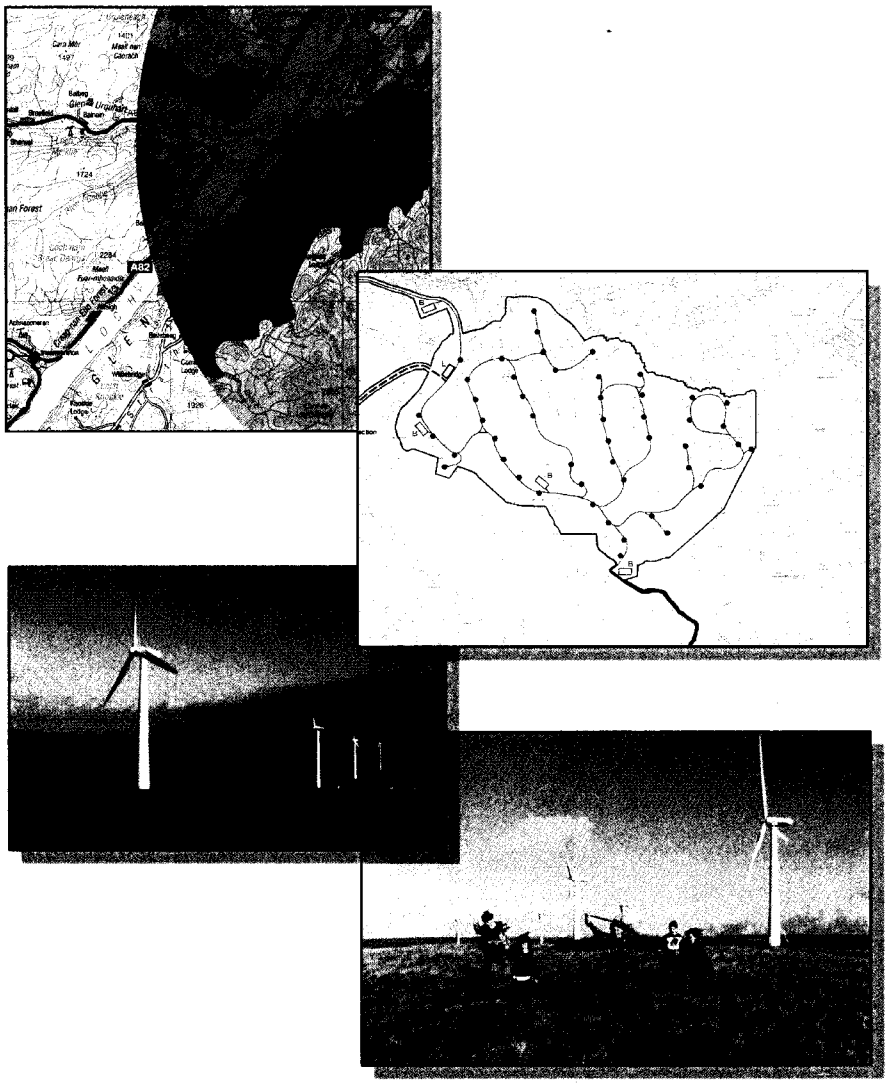
NATIONAL WIND POWER

FARR
WIND FARM



Environmental Statement
Volume 2
Written Statement
September 2002

Farr Wind Farm

Environmental Statement

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Final

National Wind Power
Riverside House,
Meadowbank,
Furlong Road,
Bourne End,
Buckinghamshire,
SL8 5AJ

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Prepared under the management of:

Signature [redacted]

Lindsey Guthrie – Project Manager

Directed, reviewed and approved by:

Signature [redacted]

Pat Alexander – Project Director

Contents

Chapter 1 Introduction

The Application

1.1 National Wind Power Limited (NWP) propose to install and operate up to 45 wind turbine generators with associated access tracks, substation and ancillary equipment at Farr, near Tomatin, Inverness-shire. (see Figure 1, Site Context). The wind turbines will be between 2 megawatts (MW) and 2.5 MW capacity, giving the site a total generating capacity of up to 112.5 MW. The wind farm will generate enough electricity to supply approximately 60,000 homes, with a capability of displacing the equivalent of approximately 200,000 tonnes of carbon dioxide emissions from conventional fossil fuel electricity generation. The proposal will contribute towards fulfilling a number of national and international objectives, including those identified by the Kyoto Protocol, New and Renewable Energy, Prospects for the 21st Century[1] and the Scottish Climate Change Programme[2].

The Applicant

1.2 NWP has developed a leading position in the UK wind power market. Formed in August 1991, the company is a subsidiary of Innogy – an integrated energy business – and has offices in England, Wales and Scotland. NWP's team of over fifty professional staff have wide, international experience of wind farm development.

1.3 With this expertise, NWP has built up a considerable portfolio of wind farm projects in the UK. NWP currently has 12 wind farms in the UK, with a number of other projects at various stages of development.

1.4 NWP has developed, owns and operates three wind farms in Scotland. Novar wind farm, north of Evanton, Highland, consists of 34 turbines of 500 kilowatt (kW) rated capacity. The first wind farm to be developed in Highland, it was consented in 1996 and opened in October 1997. There are associated environmental programmes relating to monitoring of road restoration and breeding bird surveys. Beinn Ghlas in Argyll and Bute consists of 14 turbines of 600 Kw rated capacity and Wind Standard, Dumfries and Galloway which consists of 36 turbines of 600 Kw rated capacity.

1.5 NWP has been pleased by two surveys of local residents' attitudes around Novar. The first, carried out in summer 1998, showed that 68% supported the wind farm, 3% opposed, and the remainder had no opinion. The second, carried out in 2000 by the Scottish Executive[3], provided similar results. The majority of respondents currently living near wind farms have not experienced any problems due to their presence. The problems they had anticipated did not materialise in the vast majority of cases (only 9% experienced any problems compared with the 40% who had expected them).

1.6 Most recently, NWP has been successful in obtaining consent to construct and operate an offshore wind farm site at North Hoyle off the North Wales Coast. The company has the resources and the expertise to plan, develop and operate carefully designed, efficient and cost effective wind energy projects throughout the UK and beyond.

Further copies of the Environmental Statement

1.7 Further copies of this Environmental Statement are available from National Wind Power Limited, North Range East Lodge, Mill Road, Stanley Mills, Stanley, Perthshire, PH1 4QE.

Scope of the Environmental Statement

1.8 The scope of the Environmental Statement (ES) has been discussed in detail and agreed with the local Planning department of The Highland Council in Inverness and statutory consultees. Measures have also been taken to explain and discuss the proposals with the local community. Public exhibitions of the wind farm proposal were held at Farr and Tomatin Community Halls on the 13th and 14th of August, 2002, respectively, and were attended by 216 people.

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[1] New and Renewable Energy, Prospects for the 21st Century, DTI, 2000

[2] The Scottish Climate Change Programme, The Scottish Executive, 2000.

[3] Public Attitudes towards Wind Farms in Scotland, The Scottish Executive, 2000.

1.9 The ES has been prepared in accordance with the Electricity Works (Environmental Impact Assessment) (Regulations) Scotland 2000 (SI 320). It describes the wind turbine development, the nature of the site and its surroundings, the likely effects of the development and measures proposed to mitigate any adverse impacts on the environment. A scoping study of the proposed wind farm was undertaken by Enviros Aspinwall during March and April 2002[4]. The Scoping Report and Response from the Scottish Executive are included in Appendix H. The scoping method and findings of the study are summarised below.

Legislative Context

1.10 Consent to construct and operate the Farr Wind Farm would be granted under the Electricity Act 1989. The application for consent should be made under Section 36 of the Act to the Scottish Ministers. Under the provisions of the Electricity Works (Environmental Impact Assessment)(Scotland) Regulations 2000 (SI 320), where a wind farm is likely to have significant effects on the environment, the Section 36 application must be accompanied by an Environmental Statement. These regulations give effect to the European Community (EC) Directive 85/337/EEC 'on the assessment of the effects of certain public and private projects on the environment' as amended by Directive 97/11/EC.

1.11 In addition to Section 36 consent, planning permission under the Town and Country Planning (Scotland) Act 1997 would be required for the proposed development. Under the Electricity Act 1989 the Scottish Ministers are empowered to direct the grant of deemed planning permission at the same time as Section 36 consent is given. National Wind Power's Section 36 application for the Farr Wind Farm asks the Scottish Ministers to make such a direction. In granting Section 36 consent, or making a direction as to deemed planning permission, the Scottish Ministers may attach such conditions as are thought appropriate.

Consultations

1.12 The following statutory and non-statutory organisations were contacted as part of the scoping process.

- The Highland Council
- Historic Scotland
- Scottish Natural Heritage (SNH)
- Scottish Environment Protection Agency
- British Telecom
- Cable and Wireless
- Trunk Roads Network, Scottish Executive Development Department
- Royal Society for the Protection of Birds
- North of Scotland Water Authority
- Health and Safety Executive (HSE)
- NTL

Key Issues

1.13 The following key issues were identified though the scoping process:

- Landscape and visual amenity;
- Archaeology;
- Ecology; and
- Ornithology.

[4] Farr Wind Farm, Scoping Report (June 2002) Enviros Aspinwall, Edinburgh.

1.14 Baseline studies relating to these issues, including predicted impacts, proposed mitigation and an assessment of residual effects are described within this report. Additional issues relating to land use, infrastructure, public access and electro-magnetic interference are examined in Chapter 13.

Structure of the Environmental Statement

Chapter 1	Introduction
Chapter 2	Site Selection and Alternatives
Chapter 3	Project Description
Chapter 4	National Energy Policy and Local Planning Policy
Chapter 5	Landscape and Visual Assessment
Chapter 6	Ecology
Chapter 7	Ornithology
Chapter 8	Archaeology
Chapter 9	Hydrology
Chapter 10	Noise
Chapter 11	Socio Economic Assessment
Chapter 12	Transport
Chapter 13	Electromagnetic Interference and Other Issues

1.15 This report has been summarised as a Non Technical Summary (NTS) (Volume 1) and is accompanied by a Volume of Figures (Volume 3). Technical Appendices are included in Volume 4. The NTS summarises the proposed development, its likely environmental effects and proposed mitigation measures.

List of Consultants

1.16 Various aspects of the Environmental Impact Assessment of the proposed wind farm have been addressed by a team of consultants as listed below.

Noise

Peter Simpson
Enviros Aspinwall
Walford Manor
Shrewsbury
SY4 4HH

Landscape and Visual Impact

Carol Anderson
12b Boswall Road
Edinburgh
EH5 3RH

Archaeology

Janet Hooper
24 Harrowden Road,
Inverness
IV3 5QN

Ecology

Tom Dargie
Loch Fleet View
Skelbo Street
Dornoch
IV25 3QQ

Electromagnetic Interference

Malcolm Spaven
Spaven Consulting
1 Meadowbank
Edinburgh
EH8 8JE

Hydrology

Mark Burston
Enviros Aspinwall
Enviros House
Sitka Drive
Shrewsbury Business Park
Shrewsbury
Shropshire
SY2 6LG

Ornithology

Rob Frith
Rob Frith and Associates
3 Bramble Close
Wickersley
Rotherham
South Yorkshire
S66 1FH

Socio Economic Impacts

Laura Dougal
Enviros Aspinwall
61 The Shore
Leith
Edinburgh
EH6 6RA

Transportation

Robert Warren
National Wind Power Limited
North Range East Lodge
Mill Road
Stanley Mills
Stanley]Perthshire
PH1 4QE

Local Planning and National Energy Policy

Brendan Turvey
Enviros Aspinwall
61 The Shore
Leith
Edinburgh
EH6 6RA

Chapter 2 Site Selection

Introduction

2.1 The selection of an appropriate site for a wind farm is a complex and lengthy process, which involves examining and balancing a number of technical, environmental and planning issues. Considerations in selecting the site at Farr as a potential wind farm site are described below.

Site selection rationale

2.2 The site was chosen for detailed assessment by NWP because of the good wind conditions and because it does not fall within any area of national environmental importance. In particular the site has the following attributes:

- An above average wind resource in excess of 7 metres per second (m/s) mean annual wind speed;
- The site does not support any Sites of Special Scientific Interest (SSSIs) or areas designated as of conservation importance within its boundaries;
- The site does not lie within a designated landscape;
- The land is currently part of a sporting estate and is used for rough grazing;
- The site is reasonably distant from habitation allowing the potential noise effects on residential properties to be minimised;
- There is good access to the site by both the trunk road system and adjacent minor roads;
- The main areas of settlement in the surrounding area will not have visibility of the proposed wind farm; and
- There is a potential grid connection immediately adjacent to the site, which avoids the need for any overhead power lines to make a grid connection.

Iterative design process

2.3 The layout and individual siting of turbines have been considered as part of the design process to reduce landscape and visual effects. This involved examining wireframes produced for an early site layout, and amending the layout to improve the perspective views from key viewpoints in close proximity to the proposed development. The iterative design process examined three different design layouts, each of which went through several amendments. The objective was to achieve a more balanced composition of the turbines against the landscape and skyline. This process also took account of other critical constraints such as noise, archaeological and ecological considerations. The initial layout, layout proposed in the scoping study, an interim stage layout and the refined layout, together with related wireframes from key viewpoints in the vicinity of the proposed development are all illustrated in Appendix A. These demonstrate the progression through the iterative design process which took place to accommodate ornithological, archaeological, radar as well as landscape and visual amenity considerations.

2.4 The proposed site layout shown on Figure 3 therefore represents the preferred layout in terms of technical, economic and other environmental constraints, as well as landscape and visual considerations.

Chapter 3 Project Description

Introduction

3.1 This section provides a brief description of the proposed Farr Wind Farm. The precise plant details would not become available until the detailed design phase of the development has been completed and the design approved by NWP. However, the final scheme configuration is not expected to be significantly different from that described and any differences are not expected to have a material impact on the findings of this environmental impact assessment.

The proposed development

3.2 The Farr Wind Farm would be located within the boundaries of the Glen Kyllachy Estate, near Tomatin, Inverness-shire as shown on the Site Context plan Figure 1 and the Site Location plan Figure 2. The principal components of the wind farm are shown on the Site Layout plan Figure 3 and comprise:

- Up to 45 wind turbines;
- Permanent access tracks to the site and between turbines;
- An underground cable from the site to the nearby 132kV grid line;
- A grid connection compound; and
- Site control building, garage and store.

3.3 In addition, temporary construction compounds, a lay down area and up to four borrow pits would be required as shown on Figure 3.

Wind Turbines

3.4 The proposed wind turbines would have a capacity of up to 2.5 MW, with an overall height to blade tip not exceeding 102m and hub height of 60m. The turbines would be of a typical modern design incorporating tubular towers with three blades attached to a nacelle housing the generator, gearbox and other operating equipment. Dependent on the turbine manufacturer's specification the transformer for each turbine would be housed either adjacent to the tower base or within the tower itself. The dimensions of the proposed turbines and an illustration of installation of a typical modern turbine are shown on Figure 4.

3.5 The colour of the proposed turbines is based on NWP experience with wind farms elsewhere and previous discussions and agreements with Planning Authorities. A semi-matt pale grey is proposed for the entire turbine, corresponding to colour specification RAL [7038]. This is similar to the colour used at the Windy Standard Wind Farm in Dumfries and Galloway and Novar Wind Farm in Ross-shire. The turbines would carry no external advertising or lettering except for statutory notices and a turbine number on each tower door.

3.6 The wind turbines would operate automatically requiring visits to the site by operations staff in four wheel drive vehicles approximately once or twice a week for scheduled services. Longer visits for servicing typically every six months and unscheduled maintenance would also be required. Wind farm performance would be remotely monitored.

Turbine Construction

Foundations

3.7 The detailed design specification for each foundation would depend on the geotechnical site investigation of the land on which the turbine would be located. It is anticipated that the foundation for each turbine would require an excavation of approximately 17m x 17m with a maximum depth of 4m to the underlying rock (see Figure 5). This excavation would provide for a reinforced concrete foundation of approximately 16m x 16m with a 1m gap for shuttering access with the shuttering positioned and supported. Each foundation would require approximately 235m^3 of concrete and 12 tonnes of reinforcing steel.

3.8 The excavation methods used at each turbine site would vary depending on the ground conditions present and the nature of the surface vegetation. However, the general process would be as follows: Topsoil would be stripped, keeping the top 200mm of peat/turf intact. This material would be stored adjacent to the base working area. The stored material would not exceed 2m in height to minimise the risk of overheating. Subsoil would then be stripped and stored, keeping this material separate from the topsoil or turf. Excavation of the turbine foundation would then take place followed by installation of the steel reinforcement bars and casting of concrete. The excavation would be open for about a week and after the foundation has been poured the area would be backfilled immediately with spoil pending turbine erection. Once the turbine has been installed, the area would be restored using the retained topsoil or turf to within 1m of the tower base. A 1m gravel path would then be laid down around the tower base.

Turbine Erection

3.9 The wind turbines would be erected using two large all terrain or crawler type cranes. The main lifting crane would have a lifting capacity of up to 850 tonnes and would be positioned on a 40m x 20m hard standing pad located approximately 25m away from the turbine base position. The second, or tail, crane would have a lifting capacity of up to 500 tonnes and would be positioned on a separate hard standing pad (20m x 20m) located adjacent to the delivery position of the turbine component. The two cranes would lift turbine tower sections and blades off their delivery vehicles and into their assembly position. The larger crane would be used to lift the tower sections, turbine nacelle and the hub and blade assembly into their erection position. Once the main components of the turbine have been assembled, the two cranes would be dismantled and moved to the next turbine position. It would take about a week to move the cranes and assemble a wind turbine using this two-crane method.

3.10 Construction of the temporary crane hard standing areas would be similar to the construction of the site tracks (see below). Peat or topsoil and subsoil would be removed and stored separately adjacent to the site and crushed stone laid down to a maximum average depth of 1m to form the hard standing area. Following turbine erection, these areas of hard standing would be covered with the original peat or topsoil and re-seeded.

Anemometer Masts

3.11 The exact location of the anemometer masts has yet to be finalised as this depends on the type of turbine that would be used. Three masts would be required and these are likely to be situated at the following locations, as shown on Figure 3:

- Mast 1: Grid Reference NH 7151 2877;
- Mast 2: Grid Reference NH 7343 2775; and
- Mast 3: Grid Reference NH 7495 2895.

3.12 The masts would be lattice construction measuring some 80m in height and requiring a concrete foundation measuring approximately 6m x 6m and 2m in depth. Lattice construction has been chosen due to its reduced visual impact and ease of climbing for maintenance purposes. Access to the anemometer masts would be by a 4m wide track that would connect with the main network of site tracks.

Main Site Access

3.13 Access to the site would be from the main A9 Trunk Road using an existing forestry access point at Aultnaslanach, near the village of Moy, as shown on Figure 3. The existing access bellmouth would be upgraded to allow construction traffic, in particular abnormal loads, to turn safely onto the site access track. The design of the junction would meet the requirements of the Highway Authority with regard to visibility, construction materials, surface water drainage, gradient and safety of other road users. The bellmouth would be sufficient length to accommodate two of the largest vehicles side by side and would terminate at a gate to prevent unauthorized access. General signing would be provided on the A9 to indicate to other road users that heavy vehicles may be turning at the access point.

3.14 The Aultnaslanach access point leads directly onto forest tracks that would be upgraded and extended to the wind farm site. The access track would follow the general alignment of General Wade's Military Road in a westerly direction for approximately 5km before turning to pass to the west of Meall Mor, Meall na Fuar-ghlaic and Creag an Tuathan. The access track would then cross the

Uisge Dubh watercourse on a new single span bridge. The bridge would have steel load bearing beams resting on concrete abuttments. Timber would be used for the bridge decking.

3.15 South of the Uisge Dubh the main access track would continue in an easterly direction to the first wind turbine located south east of Carn Dearg. A spur of this track would follow a southerly alignment parallel to the Garbole Road to connect with the site control building and grid connection compound. Access to the site control building during the operational period would also be obtained by upgrading a short section of estate track from the Garbole Road.

3.16 Approximately 15km of new and upgraded track would be required to connect the A9 Trunk Road with the wind farm site, the site control building and the grid connection compound. Where possible the alignment of existing forest tracks would be used. About 7.5km of new track would be constructed and this would require approximately 3 hectares of forest to be felled. The general width of the main access track would be 6.0m and the maximum allowable gradient 1: 9. The southern spur to the site control building and grid connection compound would have a width of 4.5m. Track width may be wider for short sections, such as lengths with passing places, lay down areas and or sharp bends.

3.17 A southern access track would be formed by upgrading an existing estate access track from the Garbole Road, as shown on Figure 3. This track would primarily be used to provide initial access to the site for mobilisation and geotechnical investigation purposes.

Access Track Construction

3.18 The main access track design would be developed to take account of ground conditions and angle of slope along the route described above and shown on Figure 3. The road formation would be created by cut and fill or by a cut operation where the side slope is severe. Track construction would be by placement of local crushed stone by truck and excavator to a finished road level. The stone would be obtained from existing sources within Forest Enterprise land to the north of the site. The precise depth of stone would depend on the ground conditions along the route, but a minimum depth of 300mm would be required to support the heavy loads travelling to the wind farm site. A vibrating roller would be used to grade and smooth the road surface. The sides of the track would then be dressed with soil or peat excavated from the line of the track.

