where no collision victims at

all were found (Tyler 1995) and Cemmaes, where a very low collision rate was recorded (Dulas 1995). Red grouse collisions with wind turbines have been reported at Novar in Inverness-shire (Bioscan 2001), but this was at a very low level and was clearly not significant.

- 9.8.12 Collisions with other structures associated with a wind farm could potentially cause rather more problems to the black grouse. Overhead power lines are known to pose a significant hazard to them (Bevanger 1995). However, all power lines within the black grouse range will be under-grounded to avoid this potential problem altogether. Fences can also pose a collision risk (Baines and Summers 1997); extra fencing planned as part of the project will be avoided as much as possible. Any significant adverse effects would be therefore be avoided.
- 9.8.13 Collision risk to the other two medium sensitivity species would be negligible and not significant, given the low densities in which they occurred and their behaviour at existing wind farms (Bioscan 2001, Langston and Pullan 2003, Percival 2005).
- 9.8.14 The low sensitivity species similarly occurred in small numbers and would be at low/negligible risk of collision, so significant impacts on these species would not occur.
- 9.8.15 Therefore overall it is predicted therefore that the risk of collision for any bird species of conservation importance would be at most low (and more likely negligible), and no significant impacts are predicted.

Indirect Habitat Loss (Disturbance)

- 9.8.16 Loss of habitat through disturbance could potentially affect a rather greater area than direct habitat loss. The maximum distance that wind turbines have been shown to affect breeding birds is 300m and non-breeding birds 600m (Gill et al. 1996, Percival 2000). Disturbance is likely to be greatest during construction.
- 9.8.17 Experience from existing UK upland wind farms have shown that many species are tolerant of the presence of wind turbines and not unduly disturbed by them. Some short-term displacement may occur following construction on species such as curlew but populations have subsequently re-established themselves (Bullen Consultants 2002).
- 9.8.18 Most other upland species that have been studied have not been significantly affected (Meek et al. 1993, Phillips 1994, Dulas 1995, Percival 2000). All species listed on Schedule 1 of the 1981 Wildlife and Countryside Act are protected from disturbance during the breeding season. It will be particularly important

therefore to ensure that construction activity will not disturb any of these species.

Breeding Birds

- 9.8.19 This could potentially affect a rather greater area than direct habitat loss. The maximum distance that wind turbines have been shown to affect breeding birds is 300m, though many studies have found no disturbance effect at all (Gill *et al.* 1996, Percival 2000). For the purpose of this assessment, 300m has been used for breeding birds as a worst case, to determine what the impacts would be if displacement of birds from this zone did occur. The bird populations that would be affected in such a case have been summarised in **Table 9.4** above.
- 9.8.20 Black grouse are a medium sensitivity and could potentially be displaced from a zone around the wind turbines. Experience from existing wind farms in the British uplands suggests that disturbance effects would be unlikely. Bird monitoring schemes have detected no significant problems associated with upland wind farms in Britain, including Ovenden Moor in West Yorkshire (EAS 1997), Bryn Tytli in Wales (Phillips 1994), and Orkney (Meek *et al.* 1993).
- 9.8.21 Though no specific studies have been carried out on black grouse, red grouse are clearly unaffected by wind turbines and occur commonly at a number of upland wind farms (Thomas 1999, Percival 2000). Black grouse were recorded at the Bowbeat wind farm in the Borders during construction (Percival and Percival 2003). Thus the most likely outcome for the local black grouse would be a similar lack of effect. This is particularly the case given that no lek sites were found within the study area.
- 9.8.22 Two other medium sensitivity species (but no Schedule 1 or Annex 1 species) were breeding within the study area, (skylark and reed bunting), and one of these (skylark) was found within the 300m zone. Only very small numbers of these species were found in a regional context, so any disturbance effects would be of at most low magnitude impact even taking a worst-case approach.
- 9.8.23 Experience from existing wind farms (Thomas 1999, Percival 2000, Langston and Pullan 2003) suggests that for these types of species such impacts would be unlikely, so in reality such a worst case would probably not occur, but even if it did, the impact would not be significant. No significant disturbance effect would be likely on any low sensitivity breeding species either.

- 9.8.24 There is potential nesting habitat for one high sensitivity species in the study area, barn owl. This species is protected from disturbance during the breeding season under Schedule 1 of the Wildlife and Countryside Act.
- 9.8.25 No birds were seen during the baseline surveys, but the buildings around Backhills Farm could possibly be used by this species in the future. As this is 800m from the nearest proposed wind turbine it would not be affected during the operational phase. However there would be potential for disturbance during the construction phase. Therefore if any construction activity were planned in this area during the breeding season (April-July), then further surveys should be carried out for this species to check whether it had moved into the area, and appropriate mitigation measures implemented if found (see below).
- 9.8.26 Two high sensitivity species were seen over-flying the study area, hen harrier and peregrine, though only single birds on single occasions. With regard to peregrine, there is no ecological reason to suggest that the proposed wind farm site would be particularly important for this species. It supports only a low density of grouse (a potentially important prey species), and no evidence of any racing pigeon flight route through site (another likely important prey species), and has no suitable nesting sites. As a result no significant disturbance effects on this species' foraging range would be predicted.
- 9.8.27 The study area is also very unlikely to be important for hen harrier, given the baseline survey results and the habitats present. In particular the lack of heather cover would mean that there is a lack of suitable nesting habitat and that foraging habitat would be scarce. This would equally apply to two other important upland-breeding species, merlin and short-eared owl. The heather within the study area is so sparse that it supports none of these birds' preferred nesting habitat, so the likelihood of their breeding in the study area in future years is very low.

Wintering Birds

- 9.8.28 The main wintering bird interest within the study area is the Upper Glendevon reservoir, mainly through its potential to support a pink-footed goose roost (which has been treated in this assessment as very high sensitivity). The distance from nearest turbine to the closest point of reservoir is 720m, which exceeds the largest distance that any reliable study has shown birds to be displaced from a zone around any existing wind farm (600m; Langston and Pullan 2003). Most of reservoir is further than 1km from the wind farm. Therefore if the geese did use the reservoir the disturbance effect of the wind farm would be negligible and not significant. There is no suitable goose feeding habitat within 1km of the wind farm, so possible disturbance to feeding birds is not an issue.

- 9.8.29 The nearest proposed wind turbine location is more than 6km from the South Tayside Goose Roosts SPA, so there would be no possible disturbance effect directly into this protected area. No other statutory protected areas lie within the zone that could possibly be affected by the proposed wind farm.
- 9.8.30 Hen harrier and peregrine – with only single records of each of these two high sensitivity species, the study area is clearly not important for either of these species, so any disturbance effects would be of at most negligible magnitude and not significant.
- 9.8.31 Regionally important numbers of goosander were seen on the Upper Glendevon reservoir (medium sensitivity). Given the distance between the reservoir and the wind farm (as discussed in the context of geese above), there would again for the same reasons be only a negligible disturbance effect on this species which would not be significant.
- 9.8.32 There were no additional species of conservation importance found wintering in the area that could be potentially subject to significant disturbance effects. Overall even if the birds within the potential disturbance zone were displaced, the extensive availability of similar alternative habitat in the area and its surrounds means that the ecological consequences for these generally mobile and wide-ranging species would be of at most low magnitude, and not significant.

Possible Barrier Effect

- 9.8.33 A further potential disturbance effect could be disruption to bird flight lines. Birds may see the wind farm and change their route to fly around (rather than through) it. This would reduce the risk of collision but could possibly have other effects, potentially making important feeding areas less attractive (by acting as a barrier to the birds reaching them) and (if diversions were of a sufficient scale) resulting in increased energy demand. This could be potentially significant if the wind farm was located on an important bird flight route, but it is clear from the baseline data that this is not the case. As a result any such effect would be of negligible magnitude and not significant.

9.9 ASSESSMENT OF ECOLOGICAL EFFECTS: VEGETATION & OTHER ECOLOGY

Main Habitat Sensitivities

- 9.9.1 The main habitat sensitivity within the study area is the blanket bog, which is classed as high sensitivity as a result of its priority status under the EU Habitats Directive. It is also listed as a UK and local BAP priority habitat. The blanket bog occurs widely across much of the open ground within the study area. It also supports several of the locally important plant species found

during the surveys. The EU Directive actually only includes 'active' blanket bog as a priority habitat. It has been treated in this assessment as if it were 'active' blanket bog, as it does have a remnant cover of *Sphagnum* bog mosses. Its overall quality however is low, as it has been affected by both drained and heavy grazing by sheep. The cover of dwarf shrubs such as heather is very sparse.

9.9.2 Two of the other habitats found within the study area reach medium sensitivity through their listing as UK BAP priority habitats, rush pasture (marshy grassland) and acid flush.

9.9.3 The acid grassland is a local BAP habitat.

9.9.4 One regionally important medium sensitivity plant species was noted during the surveys, mossy saxifrage. It had a very restricted distribution within the study area, however and was only found on rocky sections of the Grodwell Burn, outside area that would be affected by the development.

Assessment of possible effects of the wind farm

9.9.5 The areas of each habitat that will be lost as a result of each of the components of the development are summarised in **Table 9.6**. Any effects on the active blanket bog habitat have been minimised, as it has priority status under the EU Habitats Directive (giving it high sensitivity), even though it is only locally important (as much less than 1% of the regional resource is found within the study area). Given the extent of this habitat within the study area, some loss of blanket bog will be unavoidable. However, the magnitude of such a loss would be at most low and would be largely of the lower quality parts of that habitat, so the significance of the impact would be low (and hence not significant). Proven construction techniques will be used that minimise environmental damage and maintain the integrity of the peatland system. This will include the use of floating roads where the tracks cross deeper peat and other more hydrologically sensitive areas.

9.9.6 The other medium sensitivity habitats, acid flush and marshy grassland, have similarly been avoided as much as possible. Take of these will be of at most low magnitude and will not be significant.

Table 9.6. Direct habitat loss that will occur as a result of the proposed development. Areas are given in hectares.

Habitat	Turbine bases [no. of turbines]	Site tracks	Temporary compound	Switchgear building	Borrow pits	TOTAL
Acid grass	3.08 [11]	2.32	0.4	0.06	1.37	7.23

Blanket bog	0.56 [2]	0.93 *	0	0	0.3	2.29
Marshy grassland	0 [0]	0.3 *	0.5	0	1.79	2.59

* *track will be a floating road over more sensitive deeper peat areas within these habitats.*

9.9.7 As most of the plant species of nature conservation importance were found within the blanket bog and other medium sensitivity habitats, minimising the effects on these habitats will at the same time minimise the effects on these species. As the area supports an EU priority habitat (blanket bog) and two UK BAP priority habitats (acid flush and rush pasture), and some loss of some of these habitats will be unavoidable, mitigation measures will be implemented to ensure that there is a net gain in the conservation value of these habitats as a result of the proposed development (see below).

9.9.8 The locally important (local BAP) acid grassland and some of the locally important plant species may suffer some small losses as a result of the works for the turbines bases and the access tracks, but the magnitude of this impact would be at most low, given their wide extent over the study area and the small area of take that the wind farm would incur. Hence the impact on these would be of very low significance, and not significant.

Protected Mammals

9.9.9 No statutorily protected mammals, amphibians or reptiles were recorded within the study area during the surveys.

9.9.10 A range of potentially suitable bat habitats (roosts, hibernacula and foraging areas) were noted at the southern and northern edges of the survey area in the form of mature trees, buildings and disused underground workings (the latter in Silver Glen). For any trees that may be affected by development, a bat survey should be implemented by an experienced bat worker to ensure trees are not being used as roosts. It is important that the survey is carried out immediately prior to felling as bats are transient and may move roosts within one night.

9.9.11 Potentially suitable habitat was also identified for otter and water vole, though no signs of either were noted. Any effects on these species would therefore be unlikely. However, it is possible therefore that they could move into the area prior to construction, and if they did there could be significant effects through disturbance during construction and possible damage to breeding sites. Measures therefore need to be implemented to deal with such a possibility and ensure compliance with the nature conservation legislation.

9.9.12 The lack of any records of any protected mammals, amphibians or reptiles within the study area indicate that no significant effect on any such species is likely to occur. However, it is possible that some species may move into the area prior to construction, so the measures described below will be implemented to ensure that if they did, no significant effects would be likely to occur.

9.10 MITIGATION OF IMPACT

9.10.1 The key mitigation measure undertaken with regard to nature conservation interests is to select an area for the wind farm that:

- Is sufficiently distant from any statutorily protected sites to ensure that none are directly affected;
- Avoids any bird concentrations and main areas used by important species that may be particularly sensitive to a wind farm development;
- Avoids watercourses as much as possible;
- Minimises effects on peatland features.

9.10.2 Other mitigation measures comprise:

- No potentially disturbing wind farm construction works will be undertaken during the bird breeding season. It is possible that Schedule 1 bird species may move into the wind farm site in future years. Therefore a survey of these species within 1km of the development site will be undertaken immediately prior to construction, so that no construction activity takes place in proximity to active nest sites, ensuring compliance with the 1981 Wildlife and Countryside Act. All construction activity would be postponed within 500m of such sites if any were found.
- Use of floating roads where the site tracks cross deeper (>1m) peat and other more hydrologically sensitive areas.
- All cabling on open upland areas will be under-grounded, and the use of new fencing will be avoided to prevent bird collision risk.
- A pre-construction water vole survey will be carried out within 50m of where the watercourse crossings are proposed. If any are located in this area, no construction activity would be undertaken that would damage any active water vole burrows. In addition construction would be carried out during daylight hours to minimise disturbance to nocturnal wildlife, such as otter.
- Any crossing points of watercourses within the area be carefully designed and will include a facility to allow passage of otters and water voles.

- Further targeted survey work for otters will be undertaken prior to construction to ensure compliance with the Wildlife and Countryside Act. This will be carried out after/during a period of dry weather conditions and low water flows to maximise otter sign detectability. Detailed searches for otter holts will be carried out at all potential watercourse crossings. If any are located in this area, no construction activity would be undertaken that would damage any active otter holt.
- If any trees could be affected by development, a bat survey should be implemented by an experienced bat worker to ensure trees are not being used as roosts. It is important that the survey is carried out immediately prior to felling as bats are transient and may move roosts within one night.

9.10.3 Given the range of BAP species that occur within the site, additional measures to deliver a local nature conservation gain to these species will be implemented. This will include enhancement of the upland grassland and bog habitats to increase their nature conservation value, including blocking of grip drains to encourage re-wetting in areas that have been drained in the past and improve peatland quality, and reducing sheep stocking densities.

9.10.4 As a result of these measures, no significant effect on any protected mammal species is likely to occur.

9.11 MONITORING

9.11.1 Given the generally low bird numbers in proximity to the proposed wind farm and that no significant impact is likely, a monitoring programme would not be strictly necessary.

9.11.2 However, given the general lack of information about how birds are affected by wind farm developments in lowland farmland areas, a basic programme of bird monitoring will be undertaken in order to better understand any effects that may occur. Two years' breeding bird surveys after construction will be carried out, using the same methodology as the baseline data collection for the ES.

9.11.3 Bird distributions before and after construction will then be compared, in relation to the distance from the wind turbines, to determine whether any disturbance effect has taken place. Collision monitoring would be unlikely to yield any useful results, given the low bird numbers over-flying the site, and it is not therefore proposed. Similarly the low numbers of birds (and low frequency of occurrence) recorded during the wintering bird study would mean that it would be unlikely that a winter monitoring programme would yield any useful results, so this is not proposed either.

9.12 SUMMARY OF POTENTIAL ORNITHOLOGICAL & ECOLOGICAL EFFECTS

9.12.1 The assessment of the potential effects of the proposed wind farm on the features of ornithological interest is summarised in **Table 9.7**. The conservation importance of each species occurring in the study area is given, together with an assessment of the magnitude and significance of collision, habitat loss and disturbance effects. Details of the assessment methodology are given in **Appendix 9.1, Volume 4**.

9.12.2 Overall no ornithological impacts are likely to occur as a result of the development that would be considered significant under the EIA Regulations.

9.12.3 As a species likely to be associated with the South Tayside Goose Roosts SPA, pink-footed goose, has been recorded using the Upper Glendevon reservoir in the past (though not during the baseline surveys), particular attention has been given to these under the Conservation (Flora and Fauna etc.) Regulations 1994. Two specific tests need to be considered, firstly whether there is a likely significant effect on the SPA interest, and if so whether such effects may threaten the ecological integrity of the SPA. It is clear from the lack of current use of the study area, and the local topography, and the evidence of the effects of existing wind farms on geese that it can be safely concluded that there would not be a likely significant effect on the SPA.

Table 9.7. Summary of the Potential Effects of the Proposed Burnfoot Hill Wind Farm on Ornithological Interests.

Species	Sensitivity	Collision risk		Habitat loss		Disturbance	
		<i>Magnitude</i>	<i>Significance of effect</i>	<i>Magnitude</i>	<i>Significance of effect</i>	<i>Magnitude</i>	<i>Significance of effect</i>
Species breeding in study area:							
Kestrel	Low	Negligible	Very low	Negligible	Very low	Negligible	Very low
Red grouse	Low	Negligible	Very low	Negligible	Very low	Negligible	Very low
Black grouse	Medium	Low	Low	Negligible	Very low	Negligible	Very low
Oystercatcher	Low	Negligible	Very low	Negligible	Very low	Low	Very low
Lapwing	Low	Negligible	Very low	Negligible	Very low	Low	Very low
Snipe	Low	Low	Very low	Negligible	Very low	Low	Very low
Curlew	Low	Low	Very low	Negligible	Very low	Low	Very low
(Barn owl)	High	Negligible	Very low	Negligible	Very low	Negligible	Very low
Skylark	Medium	Low	Low	Negligible	Very low	Low	Low
Swallow	Low	Negligible	Very low	Negligible	Very low	Negligible	Very low
House	Low	Negligible	Very low	Negligible	Very low	Negligible	Very low

Species	Sensitivity	Collision risk		Habitat loss		Disturbance	
		Magnitude	Significance of effect	Magnitude	Significance of effect	Magnitude	Significance of effect
Martin							
Meadow Pipit	Low	Low	Very low	Negligible	Very low	Low	Very low
Grey Wagtail	Low	Negligible	Very low	Negligible	Very low	Negligible	Very low
Reed Bunting	Medium	Negligible	Very low	Negligible	Very low	Negligible	Very low
Non-breeding Species:							
(Pink-footed Goose)	Very high	Negligible	Low	Nil	-	Negligible	Low
Goldeneye	Low	Negligible	Very low	Nil	-	Negligible	Very low
Goosander	Medium	Negligible	Very low	Nil	-	Negligible	Very low
Hen harrier	High	Negligible	Very low	Negligible	Very low	Negligible	Very low
Kestrel	Low	Negligible	Very low	Negligible	Very low	Negligible	Very low
Peregrine	High	Negligible	Very low	Negligible	Very low	Negligible	Very low
Snipe	Low	Negligible	Very low	Negligible	Very low	Negligible	Very low
Curlew	Low	Negligible	Very low	Negligible	Very low	Negligible	Very low

Note: species in brackets were not found during the baseline surveys but the study area does hold potentially suitable habitat that could support them.