3.19 Where areas of forest have to be removed to make way for the access track, harvesting would be undertaken using to best forestry practice and in accordance with current Forests Guidelines. The exact method of harvesting would be decided at the time of development of the wind farm. The existing forest road network would be used to access those parts of the crop to be removed and allow transportation of timber and other biomass from the site.

3.20 Drainage to the access track would be provided through the use of a side drain with cross drains at appropriate intervals to divert flow to existing ditches and burns. To minimise erosion in periods of heavy rainfall or snow melt, hessian mats would be placed at the outfalls.

3.21 In addition to the bridge crossing the Uisge Dubh, several minor water crossings would be required and these would be designed in accordance with the Scottish Executive guidance on river crossings and migratory fish. Minor water crossings would be achieved by the installation of a suitably sized concrete pipe on a concrete bed with stone head walls at each location. The materials used for all water crossings would be non-erodable and benign to aquatic life. Soil stabilisation practices would be employed on exposed soil at stream and ditch crossings as far as is practicable. If necessary, seed and mulch or mechanical techniques would be used to temporarily minimise erosion immediately following construction.

3.22 Drain crossings would be constructed of twin wall plastic pipe with a smooth internal bore. The locations of drain culverts would be determined during track construction. There would be no watercourse or drain diversions.

Turbine Access Tracks

3.23 Approximately 18km of new on-site tracks, connecting the wind turbines, would be required as indicated on Figure 3. The on-site tracks would have a general width of 6.0m, except those connecting the main track network with the anemometer masts and borrow pits, that would be 4.0m in width. Track widths may be wider for short sections such as passing places and on sharp bends.

It is envisaged that the construction of all site tracks would utilize stone quarried from borrow pits located within the site boundary (see Figure 3).

3.24 The tracks would be left in place after completion of the wind farm construction, as they would provide access for maintenance, repairs and eventual decommissioning of the wind farm.

On-Site Turbine Access Track Construction

3.25 On-site track construction would use best practice methods developed at other wind farm sites, in particular the track construction methods used at NWP's Novar and Bheinn Ghlas wind farms. Alternative types of track would be required for different sections of the site, depending on local ground conditions. An outline of the two principal track types is given below and typical construction and restoration profiles are shown on Figure 6. Prior to the commencement of construction, a detailed construction method statement would be submitted for approval by The Highland Council.

Track Type 1a – Close to Rockhead

3.26 Track type 1a would be provided for areas with shallow peat depth, where rockhead or a suitable sub-soil horizon is less than approximately 500mm below ground surface. The road formation would be created either by a cut and fill operation or by a cut operation where the side slope is steep. Crushed stone would then be laid down to a minimum depth of 300mm. A lateral drain would be established on the uphill side of the road in order to drain the water running down the slopes and cross drains would be established at intervals not less than 30m. When available peat and topsoil would be stored beside the road for use in re-instatement of road shoulders at the end of the construction period.

Track Type 1b – On Peat layer

3.27 Track type 1b would be provided where the peat layer is more than 500mm deep, where the side slope is significant (typically 1in 6) and where the road may have to be built on top of stable rockhead or sub-soil to ensure the stability of the road. The peat would be dug away down to the rockhead or down to suitable subsoil horizon, leaving batters on each side of an angle sufficient to ensure the stability of the peat batter. Where necessary a small "double ditch" would be established a few meters uphill to avoid significant flow of water over the batter and thereby minimise erosion. The road would be levelled either by a cut and fill operation or by benching of the rockhead. The running surface of the road would have a cross fall in order to drain run-off into the ditches. A lateral drain would be made on the uphill side of the road with cross drains at intervals of not less than 30m. The dimensions of the cross drains would be matched to the estimated water flow. A ditch on the low side would be made where necessary. The outlet of the drain would be at appropriate locations, with hessian/copra mats placed at the outfalls (where appropriate) in order to minimise erosion at the outlet in periods of heavy rainfall or snow melting.

Track Reinstatement

3.28 Track reinstatement techniques would involve the placement of locally cut and stored turfs to encourage the rapid re-growth of vegetation cover on roadside batters. This is intended to minimise the magnitude and duration of the visual impact of track construction.

3.29 Turfs would be cut from the surface of the route of the track and stored next to the road on the uphill side. Reinstatement would occur as soon as each section of track is finished to minimise turf storage time and potential for erosion. Following the laying down of road stone, the batter on the uphill side of the track would be re-graded to no more than 25 degrees to reduce the risk of slumping prior to the placement of turfs. Where this is not possible due to the angle of slope, the batter would remain un-turfed but care would be taken to avoid vertical or near vertical surfaces. Exposed bedrock would be roughened to encourage the trapping of soils and seeds and thus allow a more rapid natural regeneration. Any cut batters of less than 25 degrees that lack turf would be re-seeded using an appropriate technique opposed by The Highland Council in consultation with SNH.

3.30 On the downhill side of the track, the batter would be formed from surplus peat at an angle of less than 25 degrees where possible. Trenches for on-site cabling between the turbines would be cut into the downslope batter at this stage to mimimise further disruption by digging the trench separately at a later stage. Once the cables have been installed the excavated peat would be replaced. Where appropriate a slight rise would be constructed from the track edge to the top of the batter, to visually screen the track from views below track level.

Borrow Pits

3.31 Approximately 18km of track would be needed for the site, requiring a total volume of approximately 150,000 m^3 of crushed stone. An additional 50,000 m^3 of crushed stone would be required for crane hard standing and lay down areas. The crushed stone would be won from four borrow pits located within the site as shown on Figure 3. Some imported quarry stone may be required for surfacing, especially for steeper gradients to maintain skid resistance.

3.32 Two borrow pits would be approximately 150m by 50m in plan and two would be 100m by 50m. All borrow pits would be up to 15m deep. This would be sufficient to provide approximately 375,000 m^3 of stone of which it is anticipated that approximately 50% would be suitable for track and hard standing construction. Additional stone would be obtained from areas where the site track is cut into the slope. If the on-site borrow pits are not able to provide stone in sufficient quantity or quality, additional borrow pits would be identified and would be subject to separate minerals applications to The Highland Council.

3.33 Prior to the excavation of the borrow pits, topsoil would be scraped and stored in a mound for use in reinstatement. Following extraction of stone, the floor of the pit would be built up with peat excavated during the construction of turbine foundations, site tracks and hard standing areas. After all suitable materials have been won from the borrow pits, the side slopes would be graded to a safe angle to avert collapse and to provide a landform shape which blends as best as possible with the adjacent ground. The peat topsoil would be replaced and smoothed to create a reasonable tilth for seeding. Re-seeding would be with a seed mix and techniques approved by The Highland Council in consultation with SNH.

Site Cabling

3.34 All cabling on site between the wind turbines and the grid connection compound would be underground, laid in trenches approximately 1.5m wide by 1m deep. These trenches would be partially backfilled with adjacent peat topsoil that has been sieved and graded to remove stones. Where appropriate clay bunds would be placed at intervals to prevent longitudinal drainage. The cabling between the wind turbines would be located directly adjacent to the access tracks.

Grid Connection

3.35 The site cables would be collected at the on-site grid connection compound where the voltage would be stepped up from 33 kV to 132 kV. The proposed location of the grid connection compound is shown on Figure 3, and the proposed layout together with an illustration of a typical grid connection compound are shown on Figure 7. The compound would have dimensions of about 60m x 60m depending on the detailed design requirements of Scottish and Southern Energy PLC. A grid connection building containing 33 kV circuit boards and protection equipment would be provided adjacent to the compound. This building would measure 12m x 5m in plan and would be of a pitched roof design of maximum 5.0 m height. The detail design of the grid connection building would be similar to that of the site control building and would be agreed with The Highland Council prior to the commencement of construction.

3.36 The 33kV/132 kV transformers would be located on an impervious base within an oil-tight bund. Drainage from the bunded area would pass through an oil interceptor prior to discharge. Any oil retrieved would be stored and disposed of at an approved recycling facility. The oil interceptor would be fitted with an automatic shut off which, in the event of a significant oil spill, would prevent leakage from the bunded area.

3.37 The grid connection compound would comply with the Electricity Supply Regulations 1988 (as amended) with regard to the installation of safety signs. To prevent unauthorised access, the compound would be located within a fence not less than 2.4m in height.

Site Control Building

3.38 The site control building would comprise a building measuring 20m x 10m in plan that would incorporate: control and metering facilities; telecommunication equipment; an office; an ATV garage; and a store, as shown on Figure 8. Mess and toilet facilities would also be provided. The building would be of a pitched roof design and constructed in a traditional local style, to be agreed with The Highland Council prior to the commencement of construction. The roof would have a maximum height of 6m.

3.39 The site control building compound would have permanent vehicular access with a hard standing area that would be surfaced with gravel. A post and wire fence would surround the area. There would be no exterior lighting.

3.40 Foul drainage from the control building welfare facilities would be directed to a septic tank. Oils, hydraulic fluid and lubricants needed to maintain the wind turbines would be stored in the control building storeroom. These materials would be kept in drums on an imperious base within an oil tight bund with no drainage outlet. A waste storage area would also be provided within the site control building compound. This would be isolated from surface drains and bunded to contain any spillages. Waste would be segregated into appropriate categories and stored in clearly identified skips for disposal in accordance with the company's duty of care obligations including the requirements of the special waste regulations if these apply.

Temporary Works

3.41 During the construction period, construction compounds and a lay down area would be required. The main construction compound would be located adjacent to the Farr – Garbole road in the vicinity of the proposed site control building (see Figure 3). A second temporary compound would be used during the site mobilisation and investigation phases of the development. This temporary building would be located at the junction of the existing estate track leading to the site and the Garbole Road (NGR NH7375 2560) at the end of the southern access route, as shown on Figure 3.

3.42 The main site control building and compound would comprise:

- Temporary porta cabin type structures to be used for the site offices, the monitoring of incoming vehicles and welfare facilities, including porta cabin toilet with provision for sealed waste storage and removal;
- Parking for construction staff, visitors and construction vehicles;
- Secure storage for tools and small parts; and
- A receiving area for incoming vehicles.

3.42 The compound would be surrounded by a security fence and would be used, where necessary, as a storage compound for the various components, fuels and materials required for construction. Toilets would be of a type to ensure that no discharges would be made into local watercourses. A temporary lay down area closer to the turbines would be required for parking and unloading delivery vehicles, in particular abnormal loads (see Figure 3). This area would also be used as a re-fuelling point during the construction period.

3.43 The compound and lay down area would have dimensions of approximately 100m x 50m (NGR NH7145 2985). The construction compound and lay down area would be built by stripping topsoil, laying down a geotextile material and then a working surface of stone. The topsoil would be stored adjacent to the site for subsequent use in reinstatement. The sub-soil would be stripped and stored separately from the topsoil. Geotextile and crushed stone to an approximate depth of 300mm would then be laid down. The compound and lay down areas would be reinstated at the end of the construction period. Reinstatement would involve removing the imported material and underlying geotextile. The exposed substrate would be gently ripped and then the topsoil replaced. The surface would be re-seeded using an appropriate seed mix, to be agreed with The Highland Council and SNH.

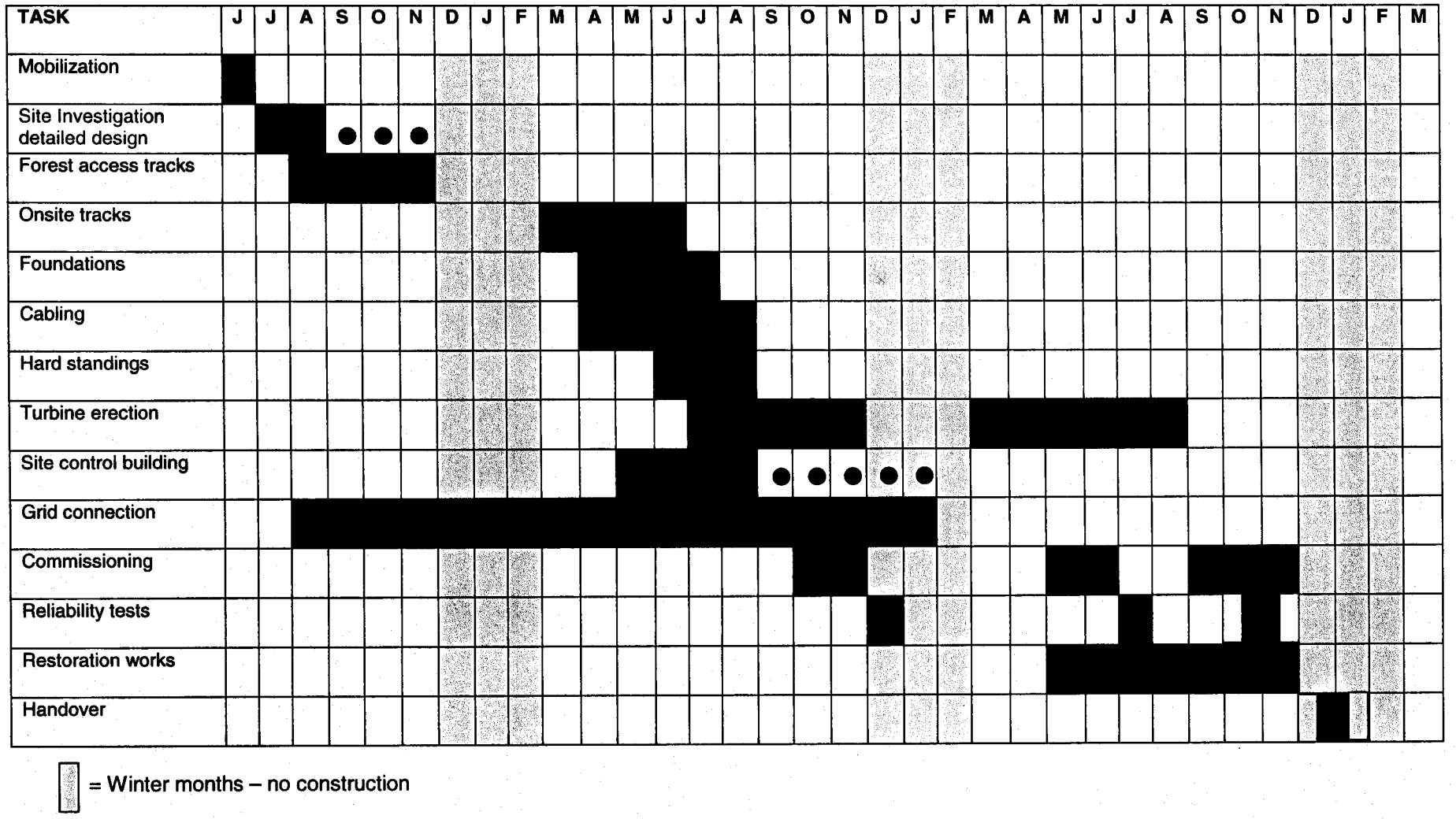
Construction Programme

3.44 The development of the wind farm would commence following agreement of the detailed design and consent conditions with the planning authority, plant designers and relevant statutory authorities.

3.45 A preliminary site investigation prior to construction would be carried out to determine the quality of the sub-grade and site arising rock, enabling a more accurate estimation of the quantity and source of road stone needed for the development to be made.

3.46 The main construction period is likely to last for up to 30 months, from commencement of site investigation, survey and design work, through to the installation and commissioning of the turbines, ending with reinstatement. Construction would consist of the following phases:

Table 3.1 : Indicative Construction Programme



- Upgrading of the existing estate access track;
- Construction of a site compound for off-loading materials and components and to accommodate site offices and mess facilities;
- Forest felling, construction of main site access track and borrow pits;
- Construction of on-site tracks for access to turbine locations by civil engineering plant and other vehicles including the excavation of cable trenches and laying of electricity and communications cables;
- Construction of turbine foundations;
- Delivery and erection of turbine towers and installation of nacelles and blades;
- Construction of the grid connection compound and 33 kV circuit board building;
- Construction of the site control building, garage and store;
- Erection of anemometer masts; and
- Site re-instatement.

3.47 Construction work would cease at the start of Winter (mid-November) and would resume in the early Spring.

3.48 A site specific construction method statement would be drawn up, in consultation with The Highland Council, SEPA and SNH, when the main contractor has been appointed and prior to the commencement of construction.

Environmental Management

Project Ecologist

3.49 A Project Ecologist would be appointed by NWP with responsibility for ensuring that measures are in place for ecologically sympathetic construction and restoration of the Farr Wind Farm site. Prior to any construction work, the Project Ecologist would assist NWP's Project Manager in the micro-siting of the turbine bases, access roads and cable runs. The Project Ecologist would also be involved with the production of the detailed construction method statement. During construction and restoration, the Project Ecologist would be responsible for site monitoring visits and on-site and remote ecological advice as required. The Project Ecologist would report to the Project Manager, who would be responsible for the implementation of recommendations made by the Project Ecologist.

Environmental Management Plan

3.50 NWP would require the main contractor responsible for construction of the Farr Wind Farm to prepare and implement an Environmental Management Plan that defines how any significant environmental issues would be dealt with. The plan would be reviewed and updated as necessary during the course of the construction period.

Control of Sub-contractors

3.51 The main contractor would produce a set of minimum control standards for sub-contractors working on the Farr Wind farm site. The control process for sub-contractors would include distribution of appropriate sections of the Environmental Management Plan and associated procedures prior to the commencement of work. All sub-contractors would receive Induction Training including site specific environmental training prior to commencing their work on the site.

Construction Noise

3.52 Appropriate guidance given in BS 5228 'Noise control on construction and open sites' would be followed with regard to the generation of noise during construction operations.

Waste Management

3.53 The main contractor would be required to carry out the construction works in such a way that, as far as is reasonably practicable, the amount of spoil and waste to be disposed of is minimised. In addition, any waste arising from the site would require to be properly classified and dealt with in accordance with appropriate legislation. As part of the Environmental Management Plan, the main contractor would identify the waste category and quantities, opportunities for recycling or re-use, disposal routes and licensing requirements for all spoil and waste arising from the construction of the

wind farm. The Environmental Management Plan would include an audit programme to be undertaken by the contractor to demonstrate compliance with Duty of Care. Wherever possible, subject to technical considerations, spoil arising from the construction works and that is classified as acceptable fill will be re-used in the construction works. The contractor would comply with appropriate guidance notes and statutory procedures in the identification, handling, storage, recovery and disposal of waste.

Fuel Storage

3.54 Careful consideration would be given to the location of any fuel storage facilities. Such facilities would be designed in accordance with SEPA guidelines, such that they are self-bunded, including the hoses and stored in a secure compound to avoid vandalism. All vehicles and plant would be regularly inspected for fuel, oil and hydraulic fluid leaks. An oil spill kit would be maintained on-site.

Control of Silty Water

3.55 Construction works would also be carried out in accordance with the relevant SEPA Pollution Prevention Guidelines, in order to prevent pollution of nearby watercourses by debris, silt and oils. Temporary soil/peat mounds would be sited away from watercourses and drains, as far as is practicable. Surface water would be directed away from construction activity to avoid silty runoff entering watercourses or ecologically sensitive areas.

Decommissioning

3.56 When the wind farm ceases operation, all major components and most above ground structures would be removed from the site. In the case of the foundation works the upper sections would be removed and backfilled with 50 – 100mm of appropriate material. The sections of the main site access road which pass through forestry would be left in place for subsequent use in forestry operations. Underground cables may also be left in place. Prior to decommissioning of the site, a method statement would be prepared and agreed with The Highland Council.

Chapter 4 National Energy Policy and Local Planning Policy

National Energy Policy

4.1 The UK Government has outlined its commitment to renewable energy resources in 'New and Renewable Energy, Prospects for the 21st Century'[5]. The Government has established a target of 5% of UK electricity to be met from renewable sources by 2003 and 10% by 2010, as a means of stimulating market growth and contributing towards the Kyoto targets on Climate Change.

4.2 The key policy aims which have been identified are:

- *assisting the UK to meet national and international targets for the reduction of emissions including greenhouse gases;*
- *helping to provide secure, diverse, sustainable and competitive energy supplies;*
- *stimulating the development of new technologies necessary to provide the basis for continuing growth of the contribution from renewables in the longer term;*
- *assisting the UK renewables industry to become competitive in home and export markets and in doing so provide employment in a rapidly expanding sector;*
- *contributing to rural development.*

European policy on renewable energy

4.3 The European Union has recently agreed (September 2001) on a Directive which will require member states to ensure that 12% of gross internal energy consumption and 22.1% of electricity consumption comes from renewable energies by 2010.

The Scottish Climate Change Programme

4.4 Whilst national energy policy remains a centralised matter for Westminster, the promotion of renewable energy and policies relating to climate change have been devolved to the Scottish Parliament. The Scottish Executive, through the Scottish Climate Change Programme (2000)[6] is'*committed to working in partnership with the UK Government in delivering our domestic goal of reducing carbon dioxide emissions by 20% by 2010.*' The Scottish Executive has further recognised that '*Scotland's geography and climate provides enormous potential for the development of renewable energy sources. The availability of wind as a resource is unparalleled anywhere else in Europe.*'

4.5 Scotland has a relatively high percentage of electricity generating capacity derived from renewables (11-12%), in the form of large hydro capacity. However, the Scottish Executive aims to further increase the proportion of electricity delivered by renewables to around 18% by 2010 as a key means of tackling the issue of climate change and of contributing to the UK target of 10%. Approximately 600-800 MW of renewable capacity needs to be built in Scotland over the next nine years to meet these targets. The Scottish Executive is currently consulting on whether these targets could be extended to 40% by 2020. [7]

The Energy Review, Performance and Innovation Unit, 2002[8]

4.6 The Performance and Innovation Unit recently made the following recommendations to the Government:

- The focus of UK policy should be to establish new sources of energy which are, or can be, low cost and low carbon;

[5] DTI (1998) 'New and Renewable Energy: Prospects in the UK for 21st Century.'
[6] Scottish Executive (2000) 'Scottish Climate Change Programme.' Scottish Executive, November 2000.
[7] Scotland's Renewable Energy potential – beyond 2010, Consultation August 2002
[8] Performance and Innovation Unit (2002) 'The Energy Review'. Cabinet Office, Feb 2002.

- The target for the proportion of electricity generated from renewable sources should be increased to 20% by 2020.

The Scottish Executive response to the UK Energy Review[9]

4.7 The Scottish Executive produced an initial response to the UK Government's Energy Review and made the following comments. *'In light of the overall recommendations of the Royal Commission for Environmental Pollution, it is clearly imperative for Scotland to develop its very considerable renewable energy resources to the greatest extent possible.' 'Scotland's potential for further renewable energy development is massive.'*

Scottish Planning Guidance

National Planning Policy Guideline (NPPG) 6 'Renewable Energy Developments'

4.8 The National Policy and Planning Guidance relating to the development of renewable energy (NPPG 6) was revised in 2000. The new guidance provides a clear message in relation to the climate change targets and renewable energy policies described above, stating that *'it is expected that much of the new capacity needed by electricity suppliers to meet the Renewables Obligation (Scotland) will come from wind farms.'*

'The aim of the Scottish Executive therefore is to ensure that the commitment to renewable energy is satisfied and supported though development plan policies and development control decisions unless, at the site level, there are serious adverse impacts that can not be mitigated.'

'Renewable Energy developments will also have a contribution to make in support of the Scottish Executive's policy to encourage rural development.'

4.9 Commenting on wind energy technologies in particular, NPPG 6 states that:

'Scotland has one of the best wind regimes in Europe which represents a very significant, albeit under utilised, renewable energy resource. This is likely to be the technology most widely used in the expansion of renewable energy in Scotland.'

4.10 Specific guidance contained in NPPG 6 on visual impact, landscape, birds and habitats and electromagnetic radiation will be discussed in the relevant chapters of this document.

Planning Advice Note (PAN) 45 'Renewable Energy Technologies'

4.11 Planning Advice Note 45 (1994) provides specific advice on a number of renewable energy technologies. This advice will be considered in the appropriate chapters of this document.

Local Planning Policy

The Highland Structure Plan (Written Statement March 2001)

4.12 The Highland Structure Plan aims to *'promote and enhance the social, economic and environmental well being of the people of Highland.'* The plan's objectives are therefore to *'emphasise the need to maximise the quality of air, water and land, to make efficient use of energy and the optimal use of renewable and non renewable resources.'*

4.13 Specific policies relating to wind energy developments are:

Policy E1 Distributed Renewable energy developments

The Council supports the utilisation of the region's distributed renewable energy resource, including hydro, wind, wave and tidal stream power. Proposals will be assessed against the provisions of the General Strategic Policies.

Approvals for renewable energy developments will normally be for a temporary period only (tied to the lifetime of a project), with provision where appropriate, for the removal and reinstatement of

[9] Scottish Executive (2001) 'Initial Paper on issues of relevance to Scotland.' September 2001.

affected areas. Earlier action for removal and reinstatement will be required in the event of premature permanent cessation of energy production.

Policy E2 Wind energy developments

Wind energy proposals will be supported provided that the impacts are not shown to be significantly detrimental. In addition to the General Strategic Policies, wind energy proposals will be assessed in respect of the following:

- *Visual impact;*
- *Noise;*
- *Electro magnetic interference;*
- *Roads, bridges and traffic;*
- *Aircraft flightpaths/ MOD operations; and*
- *Cumulative effects.*

4.14 The proposed development is consistent with these policies and the impacts described in policy E2 have been assessed and described within this ES. Structure Plan policies relating to nature conservation, landscape, transport and noise are also discussed within the appropriate sections of this document.

Strategic Policies

4.15 Strategic Policies G2 and G4 in the Structure Plan set out the Council's requirements with regard to sustainability and community benefit respectively. The compatibility of the Farr Wind Farm with these policies is shown in Table 4.1.

4.16 It is apparent from the review outlined above that the proposed Farr Wind Farm conforms with the development planning policies of The Highland Council.

Table 4.1 : Compatibility of Farr Wind Farm with Strategic Policies

Policy Number and Title	Policy Statement	Implications of Farr Wind Farm
G2 Design for sustainability	**Proposed developments will be assessed on the extent to which they:**	
	are compatible with service provision (water and sewage, drainage, roads, schools, electricity);	No additional service provision required.
	are accessible by public transport, cycling and walking as well as car;	The wind farm site is in a remote location and only 4 – 6 contract staff would be working on-site during normal operation.
	maximise energy efficiency in terms of location, layout and design, including the utilisation of renewable sources of energy;	The development would generate electricity from a renewable source.
	are affected by significant risk from natural hazards, including flooding, coastal erosion, land instability and radon gas, unless adequate protective measures are incorporated, or the development is of a temporary nature;	The design of the scheme would include consideration of risk from natural hazards, in particular peat erosion, severe weather and land stability.
	are affected by safeguard zones where there is a significant risk of disturbance and hazard from industrial installations, including noise, dust, smells, electro-magnetism, radioactivity and subsidence;	The development site is not affected by safeguard zones.
	make use of brownfield sites, existing buildings and recycled materials	Maximum use would be made of material excavated on the site.
	impact on individual and community residential amenity;	No significant effects as described within this ES.
	impact on non-renewable resources	No impact on non-renewable

	such as mineral deposits of potential commercial value, prime quality or locally important agricultural land, or approved routes for road and rail links;	resources.
	demonstrate sensitive siting and high quality design in keeping with local character and historic and natural environment and in making use of appropriate materials;	The wind turbine layout, control building, grid connection and access tracks have been sited to minimise environmental impact.
	promote varied, lively and well-used environments which will enhance community safety and security and reduce the fear of crime;	Not applicable as the proposed development would be in an isolated rural location.
	impact on the following resources, including pollution and discharges, particularly within designated areas: habitats freshwater systems, species, marine systems, landscape, cultural heritage, scenery, air quality;	Environmental effects have been minimised as described within this ES.
	Accommodate the needs of all sectors of the community, including people with disabilities or other special needs and disadvantaged groups; and	Site design would allow for visitors with disabilities or special needs where appropriate.
	Contribute to the economic and social development of the community.	The development would contribute to the economic viability of the Farr Estate – see also below.
G4 Community benefit and commitment	**The Council will expect developments to benefit the local community and contribute to the well being of the Highlands, whilst recognising wider national interests.** **The Council will seek to enter into agreements with developers as appropriate on behalf of local communities for environmental and socio-economic purposes as indicated below:**	
	where a development will have a long term impact on the environment, contributions will be sought towards a fund for local community initiatives;	NWP propose to make a contribution towards a fund for local community initiatives.
	where as a result of a development new infrastructure proposals require to be implemented by The Council or other agencies, or existing programmes brought forward, developers will be expected to pay those costs as an integral part of the development; and	No new infrastructure proposals are required to be implemented by the Council as a result of the Farr Wind Farm.
	in appropriate circumstances The Council will expect a financial bond to be secured for long term environmental restoration and/or socio-economic stability.	Restoration of the wind farm site would be undertaken at the end of its operational life in accordance with the requirements of The Highland Council.

Inverness Local Plan (Consultative Draft 2001)

4.17 The proposed development lies within the eastern 'Potential Area for Wind Farm's, as identified within the Local Plan. The site also lies within the 'Rural Development Area' where '*longstanding and acute unemployment, arising notably from retrenchment in traditional forestry, hydro electric and*

estate activities, must be addressed. Development of ***renewable energy****, specialist minerals, eco tourism based on rural conservation could offer job opportunities for local people.'*

4.18 The site lies within an area which has been identified under General Policy BP3 where '*The Council will presume against development unless there is an overriding social, economic, public health or safety reason, or benefits of primary importance to the environment.*' It is assumed that the objectives of the 'Potential Area for Wind Farm' development override this policy.

Policy summary

4.19 The development of a wind farm at Farr is considered to be consistent with:

- European policy for the deployment of renewable energy technologies;
- National policy promoting an expansion in the use of renewable energy;
- The Scottish Climate Change Programme's objective of reducing CO_2 emissions;
- The Highland Structure Plan's objectives to optimise the use of renewable energy sources;
- The Highland Council's 'Potential Areas for Wind Farm' developments;
- The Inverness Local Plan's objectives of providing local employment through renewable energy developments;
- The Scottish Executive's objectives of promoting Rural Development.

Summary of Scottish Executive Public Attitude Survey (2000)

4.20 In order to inform both developers and the relevant authorities, the Scottish Executive commissioned independent research to ascertain the opinions and perceptions of local residents to wind farms in 2000. The research focused on a sample of residents living near the four existing wind farms in Scotland. These wind farms are Beinn Ghlas in Argyll, Hagshaw Hill in South Lanarkshire, Novar in Highland and Windy Standard in Dumfries and Galloway.

4.21 The main aim of the research was to examine how local residents feel about the existence and proximity of their local wind farm and whether looking back, residents felt that their views of wind farms had changed.

4.22 The sample for the survey was drawn from all residents living within 20km of a wind farm in Scotland and the interviews were distributed across three different proximity zones within the 20km radius. Residents within 5km of a wind farm were defined as being in the high proximity zone, residents between 5km and 10km in the medium proximity zone and residents between 10km and 20km from the wind farm in the low proximity zone. The intention was not to provide separate analysis for each wind farm, but to examine the views of residents in each of the zones across the four wind farms.

4.23 Overall, 430 telephone interviews were conducted over the three proximity zones. The distribution was deliberately skewed towards residents in the high proximity zone, where 215 interviews were conducted. The remainder of the interviews were evenly split between the medium and low proximity zones.

Main Findings

4.24 Respondents were generally positive about wind farms. Those who live nearest a wind farm are more likely to provide positive responses when asked about the wind farm than those in the other zones.

4.25 The proportion of respondents who had anticipated problems prior to the development (40%) was far higher than the proportion who actually experienced problems after the development (9%). Actual noise caused by the turbines or the visual impact of the wind farm did not feature as issues for the large majority of respondents.

4.26 Only 2% of respondents said that they disliked the wind farm because it was noisy, and although 12% of respondents had expected to experience a problem with noise, only 1% had actually experienced a problem.

Chapter 5 Landscape and Visual Assessment

Introduction

5.1 This assessment examines the potential effects of the proposed Farr Wind Farm on the landscape and visual amenity of the surrounding area. The assessment is based on a study area with a 25km radius, centred on the application site, as agreed at scoping stage with relevant statutory consultees 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.

5.2 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 the 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 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 discussion on the acceptability of the proposed wind farm in landscape and visual terms.

5.3 The assessment is illustrated by plans, wireframe perspectives and photomontages that are included in Volume 3 of the ES.

Method of assessment

General Approach

5.4 The landscape and visual assessment has been based on guidelines provided in Landscape Character Assessment (The Countryside Agency and Scottish Natural Heritage 2002); the Landscape Institute's Guidelines for Landscape and Visual Impact Assessment (Landscape Institute and Institute of Environmental Assessment 2002); Guidelines on the Environmental Impacts of Wind Farms and Small Scale Hydroelectric Schemes (Scottish Natural Heritage 2001); and National Planning Policy Guideline 6 Renewable Energy Developments (Scottish Executive 2000).

5.5 The assessment has drawn on information provided by consultations with The Highland Council and SNH Area Office, Dingwall.

5.6 The landscape and visual assessment has involved a desk study, field work, data processing and analysis, and interpretation using professional judgement. The proposed development has been analysed to identify the elements of the wind farm with the potential to cause an effect on the landscape and/or visual amenity of the surrounding area.

5.7 A zone of visual influence (ZVI) was generated to identify the potential extent of the proposed wind farm's visibility over the 25 km radius study area. The ZVI has been modelled using a computer based visibility analysis package compiled using Ordnance Survey (OS) digital height data at 50m interval resolution, and a three dimensional digital model of the proposed wind farm.

5.8 A visibility assessment has been carried out within the study area to describe the general extent of visibility of the proposed wind farm within the study area. The visibility assessment has concentrated mainly on publicly accessible areas such as the road and public footpath network, residential and outdoor recreational areas.

5.9 A selection of viewpoints has been chosen in consultation with both The Highland Council and SNH. These viewpoints are considered to be representative of the main sensitive receptors in the study area. A viewpoint analysis of the potential effects on landscape and visual amenity arising from the proposed wind farm at each of these viewpoints has been carried out. This analysis has involved the production of computer generated wireframes or photomontages to predict the views of the proposed turbines from each of the agreed viewpoints. The existing and predicted views from each of these viewpoints have been analysed to identify the magnitude of the residual effects on landscape and visual amenity.

5.10 Finally an assessment of the significance of the residual effects has been carried out to determine the acceptability of the wind farm in this locality in relation to landscape and visual amenity. The significance of a landscape or visual effect is a function of the sensitivity of the affected landscape or visual receptor, and the magnitude of change that will occur as a result of the proposed development.

Assessment criteria

5.11 The aim of the environmental impact assessment is to identify, predict and evaluate potential key effects arising from a proposed development. Wherever possible, identified effects are quantified, but the nature of landscape and visual assessment requires interpretation by professional judgement. In order to provide a level of consistency to the assessment, the prediction of magnitude and assessment of significance of the residual landscape and visual effects have been based on pre-defined criteria.

5.12 The sensitivity of the landscape to changes is defined as *high, medium, low* or *negligible* based on professional interpretation of a combination of parameters, as follows:

- Landscape designation;
- Landscape scale;
- Landscape quality; and
- The nature of views.

5.13 Viewpoint sensitivity is defined as *high, medium, low* or *negligible* based on an interpretation of a combination of parameters, as follows:

- Land use at the viewpoint;
- Landscape quality at the viewpoint;
- Landscape designation;
- Frequency of use; and
- Quality of the intervening landscape between the viewpoint and the proposed development.

5.14 The magnitude of change arising from the proposed development at any particular viewpoint is described as *substantial, moderate, slight* or *negligible* based on the interpretation of a combination of largely quantifiable parameters, as follows:

- Distance of the viewpoint from the development;
- Duration of effect;
- Extent of the development in the view;
- Angle of view in relation to main receptor activity;

- Proportion of the field of view occupied by the development;
- Background to the development; and
- Extent of other built development visible, particularly vertical elements.

5.15 The significance of any identified landscape or visual effect has been assessed in terms of *major, moderate, minor* or *none*. These categories have been based on combining viewpoint or landscape sensitivity and predicted magnitude of change, as follows:

Table 5.1 Assessment of effects

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

5.16 Where the landscape or visual effect has been classified as **Major** or **Major/moderate** this is considered to be equivalent to significant effects referred to in the Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2000.

Project description and mitigation measures

5.17 The site selection rational and iterative design process for the proposed wind farm at Farr are provided in Chapter 2 and a full description of the proposed development is given Chapter 3. The design evolution has been an iterative process with the aim of arriving at an optimal design configuration in environmental, technical and economic terms.

5.18 The proposed wind farm would be located within the boundaries of the Glen Kyllachy Estate, on the rounded open hills of the eastern Monadhliath to the west of Tomatin in Inverness District. Site location plans are illustrated on Figures 1 and 2 and the site layout plan is illustrated on Figure 3.

5.19 A number of standard and site specific environmental mitigation measures were incorporated into the initial design. These include use of modern turbine design features, and site specific measures have been designed in respect of the turbine layout, design of access tracks and the site control building.

Standard Design Measures

5.20 The development will make use of three bladed horizontal axis turbines with tubular steel towers. Research (Stevenson and Griffiths 1995) has confirmed that tubular turbine towers reduce visual clutter and are preferred by the public to lattice, pylon-like generator towers.

5.21 The turbines will be painted with a semi-matt pale grey finish which tends to reduce the distance over which the turbines are visible, especially in dull or overcast weather conditions.

Site Specific Design Measures

5.22 The layout and individual siting of turbines have been considered as part of the design iteration to reduce landscape and visual effects. This involved examining wireframes produced for an early site layout, and amending the layout to improve the perspective views from key viewpoints in close proximity to the proposed development. The objective was to achieve a more balanced composition of the turbines against the landscape and skyline. This process took account of other critical constraints such as noise, archaeological and ecological considerations. The design was also considered in relation to the layout and the landform of the site. The proposed site layout shown on Figure 3 therefore represents the preferred layout in terms of technical, economic and other environmental constraints, as well as landscape and visual considerations.

Access Tracks

5.23 The design of the site access tracks has been influenced by the need to minimise the extent of disturbance to the physical landscape fabric and thus minimise landscape and visual effects, as well as taking account of ground conditions. This has been achieved by making use of an existing track through Meall Mor and Farr Forests, commercial forests managed by Forest Enterprise. Access would be from the A9 trunk road using an existing access point at Aultnaslanach to Meall Mor Forest. The existing forest track would be upgraded and approximately 7.5km of new access track would require to be constructed within the forest, involving the felling of up to 3 hectares of forest. Approximately 18km of new track would also be required to provide access to and between turbines, the site office and grid connection compound.

5.24 New access tracks will be constructed using locally won crushed stone from four borrow pits located within the site, as shown on Figure 3. Following the construction of the wind farm, borrow pits would be filled with excess peat excavated from the track base with side slopes graded and finished with reserved peaty topsoil. Access tracks would generally be 6 metres in width with drainage ditches either side. The new access tracks serving the development will be of a similar width and light orange-brown colour to other existing estate access tracks in the area. Track edges and batters would be reinstated with reserved soils peat and grass/heather turves following the construction of the wind farm.

Grid Connection Compound and Site Control Building

5.25 The location of the grid connection compound and site control building is shown in Figure 2. Cabling between turbines and to the grid connection compound would be underground. The grid connection compound would measure approximately 60m x 60m and would be enclosed by a 2.4 metre high security fence. The compound would accommodate transformers and there would be a grid connection building of 12m x 5m x 5m height, located adjacent to the fenced area, as shown on Figure 7. The area adjacent to the compound fence would be mounded to marry with the existing landform and reinstated with plant material to replicate the existing vegetation mix adjacent to the road, in order to provide some screening to the grid connection compound.

5.26 The site control building would consist of a 20m x 10m building with pitched roof of maximum 6.0 m height as illustrated in Figure 8 and would have permanent vehicular access and area of gravel hard standing adjacent to it, enclosed by a timber post and wire fence.

Development Phases

5.27 The wind farm development would comprise three distinct phases:

- A temporary construction phase;
- The operational phase; and
- A short term decommissioning phase.

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

- the activities and elements of the development that would affect the fabric of the physical landscape of the application site; and

- the activities and characteristics of the elements that would be visible from the surrounding locality, and therefore affect the landscape and visual amenity.

Construction Phase

5.29 The construction phase of the development would last for up to 30 months. During this phase the following activities and elements have the potential to cause an effect on the landscape and visual amenity of the study area:

- Upgrade of existing access and construction of site access tracks;
- Borrow pit excavations;
- Excavation and construction of turbine foundations;
- Excavations for underground cables;
- Temporary site compound;
- Construction of site control building;
- HGV deliveries to site and movement of vehicles on site;
- Erection of turbines; and
- Reinstatement works, including removal of temporary accommodation.

5.30 The location and management of these features have been carefully considered to minimise environmental effects.

5.31 All ground disturbance on-site would be restricted as far as practicable to the site compound, construction access tracks, lay down area, turbine base areas, routes for underground cables and the grid connection. The proposed location of these elements is shown on Figure 3. Physical disturbance to the site would therefore be limited to a small proportion of the overall application area.

5.32 The main site access for construction purposes would make use of an existing forest track trhough Meall Mor and Farr forests. Some sections of new track would require to be constructed within the forest and on open moorland. All new on-site tracks would be sited to avoid disturbance to significant habitats, and to minimise physical cut and loss of vegetation.

5.33 On completion of the construction phase, all ground disturbance adjacent to built elements would be reinstated under the guidance of the on-site Project Ecologist. Site access tracks would be constructed to 6 m in width with the verges reinstated using materials excavated, retained and stored on site during the construction phase.

5.34 The location of the main temporary site compound would be adjacent to the Garbole Road and in the vicinity of the proposed site control building (Figure 3). It would comprise a fenced compound housing the site construction phase accommodation and storage areas and would occupy an area of approximately 50 m x 100 m. Topsoil would be stripped and reserved and a geotextile base would be laid over the compound area and subsequently removed post construction of the wind farm and the area reinstated.

Erection of Turbines

5.35 The turbines themselves would be erected over a short period and the appearance of the construction cranes in views of the site would therefore be of short duration.