9.12.4 The assessment of the potential effects of the proposed wind farm on the features of ecological interest is summarised in **Table 9.8**. The conservation importance of each species/community occurring in the study area is given, together with an assessment of the magnitude and significance of the potential effects.

9.12.5 Overall no other ecological impacts are likely to occur as a result of the development that would be considered significant under the EIA Regulations.

Table 9.8. Summary of the Potential Effects of the Proposed Burnfoot Hill Wind Farm on Other Ecological Interests

	Sensitivity	Magnitude of effect	Significance of effect *	Significant? (×=not significant)
Plant communities				
Blanket bog (M17/M20)	High	Low	Low	×
Acid flush (M4)	Medium	Negligible/nil	Very low/ none	×

	Sensitivity	Magnitude of effect	Significance of effect *	Significant? (×=not significant)
Marshy grassland (MG10/M23)	Medium	Low	Low	×
Acid grassland (U2/U4)	Low	Low	Very low	×
Plant species				
Mossy saxifrage	Medium	Negligible/nil	Very low/ none	×
<i>Sphagnum</i> bog mosses	Low	Low	Very low	×
Heath spotted orchid	Low	Negligible/nil	Very low/ none	×
Mountain pansy	Low	Negligible/nil	Very low/ none	×
Common butterwort	Low	Negligible/nil	Very low/ none	×
Marsh lousewort	Low	Negligible/nil	Very low/ none	×
Aspen	Low	Negligible/nil	Very low/ none	×
Protected Species				
(Otter)	High	Negligible/nil	Very low/ none	×
(Bats)	High	Negligible/nil	Very low/ none	×
(Water Vole)	High	Negligible/nil	Very low/ none	×

Note: species in brackets were not found during the baseline surveys but the study area does hold potentially suitable habitat that could support them.

** - assumes implementation of proposed mitigation.*

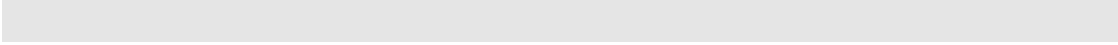
9.13 REFERENCES

- Baines, D. and Summers, R.W. 1997. Assessment of bird collisions with deer fences in Scottish forests. *Journal of Applied Ecology* 34, 941-948.
- Bevanger, K. 1995. Estimates and population consequences of tetraonid mortality caused by collisions with high tension power lines in Norway. *Journal of Applied Ecology* 32, 745-753.
- Bioscan 2001. Novar Wind Farm Ornithological Studies: breeding bird and bird strike monitoring 2001 results and five-year review. Bioscan report no. E1003BM1.
- Brown, A.F. and Shepherd, K.B. 1993. A method for censusing upland breeding waders. *Bird Study* 40, 189-195.
- Bullen Consultants 2002. Ovenden Moor Ornithological Monitoring - breeding bird survey 2002. Report to Powergen Renewables Ltd.
- Corbet, G.B. and Harris, S. 1991. *The Handbook of British Mammals*. 3rd Edition. Blackwell Science, Oxford.
- Dulas Ltd 1995. The Mynydd y Cemmaes windfarm impact study Volume IID - Ecological Impact: Final Report. ETSU Report.
- Ecological Advisory Service 1997. Ovenden Moor Ornithological Monitoring: Report on breeding bird survey 1997. Report, 16pp.
- English Nature 2002. *Badgers and development*. English Nature, Peterborough.
- Erickson, W.P., Johnson, G.D., Stickland, M.D., Young, D.P., Sernka, K.J. and Good, R.E. 2001. Avian collisions with wind turbines: a summary of existing studies and comparisons to other sources of avian collision mortality in the United States. National Wind Coordinating Committee (NWCC) Resource Document.
- Gibbons, D.W., Reid, J.B. and Chapman, R.A. 1993. *The new atlas of breeding birds in Britain and Ireland: 1988-91*. T and A.D Poyser.
- Gilbert, G., Gibbons, D.W. and Evans J. 1998. *Bird Monitoring Methods*. RSPB, Sandy.
- Gill, J.P., Townsley, M. and Mudge, G.P. 1996. Review of the impacts of wind farms and other aerial structures upon birds. *Scottish Natural Heritage Review* 21 68 pp.
- Hulbert, I., Campbell, L. and Nisbet, S. 2004. Mountain Hare Action Plan Clackmannanshire Council <http://biodiversity.clacksweb.org.uk>
- Janss, G. 1998. Bird behavior in and near a wind farm at Tarifa, Spain: management considerations. NWCC National Avian - Wind Power Planning Meeting III, 110-114.
- JNCC 1993. *Handbook for Phase 1 habitat survey*. JNCC, Peterborough.
- JNCC 1995. *Guidelines for the selection of biological SSSIs*. JNCC, Peterborough.

- Johnson, G.D., Erickson, W., White, J. and McKinney, R. 2003. Avian and bat mortality during the first year of operation at the Klondike Phase 1 Wind Project, Sherman County, Oregon. Draft Report, 17pp.
- Johnson, G.D., Erickson, W.P., Strickland, M.D., Shepherd, M.F. and Shepherd, D.A. 2000. Avian monitoring studies at the Buffalo Ridge, Minnesota wind resource area: results of a 4-year study - final report. 273pp. [Main report and extracts of Tables/Figures/Appendices]
- Kingsley, A. and Whittam, B. 2003. Wind Turbines and Birds: A Guidance Document for Environmental Assessment. Draft report to the Canadian Wildlife Service. Bird Studies Canada.
- Kirkland, P. 2004. Large Heath Action Plan Clackmannanshire Council <http://biodiversity.clacksweb.org.uk>
- Langston, R.H.W. and Pullan, J.D. 2003. Windfarms and Birds: An analysis of the effects of windfarms on birds, and guidance on environmental assessment criteria and site selection issues. BirdLife Report.
- Lawton, J.H. and Woodruffe, G.L. 1991. Habitat and distribution of water voles: why are there gaps in a species' range? *Journal of Animal Ecology* 60: 79-91.
- Meek, E.R., Ribbands, J.B., Christer, W.B., Davey, P.R., and Higginson, I. 1993. The effects of aero-generators on moorland bird populations in the Orkney Islands, Scotland. *Bird Study*, 40, 140-143.
- Mitchell, C.R. and R.D. Hearn. 2004. Pink-footed Goose (Greenland/Iceland population) in Britain 1960/61 – 1999/2000. Waterbird Review Series, The Wildfowl & Wetlands Trust/Joint Nature Conservation Committee, Slimbridge.
- Morrison, M.L. 1998. Avian Risk and Fatality Protocol. National Renewable Energy Laboratory Report. 8 pp.
- Musters, C.J.M., Noordervliet, M.A.W., and Ter Keurs, W.J. 1995. Bird casualties and wind turbines near the Kreekrak sluices of Zeeland. Report, 28 pp.
- Musters, C.J.M., Noordervliet, M.A.W., and Ter Keurs, W.J. 1996. Bird casualties caused by a wind energy project in an estuary. *Bird Study*, 43, 124-126.
- Percival, S.M. 1998. Supplementary precognition to the Beinn Churlaich, Islay, public inquiry on geese and wind turbines.
- Percival, S.M., Band, B., and Leeming, T. 1999. Assessing the ornithological effects of wind farms: developing a standard methodology. Proceedings of the 21st British Wind Energy Association Conference, 161-166.
- Percival, S.M. 2000. Birds and wind turbines in Britain. *British Wildlife* 12: 8-15.
- Percival, S.M. and Percival, T. 2003. Breeding bird populations at Bowbeat wind farm, Borders, during construction. Report to Powergen Renewables.

- Percival, S.M. 2005. Birds and wind farms: what are the real issues? *British Birds* 98: 194-204.
- Phillips, J.F. 1994. The effects of a windfarm on the Upland breeding bird communities of Bryn Titli, Mid-Wales: 1993-94. RSPB Report to National Windpower.
- Pollitt, M.S., Hall, C., Holloway, S.J., Hearn, R.D., Marshall, P.E., Musgrove, A.J., Robinson, J.A., and Cranswick, P.A. 2003. The Wetland Bird Survey 2000-01: Wildfowl and Wader Counts. BTO/WWT/RSPB/JNCC, Slimbridge.
- Preston, C.D., Pearman, D.A. and Dines, T.D. 2002. *New atlas of the British and Irish Flora - an atlas of the vascular plants of Britain, Ireland, the Isle of Man and the Channel Islands*. Oxford University Press.
- Raynor 2004. Water Voles in the Highlands – A Myth or an Undiscovered Refuge? SNH <http://www.snh.org.uk/pdfs/species/watervole.pdf>
- Rodwell, J.S. et al. 1992a. *British Plant Communities Volume 2: Mires*. Cambridge University Press, Cambridge.
- Rodwell, J.S. et al. 1992b. *British Plant Communities Volume 3: Grasslands and montane communities*. Cambridge University Press, Cambridge.
- Rowell, H.E. 2005. The 2004 Icelandic breeding goose census. Wildfowl and Wetlands Trust Report, Slimbridge.
- Royal Society for the Protection of Birds, et al. 2002. *Birds of Conservation Concern in the United Kingdom, Channel Islands and Isle of Man 2002-2007*. RSPB, Sandy.
- SEO/BirdLife 1995. *Effects of wind power plants in the Campo de Gibraltar region*. SEO/BirdLife report.
- SNH/BWEA 2002. *Methodology for assessing the effects of wind farms on ornithological interests*.
- Thelander, C.G., Smallwood, K.S. and Ruge, L. 2003. *Bird Risk Behaviors and Fatalities at the Altamont Pass Wind Resource Area*. Report to the National Renewable Energy Laboratory.
- Thomas, R. 1999. *Renewable Energy and Environmental Impacts in the UK; Birds and Wind Turbines*. Thesis submitted for Master of Research degree in Environmental Science, University College London.
- Tyler, S.J. 1995. Bird strike study at Bryn Titli windfarm, Rhayader. RSPB Report to National Wind Power., 2pp.
- Whitfield, P. 2003. *Survey methods to assess windfarm impacts on upland bird communities*. SNH guidelines, 7pp.
- Whitfield, P., Bullman, R. and Band, W. 2005. *Survey methods for use in assessing the impacts of onshore windfarms upland bird communities*. SNH Guidance, 50pp.

Winkelman, J.E. 1989. Birds and the wind park near Urk: collision victims and disturbance of ducks, geese and swans. RIN Rep. 89/15. Rijkinstituut voor Natuurbeheer, Arnhem, The Netherlands.



10 CULTURAL HERITAGE ASSESSMENT

10.1 INTRODUCTION

10.1.1 This chapter considers the likely significant effects on cultural heritage interests of the construction and operation of the proposed wind farm at Burnfoot Hill, Clackmannanshire (NGR: NN 905 030 centred). The assessment has been undertaken by CFA Archaeology Ltd, informed by comments and information provided by Historic Scotland; Lorna Main, Stirling Archaeologist on behalf of Clackmannanshire Council; and Perth and Kinross Heritage Trust in response to written requests for information.

10.1.2 The proposed wind farm would occupy an area of hill pasture as shown on **Figure 10.1, Volume 3**, comprising of undulating hill summits between 400m and 583m AOD. The wind farm would be accessed via an upgraded, existing access road that would run SSW along Glen Devon, from the A823 public highway, past the Glendevon reservoirs and onto the wind farm site at Backhills Farm.

10.1.3 The proposed wind farm would comprise 13 turbines and a meteorological mast along with connecting access roads and buried cable routes, which would mainly follow the same alignments; two temporary construction compounds; and a switchgear building as shown in **Figure 10.1**. A buried cable grid connection would run southwards from the wind farm to an existing substation south of Alva. Two route options for the grid connection were initially proposed. Following initial assessments the westernmost connection route became the preferred option and it is therefore that considered by this assessment. The route has been assessed as far as the foot of the hills at Rhodders Farm. From that point the route to the sub-station would follow public roads and no assessment has been made of that section.

10.1.4 The specific objectives of the cultural heritage study were to:

- Identify the cultural heritage baseline within the proposed wind farm area and along the proposed access road and the two grid connection route options area;
- Identify key receptors in the vicinity of the proposed development;
- Assess the proposed development site in terms of its archaeological and historic environment potential;
- Consider the likely significant effects of the construction and operation of the proposed development on the cultural heritage resource;
- Propose measures, where appropriate, to mitigate any predicted adverse effects.

10.1.5 **Figure 10.1** depicts the proposed development study area boundary, along with the locations of archaeological sites and monuments identified by the cultural heritage study within the application area. **Figure 10.2, Volume 3**, shows the locations of those key receptors that would be theoretically intervisible with the proposed development, based on the Zone of Theoretical Visibility (ZTV).

10.2 PLANNING AND LEGISLATIVE BACKGROUND

10.2.1 Cultural heritage resources include:

- Scheduled Ancient Monuments (SAMs) and other archaeological features;
- Listed Buildings and other buildings of historic or architectural importance;
- Conservation Areas and other significant townscapes; and
- Historic Gardens and Designed Landscapes and other significant historic landscapes.

10.2.2 Those relevant to this assessment are SAMs and other archaeological features, Listed Buildings, Conservation Areas and Historic Gardens and Designed Landscapes.

10.2.3 Where relevant, direct effects on Historic Gardens and Designed Landscapes are addressed in this chapter but the effects on their settings are dealt with in the Landscape and Visual Amenity chapter (**Chapter 9**), which considers the important vistas and views from and to Historic Gardens and Designed Landscapes both as historic artefacts and as modern day amenities.

Legislation and National Planning Policy Guidance

Scheduled Ancient Monuments and other archaeological features

10.2.4 Under the *Ancient Monuments and Archaeological Areas Act 1979* (1979 Act) the Scottish Ministers are required to compile and maintain a Schedule of monuments considered to be of national importance. The statutory consent of the Scottish Ministers is required before any works are carried out which would have the effect of demolishing, destroying, damaging, removing, repairing, altering, adding to, flooding or covering up a Scheduled Ancient Monument (SAM). Effects of proposed development works upon the setting of a SAM form an important consideration in the granting or refusal of planning permission. Further information on development control procedures relating to SAMs is provided in *National Planning Policy Guideline 5, Archaeology and Planning* (NPPG 5) and *Planning Advice Note 42, Archaeology* (PAN 42).

10.2.5 Archaeological sites and monuments without statutory protection are curated by the local planning authority. NPPG 5 and PAN 42 provide national planning policy guidance and advice on the treatment of this resource. PAN 42 indicates that the principle that should underlie all planning decision-making is preservation of cultural resources, *in situ* where possible, and by record if destruction cannot be avoided. It is recognised in the document that preservation may not always be possible, and where damage is unavoidable various mitigation measures may be proposed.

Listed Buildings

10.2.6 Under the *Planning (Listed Buildings and Conservation Areas) (Scotland) Act 1997* (1997 Act), the Scottish Ministers are required to compile a list of buildings of special architectural or historic interest. Such buildings are classified into Categories A, B and C(s), in decreasing order of importance. Sustainable development is the principle underlying Government policy towards the historic environment. Planning authorities and the Scottish Ministers are required to have special regard for the desirability of preserving listed buildings or their settings and any features of special architectural or historic importance they possess. The term 'setting' has no definition in the Act, although the *Memorandum of Guidance on Listed Buildings and Conservation Areas 1998* (Memorandum; published by Historic Scotland) advises planning authorities to interpret the term broadly. The Memorandum states that a Listed Building should at all times remain the focus of its setting, and that attention should not be distracted from it by the presence of any new development. Government policy and guidance is also stated in *National Planning Policy Guideline 18, Planning and the Historic Environment* (NPPG 18).

Conservation Areas

10.2.7 Under the 1997 Act, areas of special architectural or historic interest can be designated as conservation areas, the character or appearance of which it is desirable to preserve or enhance.

Historic Gardens and Designed Landscapes

10.2.8 The effect of a proposed development on a designated historic garden or designed landscape listed in *An Inventory of Gardens and Designed Landscapes in Scotland* (Inventory; published by Historic Scotland & Scottish Natural Heritage and predecessor bodies) is a material consideration in the determination of a planning application, although the designation is non-statutory in effect. Under the provisions of the *Town and Country Planning (General Development Procedure) (Scotland) Order 1992* (1992 Order), planning authorities must consult Historic Scotland and Scottish Natural Heritage on any proposed development that may affect a site contained in the Inventory. Further details are published in NPPG 18 and the Memorandum.