Potential effects of construction phase

5.36 The limited extent of the disturbance, the short duration of the effects and the reinstatement of working areas, would ensure that the effects of the construction phase on the landscape and visual amenity of the locality are minimal, and are not considered to cause any significant effects. Therefore the construction phase has not been considered in any further detail in this assessment.

Operational phase

5.37 The operation elements with the potential to affect the landscape and visual amenity of the study are:

- Wind turbine generators and anemometer masts;
- Grid connection compound and site control building; and
- Access tracks.

Wind turbine generators

5.38 The overall height of the proposed wind turbines would not exceed 102m. The 45 turbines would be arranged in a series of 'arcs' relating to the landform which radiate westwards from the summit of Carn Dubh, 606 m AOD towards Beinn Bhreac 549 m AOD, at the western edge of the main site application area.

Permanent Anemometer masts

5.39 There would be 3 permanent anemometer masts of 80m in height and of lattice construction. Access to the anemometer masts would be by a 4m wide tracks connecting with the main network of site tracks.

Grid connection compound and site control building

5.40 These are as described in para 5.25 above.

Access tracks

5.41 The site access tracks would be retained throughout the operational stage of the wind farm to provide controlled access for maintenance vehicles.

Potential effects of the operational phase on the site

5.42 Where access tracks are located within existing commercial forestry, they would not appear any different to existing forest tracks within a working forest which is in the process of first rotation felling operations and would therefore have negligible effects on local landscape character. Where new access tracks are located on the open hills of the site, they would appear similar to existing estate tracks providing access to shooting areas, although they would be more extensive. The anemometer masts would be similar in style to the communication masts on many of the hills in the study area being of lattice construction. The erection of the turbines would introduce large scale vertical structures to the open moorland of the site.

5.43 The elevated moorland site has some existing tracks and shooting butts and it is currently managed as a grouse moor. The introduction of large scale turbines and access tracks on the open moorland, as well as buildings and compound would change the character of the site. However, the effects on the fabric of the site are considered to be minor as these impacts would not affect features or landcover of particular landscape importance and would be reversible.

Decommissioning

5.44 Potential landscape and visual effects during the decommissioning phase would be minimised by the limited and temporary nature of the works. All the above ground structures would be removed and the ground reinstated. Below ground structures would be left in place to avoid further disturbance. Accordingly, the decommissioning phase would have a minimal effect on the landscape and visual amenity of the locality and would restore the site to the conditions prior to the development. This stage of the development has therefore not been considered in any further detail in this assessment.

Landscape and visual context

Regional and local context

5.45 The site is located within the eastern fringes the Monadhliath Hills, an extensive tract of open uplands. It is located approximately 16km south-east of Inverness and 20km north-west from Aviemore. The River Spey bounds the Hills to the south-east with the Great Glen located to the north-west, forming the division between the rounded hills of the south-eastern Highlands and the more rugged mountainous landscapes and steep sided glens to the north-west.

Landform and hydrology

5.46 The Monadhliath Hills form an unbroken mass of large scale, smooth rounded hills generally between 600m and 800m high but rising to 930m in the hills to the south, near Newtonmore. The Rivers Findhorn, Nairn and Dulnain cut into this upland area in a south-west to north-east alignment, draining down to the Moray Firth. Narrow, sheer sided glens accommodate small water courses draining into these principal rivers. There are no significant water bodies in the Hills, although small lochans occasionally occur on slacker slopes and plateaux areas.

Landcover, landuse and landscape elements

5.47 The upland areas in the vicinity of the site predominantly form part of sporting estates, with extensive areas of heather moorland being managed as grouse moor. Commercial forestry occurs on lower hill slopes on the fringes of the upland areas and are extensive in the Speyside and Dulnain Valley areas. There is limited sparse settlement in the upland areas. The straths which divide the upland areas and fertile coastal fringes of the Moray and Beauly Firths accommodate more intensive agriculture with settlement being concentrated in these areas.

Transport routes

5.48 The main transport route through the study area is the A9, linking the Central Belt of Scotland with Inverness and the northern Highlands. The A9 and the main railway line from Perth to Inverness are located in a similar corridor through the Spey Valley, over the Slochd summit, and within Strathdearn, to the east of the site. Other public roads within 5-8km of the site are located within the straths to the north and south and tend to be single track. The B861/B851 is located in Strathdearn and provides links between the communities there and Inverness as well as through route to Fort Augustus. The minor public road between Farr and Garbole is an exposed single track route over the hills between Strathnairn and Strathdearn and is unusual in being one of the few roads traversing the remote Monadhliath Hills.

Recreation

5.49 Shooting and fishing are important recreational pursuits within the study area, with large sporting estates being located close to the wind farm site. Walking tends to be focussed on the higher, more distinctive 'Munros' of the Cairngorms approximately 30 km to the south-east of the site and within the mountainous area to the north-west of Loch Ness. There are a number of well-used Rights of Way and other footpaths within the Speyside and Dulnain valleys, although the upland area in the immediate vicinity of the site appears to be little used by walkers.

Wind Farms in the Study Area

5.50 The existing Novar wind farm to the north-east of Inverness lies approximately 43km from the proposed Farr wind farm site and consists of 34 number of turbines of 55.5 metres height to blade tip. The Dunmaglass proposed wind farm site lies 12 km to the south-west of the site, and would consist of 50 number turbines of 100 metres height to blade tip.

Landscape Designations

5.51 The Cairngorms NSA lies at the south east edge of the study area, approximately 21.5 km from the application site. Part of the proposed Cairngorms National Park lies within the study area, with its northern boundary approximately 8km to the south-east of the site.

5.52 The study area is subject to several nature conservation designations, however the application site itself does not lie within any of these conservation designated areas, which are illustrated in Figure 9.

Landscape character and quality

General

5.53 The assessment of landscape character and quality has concentrated on the 25km radius study area, centred on the proposed wind farm at Farr. However, during the scoping exercise, it was agreed with SNH that two viewpoints outwith this study area would be considered in the assessment and the description of landscape character therefore correspondingly extends beyond the study area.

5.54 Landscape character assessments (LCAs) of Inverness District, Moray and Nairn, Inner Moray Firth and the Cairngorms have been produced by SNH and these cover the study area centred on the wind farm. Field survey work has been undertaken as part of this assessment to verify the character areas identified in the LCAs. Comparison of the boundaries and descriptions of landscape character types within the different studies has shown that although some types have different nomenclature, they share similar characteristics and could be categorised as the same character type. Therefore for the purposes of the landscape and visual assessment for the wind farm, the landscape character assessments have been simplified and 'standardised' (although boundaries remain unchanged), using the *Inverness Landscape Character Assessment* (LCA) as a basis for a unified nomenclature where duplication exists.

5.55 General landscape characteristics are described for all landscape character types falling within the 25 km study area and are included in Appendix A. More detailed and location specific landscape characteristics have been identified for the *Rolling Uplands* and *Farmed Straths* landscape character types which are described below. The purpose of this more detailed LCA is to allow a fuller assessment of the potential impacts of the proposed development on landscape character within 5-8km of the site, this being considered the extent at which significant changes to landscape character are most likely to occur. The landscape character areas identified in the study area are illustrated on Figure 10.

5.56 The *Rolling Uplands* landscape character type occurs within the site boundary. This landscape type is described below:

Rolling Uplands

5.57 This character type covers large parts of the study area to the south-west and north-east of the site. This character type is synonymous with the *The Monadhliath* and *Open Hills* type defined in the Cairngorms and Moray and Nairn LCAs. It is the most extensive landscape character type within the study area.

5.58 ***Topography*** Large scale, smooth rounded hills with summits of similar height around 600-800m but rising to 900m in the south-east collectively form broad, undulating upland plateaux. Deeply incised burns cut occasional crevices between hills, which together with rocky outcrops and scree disrupting the smoothness of the hills in places.

5.59 ***Landcover, landuse and landscape elements*** Heather moorland dominates the ground cover and has a uniform texture and colour, accentuating the smooth, rounded landform of the hills. Some coniferous plantations occur on the edge of this type, their colour, texture and shape contrasting with the smooth rolling uplands. The landscape is largely uninhabited with settlement occurring on the fringes within sheltered straths. Some service elements such as roads and powerlines pass through the landscape, although there is a general absence of built elements in the landscape.

5.60 ***Designations*** The south-eastern fringes of the *Rolling Uplands* in the study area falls within the proposed Cairngorms National Park. No other landscape designations apply to this character type.

5.61 ***Scale of landscape*** This is a large scale landscape due to the extensiveness and open nature of the rolling uplands, although it is difficult to judge distance or scale due to its expansiveness.

5.62 ***Nature of views*** There are open, long distance views across the landscape over the rolling hills from elevated ground creating a strong feeling of openness and exposure. In views to the *Rolling Uplands* from adjacent areas, the type acts as a simple backcloth and sheltering edge to the *Farmed Straths* character type.

5.63 ***Landscape quality*** The character of the *Rolling Uplands* landscape derives primarily from its extensiveness, openness, simplicity of landcover and general absence of built features. Visual composition is simple, with the main elements being rounded summits creating a series of coalescing horizons in the distance from elevated viewpoints. There are no dominant foci or hierarchy of high points or spaces. The quality of the landscape is therefore considered to be medium.

5.64 ***Sensitivity to change*** The generally open nature of this landscape combined with its long distance views from elevated locations and simple visual composition will tend to result in new elements creating focal features in some views, providing an indication of scale and distance within the landscape, thus modifying its open and unrestricted character. This landscape type generally has a high sensitivity to change, although in some areas where communications and forestry (principally at the transition between adjoining types) modify its openness and remote character, sensitivity is reduced.

5.65 ***Sensitive receptors*** Few walkers access the hills within the vicinity of the site, although a number of Rights of Way and popular hills for walking ('Munros') lie some 22km to the south of the site. Public roads are generally few although the A9 and the Perth to Inverness railway line lie to the east of the site, therefore road and rail users are also present.

Rolling Uplands - Specific landscape characteristics in the immediate vicinity of the wind farm site

- This landscape possesses a simple visual composition, its main elements being the sky, gently rounded summits and extensive moorland cover.
- Occasional boulders dot upper hill slopes and tops and disrupt the smooth cover of heather and grass. Areas of muir burn and hagging occur within some parts of moorland, the former attracting attention on account of its geometric strip pattern. Isolated trees and scrubby juniper occur in glens and on some hillsides.
- Hills are more craggy-topped to the west of the site, with narrow rocky gorges cutting through and allowing slot views of distant mountain summits.
- The Allt Tarsuinn cuts a deep and narrow sheer sided glen to the south-west of the site, flowing through Glen Kyllachy to the River Findhorn in Strathdearn. This grassy-banked winding glen is a striking feature in views from the minor public road between Farr and Garbole and leads the eye up to the smoothly rounded hill tops.
- A single track road is aligned over the hills immediately to the west of the site, linking Strathdearn with Strathnairn. An overhead powerline is aligned close to this road and is a highly visible feature on account of the openness of the hills.
- Extensive coniferous plantations occur on the fringes of this type as it borders Strathnairn, Strathdearn and the A9 corridor. Many of these are currently in the process of restructuring with recently felled areas appearing raw and contrasting with the smooth texture of adjacent moorland.
- The area of the *Rolling Uplands* in the vicinity of the site is uninhabited, this combined with the extensiveness of the hills and with few roads, give a sense of remoteness. The site lies on the eastern fringes of the Rolling Uplands where although 'Wildland' qualities of remoteness and lack of built artefacts are evident (and striking in relation to the area's proximity to the A9 corridor), they are diminished to some extent by the pylon line and nearby forestry.

Farmed Straths

5.66 This character type cuts into the *Rolling Uplands* and occurs to the north and south of the site at Strathdearn and Strathnairn.

5.67 ***Topography*** A broad, flat to gently undulating strath floor, edged by steep sided slopes of the surrounding *Rolling Uplands.*

5.68 ***Landcover, landuse and landscape elements*** The strath floor has a regular pattern of large fields of improved and semi-improved pasture. Extensive coniferous plantations and birch woodlands cover side slopes with heather moorland occurring on upper slopes and hill tops. Meandering rivers form a focus on the strath floor, sometimes aligned with thin bands of broadleaved trees. Only a few small settlements occur in this character type, often located at crossroads or aligning the main road which runs along the edge of the strath floor. Estate buildings and farmsteads are a distinctive feature throughout the straths and these are typically located at the transition between the strath floor and lower hill sides. Both of the *Farmed Straths* in the study area exhibit a strong contrast between the bright green smooth pastures on strath floor and muted coarser texture of rough grazing/heather moorland and woodlands on flanking hills.

5.69 ***Designated Landscapes*** There are no designated landscapes within this character type.

5.70 ***Scale of landscape*** Where the strath floor is open a medium scale landscape exists, contained by flanking hills. Where the strath floor is more undulating and broken by woodlands and knolls, an intimate scale occurs in places.

5.71 ***Nature of views*** The strath floor creates a sense of a linear enclosure which directs distant views along the 'corridor' of the strath and allows uninterrupted views of the flanking hill slopes.

5.72 ***Landscape quality*** Mixed woodlands, farmland, estate influenced policies and buildings and open rough grazing and moorland on flanking hill slopes, combine to produce a landscape of contrasts and high visual diversity. Overall, this character type is considered to be of high-medium landscape quality.

5.73 ***Sensitivity to change*** The general openness of the strath floor and nature of views which focus on the flanking hill slopes and strath floor, would result in a medium sensitivity to change. The introduction of new elements outwith the Farmed Strath character type may create foci which would occur in the context of the visually diverse strath below.

5.74 ***Sensitive receptors*** Sensitive receptors will principally be people who live, work and travel through the straths and the mainly local, walkers using paths and tracks in the adjacent hills.

Farmed Straths –to the north and south of the site

Strathnairn

- Within Strathnairn, landscape character changes from east to west. Towards its eastern end and adjacent to the A9 corridor, industry is evident in the extensive quarrying and forestry operations being carried out at Meall Mor . Towards the middle of the strath at Inverarnie, the flat valley floor becomes more undulating and broken by glacial deposits and flanking slopes are shallower.
- Further to the west in the Farr area, estate policies and buildings are particularly evident. and include avenues of lime, stone walls – fringed at the base with ferns, parkland and extensive areas of rhododendron. This part of the strath has an intimate scale created by the undulating valley floor and woodland.
- Upper Stathnairn opens out into a broad 'U' shaped valley and merges with *Farmed and Wooded Foothills* where the strath floor becomes less open and flat being broken by knolls and dominated by a matrix of woodlands and small undulating fields which diminish the contrast between the strath floor and flanking hill slopes .
- The River Nairn is edged by birch woodland and is generally a visually insignificant feature in views from the road.
- This is a relatively well-settled strath with a higher proportion of newer housing than Strathdearn. Housing tends to be aligned along roads and at junctions at the transition between the strath floor and hill slopes. Isolated farms and houses are often set against forest edges on lower and mid hill slopes with square pastures to the front.
- The forests of Meall Mor and Farr comprise extensive stands of commercial conifers and form a dark backdrop on the southern hill slopes of Strathnairn.

Strathdearn

- Strathdearn has a more remote character than Strathnairn due to its sparser population and lack of throughroads to major settlements.
- The meandering River Findhorn is a focus within the open farmland within the broad strath floor. Pasture on the valley floor is interspersed with rush infested ground. Occasional Scots pine shelterbelts cross the floor, disrupting the openness.
- Birch woodlands are extensive on the southern hill slopes of the strath, hill tops are open, covered with heather moorland. Coniferous plantations are a prominent feature further up the valley and displace farmland, extending onto an increasingly constricted strath floor as it merges with the Rolling Uplands.
- The architectural integrity of estate buildings is a distinctive feature of Strathdearn. Cottages, farmsteads and shooting lodges are generally located either side of the strath floor on lower hill slopes, a few extend on the valley floor itself. Many of these buildings are traditional in style with grey painted timber detailing. Large houses set within wooded, and sometimes ornamental, grounds are located either side of the strath.

5.75 Landscape character types throughout the 25km study area are shown in Figure 10. The landscape character types on which it is considered that there may be landscape and visual effects arising from the proposed wind farm, are as follows:

- Rolling Uplands;
- Farmed Straths;
- Farmed and Wooded Foothills;
- Rolling Farmland and Woodland;
- Broad Steep Sided Glen;
- Flat Moorland Plateau with Woodland;
- Rocky Moorland Plateau with Woodland;
- Inverness – Suburban Fringe;
- Enclosed Firth; and
- The Central Massif.

5.76 The latter two landscape character types are located outwith the 25km study area, but are included due to the request by SNH that viewpoints in specific popular tourist destinations be considered.

Table 5.2: Landscape Character Areas

Character area	Sensitive receptors	Views	Sensitivity to change
Rolling Uplands	Road users Rail users Hill walkers	Open long distance views over successive rounded hills.	High-medium
Farmed Straths	Road users Rail users Footpath users	Enclosed, funnelled views down strath. Views of *Rolling Uplands* across strath.	Medium
Farmed and Wooded Foothills	Local residents Road users Footpath users	Views at ground level generally contained by landform. Open panoramic views from hill tops.	Medium
Rolling Farmland and Woodland	Local residents Road users Footpath users	Limited views from type due to topography and screening provided by woodland. Type provides landscape context in views to *Rolling Uplands* from the north.	Medium - low
Broad Steep Sided Glen	Local residents Road users Tourists Footpaths users	Enclosed, funnelled views down Glen. Views of *Rolling Uplands.*	Medium
Flat Moorland Plateau with Woodland	Local residents Road users	Views limited by extensive forestry in area.	Medium- low
Rocky Moorland Plateau with Woodland	Local residents Road users	Views limited by extensive forestry in area although some hill top views.	Medium
Inverness: Suburban Fringe	Local residents Footpath/Golf course users	Views limited by intervening buildings and trees, although some views from open elevated locations to surrounding hills and Firth.	Medium -lLow
Central Massif	Walkers/climbers Tourists	Panoramic views of distant *Rolling Uplands.*	High

Assessment of residual effects

Introduction

5.77 This section provides an assessment of the landscape and visual effects arising from the proposed wind farm during the operational period having taken account of the inbuilt mitigation measures discussed above.

5.78 The potential landscape and visual effects arising during the operational phase of the proposed wind farm have been assessed in two ways:

- Analysis of the ZVIs to provide a general overview of the visibility of the wind farm from different distances within the study area; and
- Assessment of the potential landscape and visual effects at 16 viewpoints agreed with representatives of The Highland Council and SNH.

Zones of Visual Influence (ZVIs)

General

5.79 A preliminary blade tip ZVI for the initial site layout was prepared which illustrates the general areas of potential visibility within 40 km of the proposed wind farm, and is shown on Figure 11. This shows an area of visibility in close proximity to the Farr site within approximately 3 km to the north of the site, and extending slightly further to the south. Visibility is limited immediately to the east of the site and then there is more fragmented visibility on the summits and west facing slopes to the east of the A9 and Strathdearn valley. The 40 km radius ZVI shows that there are extensive parts of the Monadhliath Mountains and the north east Highlands where there would be no visibility of the proposed wind farm development. Fragmented visibility would be obtained from the summits and north west facing upper slopes of the Cairngorm Mountains and an area to the south of Forres. On the north side of Inverness and the Great Glen, the 40 km radius ZVI shows that there may be visibility of the proposed turbines along the slopes on the north shores of Loch Ness and the Moray Firth. The ZVI indicates a more extensive area of visibility from distances of over 24 km on the Black Isle, although much of this area is forested. To the north of the Cromarty Firth and north west of Struy, the ZVI also shows areas of visibility on the higher ground.

5.80 ZVIs have been prepared to illustrate the potential extent of visibility of the final layout of the proposed wind farm, and are included as Figures 12 and 12a to 12d.

5.81 It should be noted that ZVIs are a working tool to assist in identification of areas from where there is potential visibility of a given development. The ZVIs present the "worst case scenario", insofar as they are based on Ordnance Survey (OS) digital data at 50 m interval resolution and therefore do not take account of local landforms and vegetation (e.g. trees, hedges and forestry plantations), nor any built forms in the landscape. This means that the visibility shown on the ZVIs is more extensive than actual visibility on the ground. Where the ZVI shows no visibility, no turbines can be seen.

Cumulative ZVI

5.82 The cumulative ZVI for the existing wind farm at Novar and the proposed wind farm at Dunmaglass is illustrated on Figures 13 and 13a – 13d. These ZVIs indicate that there are limited parts of the study area from where both energy developments may be visible. The existing wind farm at Novar is approximately 43 km from the proposed wind farm at Farr and there is therefore only a small area of overlap between the 25 km radius ZVI for the two developments on the southern edge of the Black Isle. Within this area there is a short section of the A9, approximately 2 km in length, from where the proposed turbines at Farr maybe seen in a southerly direction and the existing wind farm at Novar may be visible to the north north east. It is likely that both wind farms may be visible in clear weather in opposite directions from the Kessock Bridge with Novar situated over 27 km to the north west and the proposed turbines at Farr over 17.5km to the south east.

5.83 The proposed wind farm at Dunmaglass would be located approximately 10.5 km to the south west of the Farr site. There are scattered areas on the south west side of the Farr study area from where both of these proposed developments may be seen. The ZVI shown on Figure 13a indicates that the most extensive area of visibility occurs to the south of Inverness and south west of the A9, with much of this occurring in forested areas.

5.84 There may be visibility of both proposed wind farm developments from the higher ground on the north side of Loch Ness, fragmented areas on the higher ground on the south side of Loch Ness, and along Strathnairn. There may be views of both wind farm developments from the summit areas of the Monadhliath Mountains to the south of the study area, from the Kinreachy Forest and from the west facing slopes of the high ground on the east side of the A9.

5.85 There are no parts of the study area where there would be views to the existing wind farm at Novar, the proposed wind farm at Dunmaglass and the proposed wind farm at Farr within 25 km radius from each of the sites.

ZVI Analysis and Verification

Sensitive Receptors

Residential settlements

5.86 The wind farm site is located within a tract of open, exposed hills. There are no villages within 4km of the site. The main settlements within the 25 km study area are Inverness and Aviemore, which lie 16 km to the north and 20km to the south of the wind farm site respectively. The small, scattered communities of Milton of Farr, Inverarnie, Tombreck, Balnafoich and Daviot occur within Strathnairn between 4-9km to the north of the site. Tomatin is the only village within Strathdearn and lies 5 km to the east of the site. Isolated farms and estate lodges and houses are dispersed throughout the straths, glens and farmland of the study area, although settlement is generally sparse. A denser pattern of settlement is evident in the Inverness area, on the coastal fringes of the Moray Firth and within Speyside, to the south-east of the site.

5.87 Within 5km of the site, the principal groups of residential receptors are located within Strathdearn and Strathnairn. Within Strathdearn, the ZVI shows that there would be no views of the wind farm from most of the valley floor and lower hill slopes where the majority of properties are located. Some properties in upper Strathdearn may have visibility. Views will also be possible from some properties within the sparsely populated valleys of the Findhorn and Allt Bruachaig to the east of Tomatin. Views of the wind farm from the more populated area of Strathnairn will be limited within the valley floor and lower slopes. In the Milton of Farr area, the ZVI indicates that views of turbines will be possible, however verification on site has indicated that existing forestry will screen views from most properties. However there would be visibility of the proposed wind farm from some properties in the strath.

5.88 To the north of the wind farm site, the ZVI indicates that there may be views of up to 50 turbines from the south-west facing slopes and from the more elevated 'interior' of the Black Isle. Verification of potential visibility in the field however has led to the conclusion that, while some properties within the coastal settlements of Fortrose, North Kessock and Avoch are likely to have views of the proposed turbines, forestry will screen views of the wind farm from the interior of the Black Isle in many areas.

5.89 The ZVI indicates that views may be possible from the north-west fringes of Inverness. However, many of these theoretical views would be screened by intervening buildings and views are only likely from properties on south-east facing elevated ground and from large scale and/or elevated open spaces within the City.

Road and Railway routes

5.90 The A9 is the principal route in the study area. It is aligned approximately 4km to the east of the site at its closest point. The main Inverness – Perth railway line is aligned close to the A9 to the east of the site. A minor public road between Farr and Garbole, known as the Garbole Road, lies to the west of the site, within I km of the nearest turbine in some stretches. A network of minor public roads are located within Strathnairn and Strathdearn to the north-west and south-east of the site.

5.91 The ZVI indicates that there may be visibility of up to 10 turbines from approximately 6 km of the A9 between the Slochd summit and north of Tomatin in Strathdearn within the study area. Turbines are also shown as being potentially visible from a second stretch of the A9 north of Daviot, as the route ascends over Drummossie Muir. Another band of potential visibility is shown as the A9 crosses the Moray Firth on the Kessock Bridge and from some stretches of the route as it crosses the Black Isle.

5.92 Verification of the ZVI on site has confirmed that visibility from the A9 will be limited within the Strathdearn area, with views of turbines only being possible over open moorland to the south of the Slochd summit and at the crossing of the Findhorn river, as roadside woodland will largely screen views. Coniferous forestry would also screen views from the A9 on Drummossie Muir, although some brief glimpses of turbines would be possible close to Daviot. There will be some views from the A9, just south of Tore, as it crosses the Black Isle where gaps occur in roadside vegetation. A series of viewpoints have been selected for detailed assessment of the effects on people using the A9, due to its importance as the principal route north and high levels of usage.

5.93 The Garbole Road, immediately to the west of the site, will offer close views of the wind farm, although steep banks bordering the eastern edge of the road will inhibit views in the middle section of the route.

5.94 From the railway line, the ZVI indicates that turbines would be visible in the Strathdearn area only. Potential views have been verified from the train with the conclusion reached that due to localised screening by woodland and the alignment of the track in cutting for much of the route, the only view of the wind farm would be from the Findhorn viaduct. The analysis of Viewpoint 8 which follows considers the effects of the wind farm on this view in more detail.

Recreational Routes and Facilities

5.95 Within 10km of the wind farm, turbines will be visible from the north-west facing slopes within Strathdearn. These hills form part of sporting estates and are not well-used by the general public for walking. Upper slopes and summits of hills to the east of the site are shown as having views of turbines, although these hills are also not well frequented by walkers.

5.96 Views will be possible from south-east facing hill slopes and summits above Loch Ness, although they will be restricted by forestry in many areas. The ZVI indicates that views may be possible from upper slopes and tops of high hills within the remote Monadhliath hills to the south and west of the site. A number of Rights of Way cross the south-eastern fringes of these Hills and views of the wind farm may be possible from sections of these routes.

5.97 The extended ZVI shows that potential visibility of turbines may be possible from the north-west facing slopes, ridges and summits within the Cairngorms plateaux. This area is outwith the 25km study area, lying over 35km from the nearest turbines and is assessed in further detail in the viewpoint analysis which follows.

5.98 The ZVI shows extensive visibility over the inner Moray Firth area, an area well used by commercial and recreational watercraft, at distances of over 20km from the wind farm site.

Viewpoint analysis

5.99 A total of 16 viewpoints have been chosen for analysis. These locations are considered to provide a representative sample of views from publicly accessible locations, from different distances and directions, as well as from the various landscape character areas identified in the study area from which the proposed wind farm would be visible. These viewpoints were agreed with The Highland Council and SNH at the scoping stage of the assessment. The selected viewpoints are listed in Table 5.3 below and their locations are shown on the ZVIs. The existing and predicted views from each of the 16 locations are shown in Figures 14 – 29.

Illustrative Tools

5.100 The viewpoint analysis is illustrated by a range of tools including photographs, wireframes and photomontages. The photographs used to construct the photomontages have been taken using a 50 mm lens, which conforms with the best practice guidance in the Guidelines for Landscape and Visual Impact Assessment (LI/IEA 1995), because this lens size is considered to most closely represent the view obtained by the human eye. The wireframes illustrated in Volume 3 of the ES, have been generated based on the same OS digital data used to generate the ZVIs, and therefore illustrate the worst case scenario, because they do not take account of the screening effect of local landform or vegetation.

5.101 The photomontages have been prepared based on combining a wireframe of the view with the photograph of the existing view and rendering the image using a model of the proposed wind turbines, also generated electronically. The resulting images should be viewed at a distance of 237 mm to most closely replicate the view which would be obtained from the viewpoint.

5.102 It should be noted that photography is only a tool to assist in the visualisation process, and can not be expected to replicate the actual view or predicted view which would be attained on the ground.

Table 5.3: Viewpoints

View-point Number	Viewpoint name	Distance to nearest turbine	Grid reference	Sensitive receptors	Landscape character area
1	Chanonry Point, Black Isle	25.1 km	275000 855700	Walkers, Tourists, Golfers, Local residents	Enclosed Firth
2	Craig Phadrig Car Park, Inverness	16.6 km	264000 844975	Local residents Walkers	Inverness: Suburban Fringe
3	Ptarmigan Station, Cairngorm	35.1 km	300450 804900	Walkers Tourists	Central Massif
4	Carn a'Bhodaich, Loch Ness	16.0 km	257450 837675	Walkers	Rocky Moorland Plateau with Woodland
5	Tomatin Village	5.6 km	280300 828000	Local residents Road users	Farmed Strath
6	Slochd Summit, A9	8.7 km	283000 826125	Road users Tourists	Rolling Uplands
7	Balvonie, A9	9.4 km	272225 840050	Local residents Road users Tourists	Flat Moorland Plateau with Woodland
8	A9 at Findhorn Railway Viaduct	6.1 km	280625 828900	Rail users Road users Tourists	Farmed Strath
9	Minor Road to West of Site at Carn Eitidh	2.0 km	272550 826300	Road users	Rolling Uplands
10	Minor Road to North of Site	1.2 km	269925 829850	Road users	Rolling Uplands
11	Carn Bad an Daimh, South Strathdearn	6.0 km	277325 822975	Local residents Walkers	Farmed Strath
12	Spot heigh 184m on minor road west of Farr	5.5 km	266850 833000	Road users Local residents	Farmed and Wooded Foothills
13	Carn a Choire Mhoir, East of A9	9.4 km	284250 829050	Walkers	Rolling Uplands
14	Kessock Bridge	18.5 km	266500 847650	Road users Local Residents	Enclosed Firth
15	Track from Dulnain to Aviemore	18.2 km	284425 813100	Walkers	Rolling Uplands
16	Carn Sgulain	22.6 km	268375 805875	Walkers Road users	Rolling Uplands

Viewpoint 1: Chanonry Point

5.103 This viewpoint is located in a small car park at the end of Chanonry Ness, the remains of a ridge of teminal moraine extending as a narrow 'spit' of land into the Moray Firth. A golf course occupies much of the Point with a memorial, lighthouse and views over the Firth, with its resident dolphins, attracting visitors. It is representative of views obtained by residential receptors from settlements on the southern coast of the Black Isle, as well as from watercraft using the Moray Firth.

Existing view

5.104 The existing view towards the application site is illustrated on Figure 14. The promontories of Chanonry Ness and Fort George on the Morayshire coast partially enclose the Moray Firth, creating a broad basin of water present in the foreground and the key focus of the view. The eye of the viewer is drawn to the west, beyond the Kessock Bridge, which is clearly visible on the ground, to the distant mountains, separated by the River Beauly valley. Boats using the Moray Firth introduce an element of movement to the landscape. An elongated band of hills with even slopes contain the Firth to the south and are strongly patterned with geometric bands of forestry and shelterbelts enclosing pasture. This contrasts with the Black Isle coast where the Firth is edged by generally wooded, small scale, distinctively rugged, hills with the cleft cut by the Munlochy Basin present in the view. Coastal settlements are prominent on both sides of the Firth as is industry, which is visible on the Morayshire coastal fringe.

Predicted view

5.105 The predicted view is illustrated by the wireframe shown on Figure 14. The wind farm would be 25 km from this viewpoint. The blades of up to 7 turbines may be visible against the skyline. Blade movement would not be perceptible at this distance.

Magnitude of change

5.106 The turbines would be present but are not likely to be perceptible to the majority of receptors due to the distance involved and the presence of coniferous forestry giving a slightly broken intermediate skyline on the distant hills, with turbines replicating this pattern. The main focus of the view, the Moray Firth, would not be affected by the wind farm. The magnitude of change would therefore be negligible.

Cumulative change

5.106 There would be no views of the existing Novar wind farm from this viewpoint. The proposed Dunmaglass wind farm would theoretically be present in the view, although would be 36km from the viewpoint and therefore barely perceptible and only visible in clear weather conditions.

Effects on landscape character

5.107 The *Rolling Uplands* character type does not comprise the principal element of the view and the small scale of visible turbines would not affect the key characteristic of rounded, open hills of this type. The wind farm is a considerable distance from the *Enclosed Firth* and *Rolling Farmland and Woodland* character types present in the view. Overall effects on landscape character would be minor.

Cumulative effects on landscape character

5.108 There would be no cumulative effects on landscape character from this viewpoint due to the distance of the Dunmaglass wind farm proposals from the viewpoint.

Effects on visual amenity

5.109 This viewpoint is representative of the views for a number of receptors; walkers, golfers and visitors. It is also representative of views for local residents in Fortrose and other nearby settlements on the southern coast of the Black Isle. The distance of the wind farm from the viewpoint will result in moderate/minor effects on visual amenity in this location.

Cumulative effect on visual amenity

5.110 The Dunmaglass wind farm proposal would be barely perceptible from this viewpoint, it is therefore considered that there would be no cumulative effect on visual amenity.

Viewpoint 2: Craig Phadrig

5.111 This viewpoint is located at the start of a forest walk to Craig Phadrig, on the western fringes of Inverness. It is representative of views obtained from the hospitals and nearby properties located on the slopes below the Craig. Views from most footpaths and the summit of Craig Phadrig are largely screened by coniferous trees or adjacent housing.

Existing view

5.112 The existing view is illustrated on Figure 15. The foreground of the view is extensively laid out to housing, with the urban fringes of Inverness in the basin below, punctuated by the 'landmark' densely wooded hills on the valley floor at Torvean. Even hill slopes rise above Inverness and form the south-eastern edge of the Ness valley. Built development extends onto these slopes to the east in the Leys area, although the hill slopes generally have a strong pattern of blocks of shelterbelts and woodlands, enclosing pasture. The higher, gently rounded hills of the *Rolling Uplands* are visible on the skyline as a thin sliver of elongated summits. Powerlines and telecommunications masts are faintly visible on the skyline to the west, although in the centre of the view tend to be backclothed by forestry and the dark hills forming a backdrop to the view.

Predicted view

5.113 The predicted view is shown on the wireframe in Figure 15. The nearest turbine would be 16.6 km from the viewpoint. Three distinct groupings of turbines would be visible against the skyline with an additional, less distinct, group of blade tips visible to the east. A total of 26 turbines would be visible from the property in the foreground of the view. From the footpath itself, it is not likely that there will be any visibility of the proposed turbines due to adjacent buildings and tree cover.

Magnitude of change

5.114 It is unlikely that blade movement would be visible at this distance. The scale of the turbines would not be appreciated at this distance and would appear similar to the existing pylons which are seen against the skyline to the west. The magnitude of change would be slight.

Cumulative change

5.115 There would be no views of the existing Novar wind farm from this viewpoint. The proposed Dunmaglass wind farm may be visible and would be 23 km from the viewpoint.

Effects on landscape character

5.116 This viewpoint is located in the *Inverness: Suburban Fringe* landscape character type. The distant *Rolling Uplands* are a component of the view and contribute to the dramatic landscape setting of Inverness. The turbines would interupt the characteristically smooth profile of this character type against the skyline although only a small part of the *Rolling Uplands* present in the view would be affected. The strong pattern of woodland and farmland, which is a key characteristic of the intermediate *Rolling Farmland and Woodland* character type, would not be affected by the wind farm. Effects on landscape character would be minor.

Cumulative effect on landscape character

5.117 There would be no cumulative effect on landscape character from this viewpoint due to the distance of the Dunmaglass proposed wind farm from the viewpoint.

Effects on visual amenity

5.118 This viewpoint is representative of views obtained by walkers and by some residential receptors, both considered to be of high sensitivity. The effect on visual amenity would be moderate/minor.

Cumulative effect on visual amenity

5.119 The proposed wind farms at Farr and Dunmaglass theorectically would be visible from this viewpoint, but not within the same view. The distance of the Dunmaglass wind farm from the viewpoint would limit visibility. The cumulative effect on visual amenity is considered to be minor/none.

Viewpoint 3: Ptarmigan Station, Cairngorm

5.120 This viewpoint is located on the Terrace of the Ptarmigan Restaurant on Cairngorm. It is accessible for visitors using the funicular railway, although similar views are possible for walkers using an adjacent track in Coire Cas to access the Cairngorm plateaux.

Existing view

5.121 The existing view is illustrated in Figure 16. This is a wide and extensive view of great visual diversity. The foreground of the view focuses on the snow fences, ski tows and tracks which litter the smooth rounded hill slopes. Loch Morlich, with its arc of sandy beach, is a key focus of the view in the middle distance. The loch is contained by the Kincardine Hills to the north and surrounded by forest. Patterns formed by the forest are prominent and include dense commercial forestry, recent felled areas and the coarse open texture of Caledonian Pine forest merging with heather moor. The shallow broad strath of the Spey can be seen beyond Rothiemurchas and coniferous forestry is also a feature here, occasionally broken by yellows and green blocks of farmland. Aviemore is visible in the distance, set amongst forest. In the far distance, an extensive tract of uplands coalesce to form successive long rolling ridges, stretching as far as the eye can see. The higher more distinctive peaks of the north-west Highlands rise above the *Rolling Uplands* to form a pale backdrop on the skyline.

Predicted view

5.122 The predicted view is illustrated by the wireframe on Figure 16. The nearest turbine would be 35km from the viewpoint with 44 turbines present in the view. The turbines would be backclothed by the north-west Highlands in the far distance.

Magnitude of change

5.123 The wind farm would be located in the middle of the view from the restaurant terrace, although at 35km distance from the viewpoint, the turbines would be barely visible and only in clear conditions. The magnitude of change would be negligible.

Cumulative change

5.124 The proposed Dunmaglass wind farm would be visible in clear weather conditions at distances over 37km from the viewpoint. The Novar wind farm would be theoretically present in the view, but would not be perceptible, being located 79km from the viewpoint.

Effects on landscape character

5.125 The viewpoint is located in the *Central Massif* character type and looks over the *Rothiemurchas/Abernethy* and *Strathspey* character types to the *Rolling Uplands*, within which the wind farm is located. The *Central Massif* forms part of the Cairngorms National Scenic Area and is also located in the proposed Cairngorms National Park. It is therefore considered to be of high sensitivity to change. As the wind farm would be barely perceptible at this distance it is considered that there would be minor effects on landscape character.

Cumulative effect on landscape character

5.126 The proposed Dunmaglass wind farm would be slightly further from the view than the Farr wind farm proposal. As both wind farm proposals would be barely perceptible due to the distances from the viewpoint, it is considered that there would be no cumulative effect on landscape character.

Effects on visual amenity

5.127 This is a visually diverse view with Loch Morlich and the Glen More/Rothiemurchas Forest forming the principal focus in the middle distance. The wind farm would be barely perceptible at this distance and would therefore not detract from the principal focus of the view. There would be minor effects on visual amenity.

Cumulative effect on visual amenity

5.128 The proposed Dunmaglass wind farm would be slightly further from the view than the Farr wind farm proposal. As both wind farm proposals would be barely perceptible due to the distances from the viewpoint, it is considered that there would be no cumulative effect on visual amenity.

Viewpoint 4: Carn a 'Bhodaich, Loch Ness

5.129 This viewpoint is located on a track adjacent to a cairn to the east of Carn a'Bhodaich, a hill on the north west side of Loch Ness. This is an estate track, which appears likely to be used by local walkers only. Similar, although less extensive views, are possible from a nearby minor road as it descends from Abriachan to the north-western shores of Loch Ness.

Existing view

5.130 The existing view is shown in Figure 17. It comprises a hummocky foreground of grass and heather moor, broken by boulders. The view looks over, rather than into, the Great Glen, focussing on the steep sided slopes covered with a broad blocky pattern of coniferous forest broken occasionally by pastures, which flank the southern shores of Loch Ness. The eye of the viewer tends to be led to the east where the Glen broadens out to the distant Moray Firth. A broad undulating plateau is perched above the extensive moorland on the upper slopes of the Great Glen to the south. This plateau is patterned by woodland and pasture and Lochs Ashie and Duntelchaig can be seen, the latter edged by craggy hills to the south. In the distance, the higher rounded hills of the Monadhliath form a distinctive elongated and even band of high ground against the skyline.

Predicted view

5.131 The predicted view of the wind farm is illustrated in Figure 17. The nearest turbine would be 16 km from the viewpoint. All 45 turbines would be present in the view with the upper towers and rotors being visible for the majority of the turbines. They would be seen against the skyline and would appear clustered together in a coherent grouping.

Magnitude of change

5.132 Blade movement may be discernable in clear weather conditions. The wind farm would introduce new vertical built features on the skyline and would interrupt the smooth and open profile of the Monadhliath Hills, which form a distant backdrop to the view. They would also introduce a new but distant focus to the view due to their location on the skyline. Their height, movement and colour would contrast with the muted foreground colours of moorland and forest and may therefore attract attention in certain weather conditions. However due to the distance to the turbines, the magnitude of change would be slight.

Cumulative change

5.133 The existing Novar wind farm would be visible in a northerly direction from this viewpoint at 35km distance. The proposed Dunmaglass wind farm would be visible to the west of the Farr wind farm within the view cone shown in Figure 17 and would be 17km from the viewpoint. No cumulative effects are likely to be associated with the Novar wind farm proposal due to its distance from the viewpoint. The proposed Dunmaglass wind farm would be at a similar distance from the viewpoint as the Farr proposal considered in this assessment and the magnitude of cumulative change is considered to be moderate.

Effects on landscape character

5.134 This viewpoint is located in the *Rocky Moorland Plateau with Woodland* landscape character type with views over the *Broad Steep Sided Glen* to the *Farmed and Wooded Foothills* and *Rolling Uplands* character types. The turbines will introduce new vertical built elements into the *Rolling Uplands* landscape type with the openness of a small part of this type being affected. This type forms a distinctive backdrop and distant focus to the view. The dramatic landform of the *Broad Steep Sided Glen* is its defining characteristic, although only a small part of this landscape character type is appreciated in the view. The wind farm will have negligible effects on the key characteristics of remoteness experienced within the *Rocky Moorland Plateau with Woodland* character type, as the viewpoint is on the fringes of this type, where views into adjacent more settled character types are a feature and thus diminish the remote character. Overall effects on landscape character are considered to be moderate/minor.