Regional and local planning policy guidance

Structure Plan policies

10.2.9 The *Clackmannanshire and Stirling Structure Plan, Written Statement, March 2002* Policy ENV6 - The Historic and Built Environment - states that the Councils will seek to ensure that cultural heritage resources are recognised, recorded, protected and enhanced as appropriate, and that new development respects and contributes to the character and quality of the area. More particularly:

- All development within or likely to affect a Conservation Area should preserve or enhance the special character or appearance of the Area. Proposals which will detract from this character including the unjustified demolition of buildings which contribute to the character or appearance of Conservation Areas will not be permitted.
- There will be a strong presumption against demolition of protected buildings of character and against development or works which would adversely affect the special architectural or historic interest of a Listed building or its setting. New uses of such buildings which protect or enhance their character or setting will be supported.
- Development which would destroy or adversely affect Scheduled Ancient Monuments, or other important archaeological sites or landscapes and their settings will not be permitted. In exceptional cases where developments may be approved which affect the heritage resource, developer funding will be legally tied to securing the appropriate level of advance investigation, excavation, recording and publication.
- Development which would have a significant adverse affect upon the landscape features, character and setting of sites identified for inclusion in the inventory of Historic Gardens and Designed Landscapes will not be permitted.
- New development will be required to address its physical and visual integration with, and opportunities for enhancement of, the established environment of the surrounding area.

10.2.10 The *Perth and Kinross Structure Plan, June 2003*, Environment and Resources Policy 8, states that the Council will seek to ensure that the rich and varied cultural heritage resources of Perth and Kinross are recognised, recorded, protected and enhanced as appropriate. New developments which would adversely affect Listed Buildings, Conservation Areas, Scheduled Ancient Monuments, Historic Gardens and Designed Landscapes or their settings will not be permitted unless there is a proven public interest where social, economic or safety considerations outweighs the cultural interest in the site. The same protection will be afforded to sites proposed for designation. Other important archaeological sites or landscapes will also be protected from inappropriate development.

Local Plan Policies

- 10.2.11 The policies outlined in the Structure Plans are reflected in the relevant local authority's planning policy relating to the protection and enhancement of heritage resources and the historic environment.
- 10.2.12 The *Clackmannanshire Local Plan (Adopted December 2004)* Policies EN6 to EN10 seek to protect and enhance buildings and sites of special architectural or historic interest within its curatorial area. Policy EN6 deals with Listed Buildings; EN7+8 covers archaeology or historic sites; EN9 addresses Historic Gardens and Designed Landscapes; and EN10 covers Conservation Areas.
- 10.2.13 The *Strathearn Local Plan 2001* provides policies protecting heritage resources within its curatorial area. Policy 19 covers Historic Gardens and Designed Landscapes, Policies 23, 24 and 25 deal with SAMs and other archaeological sites; Policy 26 addresses Conservation Areas; and Policy 27 covers Listed Buildings.

10.3 APPROACH TO ASSESSMENT

- 10.3.1 Details of the archaeological assessment methodology, data collection methods and consultants along with assessment of the significance of effects is detailed in **Appendix 10.1, Volume 4**.

10.4 BASELINE CONDITIONS

Cultural heritage sites within the proposed development area

General

- 10.4.1 Thirty-three sites of cultural heritage significance have been identified within the proposed development study area boundary as shown on **Figure 10.1**. Site numbers are shown in bold and in brackets in the following sections. **Appendix 10.2** provides tabulated gazetteer information on the character, baseline condition and importance of each site. This information is discussed thematically below

Consultation responses

- 10.4.2 The Perth and Kinross Heritage Trust identified and provided information on ten sites from the SMR, along the route of the proposed site access road through Glen Devon (**1-4** and **6-12**). No information was provided on the Communications Station (**9-10**). It was noted that there are few upstanding monuments within the immediate surrounding area, most sites being find-spots and cropmark features. The main concern expressed was the possible

impact of the proposed development on sites within the application boundary.

- 10.4.3 The Stirlingshire and Clackmannanshire Archaeologist confirmed that there are no sites recorded in the SMR within the area of the proposed wind farm. There are however, three sites (**19**, **21** and **23**) along the westernmost grid connector route option corridor and one (**26**) along the eastern route option. Information was also provided on eight other sites that lie outwith the proposed development area but in the immediate vicinity. The response also identified the 1998 RCAHMS Glendevon survey as covering part of the proposed development area.
- 10.4.4 In response to a consultation letter, Historic Scotland confirmed that there are no SAMS and no monuments proposed for scheduling within the proposed development area.
- 10.4.5 The Royal Commission on the Ancient and Historical Monuments of Scotland (RCAHMS) has carried out detailed survey of Glen Devon that includes the proposed main site access road (RCAHMS 1998). Digital mapped data of the sites was provided (Crown copyright: RCAHMS) and has been included on **Figure 10.1**, with permission.

Results of Data Collection

- 10.4.6 There are no Scheduled Ancient Monuments, Listed Buildings, Conservation Areas or Historic Gardens and Designed Landscapes present within the proposed development area.
- 10.4.7 The NMRS contains records relating to eighteen cultural heritage sites within the proposed wind farm area. These sites include: a possible nissen hut (**1**); eleven settlement, field system and other cultivation features of probable medieval or later date (**2-4**, **6-12** and **21**); the former site of a prehistoric fort (**29**); a mineral mining site (**23**); three sites associated with woollen mills (**30-31**); and a well (**33**). Clackmannanshire SMR contains reference to one site (**23**). Perth and Kinross SMR contains references to eleven of these sites (**1-4** and **6-12**).
- 10.4.8 Examination of the Ordnance Survey 1st Edition map coverage provided information on eleven of the sites recorded in the NMRS and Council SMRs. (**2**, **3**, **6**, **7**, **9**, **21**, **23**, **29-32**) and one site not recorded in either the NMRS or SMRs (**26**). Historic maps provided information relating to changing land-use on the site from the mid-18th Century. Stobies map of 1783 is the first to show the small farmsteads along Glen Devon, including that at Frandy (**7**) for example. The Silver mines at Alva (**23**) are also first shown on Stobies map (1783).

- 10.4.9 Examination of aerial photographs did not identify any additional sites.
- 10.4.10 Documentary sources provided background information on historic land-use over the last 200 years, and some additional information on some of the sites recorded in the NMRS. The records for Tillicoultry and Alva Parishes in The Statistical Account of Scotland of 1791-99 (OSA) provided information relating to mineral mining in this part of the Ochils. The reporting Minister for Alva Parish notes that between 1710 and 1715 Sir John Erskine, with the aid of miners from Leadhills, discovered a valuable vein of Silver in the glen separating Middle Hill (The Nebit) and Wood Hill, now known as Silver Glen (20, 23). Additional information on the Alva mines is provided in Dickie and Forster (1974). A seam of Cobalt was also discovered, lower down the glen, and mined and used in porcelain manufacture at Prestonpans.
- 10.4.11 The Scottish Palaeoenvironmental Database provided no information relevant to the proposed development area.
- 10.4.12 Field survey confirmed the presence of and established the baseline conditions of those sites located by the desk-based study within the proposed development area. Field survey also identified fourteen previously unrecorded sites (13-20, 22 and 24-28). These sites include a terrace of buildings (22); a small farmstead (27); seven enclosures and field systems (17-19, 21 and 24-26); Three stone quarries (13, 14, and 28); two summit cairns (15 and 16) and an additional mining site (20).

Possible prehistoric remains

- 10.4.13 The former site of Castle Craig hillfort (29) at Tillicoultry has been lost to quarrying. There are no other identifiably prehistoric sites recorded within the proposed development study area.

Medieval and later remains

- 10.4.14 Thirty-one of the 33 sites identified by the study within the proposed development study area are medieval or later rural settlement features.
- 10.4.15 Seven sites are the remains of farmsteads (2, 12 and 27) or other buildings (6, 9, 11, and 22). Relict field systems, consisting of turf and stone built boundary banks and enclosures, are represented at 14 sites (2, 3, 5, 7-9, 11, 17-19, 21 and 24-26).
- 10.4.16 Two sites (20 and 23) are associated with historic mineral mining activities and there are four small stone quarries (13, 14, 25 and 28). Relict sections of old trackways are preserved at six sites (3, 4, 9, 10, 20 and 24). Two small

cairns on the summits of Ben Buck (15) and one on Ben Ever (16) are probably simple way-marker cairns.

10.4.17 Three sites at Tillicoultry, a water-power system (30) and two carding/spinning mills (31, 32), are industrial sites associated with the woollen industry. Lady's well (33) is most probably an old domestic water supply source.

Modern features

10.4.18 The NMRS records a possible Nissen hut stance (1) close to the A823 public road, which is likely to be of twentieth century date.

Assessment of importance of cultural heritage features

10.4.19 Using the criteria detailed in **Section 10.3.15, Appendix 10.2** provides an assessment of the importance of each cultural heritage site identified by the baseline study within the proposed development study area.

10.4.20 There are no sites of national importance within the proposed development study area.

10.4.21 Two sites (20, 23) are considered to be of regional importance. These are the remains of Silver and Cobalt mines located along the steep gorge of Silver Glen and which are arguably of more than local importance.

10.4.22 Twenty-three sites are considered to be of local importance. These include medieval or later rural settlement features (2-4, 5-9, 11, 12, 17-19, 21, 22 and 24-27), industrial mills (30-32) and a former well (33).

10.4.23 Nine sites are considered to be of lesser importance. These include the former site of a possible Nissen hut (1); two old trackways (4, 10); three small stone quarries (13, 14 and 28); two groups of summit marker cairns (15, 16); and the former site of a hillfort (29), now destroyed by quarry operations.

Assessment of the archaeological potential of the proposed development area as a whole

10.4.24 Historic maps indicate that, in the recent historic past, the proposed development area was predominantly uninhabited moorland and rough pasture. Settlement appears to have been restricted to close proximity to the major watercourses, especially along Glen Devon, with temporary summer shielings at higher altitudes along tributary watercourses flowing into the River Devon. The mineral mines of Silver Glen are localised although at least

one new site attributable to mining activities has been identified by this study.

10.4.25 Field survey identified several previously unrecorded sites, all of which are likely to be features of medieval or later rural settlement and are restricted in their distribution to Glen Devon and the lower reaches of watercourses above Alva and Tillicoultry.

10.4.26 The baseline information indicates that the potential for the proposed development site to contain additional, buried features of archaeological importance is generally low. There is a slightly higher probability that buried remains may be present within Glen Devon, along the proposed site access road route.

Key receptors in the vicinity of the proposed development area

Consultation responses

10.4.27 In its scoping opinion (30 April 2004) Historic Scotland expressed particular concern that potential indirect effects on Castle Campbell, a SAM and Property in Care, should be addressed. The Historic Gardens and Designed Landscapes of Castle Campbell, Braco Castle, Gleneagles Hotel, Drummond Castle, Kippenross, Abercairny, Doune Park, Touch and Culdees Castle were identified as requiring assessment in the ES. Indirect effects on the listed buildings along the A823 at Glen Devon and those associated with the designed landscapes listed were also identified as requiring assessment. In particular HS asked that confirmation be provided that the development would not be visible from either Stirling Castle or the Wallace Monument. Digital GIS data was provided for SAMs, Listed Buildings and Historic Gardens and Designed Landscapes for the purposes of the assessment.

Results of Data Collection

10.4.28 Historic Scotland provided digital GIS data for sites with statutory protection up to 15km from the area to be occupied by proposed turbines. These include 520 SAMs; 277 category A listed buildings; 2685 category B listed buildings; 1970 category C(s) listed buildings and 29 Historic Gardens and Designed Landscapes.

10.4.29 **Appendix 10.3, Volume 4**, lists those key receptors that are predicted by the theoretical ZTV model to be intervisible with the proposed development. The ZTV model is, however, a coarse predictive tool, based on bare-earth surface topography and maximum blade tip heights, and takes no account of obstructions to intervisibility caused by existing forestry and other vegetation; or by buildings or other man-made features. The sites identified by this assessment, based upon the ZTV, should therefore be treated as a maximum

and it is likely that in practice a lesser number of receptors would be wholly or partly intervisible with the wind farm. The locations of those receptors predicted by the ZTV map to be intervisible with at least one turbine are shown on **Figure 10.2**.

10.4.30 There are many more cultural heritage features with statutory protection present within the key receptor assessment zones, but they have not been assessed as the ZTV indicates that they would not be intervisible with the proposed wind turbines.

10.4.31 A significant group of sites, often collectively referred to as The Gask Ridge Roman frontier (Breeze, 1982; Woolliscroft, 2002), lies to the NNW and within 15km of the proposed development. This group of sites includes the important Roman Fort complex at Ardoch (35) 8km to the NNW and a further Roman Fort at Strageath (37), 14km to the NNW. There are also important Roman Temporary Camps at Ardoch (34, 63) and at Innerpeffer Wood (45), near Strageath, as well as two further Roman Temporary Camps (38, 91), a Roman fortlet (36) and signal stations (40, 46, 47) distributed along an important, arterial Roman Road (59), between Doune and Perth. The Roman complex at Ardoch is open to the public and all Roman sites in this group are the focus of archaeological research (Woolliscroft, 2002). It is hypothesised that the signal stations were designed to monitor traffic along the Roman Road (Woolliscroft, 1993, 299-300) and it appears that the majority of the signal stations were placed so as to command views E-W along the Road and across the open landscape of Strathearn.

10.5 EFFECTS AND MITIGATION

Initial Design Mitigation

10.5.1 A baseline report and constraints map were provided to Wind Prospect Ltd by CFA, which showed the locations of those sites identified by the baseline assessment within the proposed development area. Recommendations were made in order to avoid, where possible, sites of cultural heritage interest potentially at risk from on-site development works. Through an iterative design process, the layout presented in this Environmental Statement takes account of those recommendations, as far as is practical within the constraints imposed by other environmental and engineering considerations.

Potential Effects

Wind Farm

10.5.2 The proposed wind farm would comprise 13 turbines and a meteorological mast along with connecting access roads and buried cable routes, which would mainly follow the same alignments; two temporary construction

compound areas; and a switchgear building as shown in **Figure 10.1**). The wind farm would be accessed via an upgraded, existing access road and a buried cable grid connection would run southwards from the wind farm to an existing substation south of Alva.

Construction

- 10.5.3 Any ground-breaking activities associated with the construction of proposed development features (such as turbines, access tracks, cable routes, etc) have the potential to disturb or destroy features of cultural heritage interest. The creation of borrow pits to extract building materials could have similar direct effects. In addition, other construction activities, such as vehicle movements, soil and overburden storage have the potential to cause adverse direct effects on the cultural heritage.

Operation

- 10.5.4 The presence of development features during the operational life of the proposed wind farm may have indirect effects on the setting of sites of cultural heritage interest. Some development features have only relatively low surface relief and only potentially localised indirect effects are likely to occur. Given their height wind turbines and anemometers have the potential to cause indirect effects over a wide area.

Decommissioning / Post Decommissioning

- 10.5.5 No additional effects are expected during the decommissioning and post decommissioning stages of the wind farm, presuming that the same road infrastructure is used for the deconstruction and removal of the built features of the proposed development.

Assessment of predicted effects within the proposed development area

- 10.5.6 The assessment of predicted effects was carried out with reference to the design layout shown on **Figure 10.1**. Using the assessment criteria detailed in **Appendix 10.1, Table 10.1** lists the predicted effects of the proposed development on the cultural heritage sites identified within the proposed development area. No effects are predicted in relation to 23 of the 33 sites identified. Nine of those 23 sites (**24-33**) lie along the proposed alternate grid connection route option and so will be unaffected by the proposed development.

Table 10.1 Predicted effects on cultural heritage features.

ID	Site	Effect Type	Site Sensitivity	Effect Magnitude	Significance of effect
1	Defence / Military (possible)	None	Local	None	None
2	Farmstead; Field system	d, a, p, ir	Local	Low	Negligible
3	Field system; Rig; Enclosures; Trackway	d, a, p, ir	Local	Low	Negligible
4	Trackway	d, a, p, ir	Lesser	Imperceptible	Negligible
5	Cultivation (rig and furrow)	None	Local	None	None
6	Building	Unknown	Local	Unknown	Unknown
7	Field system; Enclosures	d, a, p, ir	Local	Low	Negligible
8	Field system; Rig; Enclosures	d, a, p, ir	Local	Low	Negligible
9	Enclosure; Banks; Huts; Trackway	None	Local	None	None
10	Trackway	d, a, p, ir	Lesser	Imperceptible	Negligible
11	Enclosures; Hut (possible)	None	Local	None	None
12	Farmstead	None	Local	None	None
13	Quarry	None	Lesser	None	None
14	Quarry	None	Lesser	None	None
15	Summit cairn	None	Lesser	None	None
16	Summit cairns	None	Lesser	None	None
17	Enclosure bank	d, a, p, ir	Local	Imperceptible	Negligible
18	Enclosure	d, a, p, ir	Local	Imperceptible	Negligible
19	Boundary bank	d, a, p, ir	Local	Imperceptible	Negligible
20	Trackway; Mining	None	Regional	None	None
21	Enclosure banks	None	Local	None	None
22	Buildings	None	Local	None	None
23	Industrial; Extractive	None	Regional	None	None
24	Enclosure banks; track	None	Local	None	None
25	Quarry; Enclosures (possible)	None	Local	None	None
26	Enclosures; Boundary bank; Field system	None	Local	None	None
27	Farmstead	None	Local	None	None
28	Quarry	None	Lesser	None	None
29	Fort (site of)	None	Lesser	None	None
30	Water Power System	None	Local	None	None
31	Industrial/ Mill	None	Local	None	None

32	Industrial/ Mill	None	Local	None	None
33	Well	None	Local	None	None

Direct effects

- 10.5.7 There are predicted direct effects on nine sites. Six (2-4, 7, 8, 10) are predicted to occur as a result of the upgrading of the site access road and three (17-19) from the installation of the grid connection cables. There are no predicted direct effects on any known sites within the area to be occupied by turbines.
- 10.5.8 The proposed access road, from the A823 through Glen Devon would use the line of the existing access to the Glen Devon reservoirs and involve some minor upgrading of and modifications to the present road. The existing road passes through a cluster of field systems and settlement remains distributed along the length of Glen Devon, all of which have already been affected to a degree by the construction of the present road. The proposed road improvements would require minor widening of the existing road surface and the improvement of the bends at Frandy Farm by the Lower Glendevon Reservoir dam. Beyond Upper Glendevon Reservoir the access road to Backhills Farm would require full upgrading and the improvement of the bend and river crossing of the Broich Burn below Craig Bran.
- 10.5.9 The predicted effects on sites 2, 3, 7 and 8 are all considered to be of low magnitude because the sites are fairly extensive field systems comprised of field banks and containing traces of relict rig and furrow and the integrity of the sites has already been compromised by the construction of the existing road. The best preserved elements of these sites all lie more than 5m from the existing road edges; the original road construction having significantly affected the remains closest to the road line. Further significant disturbance to these sites would be avoided by micro-siting the road surface improvements to avoid the closest upstanding remains (e.g. Site 2).
- 10.5.10 The predicted effects on three sites (17-19) along the proposed grid connector route arise from the installation of cables below ground. The excavation of the trench could, without mitigation, disturb elements of these three sites. The predicted effects are however considered to be imperceptible on the grounds that the sites have already been disturbed to a degree by an access track which passes the three sites and any additional disturbance can be mitigated by micro-routing the cable trench. However it should be remembered that Scottish Power will be responsible for determining the final route of the underground export cable.

Indirect effects

10.5.11 No significant indirect effects are predicted in relation to any of the sites identified by the study. The proposed access road would follow the line of an existing metalled access road resulting in no change to the current setting of the sites distributed along the road route. The grid connector cable would be buried below ground and so would not affect the setting of any of the sites along the proposed route beyond the installation period. Additionally none of the sites identified has a setting which could be compromised by the proposed development.

Unknown Effects

10.5.12 There is a predicted unknown effect on one site (6) along the proposed access road route. An unroofed building is depicted on the OS 1st Edition map (Perthshire 1866, sheet cxxvii) but is not shown on current editions and was not identified by the field survey. It is possible that the site has been destroyed by the construction of the existing road. However, based on an interpretation of the OS 1st edition map, it is also feasible that there are buried remains of the structure preserved in the existing roadside verge, most likely on the north side of the existing road.

Mitigation Strategy

10.5.13 A range of mitigation measures (as detailed below) is proposed to avoid, reduce or offset the adverse effects predicted above, where appropriate. All recommendations for mitigation and monitoring work would need to be agreed in advance with either the Stirling and Clackmannanshire Archaeologist (for the wind farm area and the proposed grid connector route) or Perth and Kinross Heritage Officer (for the access road). If planning permission is granted a Written Scheme of Investigation (WSI) would be prepared and submitted to both Council Archaeologists for approval prior to the commencement of any site works.

Design modifications

10.5.14 The proposed layout avoids most of the known archaeological sites within the proposed development area. Turbines within the wind farm have been sited clear of known archaeological features. The underground grid connector cable route would be micro-routed during installation to avoid the known archaeological sites along the proposed route and the widening of the proposed access road would be undertaken such that the preserved elements of features adjacent to the road widening works would be avoided as far as is practicable. No further recommendations regarding design modifications are necessary to meet the requirements of PAN 42 for the preservation *in situ* of sites or features of archaeological significance wherever possible.

Construction phase

Access Road

10.5.15 The proposed wind farm access road makes use of an existing tarmac access road as far as Upper Glen Devon Reservoir although minor widening and improvement works would be carried out along its course. The construction of the existing access road has had an adverse impact on the state of preservation of the various field systems along the route and there is a zone of disturbance extending as much as 10m either side of the present tarmac surface along the road's length.

10.5.16 Should planning permission be granted for the proposed wind farm the developer would undertake to minimise the disturbance to the existing features along the proposed access road by carrying out road improvement works in such a way as to avoid as far as is practicable all upstanding features immediately adjacent to the proposed works, which would be marked out on the ground prior to the commencement of construction work. In addition watching briefs would be undertaken on road widening/improvement works between NGR NN 9486 0586 and NN 9420 0450 (where the proposed access road passes through field systems 2-4); in the vicinity of site 6 (NGR NN9411 0433) where there may be buried remains associated with a former building at that location; and, between NGR NN 9364 0440 and NN 9320 0450 (where the proposed access road passes through further field systems 8 and 9). The watching briefs would be undertaken in order to identify and record any buried remains associated with the previously recorded sites. The scope of the work would be agreed in advance with the appropriate Council's archaeological advisor.

Wind Farm

10.5.17 Proposed development features within the proposed wind farm area avoid all known archaeological sites and the archaeological potential of the wind farm area is considered to be Low. The desk-based study and walk-over survey have identified no sites or features of archaeological significance within the proposed development area and the altitude over the wind farm area is considered, at more than 400m, to be too high for permanent settlement or for either extensive or intensive exploitation. It is therefore considered that there is no necessity to carry out further archaeological mitigation work within the proposed wind farm area itself.

Grid Connector Cable Route

10.5.18 The proposed grid connection cable route passes two shepherd's cairns on Ben Buck (15) and on Ben Ever (16) that would be avoided by micro-routing

the cable trench. The grid connector cable trench along the eastern flank of The Nebit and descending to Rhodders Farm at Alva would also be micro-routed in order to avoid the cluster of sites (17-24) along its projected route through that section.

10.5.19 Should planning permission be granted for the proposed wind farm the developer would undertake to minimise the disturbance to the enclosure walls (17, 18) and head-dyke (19) by routing the cable trench immediately adjacent to the access track as it passes those locations.

10.5.20 As previously stated, the underground connection route would be the responsibility of Scottish Power. However it would be recommended that watching briefs would be undertaken at all three locations detailed above, with the aim of identifying and recording any buried remains associated with the enclosures or the dyke that may be disturbed by trenching. It would also be recommended that all sites along the proposed cable route would be marked out prior to excavation of the cable trench. The section of the proposed cable route descending Silver Glen and passing a cluster of sites there (20-24) will be further surveyed prior to the excavation of the cable trench. This work will be undertaken in order to provide a detailed topographic record of the remains identified and most likely associated with the mines in Silver Glen (23). It would also be recommended that individual features of archaeological interest would be marked off and a wayleave through the area agreed with the developer prior to the commencement of cable trenching. In addition it would be recommended that a watching brief would be undertaken between NGR NS 8910 9830 and 8910 9750 in order to identify and record any buried remains associated with mining activities that may be unavoidably disturbed by cable trenching.

Construction Guidelines

10.5.21 A set of Construction Guidelines for use by all construction contractors, outlining the need to avoid causing unnecessary damage to known archaeological sites would be prepared by an appointed archaeological advisor and issued to all relevant parties. That document would contain arrangements for calling upon retained professional archaeological support in the event that buried archaeological remains of potential archaeological interest (such as building remains, human remains, artefacts etc) are discovered. The guidance would make clear the legal responsibilities placed upon those who disturb artefacts or human remains.

10.5.22 Provision would be made for the excavation and recording of any archaeological discoveries that may be made during the construction works. This provision would include the consequent production of written reports on the findings of any archaeological work conducted, with post-excavation analyses and publication of the results of the work where appropriate.

Operational and decommissioning phases

10.5.23 No additional mitigation measures are required in relation to the operation or decommissioning of the wind farm. However, the Construction Guidelines referred to above should be incorporated into any environmental management plan for the wind farm.

Assessment of Effect on External Receptors

10.5.24 A full list of sites predicted by the ZTV from which there would be views of one or more turbines and therefore considered in this study is contained in **Appendix 10.3**, which also provides an assessment of effects on a site-by-site basis using the criteria detailed in **Tables A.10.1.1 to A.10.1.3, Appendix 10.1, Volume 4**. The assessment of magnitude of effects provided in **Appendix 10.3** has been based solely upon analysis of the ZTV (as shown in **Figure 10.2** as well as **Figure 8.2a**) which does not take into account forestry or other obstructions that can obscure views and it therefore gives a 'worst case scenario' based upon maximum blade tip height. Wireframe visualisations were therefore used to further assess the predicted effects for those sites closest to and most significantly affected by the proposed wind farm, as shown in **Appendix 10.4, Volume 4**. All assessed effects on external receptors are indirect and long-term temporary (lasting for the expected 25 year lifespan of the wind farm) and reversible in nature. They will arise during the construction of the wind farm, continue through its operation, and be removed with its decommissioning.

Significant Effects

10.5.25 There are no predicted significant effects on any external receptor arising from the proposed development.

Non-significant Effects

10.5.26 Using a combination of the ZTV model, the matrix provided in **Table A.10.1.3** and wireframe visualisations nine SAMs (**34-36, 42, 44, 46, 47, 60, and 63**) and one Historic Garden and Designed Landscape (**119**) are predicted to receive effects of Minor significance. Six listed buildings (**73, 75, 81, 90-92**) are predicted to receive effects of Negligible significance.

SAMs

10.5.27 Three scheduled Roman sites (**36, 46, and 47**) and a hillfort (**44**) are predicted by the ZTV to have views of 11-13 turbines. All four sites lie within 10km of the closest turbine and are considered to have long-distance views as an essential aspect of their function.

10.5.28 The wireframe for Kaims Castle Roman fortlet (36) indicates that the hubs of 10 turbines and the tips of all 13 turbines would theoretically be visible beyond the skyline from that fortlet. However, the wind farm would appear as a discrete and minor landscape element on the horizon to the SSE. Furthermore, the fortlet lies in woodland that provides considerable screening. Similarly, the wireframe for Ochil Fort (44) shows a view similar to that from Kaims Castle with the hubs of 10 turbines and the tips of all 13 turbines theoretically visible beyond the skyline. As with Kaims Castle the wind farm would appear as a discrete and minor landscape element on the horizon to the SSE and the fort is screened from direct line of site to the proposed wind farm by trees. The effects on the settings of these two sites are therefore assessed as being not significant.

10.5.29 The wireframes for the Roman signal stations at Shielhill (46, 47) show that in the case of (46) the tips only of nine turbine would be theoretically visible above the skyline to the SSE and in the case of (47) the hubs of six and the tips of all 13 turbines would be theoretically visible above the skyline to the SSE. The wind farm would appear as a discrete and minor landscape element on the horizon to the SSE and the effects on the settings of these two sites are considered to be not significant.

Listed Buildings

10.5.30 Of the 71 listed buildings that are predicted to have views of at least one turbine only six are considered to receive more than neutral effects. These six are all within 10km of the nearest turbine. These are Gleneagles Hotel (73), Feddal Castle (75), Glendevon Castle (91), Orchill Old and New Houses (81, 90) and Kaimknow Farmhouse (92).

10.5.31 The closest affected sites are Kaimknow Farmhouse and Glendevon Castle, which lie alongside the A823 road through Glendevon, 5.5km from the closest turbine. A wireframe visualisation from Kaimknow farmhouse (92) indicates that four turbine tips would be theoretically visible. For Glendevon Castle (91) the wireframe visualisation indicates that one turbine tip would be theoretically visible. Both sites are in valley bottom locations and surrounded by trees that provide effective screening from direct line of sight to the proposed development. The effects on the settings of these two sites are therefore considered to be not significant.

Historic Gardens and Designed Landscapes

10.5.32 Gleneagles Hotel Garden and Designed landscape (119) lies within 10km of the proposed development and has predicted views of up to 13 turbines from within the garden's boundary. The effect on the Garden and Designed landscape is dealt with in the Landscape and Visual Amenity chapter. A photomontage and visualisation (Figure 8.15, Viewpoint 6 – View from

Gleneagles Hotel Grounds) shows that only the tips of turbines would be visible above the skyline in views to the SSW. In terms of cultural heritage interest the predicted effect on the setting of the Designed Landscape is considered to be not significant.

Mitigation Strategy

10.5.33 There are no predicted significant effects on any site of cultural heritage significance within the 15km buffer zone. Therefore, no further mitigation is required to reduce or offset effects on external receptors.

10.6 STATEMENT OF SIGNIFICANCE

10.6.1 Twenty four sites of cultural heritage significance have been identified by the assessment within the proposed development area and a further nine sites along a second grid connector route option, using a range of desk-based sources, consultations and a reconnaissance field survey. The surviving sites include a group of medieval or later rural settlement features (field systems (3-5, 7-9 and 17-19) and settlement sites (2, 6 and 22)), and features associated with 18th-19th century mineral mining activities (20, 21, 23 and 24). Two sites are considered to be of Regional importance, twenty-three sites are considered to be of Local Importance and eight are deemed to be of lesser importance. It is possible that additional buried and unrecorded remains of archaeological significance survive within the proposed development area although that probability is assessed as low.

10.6.2 Direct effects have been predicted in relation to nine sites (2-4, 7-8, 10 and 17-19) within the proposed development area, none of which are considered to be significant. An unknown effect has been predicted in relation to one site (6); the site of a former building, whose exact location and state of preservation is unknown. No effects have been predicted in relation to the other 15 sites within the proposed development area.

10.6.3 Thirty-one Scheduled Ancient Monuments (34-63) (two of which (41, 49) are also category B listed buildings), One category A listed building (64), fifty-three other Category B listed buildings (64-117) and two Historic Gardens and Designed Landscapes (118, 119), present within 15km of the proposed turbine locations, would be intervisible with at least part of the proposed development, based upon the Zone of Theoretical Visibility map. None of the predicted effects is considered significant.

10.6.4 It is considered that, in overall terms, the impact of the development on the cultural heritage resource would not be significant in terms of the *Environmental Impact Assessment (Scotland) Regulations 1999*.

10.7 REFERENCES

Vertical Aerial Photographs

Sortie	Frames	Date	Scale	Lib. ref
106G / Scot / UK 120	3322 – 3319	20 th June 1946	1:10 000	B 39
CPE / Scot / UK 240	5048 – 5046 5104 – 5106	15 th July 1947	1:10 000	B 153
541 / A / 522	4050 – 4046 3050 – 3047 4074 – 4072 3075 – 3073	12 th May 1950	1:10 000	B 313
51288	089 – 091 116 – 114	10 th June 1988	1:24 000	C 272

Historic maps

Adair J 1681 - A map of Clackmannanshire

Adair J 1681 - A map of Strath Devon and the district between the Ochils and the Forth

Stobie J 1783 - The Counties of Perth and Clackmannan

Stobie J 1805 - The Counties of Perth and Clackmannan

Thomson J 1827 - Perthshire with Clackmannan

Ordnance Survey 1866 (1st Edition) Perthshire and Clackmannanshire: sheets CXXVI, CXXVII, CXXXIII and CXXXIV

Bibliographic

Dickie D. M. & Forster C. W. (Eds) 1974 Mines and Minerals of the Ochils (Research Group, Clackmannanshire Field Studies Society)

New Statistical Account of Scotland 1845: vol 8, 66: Tillicoultry Parish

New Statistical Account of Scotland 1845: vol 8, 175: Alva Parish

New Statistical Account of Scotland 1845: vol 10, 333: Glendovan Parish

The Statistical Account of Scotland 1791-99: vol. 10, 229: Glendovan Parish

The Statistical Account of Scotland 1791-99: vol. 15, 189: Tillicoultry Parish

The Statistical Account of Scotland 1791-99: vol. 18, 125: Alva Parish

II HYDROLOGY AND HYDROGEOLOGY

11.1 INTRODUCTION

Scope of Works

11.1.1 The key objectives of the Hydrology and Hydrogeology assessment were:

- To identify the key hydrological and hydrogeological features and peat depths over the site.
- To identify the likely significant impact of the proposed wind farm development on the hydrological and hydrogeological regime.
- To recommend appropriate mitigation measures to minimise the impacts of the development.

Methodology

11.1.2 The impacts of the proposed development on the hydrology and hydrogeology of the site have been assessed using the methodology laid out in **Appendix 11.1, Volume 4**, along with the criteria for assessing the magnitude of impact.

11.2 INFORMATION SOURCES

Key Guidance

11.2.1 A range of guidance is available highlighting good practice applicable to the Burnfoot Hill Wind Farm development. Key publications include:

- Forests and Water Guidelines (Fourth Edition) The Forestry Commission (2003);
- Sustainable urban drainage systems - design manual for Scotland and Northern Ireland (C521), P Martin et al, (CIRIA 2000);
- Control of Water Pollution from Construction Sites (CIRIA 2001); and
- Guidance on River Crossings and Migratory Fish (Scottish Executive).

11.2.2 SEPA Guidelines include:

- Guidelines for Water Pollution Prevention from Civil Engineering Contracts;
- Policy No.19: Groundwater Protection Policy for Scotland;
- Policy No.26: Policy on the Culverting of Watercourses;

- PPG1: General guide to the prevention of pollution
- PPG2: Above ground oil storage tanks
- PPG4: The disposal of sewage where no mains drainage is available
- PPG5: Works in, near or liable to affect watercourses
- PPG6: Working at construction and demolition sites
- PPG18: Managing for water and major spillages
- PPG21: Pollution incident response planning

11.2.3 Legislation that will apply to the development includes the Controlled Activities Regulations to be introduced in April 2006. This covers water abstraction, point sources of pollution and engineering works on watercourses.

Published Data Sources

Flood Estimation Handbook

11.2.4 The Flood Estimation Handbook (FEH) provides guidance on the most up-to-date methods for assessing the hydrological properties of rivers and burns in the UK, with the accompanying Digital Terrain Model (DTM) providing details on the extent and characteristics of each water catchment.

British Geological Survey

11.2.5 British Geological survey sheet 39E has been used to assess the underlying solid and superficial geology of the site and the Hydrogeological Map of Scotland (1988).

Consultation

11.2.6 Written requests for information and comment on hydrological and hydrogeological issues have been made to each of the organisations listed in **Table 11.1**.