Cumulative effect on landscape character

5.135 The proposed Dunmaglass wind farm would introduce further man-made features to the open hills present in the view, and the cumulative effect on landscape character is considered be moderate.

Effects on visual amenity

5.136 The view is representative of that obtained by walkers who are considered to be of high sensitivity. However, as the magnitude of change is considered to be slight due primarily to the distance of the proposed development, the effect on visual amenity is considered to be moderate.

Cumulative effect on visual amenity

5.137 The proposed Dunmaglass wind farm would increase the prominence of wind farm development on the skyline and accentuate the new focus introduced to the view, and the overall cumulative effect on visual amenity is likely to be moderate.

Viewpoint 5: Tomatin Village

5.138 This viewpoint is located on the minor public road on the southern edge of Tomatin, a small village within Strathdearn to the south-east of the site. It is representative of views obtained by some local residents and road users.

Existing view

5.139 The existing view is illustrated on Figure 18. The view is contained, focussing on the foreground flat pastures occupying the strath floor and the hummocky lower hill slopes of rougher grazing and scrub with a flattened backdrop of low, rounded and largely forested hills. Gorse and juniper scrub colonises the lower slopes of Craig Morile to the west. A number of dispersed farms, houses and sheds are present in the view. Woodpole power lines are a feature, but are not prominent due to their location within woodland. To the far west, the distant heather-clad hills further up the strath, contrast with the greens of woodland and pasture in the focus of the view.

Predicted view

5.140 The predicted view from this location is shown by the wireframe on Figure 18 and indicates that even if the existing forestry in the middle ground was felled, there would be no turbines visibile from this location. The ZVI indicates that there may be some parts of Tomatin from where up to ten turbines would be visible.

Magnitude of change

5.141 There would be no perceptible change to the present view assuming that woodland would continue to provide a screen. However, should this woodland be felled in future, the blade tip in view would be small and barely perceptible and the magnitude of change would be negligible.

Cumulative change

5.142 No other existing or proposed wind farms would be visible from this viewpoint.

Effects on landscape character

5.143 There would be no effect on landscape character.

Effects on visual amenity

5.144 The main receptors at this viewpoint will be residents of the adjacent settlement (high sensitivity) and local road users (medium sensitivity). The wind farm would have no effect on the visual amenity of both groups of receptors at this location in Tomatin.

Viewpoint 6: Slochd Summit, A9

5.145 This viewpoint is located close to the Slochd summit sign on the A9. When travelling from the south, the A9 climbs through a narrow rocky pass to the summit with views being consequently enclosed. Once past the summit, views open out over moorland as the route descends down to Strathdearn. The wind farm would be visible for approximately 1km along this section of the A9 before roadside vegetation screens views to the west. Road users would be the principal group of receptors affected.

Existing view

5.146 The existing view towards the application site is illustrated on Figure 19. The foreground of the view takes in the main Perth – Inverness railway line located in a narrow cutting, with steep banks colonised by birch and thick heather. Metal towers, woodpole overhead powerlines and the carriageway and signage of the A9, enforces the cluttered character of this communications corridor. The middle ground of Strathdearn is screened by vegetation and topography with the smooth and gently rolling hills to the north of the strath forming a distant focus.

Predicted view

5.147 The predicted view from this viewpoint is illustrated by the photomontage on Figure 19. Two turbines would be visible on the distant hills in the centre of the view with the wind farm being located 8.7km from the viewpoint.

Magnitude of change

5.148 The wind farm would introduce new vertical and man-made elements into a view, where communications and vertical structures are already evident. The turbines would be prominent in certain light conditions because of their colour contrast with the dark moorland covering the hills and as they would be seen on the skyline. Movement of turbine blades would be visible. The magnitude of change would be slight.

Cumulative change

5.149 No existing wind farms or other proposed wind farms would be visible from this viewpoint.

Effects on landscape character

5.150 The viewpoint is located in the *Rolling Uplands* landscape character type with a view over the *Farmed Strath* to distant *Rolling Uplands*. There would be some a slight interruption of the smooth, open profile of the *Rolling Uplands* character type as the turbines are located on the skyline. The wind farm would be located on the eastern edge of the *Rolling Uplands*, considered to be of medium sensitivity to change due to the visual association with the A9 road corridor and the settled straths. There would be no effect on the *Farmed Strath* character type as so little of this type is present in the view. Overall effects on landscape character would be moderate/minor.

Effects on visual amenity

5.151 There would be moderate/minor effects on the visual amenity of road users on the A9.

Viewpoint 7: Balvonie, A9

5.152 This viewpoint is located at Balvonie, at the junction of the A9 and B851. It is a view principally seen by road users, although the farm at Balvonie may have similar views.

Existing view

5.153 The existing view is illustrated on Figure 20 and shows a brief and restricted view, focussing on the A9 carriageway and junction with the B851 with a bank of roadside vegetation screening longer views of the distant hills to the south of Strathnairn. Meall Mor Forest is visible to the south covering much of the hill slopes in view, with its pattern of felled and forested areas criss-crossed by rides and species breaks. The hilltops visible on either side of the road are covered with dark moorland.

Predicted view

5.154 The predicted view is illustrated by Figure 20. The nearest turbine would be 9.4 km from the viewpoint. The blade tips of 2 turbines would be visible on the hill tops to the right of the roadside vegetation with the tips of an additional 3 turbines being screened by this vegetation.

Magnitude of change

5.155 It is considered that the magnitude of change would be negligible due to the small gap in which this view is possible and the speed of traffic using the A9.

Cumulative change

5.156 Although the existing Novar wind farm would be theoretically visible from this viewpoint, the nearest turbine would be 34 km distance. It is also likely that coniferous forestry to the south of the viewpoint would screen any views. It is therefore considered that there would be no cumulative change.

Effects on landscape character

5.157 The viewpoint is located at the transition between the *Farmed Strath* and *Flat Moorland Plateau with Woodland* landscape character types. The view takes in the *Rolling Uplands* landscape character type in the distance. There would be minor effects on these landscape character types due to the small portion of the turbines in view and their visual association with extensive forestry at Meall Mor.

Effects on visual amenity

5.158 There would be minor effects on visual amenity from this viewpoint as the wind farm is unlikely to be perceptible to the majority of road users.

Viewpoint 8: A9 at Findhorn Railway Viaduct

5.159 This viewpoint is located on the A9 as it bridges the River Findhorn. It is adjacent to the Findhorn railway viaduct and is thus typical of views from both the A9 and from trains crossing the viaduct, although the increased height of the viaduct may result in additional, and a slightly increased height of the turbines being visible. This viewpoint gives one of the few open views over a *Farmed Sstrath* character type into the 'interior' of the *Rolling Uplands* from the railway and A9, as views are largely enclosed by landform and forestry when travelling northwards from Aviemore.

Existing view

5.160 The existing view towards the application site is illustrated on Figure 21. It comprises a dramatic elevated view through and over the magnificent tapered stone uprights and lattice iron work of the railway viaduct, to Strathdearn and the *Rolling Uplands* either side of the strath. The River Findhorn is dwarfed by the scale of both the viaduct and A9 bridge, yet leads the eye of the viewer along the broad, flat farmland of the strath floor to a distant focus of open rounded hills to the west (not shown on the photograph in Figure 21). The open strath floor contrasts with the flanking hill slopes which are mainly forested and the uniform moorland cover of open hill tops in the distance to the north and west. The village of Tomatin is visible below the viaduct; the many white rendered houses catch the eye yet are partially screened and softened by surrounding woodland.

Predicted view

5.161 The predicted view from this location is shown by the wireframe on Figure 21. The nearest turbine would be 6km from the viewpoint. The turbines would be visible on the northern edge of the view and would be most noticeable when travelling northwards. The blade tips of up to three turbines would be visible on the skyline, as existing forestry is likely to screen the most westerly turbine shown in the wireframe.

Magnitude of change

5.162 A small number and extent of the turbines would be visible. However, the relative proximity of the wind farm to the viewpoint would result in a moderate change to the existing view.

Cumulative change

5.163 There would be no views of any other existing or proposed wind farms from this viewpoint.

Effects on landscape character

5.164 The wind farm is located within the *Rolling Uplands* and adjacent to the *Farmed Strath* landscape character types. In the wider panoramic view, the open rounded hills of the *Rolling Uplands* are seen against the skyline. The wind farm would occupy a small part of these hills visible to the north. The proximity of the *Rolling Uplands* in the view to the communications corridor and forestry within Strathdearn results in it being considered to be of medium sensitivity to change. The character of the *Farmed Strath* in the view is influenced by large scale engineering structures set within the context of a settled and farmed landscape. The wind farm would introduce additional structures to this view. Overall effects on landscape character would be moderate.

Effects on visual amenity

5.165 The railway viaduct and the long open funnelled views through Strathdearn would remain the key focus for travellers and train passengers from this viewpoint, particularly in the context of the enclosed character of views when travelling northwards on the A9 and on the railway. The small extent of turbines present in the view means that they are unlikely to be a prominent feature. Effects on visual amenity would be moderate.

Viewpoint 9: Minor Road to West of Site at Carn Eitidh

5.166 This viewpoint is located on a small hill adjacent to the Garbole Road, aligned to the west of the site. The view is representative of those seen from a 3-4 km section of this minor road from Strathdearn as it rises through the extensive forests above Glen Kyllachy to give sudden and striking views over open moorland.

Existing view

5.167 The existing view is illustrated on Figure 22 and comprises gently rolling open hills with indistinct summits and few features, covered with heather and grass moorland. The geometric pattern of muir burning is evident on the hills as are occasional tracks, tracing a pale red/sandy brown line against the dark browns of heather moorland. The hill slopes are deceptively long, distance and scale being difficult to appreciate due to the subtle landform and absence of landscape features. Pylons and overhead line are prominent vertical features in the foreground of the view and in the context of an open landscape of low rounded summits and large skies.

Predicted view

5.168 The photomontage on Figure 22 shows that the upper towers and rotors of approximately 15 turbines would be seen with the blade tips of up to 16 additional turbines also potentially being seen. All turbines would be seen against the skyline and blade movement would be visible. Some sections of the proposed access track to the turbines may be visible in the south of the view. The nearest turbine would be 2km from this viewpoint.

Magnitude of change

5.169 The development would introduce a number of large scaled vertical structures to an area of open moorland. This is a gently rolling landscape where the only existing vertical features are a single line of pylons, aligned adjacent to the public road. No cohesive pattern would be discernable in the turbine layout due to the diminishing extent of turbines visible as they extend beyond the horizon. New tracks would be visible against the dark moorland, although only short sections are likely to be present in the view and some existing newly formed estate tracks are already apparent. The magnitude of change would be substantial.

Cumulative change

5.170 There would be no views of any other existing or proposed wind farms from this viewpoint.

Effects on landscape character

5.171 The wind farm site is located on the eastern edge of the *Rolling Uplands* character type and closer to the settled and more developed landscapes of the *Farmed Strath* character type. This area of the Rolling Uplands differs from the extensive area of *Rolling Uplands* to the west of the site in being relatively accessible, with the A9 corridor, a single track public road and Strathdearn and Strathnairn nearby. The character of this part of the *Rolling Uplands* is influenced to some extent by the presence of extensive commercial forestry on its fringes, which tends to mask, and conflict with, the rolling landform and openness of the hills. The presence of a major powerline across the open moorland also slightly diminishes the sense of expansive openness and remoteness experienced in the Rolling Uplands. The landscape of the Rolling Uplands in the area to the east of the minor road and in the vicinity of the site is therefore considered to be of medium - high sensitivity to change.

5.172 The wind farm would introduce further man-made features into this open and relatively remote landscape. Turbines would be dominant features due to their size and would substantially change the character of this part of the *Rolling Uplands* character type. Effects on landscape character would be major/moderate and would represent a significant effect.

Effects on visual amenity

5.173 There is no settlement in the area and few walkers are likely to access the hills, however people shooting in the adjacent area will experience similar views. The minor public road and informal laybys off it, are used by people as the only public access to an expansive area of open moorland for bird watching. The road is single track and winding and traffic speeds are therefore slow. Currently, when travelling on the minor public road from the south, the enclosure of forestry within Glen Kyllachy suddenly opens to give expansive views over moorland covered hills and the deep glen of Allt Tarsuinn to the west. The turbines would dominate this view and alter the sense of openness and remoteness currently experienced, at the point where views open out and provide a great visual contrast for the viewer and the effect on visual amenity for road users would be major/moderate and represents a significant effect.

5.174 While few walkers are present in the hills, many of the people accessing the area seek its relatively remote and peaceful qualities and their sensitivity to change could therefore be considered to be high. The presence of the overhead powerline is currently intrusive and diminishes the appreciation of open, rolling hills and moorland. The turbines and access track visible and introduction of movement to the scene would further accentuate this effect. The effects of the wind farm on visual amenity from this viewpoint is judged to be major and therefore represents a significant effect.

Viewpoint 10: Minor Road to North of Site

5.175 Located on the single track public road aligned to the west of the site, this viewpoint lies to the north-west of the site and represents the first views that would be obtained of the wind farm when travelling southwards on this road.

Existing view

5.176 The existing view is illustrated on Figure 23 and comprises gently rolling open hills with elongated tops, covered with heather and grass moorland. Small boulders break the smooth cover of heather and grass and stand proud against the skyline on the eastern hill tops. The small scale geometric patterning caused by muirburn is evident on the hills. To the west of the 90° view cone shown on Figure 23, the incised valley of the Allt Beag and a series of craggy topped hills are the principal focus of wider views from this section of the public road. To the north of this view cone, pylons and overhead lines are prominent vertical features close to the public road as they are seen against the open landscape of low rounded hills and large skies. The single track public road itself is also a linear feature drawing the eye of the viewer through the landscape. Its narrowness and mid-strip of colonising vegetation accentuate the perceived remoteness of the area.

Predicted view

5.177 The nearest turbine would be 1.2km from the viewpoint. The blade tip of one turbine and part of the nacelle and blade of another turbine would be visible on the skyline. To the north of the view cone shown on Figure 23, the proposed grid connection compound and perimeter fence would be visible at the base of the existing pylon in the foreground of the view. A small section of access track may also be visible adjacent to the compound, although access tracks will be generally screened by landform.

Magnitude of change

5.178 The turbine blade tips visible will introduce obviously man-made features to an area of open moorland. This is a gently rolling, open landscape where the only vertical features are a single line of pylons, aligned adjacent to the public road. The magnitude of change would be substantial.

Cumulative change

5.179 The existing Novar wind farm would theoretically be present in northern views from this viewpoint. However, as this wind farm would be 43km from the viewpoint, it is considered that there would be no cumulative change.

Effects on landscape character

5.180 The wind farm will introduce further man-made features into this open and relatively remote landscape. Turbine blades and the grid connection compound would be dominant features due to their size and relative proximity. These features would accentuate the presence of the overhead powerline on the landscape and would substantially change the character of this part of the *Rolling Uplands* character type. Effects on landscape character would be major/moderate and would represent a significant effect.

Effects on visual amenity

5.181 While few walkers are present in the hills, many of the people accessing the area seek its relatively remote and peaceful qualities and their sensitivity to change could therefore be considered to be high. Views along this section of the public road to the east are brief with the convex slopes against the road providing a screen. The valley of Allt Beag, with its backdrop of craggy hills and Glac a' Chatha gorge which provides dramatic glimpsed views to distant mountains to the west, tend to form the focus of the view when travelling on the road.

5.182 The partial views of turbine blades on the skyline would be seen sequentially when travelling along the Garbole Road, so that although at this viewpoint only the upper parts of turbines would be visible, they will be seen from the context of more extensive visibility of the turbines. The presence of the overhead powerline is currently intrusive and diminishes the appreciation of open, rolling hills and moorland. The moving turbine blades and grid connection compound would introduce additional man-made features in the view. The compound will be a functional structure surrounded by perimeter fencing and introducing a number of structures and materials. These new features associated with the wind farm will be relatively close to the viewpoint and will therefore be prominent and their presence may detract from the main focus of the view - the Allt Beag valley and hills to the west. The effects of the wind farm on visual amenity at this location is considered to be major/moderate for road users and major for those walking in the area and therefore represents a significant effect.

Viewpoint 11: Carn Bad an Daimh, Strathdearn

5.183 This viewpoint is situated on the southern hill slopes above Strathdearn to the south-east of the site. The viewpoint is accessible by a combination of public road to Knockandoo then by private estate track. There is little settlement in the area and none of the isolated properties on the south side of Strathdearn are likely to experience similar such extensive views due to their siting at the base of the hills.

Existing view

5.184 The existing view is illustrated on Figure 24. It is a panoramic and visually diverse view over the *Farmed Strath* of Strathdearn and to the *Rolling Uplands* to the north comprising flat pasture on the strath floor with the curving River Findhorn a prominent feature; traditional stone built farmsteads and shooting lodges located at the transition between valley slopes and farmed floor and; undulating hill slopes flanking the strath, largely forested and with extensive birch woodlands on lower slopes merging with coniferous species. The extensive moorland covered *Rolling Uplands* provide a dark, backdrop to the view and smooth skyline. To the west the view is less visually diverse as commercial forestry masks and contrasts with the smooth landform of the *Rolling Uplands* which constrict the strath in its upper reaches. Wayleaves, margins and felled areas within forestry are prominent as are pylons when seen against the sky.

Predicted view

5.185 The predicted view is illustrated by the photomontage on Figure 24. The nearest turbine would be 6km from the viewpoint. Five main clusters of turbines would be visible with the nacelles of most turbines visible against the sky descending from the summit at Carn Dubh.. The blade tips of some intermediate turbines would also be in view with a total of 36 turbines being visible in all.

Magnitude of change

5.186 The turbines would be a prominent feature in the view, with a series of turbine cluster descending with the landform from the high ground in the centre of the view. Movement of blades would be visible. Largely due to the proximity of the proposed turbines, the magnitude of change is considered to be substantial.

Cumulative change

5.187 There would be no views of the existing Novar wind farm from this viewpoint. The proposed Dunmaglass wind farm would be visible from this viewpoint but not within the view cone shown in Figure 24. Six of the proposed turbines at Dunmaglass would be visible with the nearest turbine being 12km distance from the viewpoint, and the magnitude of cumulative change is considered to be moderate.

Effects on landscape character

5.188 The turbines would be located away from the distinctive farmed and settled landscape of Strathdearn, which is visible in the east of the view, and would be more associated with the extensive commercial forestry and overhead line to the west, a characteristic of the transition between *Farmed Strath* and *Rolling Uplands* in the upper strath. There would be minor effects on the landscape character of the *Farmed Strath*. The smooth, rounded, open hill tops, a key characteristic of the *Rolling Uplands*, would however be interrupted by the introduction of 36 large scale vertical built structures. Although pylons are already prominent elements on the skyline in this view, the turbines would be more numerous and of a larger scale. The effect on the landscape character of the *Rolling Uplands* would be major/moderate and represents a significant effect.

Cumulative effect on landscape character

5.189 The proposed wind farm at Dunmaglass would be visible approximately 12.18km to the south west, and would increase visibility of turbines introducing a new foci in the view across the Rolling Uplands. The turbines would be seen in the context of a view comprising the transition between the Farmed Strath and Rolling Uplands which accommodates several man-made elements, and the cumulative effect on visual amenity is considered to be moderate.

Effects on visual amenity

5.190 This view is likely to be experienced by people working and shooting on the estate. It is unlikely to be accessed by many walkers due to the long walk in on a private track and the obvious sporting use of the land. The turbines would be a dominant feature and deflect the viewers' attention from the strath floor to the skyline, as they interrupt the smooth, gently undulating profile of backdrop hills. Turbines may be associated with the cluttered effect of overhead powerlines and geometric patterns of forestry. Effects on visual amenity would be major and represent a significant effect.

Cumulative effect on visual amenity

5.191 The proposed Dunmaglass wind farm would be visible to be north west, and would increase visibility of turbines introducing a new foci into the view and would be seen in the context of a working landscape with coniferous forestry and muir burn evident. The cumulative effect on visual amenity is considered to be moderate.

Viewpoint 12: Spot height 184, west of Farr, Strathnairn

5.192 This viewpoint is located on the minor road aligned on the west side of Strathnairn, close to Dunlichity Lodge. Views from the minor road open out at this point, having been screened by woodland close to the River Nairn to the east and before becoming more enclosed once more to the north-west. Similar views are possible from minor roads crossing Strathnairn and from some of the isolated properties located within the strath floor with more open views.

Existing view

5.193 The existing view is illustrated on Figure 25. A tributary of the River Nairn is a visually insignificant feature in the foreground of the view flowing through an undulating valley floor, broken by sometimes angular banks of glacial deposits. The rounded hills of the *Rolling Uplands* form a backdrop to the view. Craggier, more pronounced, hills constrict the strath to the south-west and continue the enclosure provided by hills to the scene. Fenced pastures sit above flatter hummocks within the valley floor with birch woodland generally located on steeper banks. Areas of rough pasture and occasional wet hollows also contribute to the overall diversity of the view. In the distance, forestry on the slopes of Meall na Fuar-ghlaic is a prominent feature, with upper margins creating a sharp division with heather moorland on the hill tops. The pale browns and coarse texture of recently felled areas are visible. A cluster of small farm buildings provides a foreground focus to the view. A number of overhead lines are present, although these are not prominent features in the foreground of the view, as woodpole supports generally merge with woodland.

Predicted view

5.194 The predicted view is illustrated by the photomontage on Figure 25. The nearest turbine would be 5.5km from the viewpoint with 11 turbines visible above hub height and the blade tips of up to 13 turbines also in view. Blade movement would be visible at this distance. Access tracks to the wind farm would be aligned on the route of existing forest tracks with some upgrading proposed. The line of these existing tracks is visible in some areas as a break in standing forest. Where new access tracks are aligned on open moorland, closer to the turbines, it is anticipated that they will be screened by intervening landform in this view.

Magnitude of change

5.195 The turbines would occupy a discreet ridge within a wide view of encircling hills. They would be seen against the skyline and interrupt the smooth profile of hills which forms the backdrop to the view. The nearest turbine would be 5.5 km from the viewpoint and at this distance they would be a prominent feature in the view. The magnitude of change would be moderate.

Cumulative change

5.196 There would be no views of any existing or proposed wind farm developments from this viewpoint.

Effects on landscape character

5.197 The viewpoint is located in the *Farmed and Wooded Foothills*, a small to medium scale landscape due to the enclosure provided by landform and woodland. The wind farm is located in the large scale *Rolling Uplands* seen as a backdrop to the view. The foreground of the *Farmed and Wooded Foothills* comprises a mainly pastoral landscape. Commercial forestry is a feature in the middle view and appears as a strongly man-managed landuse, contrasting with the complex undulating landform and naturalistic pattern of birch woodland in the foreground of the view. The wind farm would interrupt the smooth profile of the *Rolling Uplands* and the height of turbines would alter the scale of the *Rolling Uplands* in view. The turbines would introduce a new man-made feature to the landscape, although their visual association with commercial forestry will mitigate this effect to some extent. Overall effects on landscape character are judged to be moderate.

Effects on visual amenity

5.198 This view would be seen by mainly local road users and is also representative of views from nearby properties with open views towards the application site. The wind farm would be a prominent feature in the view due to its location on hills which provide a backdrop to the view and its relative proximity. Effects on visual amenity would be major/moderate for residents and represents a significant effect. For road users the effect on visual amenity is considered to be moderate.

Viewpoint 13: Carn a Choire Mhoir, East of A9

5.199 This viewpoint is located on Carn a Choire Mhoir, a hill to the east of the A9 and to the west of Tomatin. The viewpoint is reached by a rough stone track giving access to a telecommunication mast. This area of uplands is uninhabited. Walkers accessing this and other surrounding hills are likely to be few.

Existing view

5.200 The existing view is illustrated on Figure 26. Extensive views are possible over the convex heather-clad slopes of the summit in the foreground, to Strathdearn and including broad coalescing bands of rolling hills to the west. The focus of the view is the settled Strathdearn with its strong pattern of woodlands, shelterbelts, bright green blocks of pasture and the meandering River Findhorn, contrasting with the openness and uniformity of grass and heather moorland covering softly rounded hills. The light reflective concrete structure of the Findhorn road bridge carrying the A9 is visible within Strathdearn, although the darker colours of the railway viaduct nearby make it less visually distinct in the view. The eye of the viewer tends to be drawn westwards through the depression of the strath to its head, where the *Rolling Uplands* meet in a distinctive tight cluster of hills.

Predicted view

5.201 The predicted view is illustrated on Figure 26. The nearest turbine would be 9.4 km from the viewpoint All 45 turbines would be visible with the majority located against the skyline. Blade movement would be visible.

Magnitude of change

5.202 The wind farm would introduce new moving vertical elements on the skyline, interrupting the smooth rolling profile of hills which form the backdrop to the view. The magnitude of change would be moderate.

Cumulative change

5.203 The existing Novar wind farm would theoretically be present in the view but would be 50km from the viewpoint so would not be visible. The proposed Dunmaglass wind farm would be 20.9 km from the viewpoint with up to 27 turbines being potentially visible. The distance of the Dunmaglass wind farm from the viewpoint would result in a slight magnitude of cumulative change.

Effects on landscape character

5.204 The wind farm and viewpoint are located in the *Rolling Uplands* landscape character type with views over the *Farmed Strath* landscape character type. The wind farm would disrupt the smooth profile and openness of the *Rolling Uplands*, a key characteristic of the type. The location of the wind farm above the *Farmed Strath* in this view would diminish the present contrast between the complex patterns and settlement of this type and the openness and simplicity of the *Rolling Uplands,* although this visual association with the A9 corridor and the settled strath below, would also mitigate this effect to some extent. Overall effects on landscape character would be moderate.

Cumulative effect on landscape character

5.205 The proposed Dunmaglass wind farm would be located close to the tight cluster of *Rolling Uplands* at the head of the Findhorn. This western part of the *Rolling Uplands* is considered to be of high sensitivity to change due to its relative remoteness and distance from the more settled straths. The Dunmaglass wind farm would, however, be distant in the view and is only likely to be visible in clear conditions. The cumulative effect on landscape character is considered to be moderate/minor.

Effects on visual amenity

5.206 This viewpoint is accessed by a few, mainly local, walkers. Extensive and diverse views are possible from the viewpoint. The turbines would reinforce the emphasis centred on the Findhorn bridge and be visually associated with the central focus of more complex landuse patterns and settlement in the area of Tomatin in the centre of the view. Effects on visual amenity would be moderate.

Cumulative effect on visual amenity

5.207 The Dunmaglass proposed wind farm would be located closer to the western focus of the view at the head of the River Findhorn. However, the distance of this proposed wind farm from the viewpoint would limit views and the scale of turbines and the cumulative effects on visual amenity would be moderate/minor.

Viewpoint 14: Kessock Bridge

5.208 This viewpoint is located in a layby at the northern end of the Kessock Bridge. The bridge carries the A9 across the Moray Firth and is the principal route north of Inverness. The view is similar to those possible from nearby elevated properties in Craigton and North Kessock.

Existing view

5.209 The existing view is shown in Figure 27. The focus of the view is the foreground of water with the commercial and harbour area of Inverness to the west. Light reflective metal clad containers and sheds adjacent to the docks attract attention. To the west, the suburban fringes of Inverness rise onto the lower slopes of Craig Phadrig and are punctuated by the wooded knolls of Torvean and Tomnahurich. A broad elongated ridge of land, with a strong enclosure pattern of woodlands and farmland on hill slopes, provides a backdrop to the urban area to the south. Occasional settlements and powerlines are visible on these slopes. In the far distance, a narrow band of higher hills extends above this ridge. Views from the middle of the bridge tend to focus on the wide expanse of the Moray Firth and huge skies to the east.

Predicted view

5.210 Figure 27 shows the predicted view of the wind farm. The nearest turbine would be 18.5km from the viewpoint. Up to 25 turbines would be visible, with most being located against the skyline. Movement of blades would only be perceptible in certain light conditions at this distance.

Magnitude of change

5.211 At this distance, the turbines would appear as small features on the skyline. They would tend to be visible in clear conditions when light is reflected off blades. The great visual diversity of buildings, bridge structure and water in the foreground comprises the key focus of the view. At this distance, turbines would appear small and would be unlikely to divert attention from this focus. The magnitude of change would be negligible.

Cumulative change

5.212 There would be no views of the existing Novar wind farm from this viewpoint due to the landform immediately adjacent to the road. The proposed Dunmaglass wind farm would be present in the view and would be 27km from the viewpoint with up to 42 turbines potentially visible.

Effects on landscape character

5.213 The view includes the urban area of Inverness in the foreground with the *Rolling Farmland and Woodland* character type in the middle distance, rising to the *Rolling Uplands* in the distance which are visible as a thin sliver of elongated, rounded hills against the sky. The turbines would be located on the western edge of an area of higher distant hills. The distance of the wind farm from the *Farmland and Woodland* and *Inverness* character types and the small role played by the *Rolling Uplands* in the view, would result in minor effects on landscape character.

Cumulative effect on landscape character

5.214 There would be no perceptible cumulative effect on landscape character due to the distance of the Dunmaglass wind farm proposal from the viewpoint.

Effects on visual amenity

5.215 Traffic using the bridge is travelling fast, so views tend to be brief. This view is also similar to views experienced by nearby residents. The turbines would be largely visible in clear conditions and would tend to merge with the slightly serrated edge of forestry on the middle distance ridge in duller light conditions. The foreground of Inverness and the firths would remain the dominant features in the view. The effect on visual amenity would be moderate/minor for residents and minor for road users.

Cumulative effect on visual amenity

5.216 There would be no perceptible cumulative effect on visual amenity due to the distance of the Dunmaglass wind farm proposal from the viewpoint.

Viewpoint 15: Track from Dulnain to Aviemore

5.217 This viewpoint is located close to a cairn on the 'Burma Road' Right of Way between Lynwilg and the Dulnain valley. It is a route popular with mountain bikers, walkers and is also used by people accessing the hills for shooting. The route offers spectacular views of the Cairngorms and Spey valley to the south-east and provides one of a number of rough access tracks penetrating the south-eastern fringes of the remote Monadhliath Hills.

Existing view

5.218 The existing view is illustrated in Figure 28. The view suddenly opens to the north as the track rises over a broad ridge. It takes in smoothly rounded hills covered with short carpets of heather in the foreground. The sandy-gold of the access track makes it a prominent feature, leading the eye of the viewer in a sinuous route down rolling hills into the Dulnain valley. In the middle distance a band of hills edge the Dulnain valley - these strongly patterned by muir burn. Isolated pine and medium scale conifer plantations are located on lower valley sides, although most of the landscape is striking in its openness, uniformity of vegetation cover and lack of apparent settlement. In the far distance, successive ridges of rolling hills coalesce and the pale profile of Ben Wyvis can be seen against the skyline.

Predicted view

5.219 The predicted view is illustrated in Figure 28. The nearest turbine would be 18.2 km from the viewpoint and up to 38 turbines would be visible.

Magnitude of change

5.220 The viewer approaching the viewpoint from the south-east would see the wind farm in the centre of a suddenly revealed view over the Dulnain valley and to extensive softly rolling hills in the distance. Turbines would be distant and appear like small dashes in the landscape. They would be seen against the backdrop of Ben Wyvis in the far distance and in the context of an open landscape with few man-made structures in view. The magnitude of change would be slight.

Cumulative change

5.221 The existing Novar wind farm would be theoretically present in the view, although as it would be 64km from the viewpoint, it would not be perceptible. The ZVI indicates that the proposed wind farm at Dunmaglass would be visible at approximately 20 km to the north west. The magnitude of cumulative change is considered to be slight. Although both of the proposed wind farms would be visible in the same general north westerly direction, they will be located over 18 km distance from the viewpoint and will occupy a small proportion of the overall sweep of view obtained from this track.

Effects on landscape character

5.222 The viewpoint and the wind farm would both be located in the *Rolling Uplands* landscape character type, a landscape of high sensitivity in this locality due to its openness and perceived remoteness. The turbines would be seen on the plateaux-like tops of the *Rolling Uplands* in the distance, but would not break the skyline. They would affect the openness and remote character of the *Rolling Uplands* in introducing an obviously man-made feature into the view, but at a considerable distance, and the effects on landscape character would be moderate/minor.

Cumulative effect on landscape character

5.223 The proposed wind farms at Farr and Dunmaglass may be visible in the Rolling Uplands landscape, introducing man-made features to the open view. However, they will be at distances of over 18 km and it is considered that the cumulative effect on landscape character would be moderate.

Effects on visual amenity

5.224 The turbines would appear small due to their distance from the viewpoint, although their colour may contrast with the muted green-browns of moorland, heightening visibility in some lighting conditions. The effects on visual amenity would be moderate/minor.

Cumulative effects on visual amenity

5.225 The proposed wind farms at Farr and Dunmaglass may be visible in a generally north westerly direction at distances of over 18 km and approximately 20 km respectively. The cumulative effect on visual amenity is considered to be moderate.

Viewpoint 16: Carn Sgulain

5.226 This viewpoint is located at the summit of Carn Sgulain, a hill on the southern edge of the Monadhliath range. The 'Munro' status of this hill makes it a popular destination for walkers.

Existing view

5.227 The existing view is illustrated in Figure 29. The summit is marked by a cairn on the broad flattish top of Carn Sgulain. A smooth carpet of grasses and mosses are broken by angular boulders and fence posts. The view looks over a vast undulating plateau of high grassy moorland. Strath Spey is partially visible to the south-east and allows the viewer to appreciate the vertical scale of the mountain plateaux. In clear conditions the focus of the view is towards the distant but distinctive peaks of the north-west Highlands.

Predicted view

5.228 The predicted view is illustrated in Figure 29. The nearest turbine would be 22.6 km from the viewpoint and the visibility analysis shows that up to 45 turbines may be visible.

Magnitude of change

5.229 This is an open, empty and largely featureless landscape that appears to stretch for miles. The wind farm would be some distance from the viewpoint and the scale of the turbines would therefore not be fully appreciated. Some turbines would be visible against the sky, although the majority would be backclothed against far distant hills. Blade movement is unlikely to be perceptible at this distance. The wind farm would introduce distant structures where none exist at present in the view and

although these would appear small, in certain lighting conditions, the light colour of turbines may be reflective and contrast with the muted dark brown and greens of moorland, thus attracting attention. The magnitude of change is considered to be slight.

Cumulative change

5.230 The existing Novar wind farm site would theoretically be present in the view but at 66 km distance from the viewpoint, it would not be perceptible. The proposed Dunmaglass wind farm would be 11km from the viewpoint and 42 turbines may be visible and the magnitude of cumulative change is considered to be moderate.

Effects on landscape character

5.231 The viewpoint and wind farm would both be located in the *Rolling Uplands* character type which is considered in this location to be of high sensitivity to change. The wind farm would interupt the smooth rolling moorland and openness of the *Rolling Uplands*. They would introduce an obviously man-made feature into an area perceived to be remote and possessing elements of 'Wildland' character. The wind farm would however, occupy a small part of the *Rolling Uplands* in the view and would not be a prominent feature at this distance. The effects on landscape character would be moderate.

Cumulative effect on landscape character

5.232 The proposed Dunmaglass wind farm would be closer than the Farr proposed wind farm. Both wind farms would be seen in the context of an extensive open upland landscape, and the cumulative effect on landscape character is considered to be major/moderate and represents a significant effect.

Effects on visual amenity

5.233 The wind farm would be seen by walkers who are considered to be of high sensitivity. Views of the north-west Highlands would remain a distant focus in clear conditions, although the wind farm may also form another minor, although distant, focus to the north-east due to its colour contrast and potential reflectivity. Effects on visual amenity would be moderate.

Cumulative effects on visual amenity

5.234 The proposed Dunmaglass wind farm would be 11km from the viewpoint with the Farrr Wind Farm at 22.6 km distance. Both wind farms would introduce new foci into the extensive open and remote view. The cumulative effect on visual amenity is considered to be major/moderate and represents a significant effect.

Table 5.4: Summary of effects on landscape quality and visual amenity

No	Viewpoint	Magnitude of change	Landscape sensitivity	Effects on landscape quality	Receptor sensitivity	Effects on visual amenity
1	Chanonry Point, Black Isle	Negligible	Medium	Minor	Visitors – high Golfers – high Walkers – high Residents - high	Moderate/Minor
2	Craig Phadrig, Inverness	Slight	Low-medium	Minor	Walkers – high Residents – high	Moderate/minor
3	Ptarmigan Station, Cairgorm	Negligible	High	Minor	Walkers – high Visitors – high	Minor
4	Carn a' Bhodaich, Loch Ness	Slight	Medium	Moderate/ minor	Walkers - high	Moderate
5	Tomatin Village	None	Medium	None	Residents – high Roads users – medium	None None
6	Slochd Summit, A9	Slight	Medium	Moderate/ minor	Road users – medium	Moderate/ minor
7	Balvonie, A9	Negligible	Low-medium	Minor	Road users – medium	Minor
8	A9 at Findhorn Railway Viaduct	Moderate	Medium	Moderate	Road users – medium Railway users - medium	Moderate
9	Minor Road to West of Site at Carn Eitidh	Substantial	Medium-high	**Major/ moderate**	Visitors – High Road users – medium	**Major** **Major/moderate**
10	Minor Road to North of Site	Substantial	Medium-high	**Major/ moderate**	Visitors - high Road users - medium	**Major** **Major/moderate**
11	Carn Bad an Daimh, South Strathdearn	Substantial	Medium	**Major/ moderate**	Walkers - high	**Major**
12	Spot Heigtht 184 on minor road west of Farr	Moderate	Medium	Moderate	Residents – high Road users – medium	**Major/moderate** Moderate
13	Carn a Choire Mhoir, East of A9	Moderate	Medium-high	Moderate	Walkers – high	Moderate
14	Kessock Bridge	Negligible	Low-medium	Minor	Residents – high Road Users – medium	Moderate/minor – Minor
15	Track from Dulnain to Aviemore	Slight	Medium-high	Moderate/ minor	Walkers – high	Moderate/ minor
16	Carn Sgulain	Slight	Medium-high	Moderate	Walkers – high	Moderate

Summary and conclusions

5.235 This section examines the significance of the landscape and visual effects arising from the proposed wind farm development as follows:

- Effects on landscape fabric - the effects of the proposed development on the landscape fabric of the application site;
- Effects on landscape character - the effects on the key characteristics of landscape character areas potentially affected by the proposed development;
- Effects on visual amenity - the effects on the visual amenity within the study area; and
- Cumulative effects– the effects of the proposed development in combination with other existing and proposed wind farm developments on landscape character and visual amenity.

Effects on Landscape Fabric

5.236 The effects of a proposed development on the fabric of the landscape can be either direct or indirect. Direct effects occur where changes to the fabric of the landscape arise as the result of physical disturbance, for example the loss of landscape elements such as vegetation cover. Indirect effects are consequential changes that are separate from the source of the change in a temporal or spatial manner, for example changes in vegetation structure downstream as the result of modifications to surface water patterns upstream due to development.

Construction Phase

5.237 The proposed wind farm would be located in an area of open moorland, currently managed and used for grouse shooting. Heather moorland is periodically burnt as part of the management regime and access tracks and shooting butts are present within the site. Access to the proposed wind farm site would largely utilise existing tracks within Farr Forest and within forestry to the south. Some limited upgrading and a 7.5 km of new track will be constructed within Farr forest. A network of tracks will be constructed to provide access to each turbine on open moorland with a total length of 18km of new track proposed. A grid connection compound with underground electricity connection to the wind farm and site control building would be constructed and turbines and anemometer masts erected.

5.238 The physical effects of the construction phase of the proposed wind farm on the landscape fabric of the application site will be limited in extent and will be reversible at the end of the operational phase of the wind farm. The changes that will occur in the landscape will be the introduction of more human activity, introduction and movement of large construction vehicles and associated construction operations.

5.239 These activities will affect a small proportion of the overall application site leaving the majority of the existing landform and associated vegetation and soil structure unaffected. Furthermore, the change will be undertaken in such a way as to mitigate the extent of any unnecessary damage, potential soil erosion or indirect effects due to changed surface or groundwater conditions. As described in Chapter 6, restoration of currently eroded peat bog habitat on site will be undertaken in conjunction with the proposed development.

5.240 For the above reasons, the construction phase of the proposed development is considered to have a minor effect on the fabric of the application site.

Operational Phase

5.241 The effects of the operational phase of the proposed wind farm on the landscape fabric of the application site will constitute a change arising from the introduction of operating turbines on open moorland. However, the existing land use on the application site will not be affected by the proposed development. There will be no further changes to the physical landscape during the operational phase apart from the restoration of peat bog as described in Chapter 6. The proposed development is likely to require infrequent maintenance visits, which will make use of the existing access tracks and will not cause any further disturbance to the landscape baseline conditions.

5.242 The operational phase of the proposed development will have a negligible effect on the landscape fabric of the application site. The direct effects will be minimal in extent and reversible at the end of the operational stage of the wind farm.

Effects on landscape character

5.243 Having reviewed the LCA undertaken by SNH, and verified this in the field, the landscape character types identified in SNH's LCA that may be potentially affected by the wind farm development have been used as the basis for describing the landscape.

5.244 The proposed wind farm would occur within the *Rolling Uplands* landscape character type. A summary of the potential effects of the proposed wind farm on the key characteristics of the *Rolling Uplands* and other landscape character types is provided below:

Rolling Uplands

5.245 The expansive, open and softly rounded hills of the *Rolling Uplands* occupy large tracts of the study area. The *Rolling Uplands* are largely uninhabited with few built features and roads and their remoteness and lack of artefacts give them a 'Wildland' character. This is particularly evident in the Rolling Uplands to the west of the site. This landscape type generally has a high sensitivity to change, although in some areas where communications and forestry modify its openness and remote character, sensitivity to change is reduced to medium.

5.246 The proposed wind farm would be located on high ground within the eastern *Rolling Uplands*. The introduction of the large vertical structures of the turbines would interupt the smooth rounded summits and openness of the hills which are key characteristics of the type and would provide a new focus within the area. The proposed wind farm would represent a significant effect on the landscape character of a small part of the *Rolling Uplands* character type, but will occur in an area where the influence of adjacent forestry and communications is apparent.