Table 11.1. Consultations

Organisation	Issues/concerns
Clackmannanshire Council	Concern for the local private water supply at Backhills Farm and the Frandy Fish Farm.
The Forth Fisheries	A request has been made but no comments have been received as yet.
Frandy Fisheries (Ken McCutcheon 01259 781352)	Points raised include: <ul style="list-style-type: none"> • The stocked fish are sterile but do run the Burns from the reservoirs;

Organisation	Issues/concerns
	<ul style="list-style-type: none"> • Native brown trout run and spawn upstream on the Corim Burn; and • No fish passes on the dams.
British Geological Survey	The online BGS archives were searched.
Scottish Executive	<p>Hydrological work to encompass an envelope around the site, turbine locations, anemometry, substations and access tracks.</p> <p>Consider the effects of run off waters from tracks and turbine bases on any adjacent marshes or ponds.</p> <p>Turbine locations, track routes and construction methods should be considered to minimise their effects on wetland habitats and hydrology.</p> <p>Also consider the impacts during the construction phase on the water environment of track crossings of watercourses and on the use of borrow pits.</p>
Scottish Natural Heritage	<p>Map peat (depth, nature, hydrology and condition) and use to avoid deep peat areas (blanket bog).</p> <p>Assessment of ground waters and any abstractions within the area. Identify areas sensitive to soil compaction or other disturbance (related to water flow or siltation)</p>
Scottish Environment Protection Agency	<p>Principal concern is water pollution due to the release of sediment from exposed surfaces and accidental spillages, during construction and access track activities.</p> <p>Other concerns include:</p> <p>Concrete works for the turbine bases; and</p> <p>Increased risk during periods of high rainfall.</p> <p>Requirement for silt traps and possibly a silt settlement lagoon.</p> <p>Any drainage from borrow pits to be routed to on site treatment facilities.</p> <p>Any discharges will need to be considered for SEPA consent.</p> <p>Steps need to be taken to ensure that the work does not cause mud, silt or concrete to be washed away during construction of as a result of subsequent erosion.</p> <p>Refer to Pollution Prevention Guidelines (PPGs)</p> <p>PPG 5 for works in, near or liable to affect watercourses; and</p> <p>PPG 6 working at construction and demolition sites</p> <p>Fuel oil stored on site needs to be bunded or contained to retain spillage or leakage.</p> <p>If there is the need for sewage treatment and discharge</p>

Organisation	Issues/concerns
	<p>from on site facilities refer to PPG 4 – disposal of sewage where no mains drainage is available.</p> <p>Identify any private water supplies and ensure (take measures) that there is no pollution of these resources, during or after construction. SEPA is opposed to the culverting of watercourses, bridge crossings should be considered in preference to culverts.</p> <p>Follow the Water Framework Directive (WFD) Water Environment and Water Services (Scotland) Act 2003 – The Water Environment (Controlled Activities) Regulations July 2005 to replace the Control of Pollution Act (CoPA) for point source pollution from 1st April 2006 – the new regulations will also cover engineering works in or near waterbodies.</p>
Scottish Water	<p>Site lies within the Glendevon Reservoirs (upper and lower) catchment basin. These supply the Glendevon Water Treatment Works. Potential pollution of the watercourses or alterations to the runoff profiles as a result of the construction works or operation of the wind farms is of concern.</p> <p>Activities such as the construction of access tracks, laying of cables or erection of the wind turbines could lead to possible detrimental changes in the runoff profile from the catchment (through changes in topography, blocking and silting of the natural watercourses in the area.)</p> <p>Access track alterations – significant increases in track surface area, construction of a new bridge.</p> <p>Track widening at the Corim Burn, which is in close proximity to the Lower Glendevon Reservoir, concern raised over possible protection of the watercourse from accidental pollution.</p> <p>Track widening at the Brioch Burn is the main feed into the Upper Glendevon Reservoir, concern raised over culverting of Burn and possible protection of the watercourse from accidental pollution.</p> <p>Concern expressed over the new bridge location (Frandy Farm) and its proximity to several raw water mains and a pipe used to discharge compensation flows to the River Devon.</p> <p>Concern expressed over general protection of the Reservoirs from the extensive track widening.</p> <p>Provide detailed proposals indicating how the reservoirs and watercourses are to be protected during access track construction works.</p>

11.3 BASELINE CONDITIONS

Site Description

11.3.1 The site is located in the headwaters of the River Devon, which becomes the River Forth and flows into the Firth of Forth. The physical landscape of the site consists of rounded hills with slopes incised by steep valleys, with significant natural exposures of bedrock. The site covers approximately 2.5km² with the highest point being the hill south of Burnfoot Hill at 583m AOD (above Ordnance Datum) whilst the lowest is approximately 300m AOD by Backhills towards the northeast of the site. The site consists primarily of a mosaic of upland acid grassland, wet heath and blanket bog used as rough grazing.

Site Visit

11.3.2 A site visit was undertaken on the 19th April 2005 during which time the weather conditions were wet and overcast. In general the site was found to be wet underfoot. A representative photographic record of the site was made and is included within **Appendix 11.2, Volume 4**.

Hydrology

11.3.3 The proposed site area lies within the headwaters of the River Devon catchment. The flows in the upper reaches of the River Devon are routed through the Upper and Lower Glendevon Reservoirs. These are regulated through the Reservoirs Act 1975 and operated by Scottish Water for public supply.

11.3.4 The wind farm area, excluding the proposed access track up grades and the grid connection route, lies within the Upper Glendevon Reservoir catchment, this catchment extends to 18.3km², of which the proposed site covers 2.5km² (13.7%) of this catchment.

11.3.5 The site is dominated by two hills, Burnfoot Hill and a hilltop at spot height 583mAOD, incised by three steep sided (v-shaped) valleys and their associated steep headwater burns.

11.3.6 The baseline conditions of the River Devon catchment are detailed in the following sections, and the key hydrological features on the proposed wind farm site can be summarised as:

- Greenhorn Burn catchment;
- Grodwell (Broich) Burn catchment;

- Muckle Burn catchment;
- Blanket bog areas across Burnfoot Hill

11.3.7 Hydrological features of interest along the grid connection route are the:

- Glenwinnel Burn;
- Daiglen Burn; and
- Silver Glen Burn.

11.3.8 Other hydrological features of interest outwith with site and along the access tracks are:

- Upper Glendevon Reservoir;
- Lower Glendevon Reservoir and the associated Burns and springs, which include: Craig Bran Burn; Frandy Moss Burn; Smithsleuch Burn; Corim Burn; springs at Frandy Farm; and Meadow Burn.

Greenhorn Burn Catchment

11.3.9 The Greenhorn Burn flows from south to north through a steep sided v-shaped valley into the River Devon above the Upper Glendevon Reservoir, with several small channels draining into the burn.

11.3.10 This catchment drains the northwest of the site; including the western slopes of Burnfoot Hill, the eastern slopes of Scadlaw and part of the northern slopes of Ben Buck. It drains an area of the site, approximately 1km² (the whole catchment is 2km²), to the River Devon above the Upper Glendevon Reservoir. Water from the upper reservoir is used with the Lower Glendevon Reservoir as a public water supply.

11.3.11 Upper and middle tributaries, medium fast flowing, are approximately 1m wide and 0.25m deep, with bed material of silt and gravel.

11.3.12 Middle and lower sections are 2m wide to 0.5m deep, medium fast flowing with gravel and pebble bed material.

11.3.13 The catchment, in the drier areas is covered in acid grassland/heath vegetation and in the wetter areas pockets of blanket bog.

11.3.14 Manmade drainage ditches (not recently maintained, herringbone patterned 0.5m deep and 0.5m wide) drain the slopes of Burnfoot Hill. The flow in the channels draining from the blanket bog contains dark sediment (peat debris).

11.3.15 Hagging and erosion are present in the upstream tributaries. The tops of the tributaries show evidence of hagging and soil erosion down to bedrock in places, slippage has occurred in some areas.

Grodwell (Broich Burn) catchment

11.3.16 This catchment drains the south and east of the site. From the site, the catchment drains down to the Grodwell Burn and further downstream into the Broich Burn (the lower reaches are >2m wide). The Broich Burn flows under the existing access track via a bridge and down past Backhills Farm. It drains an area of the site approximately 0.75km² (the whole catchment is 6.5km²).

11.3.17 Areas of blanket bog on the slopes above the Burn are drained by a series of tributaries (<1m wide), the blanket bog has been artificially drained using a series of manmade ditches. Evidence of peat erosion was visible at the edges of these bogs (peat hagging and minor slumping) and at the heads of the tributaries. This would appear to be attributable to the impacts of the drainage ditches (causing desiccation) and loss of vegetation cover (due to over grazing and watering activities of livestock and deer).

11.3.18 The burn corridor holds a series of small wetlands, evidence of previous flooding levels (a trash line upto 0.5m above the bankfull height) was observed on fences both crossing and running alongside the burn. The water was observed to be clear with little evidence of sedimentation. The streambed contained some fine gravel material, with the majority of the bed material ranged from pebbles to large cobbles in size, and bedrock exposed in places creating small waterfalls.

Muckle Burn Catchment

11.3.19 This catchment drains the north of the site. From the site, the catchment drains down to the Upper Glendevon Reservoir (the lower reaches are >2m wide). The effective catchment area potentially impacted by the site, is approximately 1km².

11.3.20 Areas of deep bog (>4m deep) on the slopes above the Burn are drained by a series of tributaries (~0.5m wide) and the blanket bog has been artificially drained using a series of manmade ditches. Evidence of severe peat erosion was visible at the edges of these bogs (peat hagging and slumping) and at the heads of the tributaries. This would appear to be attributable to the impacts of the drainage ditches (causing desiccation) and loss of vegetation cover (due to over grazing and watering activities of livestock and deer).

11.3.21 The water was observed to be dark and peaty with some evidence of sedimentation. The streambed contained some fine gravel material, with the majority of the bed material ranged from gravel to pebbles in size.

Blanket bog areas across Burnfoot Hill

11.3.22 The blanket bog across the site has been artificially drained and heavily grazed. The peat depth survey showed depths of peat ranging from 0.5m up to >4m depth across the site, as shown in **Figure 11.1, Volume 3**.

11.3.23 Generally the site is covered in a depth of peat no greater than 1m. The deeper areas are centred at the top of the Muckle Burn catchment with depths ranging from >2m to >4m, and to the west side of Burnfoot Hill with depths ranging from >0.5m to 2m. A deeper area of peat also occurs along the saddle (at 518mAOD) between Burnfoot Hill and the higher hill at spot height 583mAOD, this area also contains various bog pools. The flows from this area feed down to both the Greenhorn Burn catchment and the Muckle Burn catchment.

Hydrological features of interest along the grid connection route

11.3.24 (See **Figure 11.2, Volume 3**)

- Several tributaries of the Glenwinnel Burn are linked to a spring line at the foot of the blanket bog draining the slopes of Ben Buck.
- The saddle between Ben Cleuch and Ben Buck holds a blanket bog, this also drains down into the Grodwell Burn to the north;
- The head of Daiglen Burn catchment (steeply sided v-shaped) is heavily eroded with some areas of slippage visible;
- Silver Glen Burn runs along the east side of the proposed grid connection route, this catchment is also steeply sided and v-shaped showing signs of erosion and slippage along its west slopes, the tributaries and drains cross the line of the existing track through culverts with deeply eroded outfalls; and
- Deep peat towards the south west of the site on the slopes up to Ben Buck, depths of up to 3m, were measured, this peat is broken and hagged.

Hydrological features of interest along the access route

11.3.25 (See **Figure 11.3, Volume 3**) The existing track is unsurfaced and currently unsuitable for heavy construction traffic. The existing access track leaves the site at Backhills Farm and goes downhill, crossing the Broich Burn at Backhills Farm, running along the south east side of the Upper Glendevon

Reservoir, along the slopes above the south bank of the River Devon, and then along the south banks of the Lower Glendevon Reservoir crossing several tributaries (see below), before crossing the River Devon upstream of the Frandy Farm and Frandy Burn where it runs along the north bank of the River Devon behind the Frandy Fish Farm, this fish farm draws water directly from the River Devon below the Lower Glendevon Reservoir. The track then joins the A823 to the east of the Meadow Burn.

11.3.26 Several Burns are to be crossed by the proposed access track these include:

- Muckle Burn;
- Broich Burn;
- Craig Bran Burn;
- Frandy Moss Burn;
- Smithsleuch Burn;
- Corim Burn;
- Meadow Burn; and
- River Devon.

11.3.27 The proposed access track also passes through various springs/issues feeding into the Lower Glendevon Reservoir.

Private Water Supplies

11.3.28 There are two private water supplies contained within the Upper River Devon Catchment, Backhills Farm and the Frandy Fish Farm. The nearest property downstream of the site is Backhills Farm (Grid Ref: NN 913 036). This farm has a private water supply, sourced from a Burn above the farm, this Burn catchment is part of the Grodwell/Broich Catchment draining down from the north of the site.

11.3.29 The Frandy Fish Farm (Grid Ref: NN 947 047) extracts water from the River Devon below the Lower Glendevon Reservoir.

Water Quality

11.3.30 SEPA do not hold any water quality information available for the burns in this area. However the River Quality Classification interactive map shows the upper reaches of the River Devon classed as A2 (good).

11.3.31 There are no consented discharges in this area and potential contaminant sources are currently restricted to grazing sheep and deer. Observations

during the site visit did not detect any impacted water quality. As a result, the water quality is likely to be of good quality.

Catchment Analysis

11.3.32 The Flood Estimation Handbook (FEH) has been used to determine catchment boundaries and calculate a range of design flows for each catchment, as summarised in **Table 11.2**. The annual average rainfall in the catchment varies from 1,783mm across the Grodwell Burn catchment to 1,711mm across the Muckle Burn catchment and evapotranspiration losses have been assumed to be 550mm per annum (taken from Hydrological Data UK (hydrometric register and statistics 1991-95, Institute of Hydrology and British Geological Survey 1998).

Table 11.2. Catchment design flows

Watercourse	Greenholm Burn	Muckle Burn	Grodwell Burn	Corim Burn	
Area (km ²)	1.97	0.92	6.37	0.57	
Grid Reference	NN89600 04200	NN91050 03900	NN91200 03800	NN93400 04450	
Q ₉₅ Low Flow (m ³ /sec)	0.004	0.002	0.017	0.001	
Mean Annual Flow (m ³ /sec)	0.075	0.034	0.244	0.019	
Return Period (Years)	2.33	2.65	1.27	6.71	0.72
	5	3.75	1.81	9.41	1.03
	10	4.43	2.15	11.29	1.23
	25	5.62	2.72	14.25	1.52
	50	6.51	3.17	16.51	1.79
	100	7.43	3.64	18.84	2.07
	200	8.45	4.16	21.46	2.38

11.3.33 These figures provide indicative flows that can be expected for a range of design events and should be used to ensure that any new culverts or bridges associated with the development are suitably sized to convey the expected range of flows.

11.3.34 The Corim Burn design flows are indicative of the various burns that are to be crossed by the proposed access track.

11.3.35 These figures will also be used should any water abstractions be necessary during construction.

11.4 HYDROGEOLOGY

Solid Geology

11.4.1 The site is mostly underlain by igneous intrusive basic andesite and basalt lavas of Old Red Sandstone age, with small areas of trachyandesite in the centre of the site and unclassified tuffs on the northern part. Some faults are located on the periphery of the site. Bedrock is exposed along most of the burns on and around the site.

11.4.2 No quarries or other works are depicted on BGS or Ordnance Survey maps. See Solid Geology Map shown in **Figure 11.4, Volume 3**.

Drift Geology and Soils

11.4.3 According to BGS sheet 39E the bedrock to the west of the site is overlain by peat. Boulder clay overlies the bedrock in a small valley in the north of the site. It is likely that the boulder clay in the valley and the exposed bedrock on the higher ground continue under the peat cover.

11.4.4 A peat depth survey undertaken on the site showed peat depth to range between 0m and >4.0 metres (as shown in **Figure 11.1**), however peat depth for most of the site is between 0.5 and 1m. This is consistent with the BGS maps depicting areas of no peat cover, as the BGS maps do not include peat with a depth of less than 1m. The BGS Drift Geology Map is shown in **Figure 11.5, Volume 3**.

Existing Hydrogeological Regime

11.4.5 As basalt and andesite have little to no intergranular porosity, any groundwater flow within the bedrock will be minimal, however small amounts of fracture line permeability may increase flows locally. This is more likely to affect the periphery of the site, where faults are located.

11.4.6 Groundwater is likely to be present within the peat deposits, although flows within the peat will be small, especially considering the shallow depth of peat over most of the site. This coupled with the impermeable nature of the bedrock in the region indicates that any groundwater encountered is likely to be perched and localised, and the potential for impacting groundwater is therefore limited (ref: the Hydrogeology Map of Scotland (BGS)).

11.5 ASSESSMENT OF POTENTIAL SIGNIFICANT IMPACTS

11.5.1 This section assesses the potential significant impacts on the hydrology and hydrogeology of the site during the construction, operation and decommissioning of the wind farm. Tables 11.3, 11.4 and 11.5 list the potential impacts.

11.5.2 All turbines have been sited at least 50m from any watercourses, there are no new crossings of watercourses proposed, the old crossings are however proposed to be upgraded as illustrated in Figure 11.6, Volume 3.

Table 11.3: Potential Turbine Impacts

Turbine	Potential Impact on Hydrology and Hydrogeology
1	Peat >0.5m
2	No impact
3	Water pollution
4	Peat >0.5m
5	Blanket bog deep peat > 0.5m
6	Steeper ground potential erosion
7	Blanket bog deep peat > 0.5m
8	No impact
9	Peat >0.5m
10	No impact
11	No impact
12	No impact
13	Peat >0.5m

Table 11.4: Potential Access and Site Track Impacts (Figure 11.3, Volume 3 – showing track locations)

Access Track Crossings (numbering corresponds with Fig 2)	Grid Reference	Details	Potential Impact
2 Backhills Bridge over Broch Burn	NN914 036	New bridge and turning circle	Water pollution native trout spawning disturbance
3 Below Craig Bran	NN912 039	Track widening	Water pollution
4 Craig Bran Burn	NN914 043	Crossing of burn	Water pollution, flooding, erosion
5 Unnamed Burn	NN919 043	Crossing of burn	Water pollution, flooding, erosion
6 Smithcleuch Burn	NN923 043	Crossing of burn	Water pollution, flooding, erosion
7 Corim Burn	NN933 044	Crossing of burn	Water pollution, flooding, erosion and fish spawning Burn
8 Weir	NN941 045	New bridge near Frandy Farm Bridge and widening track near a spring line	Water pollution, flooding, erosion
9 Lower Frandy Farm Bridge	NN949 052		Water pollution
Site Track Crossings			
Blanket bog	NN901 031	Crossing of blanket bog	Erosion, water pollution, loss of hydrological connectivity
Private water supply to Backhills Farm	NN905 031	New track runs above the water supply catchment	Water pollution

Table 11.5: Potential Grid Connection Route Impacts

Access Track Location	Grid Reference	Details	Potential Impact
North of Ben Buck	NN898 020	Crosses an area of deep peat	Water pollution, change in hydrological connectivity
South of Ben Buck	NN895 008	Potentially crosses a blanket bog, wet flushes and a spring line	Water pollution, change in hydrological connectivity
Silver Burn	NS891 985	Severe erosion is present along the existing track on the slopes of a steep valley	Water pollution and bank erosion

Site Activities

11.5.3 The construction phase of the wind farm will involve the following key activities that may have potential impacts on the local hydrology and hydrogeology:

- Runoff from stockpiles of excavated soils;
- Upgrading and construction of access tracks;
- Construction of two site compounds, including office and toilet facilities;
- Oil, fuel and site vehicle storage;
- Construction of turbines;
- Concrete pouring;
- Site cabling (including the Underground Grid Connection Route); and
- Borrow pits.

11.5.4 During the operation phase potential impacts include contamination (oil, fuels and sediment) from site traffic and damage to the tracks caused by rutting and gullying.

11.5.5 The potential impacts during decommissioning will be the similar as those described for construction phase.

11.5.6 The nature of the potential impact of these activities can be summarised as being related to:

- Flow alterations (increased runoff/ groundwater draw-down/alteration of flow paths);
- Sediment discharges; and
- Contaminant discharges.

11.5.7 Each of these impacts are discussed further in the following sections, with specific issues relating to individual activity highlighted as appropriate.

Flow alterations

11.5.8 During construction there is potential for increased runoff due to the introduction of impermeable surfaces such as site compounds and tracks, and the compaction of soils. This will reduce the infiltration capacity of the catchment and increase the rate and volume of direct surface runoff. The potential environmental impact of this is to increase flow rates, leading to

increases in channel erosion, sediment loading reaching watercourses and downstream flood risk. Track crossings have the potential to locally affect flows and increase erosion.

11.5.9 The access tracks, site cabling and turbine bases have the potential to affect local flows within the peat, potentially leading to barriers or preferential pathways. If excavations for turbine bases or borrow pits encounter groundwater, it may require to be pumped, resulting in localised drawdown of the water table.

Sediment discharges

11.5.10 There is the potential for the release of sediments into watercourses as a consequence of the following activities:

- Soil stripping to construct tracks, crane hardstandings, sub-surface cabling, site compounds, turbine foundations and other infrastructure;
- Run-off and erosion from soil stockpiles (prior to reinstatement);
- Dewatering of excavations for turbine foundations or borrow pits; and
- Erosion from increased flows as a result of the development (infrastructure drainage).

11.5.11 The result of increased sediment loading to watercourses is to degrade water quality of the receiving waters and change the substrate character. Such effects could adversely affect fisheries and result in changes in the flora and fauna of the receiving watercourse.

Contaminant discharges

11.5.12 During construction of the wind farm, there is a risk of accidental pollution incidences from the following sources:

- Spillage or leakage of oils and fuels stored on site;
- Spillage or leakage of oils and fuels from construction machinery or site vehicles;
- Spillage of oil or fuel from refuelling machinery on site;
- Spillage or leakage from on-site toilet facilities; and
- The use of concrete and cement for the turbine foundation.

11.5.13 Oils and fuels are List 1 substances under the Groundwater Regulations 1998. There will be a risk of pollution from site traffic and turbines through the accidental release of oils, fuels and other contaminants from vehicles.

11.5.14 Concrete (specifically, the cement component) is highly alkaline and any spillage to a local watercourse would be detrimental to water quality and fauna and flora.

11.6 MITIGATION MEASURES

11.6.1 Due to the interrelationship between the hydrology and hydrogeology at the proposed development the potential impacts and mitigation measures will be common to both.

Construction Phase

11.6.2 The construction phase of the wind farm will involve the key activities identified in **Section 11.5.3**. These activities will require mitigation measures to minimise any potential impacts to the hydrology and hydrogeology.

11.6.3 An accident management plan will be followed during the construction phase of the project, it will take full consideration of best practice, statutory requirements and identification of areas of highest sensitivity. This will provide site spill response procedures, emergency contact details and equipment inventories and their location. All staff will be made aware of this document, and its content, during site induction and it will be available in the site office.

11.6.4 Water quality monitoring will be undertaken at the site prior to any construction works commencing (baseline) and during construction activities. This will include an aquatic macro invertebrate study and monitoring of suspended solids. This will allow any change in water quality as result of the construction phase to be actively managed.

Runoff from stockpiles of excavated soils

11.6.5 Stockpiles of soil will not be located within the immediate vicinity of any watercourses. Stockpiles will be sealed at a suitable gradient and revegetated if stored long term. Any runoff from stockpiles will be passed through a silt trap or buffer zone prior to any discharge to local watercourses.

11.6.6 Provided the above mitigation is adopted the residual impact relating to runoff from stockpiles is considered minor (adverse).

Upgrading and construction of access tracks

11.6.7 There is currently an access track to the site from the east. This track will require to be upgraded (widened) and extended to allow the turbines, cranes and other necessary equipment access to the site.

11.6.8 All tracks will be constructed with a suitable camber and all runoff will be captured in trackside drains. Cross drains will be incorporated into the site tracks at regular intervals to divert runoff into trackside drains, preventing the tracks themselves acting as channels. Track runoff will not be discharged directly to watercourses, but to buffer zones, or silt traps will be incorporated if necessary. The width of a buffer area will be determined by the risk of sediment movement. This in turn depends on cultivation, soil type gradient and catchment area. **Table 11.6** provides guidance on buffer zones for the site, and these should be increased locally if soils are very prone to erosion. Where possible, construction activities near watercourses will be avoided during periods of high rainfall.

Table 11.6 Buffer zones

Water Body	Recommended Buffer Zone
Burns <1m wide	5m on either side
Burns between 1-2m wide	10m on either side
Burns >2m wide	20m on either side
Lochs and pools	At least 20m

Source: Forests and Water Guidelines (4th ed.). The Forestry Commission (2003)

11.6.9 The on site tracks to access the turbines, have been laid out to avoid deep peat, vulnerable erosion areas and watercourses. However one length of track between turbines 5 and 7 crosses an area of deeper blanket bog. A floating track design will be used as illustrated in **Figure 5.30, Volume 3**.

11.6.10 Several water crossings exist along the current off site access track, these will be upgraded to support the weight and width of vehicles used during construction. The crossings will be of sufficient size not to restrict or concentrate flows downstream. Measures will be taken to minimise potential erosion by reinforcing the substrate and abutments/headwalls as necessary. Exposed soil will be artificially revegetated with stripped turf if natural re-establishment is slow.

11.6.11 Where the track is close to the reservoirs, camber the track into the hill so that the runoff is directed away from the reservoir into the trackside drains.

11.6.12 These crossing points will be designed in such a way so as not to hinder the passage of fish. Although no migratory fish are expected above the Lower Glendevon Reservoir, the burns that drain into the two reservoirs contain spawning native brown trout (and sterile trout from stocked sources within the reservoirs). Any culverts will be designed in accordance with the Scottish Executive guidance on River Crossings and Migratory Fish, and construction will not be undertaken during periods of high flow or high rainfall.

11.6.13 The following mitigation measures will be adopted to minimise any potential impact on the groundwater flow direction or level:

- Where tracks are excavated to bedrock/rock (in areas of peat of <1m thickness) the fill material imported will be local stone with sufficient permeability to allow cross drainage and not provide a barrier to flow in areas where the access track is on fairly level ground (less than 1:50 gradient approximately).
- Floating access tracks are to be used in areas of deeper peat if necessary. This will result in a negligible impact on groundwater flow or level as such tracks are constructed on the ground surface. The design and drainage details for such tracks should be based on the findings of a detailed geotechnical investigation.
- In areas of normal track (not floating track) construction where the gradient exceeds approximately 1:50 and the access track is parallel to the down gradient direction, the track will utilise material that when placed has a permeability/transmissivity lower than the surrounding peat. This will prevent the track acting as a conduit for groundwater flow in areas of steeper gradient.
- Excavations for normal track construction will remain open for as little time as possible before placement of fill to minimise potential for groundwater ingress to excavations and subsequent dewatering local to the excavation.

11.6.14 Provided the above mitigation measures are adopted the residual impact relating to track construction is considered minor (adverse).

Construction of Site Compounds

11.6.15 Runoff from the compound during construction will not be allowed to directly enter any watercourse and will be captured and passed through silt traps or a buffer zone prior to discharge. This will use a Sustainable Drainage System (SuDS) approach, which will enable the flows to be attenuated and allow removal of sediment loading.

11.6.16 Construction plant washing facilities, including wheel washes, will be provided to minimise the transport of contaminants. Drainage from this area will be collected and treated prior to discharge. Site toilet facilities will use a closed system to ensure that no discharge is necessary.

11.6.17 Provided the above mitigation is adopted the residual impact relating to site compound construction is considered minor (adverse).

Oil, Fuel and Site Vehicle Storage

11.6.18 The mitigation measures to minimise any risk of contaminant release include the following:

- Oil and fuels will be stored on site in a designated bunded area of hardstanding (site compound);
- Designated refuelling point if refuelling is taking place on site;
- Use drip trays while refuelling;
- Regular maintenance of vehicles; and
- Documented emergency procedure in place to deal with any accidental spillages.

11.6.19 This mitigation applies also to the operations phase where plant or machinery are involved during maintenance in the operational phase and during the decommissioning phase.

11.6.20 Provided the above mitigation is adopted the residual impact relating to contamination of groundwater or surface waters by oils/fuels is considered minor (adverse).

Construction of Turbines

11.6.21 The proposed turbines will require excavation of foundations to a suitable depth, as determined by a detailed geotechnical investigation. The time any excavation is open will be kept to a minimum to avoid ingress of water and temporary cut off drains will be installed to prevent any surface water flow into excavations.

11.6.22 Should pumping of excavations be necessary, the water will not be discharged directly to a watercourse, but to a buffer zone or a silt trap if a high level of sediment is present.

11.6.23 Provided the above mitigation is adopted the residual impact relating to the construction of turbines is considered minor (adverse).

Concrete Pouring

11.6.24 The concrete used in the construction will be mixed off-site and transported to the site. The following mitigation is proposed for concrete transport and placement:

- Pouring of concrete for turbine bases will take place within well shuttered pours to prevent egress of concrete from the pour area.

- the accident plan will include a site spill response and be advised to drivers of vehicles carrying concrete to raise awareness of potential impact of concrete and advise staff of procedures for clean up of any accidental spills.
- Wash down and washout of concrete transporting vehicles will be provided at an appropriate facility offsite.
- Ensure that concrete pH be close to neutral (or site specific pH) as practicable as a further precaution against spills or leakage impacting groundwater pH.

11.6.25 Provided the above mitigation is adopted the residual impact relating to concrete pouring is considered minor (adverse).

Site Cabling (including the Grid Connection Route)

11.6.26 Underground cabling will be installed to connect the turbines to the transformer/substation. Cable runs will be installed alongside tracks where practicable to minimise the disturbance of ground, as ground excavation can increase sediment wash out. Where the cables are not laid along tracks they will be reinstated with a turf cover. On steep slopes low permeability plugs will be used to prevent the trench acting as a preferential flow channel.

11.6.27 The cable trenches will be approximately 1.0m deep and 0.5m wide, with the cable bedded in sand in the lower 0.25m and the remainder of the trench will be backfilled with excavated material to reduce the risk of creating an artificial water channel. When excavating, the trenches will be open for the shortest practicable time period.

11.6.28 Provided the above mitigation is adopted the residual impact relating site cabling is considered minor (adverse).

Borrow Pits

11.6.29 Borrow pits will have perimeter drains to divert any surface water runoff away from excavations. Where possible borrow pits will be self-draining, with drainage from the excavation area flowing through a silt trap and/or buffer zone prior to discharge.

11.6.30 If dewatering of excavations is required, this should be kept to a minimum to minimise any impact to the groundwater, however, this would be a short-term localised effect as the groundwater levels should recover after pumping. Proposed borrow pit sites will be assessed for their potential impact on local hydrogeology prior to excavation to minimise this potential impact.

Operational Phase

- 11.6.31 During the operational phase there should be no requirement for excavation. Should excavation be required mitigation highlighted in the construction section should be adopted as appropriate.
- 11.6.32 Site traffic will continue to run on the network of site tracks, although the traffic loading will be significantly lighter than during construction, there will remain a risk of oils, fuels and other contaminants running off the site vehicles. Oil or fuel spills should be dealt with according to documented site emergency procedures.
- 11.6.33 The trackside drains and silt traps will be inspected regularly and cleaned out as necessary. Tracks will be maintained to have an adequate cross-camber and prevent the formation of wheel ruts to prevent consequential erosion of track surface materials. Cross drains will be incorporated into the site tracks at regular intervals to divert runoff into trackside drains, preventing the tracks themselves acting as channels.
- 11.6.34 The risk of polluting the local hydrological regime from the operating equipment is limited. As part of the standard operations procedures, routine monitoring and maintenance will be carried out to minimise these risks to acceptably low levels of likelihood and severity.

Decommissioning Phase

- 11.6.35 The potential impacts on site will be the same as those described for construction. Consequently the same mitigation, environmental management and monitoring measures will be adopted, subject to advances in approach at the time of decommissioning.
- 11.6.36 Decommissioning is expected to be undertaken by track, and the associated increase in traffic will have impacts on the quality of surface runoff e.g. increased risk of oil, fuel and mud from vehicles.
- 11.6.37 It is not expected that the foundations of the turbines will be removed, as they will already be partially vegetated, the lower impact option is to cover the exposed area with stored topsoil and allow it to revegetate. Removal of the transformers will have an associated risk of spillage of oils contained within and will be undertaken to an agreed procedure at the time.
- 11.6.38 The underground cabling network will be cut-off at ground level and left below ground. No fluids or toxic materials are contained within the cables.

11.6.39 Should tracks be removed in part or in whole they will be covered with stored material from construction excavations and encouraged to revegetated using an approved seed mix.

11.6.40 Provided the above mitigation is adopted the residual impact relating to the decommissioning phase is considered minor (adverse).

Summary of Potential Impacts and Mitigation measures

11.6.41 A summary of the potential impacts and mitigation measures discussed is provided in **Table 11.7**.

Table 11.7: Summary of Potential Impacts and Mitigation Measures

Phase	Potential Impact	Magnitude	Duration	Mitigation	Residual Impact (Nature)
Construction	Increased runoff due to peat extraction and formation of lower permeability surfaces.	Moderate	Long term	Ensure any bridges/culverts are suitably sized to convey the increased runoff. Design scheme to minimise peat loss. Attenuate runoff and use SuDS to reduce surface runoff across farmland.	Minor (Adverse)
	Alteration to surface water flows	Moderate	Long term	Install regular cross drains, regularly maintain culverts and SuDS	Minor (Adverse)
	Crossing of areas of deep peat - altering subsurface flows	Moderate	Long term	Ensure any crossings of areas of deep peat are made using suitably designed floating tracks and cable trenches to avoid disrupting the hydrological conditions.	Minor (Adverse)
	Access track crossing of water courses	Moderate	Permanent	Ensure any bridges/culverts suitably sized to convey increased runoff. Design to allow passage of fish (brown trout). Include erosion control measures.	Minor (Adverse)
	Reduction in water quality due to sediment loading	Moderate	Short term	Use of silt traps and buffer zones of at least 5m. Avoid excavation/track building/widening adjacent to private water supplies and watercourses, and minimise construction time when avoidance is impracticable. Revegetate and turf over bare soil and bunds. Undertake good site construction practice. Have a back up	Minor (Adverse)

Phase	Potential Impact	Magnitude	Duration	Mitigation	Residual Impact (Nature)
				supply if quality or quantity of private water supply deteriorates.	
	Reduction in water quantity due to abstraction for dewatering of borrow pits	Moderate	Short term	Locate borrow pits outwith any private water supply catchments. Have a back up supply if quality or quantity of private water supply deteriorates. Ensure sufficient compensation flow to support aquatic life.	Minor (Adverse)
	Reduction in water quality due to leakage/spillage of oils or fuels	Minor	Short term	Store fuels in banded area of hardstanding. Fuelling to be undertaken within site compound where possible. Regular maintenance of all plant/vehicles. Use drip trays when refuelling. Emergency accident plan for event of accidental spillage. Keep machinery clear of riparian zone where possible.	Minor (Adverse)
	Reduction in water quality through onsite sewerage	Minor	Short term	Use chemical plant, waste products removed off site. Emergency accident plan for event of accidental spillage.	Negligible
	Reduction in water quality due to use of cement and concrete	Minor	Short term	Avoid construction near watercourses in wet weather. Suitably located batching plant with a minimum of 50m buffer from any watercourses. Operate a closed loop system with suitable treatment.	Minor (Adverse)
Operational	Reduction in water	Minor	Medium-long	Bunds on external transformers to prevent	Negligible

Phase	Potential Impact	Magnitude	Duration	Mitigation	Residual Impact (Nature)
	quality		term	leakage of oils and fuels. Regular maintenance. Use of trackside drainage ditches. Use buffer areas or silt traps if high sediment loading. Ensure adequate cross camber on tracks. Emergency accident plan for event of accidental spillage.	
Decommissioning	Reduction in water quality	Minor	Short-term	Regular maintenance of plant/vehicles. Bunded oil storage/fuelling areas. Accident plan in place in the event of spillage	Minor (Adverse)

11.7 CONCLUSIONS

11.7.1 The key hydrological and hydrogeological features at the site include the River Devon, the Upper and Lower Glendevon water supply reservoirs, and their associated tributaries, the Muckle Burn, the Greenhorn Burn and the Broich Burn.

11.7.2 The impacts and mitigation measures for hydrology and hydrogeology can be summarised as falling into three main areas:

- Flow Alteration – install adequate drainage and maintenance programmes to minimise alterations to flow paths and runoff rates that could lead to channel erosion and downstream flood risk;
- Sediment discharges – implement a buffer zone to minimise impacts to watercourses and water supplies, undertake water monitoring and ensure that any culverts or bridging of watercourses are of sufficient size and spacing with appropriate erosion mitigation measures; and
- Contaminant discharges – follow SEPA pollution prevention guidance (PPGs), refuel and store oils and fuels in designated areas only, ensure vehicles are regularly cleaned and maintained to keep contaminant potential to a minimum, and implement an accident management plan.

11.7.3 The impacts and mitigation measures have been assessed using a matrix, which can be seen in **Table 11.7**. This demonstrates that if the appropriate mitigation measures are undertaken the residual impact to the hydrology and hydrogeology of the site from the proposed development will be minor (adverse).

11.7.4 Monitoring recommendations include:

- Monitor private water supply at Backhills Farm; and
- Monitor biological water quality on the Burns leaving site, those crossed by access tracks and along the underground grid connection route.

12 NOISE

12.1 SCOPE OF ASSESSMENT

12.1.1 A survey of ambient noise around the site of the proposed wind farm development at Burnfoot Hill, in the Ochil Hills, Clackmannanshire was carried out. This then allowed the levels of noise likely to occur at local residential properties as a result of the operation of the wind farm to be calculated, and the environmental implications of the noise considered.

12.1.2 The results are assessed against the guidelines available for wind farm developments, including the Scottish Office planning guidance documents PAN56 and PAN45, and the ETSU-R-97 report *The Assessment and Rating of Noise from Wind Farms* specifically designed for the purpose. This has enabled the likely significant effects of the noise from the wind farm to be assessed.

12.2 ASSESSMENT CRITERIA

12.2.1 The noise assessment was carried out in accordance with the guidelines specified in **Section 12.1.2**. Specific details of the methodologies used are explained in **Appendix 12.1, Volume 4**.

12.3 SURVEY DETAILS

Dates and times

12.3.1 Automatic noise monitoring took place for various periods at a single location near the site, between 16:00h BST on Friday 22 October and 21:50h GMT on Wednesday 3 November 2004. Wind data was obtained from a 10m high meteorological monitor located on a mast centrally placed on the turbine site, in accordance with ETSU-R-97 recommendations.

Instrumentation

12.3.2 The instrument used for automatic noise monitoring was a Rion NL-31 data logging sound level meter fitted with a type UC-53A condenser microphone and a shower-proof outdoor windshield assembly. The microphone was mounted on a robust stand at a height of 1.2 metres above ground. The sound level meter was powered by high-capacity external battery packs housed with it in a sealed weatherproof case to prevent tampering. Ambient noise levels expressed in the form of ten-minute L_{A90} (correctly $L_{A90,10min}$) values dB, were recorded continuously 24 hours a day throughout the survey period. The results were downloaded to a laptop PC at the end of the survey.

12.3.3 Calibration of the instrument was checked before and after the measurements using a Bruel & Kjaer type 4231 electronic calibrator. No drift of calibration was observed. It had been subject to laboratory calibration traceable to national standards within the previous 12 months. For the avoidance of doubt the internal clocks were set to GMT, as British Summer Time would end during the course of the survey.

12.3.4 Wind data was collected from the temporary meteorological mast (anemometer and weather vane) which was set up near the proposed location of turbine number 7. The time history of wind speed and direction was downloaded and collated with the noise data from the automatic noise monitor.

Measurement locations

12.3.5 The sole location used for measurement was Backhills Farm, an isolated farm occupied by the site landowner. The only other habitation of interest is at Frandy Farm, some 3.5km to the east: there are no other houses within a 5km radius.

12.3.6 **Table 12.1** shows the OS grid references of the two properties, the identification number of the nearest proposed turbine in each case, and the relevant separation distances.

Table 12.1: Grid references and separation distances

Property	Easting	Northing	Distance
Backhills Farm	291237	703542	803m from T9, 982m from T4
Frandy Farm	294178	704271	3594m from T9

Weather during the survey period

12.3.7 The noise survey began in the afternoon of Friday 22 October. The survey period was predominantly dry although there were a few showery periods. The lack of a main road near the monitoring location meant that background noise levels would not be greatly elevated by wet weather, because traffic on wet roads is the usual cause of this effect. Care was taken when placing the noise monitor to avoid burns or other flowing water which might affect the noise levels in spate. The wind speeds ranged from zero to nearly 20ms⁻¹. The wind direction during the monitoring period included significant amounts of easterly wind, a reasonable frequency of westerly wind, and very little time with a northerly component in the wind vector. The spread of wind direction and wind speed observed during the survey can be seen from the wind rose in Appendix 10.1. It is to be expected that winds from other directions would also occur, but since the residential properties of interest both lie north-east or east of the site, and the background noise data was obtained for winds in adverse directions, the data are regarded as representative. In other words, noise problems would not be expected if there were significant northerly winds so the lack of data for such winds does not invalidate the results.

12.4 RESULTS OF BACKGROUND NOISE SURVEY

- 12.4.1 The results of the automatic monitoring of noise and wind speed are presented graphically in the appendices. **Appendix 12.2, Volume 4**, shows the variation in wind direction, and **Appendix 12.3, Volume 4**, the noise level and wind speed history at Backhills. Data regarded as doubtful because of rainfall or other extraneous noise is included in the time history in **Appendix 12.3**. It can be seen that the measured noise levels were dependant on the wind speed and normal daytime/night-time variation. Ambient noise tends to be lower at any particular location during the hours of darkness wherever there is significant human habitation, but the fall in levels at night was not very obvious at this location, probably because it was extremely rural.
- 12.4.2 **Appendices 12.4 and 12.5, Volume 4**, show scatter plots for the quiet daytime and night-time periods, with noise levels plotted against wind speed. It should be noted that although all times were logged as GMT, the quiet daytime and night-time periods were defined by the clock time. This meant that the 'night' of 30 – 31 October was nine hours long (23:00 BST to 07:00 GMT).
- 12.4.3 Data points regarded as doubtful because of rainfall or other extraneous noise were eliminated, as recommended by ETSU-R-97 (see Sections 2.4 and 3.2 of this report), but there is still considerable variation in noise level at any given wind speed. A best-fit curve is superimposed on the data in each case in order to derive the typical wind-dependant background noise levels as recommended by ETSU. The curves are of the shape expected for a rural location.
- 12.4.4 At Backhills the trend line for quiet daytime background noise levels varied from 26dB $L_{A90,10min}$ at a wind speed of $4ms^{-1}$ to 34dB at $10ms^{-1}$.
- 12.4.5 Night-time noise levels were very similar. The trend line for night-time background noise varied from 24dB $L_{A90,10min}$ at a wind speed of $4ms^{-1}$ to 34dB at $10ms^{-1}$.
- 12.4.6 There is no reason to assume that the background noise at Frandy Farm differs significantly from that at Backhills, so the same levels were used for comparisons with turbine noise.

12.5 ASSESSMENT PROCEDURE

Characteristics of wind turbine noise

- 12.5.1 Noise from wind turbines is typically made up of three distinct elements: a reasonably steady, broad-band noise of aerodynamic origin, which depends on blade tip speed; a tonal noise element from mechanical components within the

nacelle; and a regular, pulsed element resulting from the interaction of blade and tower.

- 12.5.2 Modern turbine designs do not emit significant mechanical noise, and in general, at distances greater than about 400m the only sound heard by a casual observer of a single turbine is aerodynamic noise modulated at the blade passing frequency (three times the rotational speed), sometimes described as 'blade swish'.

Turbine noise data

Certified sound power data

- 12.5.3 It is the intention to use 13 2MW wind turbines at this site, and the Vestas V80 turbine is a typical example of such a machine. The cut-in wind speed is 4ms^{-1} and the blades stop moving once wind speeds reach 25ms^{-1} . The turbine generator in its unmodified form is rated at 2MW at a wind speed of 15ms^{-1} .
- 12.5.4 The base data for the wind turbine was taken from the manufacturer's own predicted noise emission characteristics, assuming the most powerful version of the turbine. The predicted noise emission levels are those which would be obtained by actual measurements conforming to International Energy Agency (IEA) recommended practice, the most commonly used procedure. This calls for microphone locations close enough to the turbine that background noise is insignificant. Spherical sound radiation is assumed, and the wind speeds referred to are those at a height of 10m above ground, as called for by ETSU-R-97 and other environmental noise standards.
- 12.5.5 The standard wind turbine is configured for a maximum overall sound power level of 105.5dBA at the reference wind speed of 8ms^{-1} . The sound power depends closely on the wind speed, and both the physical configuration and software settings of the installed turbines have a bearing on the noise emissions. Other versions of the V80 and similar 2MW class machines will be available which are able to achieve slightly lower noise emissions at a cost of reduced power generation capability, but for the purposes of this assessment the standard version is assumed.
- 12.5.6 The turbine type is confidently expected to have a directivity index of 0dB in all directions, so the noise source itself has no significant directional characteristics. Tonal noise components which would warrant a tonal penalty as described in ETSU-R-97 are not usually a feature of large Vestas turbines.

Turbine coordinates

12.5.7 The OS grid coordinates of the proposed turbines and used in this assessment are listed previously in **Table 2.1, Section 2.2.2.**

12.6 CALCULATION PROCEDURE

12.6.1 The model adopted for the assessment of wind farm noise at the nearest residential properties assumes hemispherical sound radiation, as is customary for a receiver in the acoustic far-field of an elevated sound source, and only a small degree of attenuation by ground effects is included. Air absorption and ground effects vary with frequency and distance, and the predictions are carried out in octave bands. The source sound power levels used for calculation purposes take no account of the available noise reduction methods on various turbine types.

12.6.2 In order to calculate the steady noise from the proposed site the combined effect of 13 wind turbines at each monitoring location is calculated. ETSU-R-97 guidance suggests that the steady nature of the noise emitted by wind turbines is such that the level difference between L_{Aeq} and L_{A90} is typically 2dB. This has been confirmed at several wind farms in various types of terrain. A 2dB deduction was therefore made from the sound power level to yield the typical L_{A90} for calculation purposes.

12.7 EFFECT OF WIND DIRECTION

12.7.1 The direction of the wind makes the noise from the turbines effectively directional, since downwind, the noise from the wind farm will appear to increase with wind speed, and upwind, the noise will be attenuated with increasing wind speed. To take this effect into account, an additional computation is made to assess the attenuation values for different sectors of the compass. The measurements made during the certification noise tests were made downwind of the turbine, so a cross-wind would give an apparent attenuation which also depends on the distance from the source, and at an upwind location, a greater attenuation would apply. The values used in the calculation procedures originate from CONCAWE 4/81, which investigates the propagation of noise up to 2km by comparing experimental data with theoretical sound propagation models. The method closely resembles that presented in ISO.9613-2 1996 in terms of the geometrical propagation terms, ground effects, and atmospheric attenuation. It should be noted that the ISO method, although intended to be general in application, is appropriate to 'ground based' noise sources. It is arguable that because of its elevation, a wind turbine cannot be regarded as ground based, and thus the ground effects will be reduced in comparison with a noise source near ground level. The attenuation due to wind direction is also affected by air temperature and the topography of the area, so the actual effect of wind direction may be subject to a small variation.

12.7.2 It is evident that the maximum noise levels will occur at times when the nearest turbine or turbines to the observation point happen to be immediately upwind of the listener.

12.8 NOISE LIMITS

12.8.1 No planning conditions with regards to noise limits have yet been agreed for this proposed development. ETSU-R-97 suggests that noise from wind farm developments in terms of the 10 minute L_{A90} index should be limited to 5dB above background (also $L_{A90,10min}$) during the period 07:00h to 23:00h, with the background noise level being determined from the 'quiet daytime' periods only. This is subject to the further qualification that if the background level plus 5dB is less than 35dB, then the limit is a flat 35dB. This is typically the case at lower wind speeds. At property occupied by the landowner (in this case Backhills Farm), a flat limit of 45dB is appropriate.

12.8.2 The ETSU-R-97 guidance discusses the need for a night-time noise limit for wind turbine developments. For conventional industrial noise sources, the small hours of the night are the time when the potential for noise nuisance is at its maximum, because the background noise is at its minimum. Night-time noise limits are therefore usually more stringent. The premise does not apply to a wind turbine: these machines only operate when the wind is blowing, and the background noise even at night can never be at its minimum under such conditions. Moreover, the greatest potential for noise annoyance occurs when residents are out of doors, as would be expected during summer evenings and at weekends.

12.8.3 ETSU-R-97 suggests a limit no lower than 43dB $L_{A90,10min}$, between 23:00h and 07:00h. At night, residents are indoors and higher levels of external noise would be acceptable. At levels of around 43dB, L_{A90} , the noise from the turbines will be sufficiently attenuated by the building envelope to reduce the levels to less than 30dB, even through an open window. The latest World Health Organisation guidelines suggest that levels of 30dB or less in a bedroom do not give rise to sleep disturbance.

12.8.4 It should be noted that this does not mean that noise levels will increase at night, as the turbines will operate with exactly the same control parameters at all times.

12.9 PREDICTIONS

Results

12.9.1 The predicted worst-case noise levels for each of the residential properties closest to the proposed site are presented graphically in **Appendices 12.6 and 12.7, Volume 4**. For those properties where background noise monitoring did not take place, estimates of the existing daytime and night-time background levels were

made based on the average noise levels measured at nearby locations. The results of the calculations are summarised in **Table 12.4**.

Proposed noise limits

Daytime limits

12.9.2 It can be seen from **Table 12.2** that at the nearest noise-sensitive location, Frandy Farm, the noise of the turbines will be well within the likely noise limits, and subjectively undetectable over background noise. The ETSU recommendation limiting $L_{A90,10min}$ values to no more than 35dB or 5dB above background noise, whichever is the greater, during 'quiet daytime' hours would readily be met at all residential locations.

12.9.3 The nearest turbines will be audible under adverse wind conditions at Backhills, but the 'owner' noise limit of 45dB will be achieved.

Night-time limits

12.9.4 The noise levels from the turbines in the wind speed range of interest will in all cases be within the minimum recommended noise limit of 43dB $L_{A90,10min}$ or 5dB above background noise, whichever is the greater.

Table 12.2: Worst-case noise levels LA90 dB at different wind speeds

Location	Wind Speed ms ⁻¹	Background	Turbines	Difference	Below Limit?
<i>Backhills, daytime</i>					
	4	26	28	2	✓
	5	27	33	6	✓
	6	28	37	9	✓
	8	31	39	8	✓
	10	34	37	3	✓
<i>Frandy Farm, daytime</i>					
	4	26	12	-14	✓
	5	27	17	-10	✓
	6	28	20	-8	✓
	8	31	22	-9	✓
	10	34	21	-13	✓
<i>Backhills, night-time</i>					
	4	24	28	4	✓
	5	25	33	8	✓
	6	26	37	11	✓
	8	30	39	9	✓
	10	34	37	3	✓
<i>Frandy Farm, night-time</i>					

4	24	12	-12	✓
5	25	17	-8	✓
6	26	20	-6	✓
8	30	22	-8	✓
10	34	21	-13	✓

12.10 CONCLUSIONS

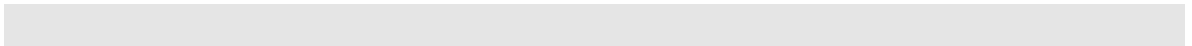
12.10.1 The wind-speed-dependent noise levels predicted at the nearest residential property with no financial interest are below the existing background levels at the same wind speed. The standard version of the V80 turbine is thus able to achieve the ETSU recommended noise limits.

12.10.2 Total noise from all the turbines at the house occupied by interested parties will remain within a 'flat' limit of 45dB, and also meets the 43dB night-time noise limit proposed by ETSU.

12.10.3 The calculations presented in this report are for the most powerful (and noisiest) version of the V80 currently commercially available. Whichever turbine model is chosen, modern designs are electrically and aerodynamically very efficient, and are constructed with noise emissions in mind. The improvements introduced in commercial wind turbines over the years have led to highly developed designs with minimum acoustic impact.

12.10.4 The ETSU recommendation for limiting noise from wind farms, which would restrict the noise emissions in terms of $L_{A90,10min}$ values to no more than 5dB above background at noise-sensitive locations, will be met by the proposed site design.

12.10.5 It can therefore be concluded that noise from the wind farm would not be detrimental to the amenity of local residents.



13 ELECTRO-MAGNETIC SIGNALS AND AVIATION

13.1 INTRODUCTION

13.1.1 Radar, microwave and other electromagnetic signals are transmitted throughout the country by a wide range of operators, including both statutory agencies and commercial companies. There is potential for interference to the transmission of these signals from any large structure, including wind turbines, which may be developed close to the signal path. This section describes the existing situation with regard to the proposed Burnfoot Hill Wind Farm site, potential interference effects and possible mitigation measures.

13.2 EXISTING SITUATION

13.2.1 In order to establish the location and nature of microwave, broadcast and other radio links in the vicinity of the site, the bodies and operators referred to in **Table 13.1** have been consulted.

13.2.2 Ofcom (formerly Radiocommunications Agency) is the statutory consultee that operates a coordination policy to act as the point of contact when they are notified of a wind farm proposal and check to determine if there are any radio communication links that could be affected by the wind farm proposal.

13.2.3 The responsibility for television receptions in the UK is divided on a geographical basis between the ITC and the BBC for the purposes of television service planning. The Burnfoot Hill Wind Farm site falls into an area of ITC responsibility.

13.2.4 The respective Military and Civilian Air Safety statutory consultees were consulted in accordance to the Wind Energy and Aviation Interests Interim Guidelines (DTI/MOD/CAA/BWEA 2002).

13.2.5 All responses to consultation are summarised in **Table 13.1**.

Table 13.1 Observations & comments on EMI and air safety consultation responses

Consultee	Observation	Response Date
Telecommunications Links		
British Telecom	The development would not cause interference – no objection	02/05/2003
Cable & Wireless	No objection	14/03/2003
CSS Spectrum Management Services Ltd	No response to date	
National Grid Wireless	No objection	30/01/2006

(formerly Crown Castle UK)		
Joint Radio Company (JRC)	No objection	13/02/2006
Maritime and Coastguard Agency	Proposals will not affect MCA telecommunications infrastructure	14/03/2003
MLL Telecom	No objection, based on a previous 20 turbine layout	03/04/2003
Northern Lighthouse Board	No response to date	
National Transcommunications Limited (NTL)	No response to date	
O2	No objection	08/03/2006
Orange	No response to date	
Ofcom (formerly Radio-communications Agency)	No objection	10/02/2003
T-Mobile	No objection	18/03/2003
Vodafone	No objection	27/02/2006
WS Atkins Consultants Limited (Cable & Wireless)	No objection	14/03/1003
Television Reception		
British Broadcasting Corporation (BBC)	Area does not lie within their watching brief – referred to ITC	20/03/2003
Independent Television Commission (ITC)	No observations	11/03/2003
Civilian and Military Air Safety		
Civil Aviation Authority (CAA)	No observations	17/03/2003
Ministry of Defence (MoD)	No objections	09/06/2003
National Air Traffic Services (NATS)	No observations	06/04/2004

13.3 POTENTIAL IMPACTS

13.3.1 Ofcom (formerly the Radiocommunications Agency) did not identify any links within the vicinity of the site.

13.3.2 Consultation with British Telecom, Cable & Wireless, Joint Radio Company, National Grid Wireless, MLL Telecom, the Maritime & Coastguard Agency, O2 and Vodafone confirmed that the proposed wind farm would not interfere with their links.

- 13.3.3 No response to consultation has been received from CSS Spectrum Management Services Ltd, Northern Lighthouse Board, NTL and Orange.
- 13.3.4 Consultation with both the British Broadcasting Corporation (BBC) and the Independent Television Commission (ITC) confirmed that the development is unlikely to interfere with television receptions.
- 13.3.5 No objections were raised to the development on the basis of either civilian or military air safety.
- 13.3.6 The response from NATS En-Route Limited states that at the time of writing they are unable to provide advice due to their experiencing a current lack of resources. This currently remains the situation. However, as part of an advanced consultation process which the British Wind Energy Association and the Department of Trade and Industry have advised wind farm developers to adopt, NATS have made available graphical information that shows areas where wind farm projects will, or may, affect NATS operation, depending on the blade tip height of the proposed turbines. The location of the Burnfoot Hill wind farm proposal is outwith NATS area of concern as shown in **Appendix 13.1, Volume 4**.

13.4 MITIGATION

- 13.4.1 As is usual with wind farm planning applications, Wind Prospect is prepared to remedy any interference to domestic TV or radio reception should it occur. Details are given in **Appendix 13.2, Volume 4**.

13.5 SUMMARY

- 13.5.1 There are no significant effects predicted. Although from the consultation carried out to date the possibility of degradation of microwave and other electromagnetic signals would appear unlikely, Wind Prospect is prepared to resolve any such problems should they arise as a result of construction of the wind farm.

13.6 REFERENCES

Bacon, D. (2002) Fixed-link wind turbine exclusion zone method
Radiocommunications Agency Publication
(http://www.ofcom.org.uk/licensing_numbering/radiocomms/licensing/classes/fix ed/Windfarms/windfarmdavidbacon.pdf)

DTI/ MoD/ CAA/ BWEA (2002) Wind Energy and Aviation Interests – Interim Guidelines
(<http://www.dti.gov.uk/energy/renewables/publications/pdfs/windwnenergyaviation.pdf>)



14 SOCIO-ECONOMIC ISSUES

14.1 INTRODUCTION

- 14.1.1 Agriculture is the most extensive land use within Clackmannanshire and is very diverse, reflecting the area's varied topography, climate and soils.
- 14.1.2 Agriculture and other traditional land uses have experienced recent uncertainty. Clackmannanshire Council recognises the need and aspirations for economic diversification in rural areas in line NPPG 15 Rural Development, that seeks to encourage diversification and growth of the local economy.
- 14.1.3 Agricultural diversification has become increasingly important in recent years as the rural economy has entered a period of major change. It is widely recognised that it is essential to stabilise and reverse the job losses and reductions in income which have affected rural areas.
- 14.1.4 However, it is of key importance that the correct balance is achieved between the encouragement of new economic development opportunities and the need to protect the rural environment.
- 14.1.5 This section examines the contribution that the proposed wind farm could make, both directly and indirectly, towards the economic and social well-being of the local community while ensuring the protection of the rural environment.

14.2 POTENTIAL IMPACTS

- 14.2.1 The development of this project would have a number of socio-economic impacts within the local area during both the construction and subsequent operation of the wind farm. These would all be beneficial, and include:

Opportunities to Invest

- 14.2.2 It is proposed that local residents would be able to invest in the project through an independent company. The shares are to be offered under arrangements developed by Wind Prospect. Priority would be given to people living in the immediate vicinity of the wind farm.

Local Trust Fund

- 14.2.3 Wind Prospect would set up to a local trust fund and, based on a 26MW wind farm, regular contributions of £26,000 per year would be made. The administration of the trust fund would be undertaken by an independent charitable organisation. A local advisory panel would be formed following a consultation process that which would represent the different sectors of the community, and would be

chaired by the independent body. The advisory panel in conjunction with Wind Prospect will identify the priorities for funding and criteria for award of funds will be drawn up, for the ongoing distribution of funds throughout the lifetime of the project.

Enhanced rural land viability

14.2.4 Wind farms are a form of farm diversification that would provide a valuable guaranteed rental income for landowners for the duration of the life of the wind turbines, thus increasing the viability of the land unit. Apart from the small amount of land occupied by access tracks, turbine towers and ancillary equipment, the land would continue to be fully available for its previous use.

Employment Opportunities

14.2.5 The developer intends to place as much of the construction work as possible in the local area. Suitable local civil and electrical contractors would be identified and invited to tender for the works, with all local companies given due consideration. Approximately 50 short-term construction jobs will be created for this development and the support of this temporary workforce will have a beneficial effect on the local economy.

14.2.6 The use of local contractors for the maintenance operations could continue throughout the operational life of the wind farm, and this is estimated to provide the equivalent of 1-2 full time positions.

14.2.7 It is estimated that contracts worth approximately £2,000,000 would be available for tender by local companies, during the construction of the wind farm.

14.2.8 Contracts will again be sourced locally when appropriate during decommissioning.

Income to the Local Authority

14.2.9 The development would additionally pay rates according to the national formula for wind generating plant.

Educational Benefits

14.2.10 The wind farm would be of potential benefit as an educational resource for local schools and interest groups. Other wind farms have already proved to be of considerable educational value to schools in the study of technology, sustainability and the broader issues of man's influence on the environment.

14.3 SUMMARY AND CONCLUSIONS

14.3.1 Clackmannanshire Council recognises the need and aspirations for economic diversification in the rural areas at a time when traditional land based revenues are becoming more uncertain.

14.3.2 The development of the proposed wind farm would be consistent with this policy and would result in a number of socio-economic effects on the local economy, which would be largely beneficial. These include:

- Opportunity to participate in the project through investment
- Local Trust Fund of £26,000 per year based on a 26MW project
- Enhanced agricultural viability of the land through rental income from the wind farm combined with existing land use practices
- Local employment and contracts in both the construction of the wind farm and in its subsequent maintenance, which would be to the value of approximately £2,000,000
- Income to the local authority through liability for rates
- Benefits of the wind farm as an educational resource for local schools and communities

15 PLANNING POLICY CONTEXT

15.1 INTRODUCTION

- 15.1.1 The purpose of this chapter to outline how the development sits in relation to planning policy, at both a local and national level.
- 15.1.2 The Clackmannanshire and Stirling Structure Plan (2002) translates national policy to a more local level. Alteration 1, adopted in June 2004, replaced the original policy ENVP5: Renewable Energy which advised that *the “Councils will prepare a policy on renewable energy in accordance with NPPG6 and submit it as an alteration by 31 March 2003”*.
- 15.1.3 Policy ENV 14 ‘Renewable Energy and Energy-Efficient Development’ generally supports proposals for renewable energy developments in appropriate locations. With specific regard to Wind Energy, Policy ENV 16 ‘Wind Energy’ identifies a number of exclusion areas where wind energy developments *“will not normally be acceptable”*. However, it notes that the remainder of the Structure Plan area *“will be regarded as an area of search for development opportunities”*. Proposals will usually be acceptable where they would not adversely affect the amenity of the surrounding area or impact on features of scenic and/or heritage value.
- 15.1.4 The site falls within the Clackmannanshire Local Plan Area. This Plan acknowledges the potential of the area to accommodate wind or other renewable energy developments. Policy INF 9 ‘Renewable Energy Developments’ advised that proposals for renewable energy developments will be considered favourably provided they create no significant adverse environmental impacts. It is understood that this policy has since been superseded by the above noted alteration to the Structure Plan.
- 15.1.5 Section 25 of the Town and Country Planning (Scotland) Act directs a planning authority to determine a planning application in accordance with the provisions of the statutory development plan, unless material considerations indicate otherwise. The weight to be ascribed to other planning and related guidance is also of relevance.
- 15.1.6 In addition to the principle elements of planning policy, identified above, other relevant national planning policy guidance and advice is contained in:
- SPP1: The Planning System
 - NPPG5: Archaeology and Planning
 - NPPG 14: Natural Heritage
 - SPP 15: Planning for Rural Development

- SPP 17: Planning for Transport
- NPPG 18: Planning and the Historic Environment
- PAN 42: Archaeology
- PAN 56: Planning and Noise
- PAN 60: Planning for Natural Heritage
- PAN 73: Rural Diversification

15.1.7 Additional related government policy is contained in:

- The Clackmannanshire Landscape Character Assessment (1998) prepared for SNH by the ASH Consulting Group.
- ‘SNH Policy Statement No. 01/02: Policy on Renewable Energy’
- SNH Policy No. 02/02: ‘Strategic Locational Guidance for Onshore Wind Farms in respect of the Natural Heritage
- The Tayside Landscape Character Assessment (1999) prepared for SNH by Land Use Consultants

15.2 NATIONAL PLANNING GUIDANCE

15.2.1 As previously stated, the principal source of planning policy guidance relating to renewable energy proposals in Scotland is NPPG 6, revised in 2000.

15.2.2 This document is supportive of renewable energy developments taking as its context European and national directives to reduce greenhouse emissions. With regard to more specific considerations, PAN 45 provides detailed guidance and advice relating to the technology of harnessing wind energy. It also provides the context for the formulation of policies within development plans and subsequent considerations within the development control framework.

15.2.3 Scottish Planning Policy 1 (SPP 1) ‘The Planning System’ emphasises the Government’s commitment to the concept of sustainable development. SPP 1 links the role of the planning system in regulating the use of land in the public interest, to the achievement of sustainable development. It states that “planning decisions should favour the most sustainable option, promoting development that safeguards and enhances the long-term needs of the economy, society and environment” (Paragraph 8).

15.2.4 Government policy is therefore to vigorously promote the exploitation and development of renewable energy sources wherever they have the prospect of becoming economically attractive and environmentally acceptable in the interests of sustainable development.

15.2.5 The proposed wind farm supports this aim of sustainability by:

- Providing an alternative to the production of harmful greenhouse gases whilst not in itself contributing to harmful emissions;
- Locating at a site which will minimise the environmental, specifically visual impact from Clackmannanshire;
- Maintaining land resources;
- Resulting in limited traffic movements subsequent to completion;
- Limiting effects on wildlife and ecology; and
- Locating on a site which can be returned to its previous use.

15.3 STRATEGIC PLANNING POLICY

Clackmannanshire and Stirling Structure Plan (2002)

15.3.1 The Clackmannanshire and Stirling Structure Plan was approved by the Scottish Ministers in 2002. The overriding principle driving the Structure Plan is that of Sustainable Development, key elements of which include the promotion of environmentally sustainable infrastructure and the use of renewable energy and resources. In this respect, the Structure Plan “encourages renewable energy developments in locations where there would be no significant loss of amenity, and the settings and integrity of features of importance for their scenic, conservation and heritage value would not be harmed” (Paragraph 3.14.1).

15.3.2 As previously noted Alteration 1 was adopted in 2004 and replaced the original Policy ENVP5 with Policies ENV 14 ‘Renewable Energy and Energy-Efficient Development’, ENV15 ‘Energy from Hydro Sources’, ENV16 ‘Wind Energy’ and ENV17 ‘Energy from Bio Mass’.

15.3.3 Policy ENV 14 ‘Renewable Energy and Energy-Efficient Development’ supports renewable energy developments provided they are in conformity with other policies contained within the Structure Plan and relevant Local Plan. Of particular relevance are:

- SD1: Key Principles
- ENV 1: Nature Conservation
- ENV 2: Protected Landscapes
- ENV 3: Development in the Countryside
- ENV 4: Green Belts
- ENV 5: Environmental Enhancement
- ENV 6: The Historic and Built Environment

15.3.4 With specific regard to wind energy, Policy ENV16 notes that the siting of wind turbines *“will not normally be acceptable in National Scenic Areas, in Green Belts”* or in areas identified by the Structure Plan as *“Exclusion Areas”*. These areas are identified as:

- *“The Ochil Hills Escarpment*
- *The Touch – Gargaunnock – Fintry Hills Escarpments (including Lewis Hills)*
- *The Campsie Fells Escarpment*
- *Queen’s View (Auchineden)*
- *The settings of Abbey Craig – Wallace Monument, Stirling Castle, Bannockburn Memorial and battlefield, and Sheriffmuir battlefield*
- *Flanders Moss”*

15.3.5 With regard to the application site, which is not within any of the locations detailed above, Policy ENV16 advises that *“The remainder of the Structure Plan Area will be regarded as an ‘area of search’ for development opportunities”*.

15.3.6 Policy ENV 3 ‘Development in the Countryside’ is also relevant in the determination of this proposal. It notes that development in the countryside will only be permitted where:

- The proposed enterprise or activity is dependant upon a countryside location; or
- It accords with Policy ED4.
- All development in the countryside should, both in function, siting and design, be suitable for its particular location, and should respect and preserve features contributing to local character.

15.3.7 Rural Development, Policy ED 4 advises that, *“The Councils will support economic development in rural areas to support the economic and social needs of communities through detailed Local Plan policies”* (page 25).

Clackmannanshire Local Plan

15.3.8 The Clackmannanshire Local Plan was adopted in 2004. *“The Local Plan’s strategy promotes development opportunities so that the social and economic priorities of Clackmannanshire can be realised within the context of caring for the environment”* (Paragraph 1.1).

15.3.9 Clackmannanshire Local Plan (Interim Policy) INF9 related specifically to Renewable Energy Developments. This policy advised that;

“Proposals for renewable energy developments will be considered positively provided that they have no significant adverse impact on the built or natural environment. There

will be a presumption in favour of smaller renewable energy schemes provided that they do not result in any significant harm to the visual amenity, landscape or habitats and do not result in unacceptable noise intrusion. Wind farm developments will not normally be permitted within areas of Green Belt or in any part of the Ochil Hills”.

15.3.10 With regard to the application site it is noted that the interim policy detailed above, has since been superseded by Policies contained within Alteration 1 of the Clackmannanshire and Stirling Local Plan. This alteration identifies large areas of the Ochil Hills, including the application site, as being located within an established area of search.

15.3.11 The application site is located within an Area of Great Landscape Value and as such Policy EN2 ‘Landscaping and Ecology’ is relevant. This policy notes that within these areas development will only be permitted,

- *“Where it is an essential requirement of farming, renewable energy initiatives, appropriate recreational and tourism activities, or forestry which conforms with the Indicative Forestry Strategy; and*
- *Where there is a specific need for the development which could not be met in a less sensitive location; and*
- *Where the landscape character and scenic interest would not be adversely affected”*

15.3.12 A detailed assessment of the site’s suitability and the potential visual impact of the development has been undertaken and is detailed in other chapters of this report. It is noted that the application site is located within the Council’s own ‘Area of Search’ for renewable energy developments. As detailed elsewhere in this Environmental Statement, the proposed development would not adversely impinge on the site’s landscape character or scenic value. In addition, following a detailed search of the surrounding area, the application site is assessed as being the location which best meets the operational requirements of the proposal.

15.3.13 Policy EN8 ‘Site Assessment, Evaluation and Recording’ relates to the cultural heritage of the application site and surrounding area. In addition Policy EN7 advises that developments will not normally be permitted where they “could destroy or adversely affect a Scheduled Ancient Monument or other important archaeological or historic site”. As detailed in Chapter 10, following a detailed assessment of the proposal, its potential impact and the surrounding historical sites, it is concluded that the development would not destroy or adversely impact upon any Scheduled Ancient Monuments or important archaeological sites. The proposal therefore complies with both Policy EN7 and Policy EN8 of the Local Plan.

15.4 CONCLUSIONS

15.4.1 The proposed development at Burnfoot Hill, Clackmannanshire is supported by national, strategic and local planning policy. The provision of a wind farm in this location will provide thoroughly sustainable energy in accordance with the promotion of energy production from renewable resources.

15.4.2 Specifically it fully complies with SPP 1, NPPG 5, NPPG 14, SPP 15, and NPPG 18.

15.4.3 The proposal also complies with the statutory development plan, specifically the Clackmannanshire and Stirling Structure Plan and the adopted Clackmannanshire Local Plan. There are no material reasons to reject the proposal on the basis that:

- It will contribute to national energy generation targets for renewable resources and thus reduce the production of harmful greenhouse gases;
- It supports the objective of sustainability expressed at all levels of the planning policy hierarchy, which aims to meet the needs of the present without compromising the ability of future generations to meet their own needs;
- The development will not compromise the quality of any areas designated as of high heritage or environmental quality and will not substantially adversely impact on the Area of Great Landscape Value.
- The site lies at least 5km from any major settlement and, given the lie of the land and nature of the site will not be visible from any settlements located within Clackmannanshire. It is therefore considered that the proposal will not significantly adversely affect residential amenity in the surrounding area.
- The site lies within a preferred location for wind farm development in respect of guidance and policy documents produced by SNH and by Clackmannanshire Council.

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Appendix 13.2	Electromagnetic Interference to Television Reception: Remedial Action