Farmed Straths

5.247 The general openness of the strath floor and contained nature of views which focus on the flanking hill slopes and strath floor, results in a medium sensitivity to change. The wind farm would introduce new elements visible on the skyline, although views of the full extent and number of turbines would only generally be possible from upper flanking slopes of the *Farmed Straths*. The location of the wind farm above the *Farmed Strath* would diminish the present contrast between the complex patterns and settlement of this type and the openness, simplicity and scale of the *Rolling Uplands* to some extent. However, effects on landscape character are not considered to be significant.

Farmed and Wooded Foothills

5.248 The wind farm would introduce large scale vertical features on the *Rolling Uplands* which form a backdrop to views from this small to medium scale, visually diverse landscape with a medium to high sensitivity to change. The height of turbines would have the effect of redcuing the scale of the *Rolling Uplands* in view and in turn, would affect the contrast which exists between the small-medium scale of the *Farmed and Wooded Foothills* and the enclosing large scale hills which form a backdrop to the view. Significant effects on landscape character will occur on the *Farmed and Wooded Foothills* character type, although where the turbines are visually associated with commercial forestry this will mitigate effects to some extent.

Rolling Farmland and Woodland

5.249 Views from within the *Rolling Farmland and Woodland* type focus to the north and are generally contained by woodland. The type is considered to be of low to medium sensitivity to change from development outwith its boundaries. The *Rolling Uplands* within which the wind farm site is located, feature as a backdrop to this landscape character type in views from the north, although the distance of the wind farm from the *Rolling Farmland and Woodland* character type and limited visibility of the wind farm from the type itself would result in no significant effects on landscape character.

Broad Steep Sided Glen

5.250 This is a strongly self-contained landscape with few views of adjacent character types. The landform of this deep 'v' shaped glen would limit visibility of external features and it is therefore considered to be of low- medium sensitivity to change. There are few views, both within and outwith the type, which take in both the full extent of the Broad steep sided Glen and the Rolling Uplands as a backdrop to

the proposed development. The wind farm would therefore have no significant effects on this character type .

Flat Moorland Plateau with Woodland

5.251 The openness of the landscape makes it of moderate sensitivity to change, although in parts of this type, the presence of large scale man-made features, such as power lines, and extensive commercial forestry, reduces this to low sensitivity to change. Views from the *Flat Moorland Plateau with Woodland* to adjacent character types are generally restricted by screening forestry. The wind farm would have no significant effects on this lanldscape character type.

Rocky Moorland Plateau with Woodland

5.252 This landscape type appears remote due to its elevation and general lack of open views, although it is adjacent to the Great Glen and more settled areas to the east. Extensive forestry is a characteristic of the type and tends to screen views of adjacent character types. The *Rocky Moorland Plateau with Woodland* is considered to be of medium sensitivity to change. The wind farm will introduce new vertical built elements into the *Rolling Uplands* landscape type which forms a backdrop to views looking south from the elevated edge of the *Rocky Moorland Plateau with Woodland.* The wind farm would have no significant effects on the key characteristic of remoteness experienced within the *Rocky Moorland Plateau with Woodland* character type, as it could only be seen from the fringes of this landscape, where views into adjacent more settled character types are a feature and thus diminish this remote character. The wind farm would have no significant effects on this landscape character type.

Inverness - Suburban Fringe

5.253 The presence of a wide range of built elements within this landscape character sub-type as a whole reduce its sensitivity to change. However, the *Rolling Uplands* within which the wind farm is located provides a distant backdrop to the south and in combination with the *Rolling Farmland and Woodland* and *Enclosed Firth* character types, plays a small role in the distinctive landscape setting of the City. The distance of the wind farm from the *Inverness – Suburban Fringe* would result in it having no significant effect on landscape character, and on the landscape setting of the City.

Enclosed Firth

5.254 The introduction of large scale vertical elements outwith the *Enclosed Firth* has potential to impact on its landscape character due to their location on the skyline which forms a wider landscape context in views from the Firth. A number of vertical industrial elements are present on part of the Morayshire coast within the *Enclosed Firth* character type, although no such features interupt the skyline. The openness of this landscape character type would allow extensive views of the wind farm, located on the *Rolling Uplands* which form a backdrop to views to the south. However, the wind farm would have no significant effects on the character of the *Enclosed Firth* seen in the view due to the distance of the turbines from this character type.

The Central Massif

5.255 The elevated character, openness and unique character of the Cairngorm plateaux results in it being highly sensitive to change within and close to the Central Massif landscape character type. The wind farm would be a considerable distance from this character type and would be barely perceptible in views, and effects on the landscape character therefore would not be significant.

Effects on visual amenity

5.256 The computer visibility analysis and the viewpoint assessment, together with field observations, has enabled conclusions to be drawn about the predicted changes to the visual amenity baseline condition throughout the study area, with particular reference to identified sensitive receptors.

Settlements

5.257 There are no villages within 4km of the site. The main settlements within the 25 km study area are Inverness and Aviemore. Large areas of uninhabited uplands are located within the study area with settlement concentrated in the straths, glens and farmland. Generally, settlement is sparse, although a denser pattern of settlement is evident in the Inverness area, on the coastal farmland of the Moray Firth and within Speyside, to the south-east of the site.

5.258 The closest settled areas to the site are Strathnairn to the north and Strathdearn to the south. Settlement within these straths is sparse with some small scattered communities, isolated farms and estate properties. Within Strathdearn and Strathnairn, there would be limited views of the wind farm from the valley floor and lower hill slopes where the majority of properties are located. Some isolated properties in upper Strathdearn, to the east of the A9 may have views. Isolated properties on the south facing flanking hills of Strathnairn and where the strath opens out to the west would have relatively close views of turbines and the effects on visual amenity would be significant for some residents in these areas.

5.259 Views from Inverness are only likely to be possible from properties on south-east facing elevated ground and from elevated open spaces within the City. Some properties within the coastal settlements of Fortrose, North Kessock and Avoch on the Black Isle may have views of the wind farm, although forestry will tend to screen views of the wind farm from inland. In both instances, the viewpoint assessment has concluded that effects on visual amenity will not be significant due to the distance from the wind farm

5.260 There would be no views or very limited visibility of the wind farm in a wide area between Strathnairn and the Moray coast primarily due to the orientation of north-facing slopes. The presence of extensive coniferous forestry will also screen views where they are theoretically possible.

Road and Rail Network

5.261 The visibility of the wind farm from the A9 will be limited with views of turbines only being possible over open moorland to the south of the Slochd summit, at the crossing of the Findhorn river, and to the south of Tore as the A9 crosses the Black Isle. The viewpoint assessment has concluded that views will generally be brief and effects on visual amenity would not be significant.

5.262 Views from the minor public road immediately to the west of the site would offer close views of the wind farm. Two viewpoints were selected for assessment close to this route and the effects on visual amenity were judged to be significant. There would be few views from minor roads within Strathdearn and Strathnairn as these tend to be aligned close to the base of the tract of uplands within which the wind farm would be located. Woodland would also inhibit views.

5.263 Views from the railway would be limited to a brief glimpse from the Findhorn viaduct and effects would not be significant.

Recreational Routes and Facilities

5.264 The wind farm site is located in an extensive area of uplands, primarily managed and used for grouse shooting. These hills are not used by significant numbers of walkers, unlike the 'Munro' hills of the Cairngorms, the Highlands to the north-west of Inverness and south-eastern Monadhliath, however they are used by bird watchers accessing the area by car. A number of Rights of Way exist to the south-east of the site.

5.265 There would be extensive visibility of the wind farm from surrounding hill summits and upper slopes. Within 10km of the wind farm, turbines would be visible from the north facing slopes within Strathdearn and would have significant effects on visual amenity. These hills form part of sporting estates and are not well-used by the public for walking. Upper slopes and summits of some hills to the east of the A9 would allow views of turbines with significant effects on visual amenity, although these hills are also not well frequented by walkers.

5.266 Views would be possible from south-east facing hill slopes and summits above Loch Ness, although they will be restricted by forestry in much of this area and due to the distance from the wind farm, and are not considered to be significant. Turbines would be visible from the upper slopes and tops of high hills within the remote Monadhliath Hills to the south and west of the site. A number of Rights of Way cross the south-eastern fringes of these Hills. Effects on visual amenity are not considered to be significant due to the distance of the wind farm from this area.

5.267 The wind farm would be present in views from the north-west facing slopes, ridges and summits within the Cairngorms plateaux, however, the distance of the wind farm from this area would result in turbines being barely perceptible. There would be extensive visibility over the inner Moray Firth area, an area well used by commercial and recreational watercraft, although effects on visual amenity would not be significant due to the distances involved.

Cumulative Effects

5.268 The cumulative ZVI indicates that there would be no locations within the study area where the existing Novar wind farm, the proposed Dunmaglass wind farm and the proposed Farr wind farm would be seen together within 25 km radius from each of the developments. The proposed Dunmaglass and Farr wind farms may be seen together from a number of locations on the northern edge of the Great Glen, in some limited elevated and open areas to the north of Strathnairn and from summit and upper hill slopes of the uplands to the south and east of the study area.

5.269 Where the Novar wind farm is shown to be present in views from the viewpoints assessed, it would be between 33 – 79km from the viewpoints and has therefore been discounted in terms of contributing to cumulative effects as it would not be readily perceptible. The proposed Dunmaglass wind farm would be located 12km south-west of the Farr wind farm site and would be visible together with the Farr proposal in 8 of the viewpoints assessed. Significant cumulative effects on landscape and visual amenity are identified for Viewpoint 16, Carn Sgulan, but there are no other significant cumulative effects identified at any of the other viewpoints included in the assessment.

Public Attitudes

5.270 Public attitude surveys carried out near wind farms in Wales, Cornwall, Cumbria and the recent survey commissioned by the Scottish Executive which is reported in Chapter 4 suggest that the vast majority of people who live nearby a wind farm, look favourably on the development after it has been constructed. The surveys found that local residents considered them to be acceptable objects in the landscape, despite initial feelings of concern at the possibility of a substantial change to their residential amenity.

5.271 There are two particular aspects of wind farms which are important when considering public attitudes. Firstly, the appearance of a wind farm in a remote windswept landscape can be interesting to tourists and other visitors to an area, despite their conspicuous nature. Secondly, wind farms have a positive symbolic value directly related to the promotion of non-polluting renewable energy.

5.272 It is acknowledged that local residents are likely to vary in their opinions towards the proposed development depending on their individual views of wind turbines and their own personal perceptions regarding wind energy. However, the evidence of public attitude surveys means that changes to landscape quality and visual amenity can not necessarily be regarded as adverse.

Conclusions

5.273 The landscape and visual assessment has established that the proposed development would change the landscape and visual baseline conditions during construction and operation phases of the wind farm. The direct effects on landscape fabric are not considered to be significant.

5.274 The proposed wind farm has been designed to incorporate standard mitigation measures in relation to the design of the turbines and site specific mitigation measures. The layout has been optimised in respect of technical, economic and environmental constraints including landscape and visual amenity considerations.

5.275 The assessment of landscape and visual amenity effects arising from the proposed wind farm at Farr has identified that significant effects will be confined to areas within 6.1 km distance of the wind farm.

5.276 There will be no significant effect on Inverness or on the principal transport routes of the A9 and the Perth - Inverness railway line.

5.277 It should be noted that significant effects are not necessarily unacceptable. As discussed above, surveys carried out in Wales, Cornwall, Cumbria and recently in Scotland, indicate that the majority of people who live nearby, look favourably on the wind farms after they are constructed.

5.278 The proposed development is considered to be well sited with due consideration to landscape and visual effects in relation to the other environmental constraints. It occurs towards the eastern edge of the Rolling Uplands, close to the transition between extensive open hills and the settled straths of Strathnairn and Strathdearn. There are no villages within 4km of the site with only sparse settlement present in the straths to the north and south. The hills in the immediate vicinity of the site are not well-frequented by walkers. Receptors are therefore few in number. The site and its immediate surroundings have some

elements of 'Wildland' character, namely a sense of remoteness and absence of settlement. These characteristics are, however, more pronounced in the extensive uplands to the west of the site and the extensive coniferous forestry and existing electricity pylon lines, as well as adjacent communiation corridor along Stratehdearn, contribute to a landscape within the vicinity of the proposed wind farm which accommodates several man made features and elements.

5.279 Having carefully examined the potential effects on landscape and visual amenity associated with the proposed Farr Wind Farm, it is considered that the proposals are acceptable in this location in landscape and visual terms.

Chapter 6 Ecology

Summary of Scoping - Potential Effects

6.1 This chapter considers the impact of the proposed wind farm on the habitats of the proposed development area. It is based upon a survey of baseline conditions of vegetation and flora and takes account of a range of issues covered in guidelines on the environmental impacts of wind farms (Scottish Natural Heritage, 2001) and responses of SNH to the scoping report issued earlier in 2002. The scope of the assessment covers the following main issues:

- Direct impacts of access road construction and borrow pit excavation on site habitats;
- Direct impacts of turbine construction on site habitats;
- Direct impacts of electricity connection on site habitats;
- Direct impacts of temporary compound construction on site habitats;
- Extent and nature of ground disturbance during the construction phase;
- Proposals for restoration of disturbed ground.

Methodology

Overall approach to assessment

6.2 This section describes the methods used to assess the significance of impacts of the proposed development upon the habitats, flora and fauna (excluding birds) of the site. It uses professional judgement to do the following:

1 Identify and value the nature conservation interest of a site in a systematic manner, establishing levels of interest for its main ecological features;

2 Assess the likely magnitude of impact of the development on each feature of nature conservation interest;

3 Assess the significance of ecological impact in relation to level of ecological interest and impact magnitude.

6.3 This approach follows draft guidelines on ecological assessment which have been produced by the Institute of Ecology and Environmental Management (IEEM). The IEEM approach is set in the context of use by ecologists, local authorities and other organisations in the UK.

Evaluation criteria

6.4 In an environmental impact assessment context, features of nature conservation interest can be considered as **Valued Ecological Receptors** (VERs). These are populations, species, communities, habitats and sites selected as likely to be affected (in a positive or negative way) by the environmental changes created by a proposed development. There are essentially five types of VER (IEEM, 2002):

- Designated sites and features;
- Identifiable, discrete units of important natural or semi-natural habitat (e.g. an isolated patch of chalk grassland in England);
- Definable populations, sub-populations or metapopulations (e.g. a population of Pyramidal orchid *Anacamptis pyramidalis* in the isolated patch of chalk grassland);
- Areas of habitat which are part of a continuum which extends far beyond the boundaries of the development site (e.g. a strip of inter-tidal mud within a large estuarine system);

- Groups of individuals which are part of populations which may span continents, due to the mobility of the species.

6.5 Once identified, VERs define the nature conservation interest of the development site and must be valued to provide a basis for assessing the impacts of a development. Valuation covers two main themes. First, legal protection must be considered because some species and habitats are rare or declining and are covered either by statutory instruments (e.g. Wildlife and Countryside Act 1981) or formal guidance (e.g. UK Biodiversity Action Plan, Local Biodiversity Action Plans). Second, species and habitats deliver economic and aesthetic benefits which people value, or are useful to society in general (e.g. the conservation of genetic diversity).

Level of ecological interest: designated sites

6.6 An assessment is usually straightforward if a site, habitat or species already has a nature conservation designation. This is done by checking the features identified (habitats and/or species) against the criteria for the four main levels of designation awarded (international, national, regional and various scales of local importance). The assessment process therefore recognises formal Levels of Ecological Value and these are summarised in Table 6.1. Sites of international status on the basis of their habitats are covered by the EC Habitats Directive (Scottish Office Environment Department, 1995). Sites of national status are covered by guidelines on the selection of Sites of Special Scientific Interest (SSSIs) (JNCC, 1998), as well as species listed in Section 1 of the Wildlife and Countryside Act 1981. There is less formal guidance available for designation at regional and local level, with two sources recommended by Regini (2000): Collis & Tyldesley (1993) and Hawkswell (1994). However, non-statutory regional and local designations are poorly developed in Scotland and, in particular, aspects of conservation criteria might not be fully appropriate for the much larger scales of upland habitat which are encountered in the Highlands and Islands.

6.7 Sites worthy of designation with habitat and/or species interest at any level must have a 'viable area' of habitat. Viability means that the area should be sufficient to maintain the habitat interest in adequate condition through appropriate management (which might involve some form of rotational manipulation of vegetation), as well as providing sufficient territory and suitable habitat for the breeding and wintering populations of species of interest. A more formal definition used by a statutory agency (NCC, 1989 – see paragraph 2.10.3) is as follows: "*Given that the intrinsic vegetational quality of the habitat is acceptable, its area must be big enough to be viable, in respect of the resistance of the habitat and its flora and fauna to edge effects, loss of species and colonization by unwanted species*".

Level of designated interest: non-designated sites

6.8 It is more difficult to judge a level of interest for potential development sites with no designation. It is therefore important to establish the level of interest relating to nature conservation features found by baseline surveys. This involves applying the criteria for designation of international, national and sub-national (regional and local) sites to the feature set. There is no agreed approach to applying these criteria. Logically, it should involve two stages:

1. Within the surveyed area, divide it, if necessary, into ecologically coherent units and consider each separately when applying designation criteria;

2. Out with the site, establish as best as possible the extent of equivalent ecologically coherent units at the local, regional, national and international scales in order that the development site can be placed in an appropriate level of interest.

6.9 The development site at Farr is not within a designated site and the above approach for non-designated ground is applied here.

Table 6.1 Valuation of ecological receptors

Source: adapted and modified to fit a Scottish context from Regini (2000) and IEEM (2002)

Level of Value	Habitats	Species
International	Internationally designated or proposed sites, such as Ramsar Sites, Special Protection Areas, Biosphere Reserves, Special Areas of Conservation, or otherwise meeting criteria for international designation. A viable area of a habitat type listed in Annex 1 of the Habitats Directive.	Sites supporting populations of internationally important species. Any regularly occurring population of an internationally important species which is rare or threatened in the UK, i.e. a UK Red Data Book species, or listed as occurring in 15 or fewer 10km squares in the UK (categories 1 and 2 in the UK BAP), or of uncertain conservation status or of global conservation concern in the UK BAP.
National	Nationally designated sites such as Sites of Special Scientific Interest (SSSIs), or non-designated sites meeting SSSI selection criteria, National Nature Reserves (NNRs), Marine Nature Reserves, Nature Conservation Review Grade 1 sites. A viable area of a priority habitat identified in the UK BAP, or of smaller areas of habitat which are essential to maintain the viability of a larger whole.	Any regularly occurring population of a nationally important species which is threatened or rare at a regional scale (see local BAP). A regularly occurring, regionally significant population of any nationally important species. A regularly occurring, regionally significant population of any nationally important species during a critical phase of its life cycle.
Regional	Sites containing viable areas of key habitats listed in a regional Biodiversity Action Plan and/or habitats covered within an SNH Natural Heritage Zone. Or smaller areas of such habitat which are essential to maintain the viability of the larger whole. Sites should comfortably exceed Site of Importance for Nature Conservation (SINC) criteria if those exist, but not meet SSSI selection criteria.	Sites supporting viable breeding populations of Nationally Scarce species (occurring in 16-100 10km squares in the UK) or those included in a regional Biodiversity Action Plan on account of their rarity, or supplying critical elements of their habitat requirements. A regularly occurring, locally significant number of a regionally important species during a critical phase of its life cycle.
Local (county, district, parish, neighbourhood scales)	Designated (SINC) or undesignated sites of varied quality containing habitat types of local interest, including amenity and educational functions. Areas of habitat considered to enrich appreciably the habitat resource of a parish or neighbourhood, e.g. species-rich hedgerows.	Sites supporting viable breeding populations of species known to be rarities on a local scale. A regularly occurring, locally significant number of a locally important species during a critical phase of its life cycle.
Negligible	Low grade and widespread habitats	

Measuring impact magnitude

6.10 The impact of a development can be judged in terms of magnitude in space and time (Regini, 2000), with both negative and positive impacts possible. Positive impacts are likely to be rarer, but are possible if ecological enhancements are included within a scheme design at an early stage in the project design.

6.11 There are five levels of impact recognised in draft IEEM proposals (Table 6.2). These levels are based on the concept of ecological integrity. In very broad terms this means maintaining the ecological structure and function of an area and/or its species (environmental conditions, ecological resources, pre-development disturbance regimes, ecological interactions and processes). More formally, three definitions of ecological integrity might be needed to cover the range of VERs (IEEM, 2002):

6.12 A definition referring to European sites of conservation interest: "*the coherence of ecological structure and function across the site's whole area, that enables it to sustain the complex of habitats and/or the levels of populations of species for which it was classified*".

6.13 For non-designated sites the definition can be amended as follows: "*the coherence of the site's/habitat's structure and function, across its whole area, that enables it to sustain the habitat, complex of habitats, and/or the levels of populations of the species for which it was identified as a valued ecological receptor*".

6.14 For species or an assemblage of species, integrity is defined as: "*the coherence of the ecological structure of the population or group, that enables it to maintain the numbers and functionality for which it was identified as a valued ecological receptor*".

Table 6.2 Criteria for describing the scale of impact
Source: adapted from IEEM (2002)

Scale of impact	Criteria
Major Negative	The change is likely to cause a permanent adverse effect on the integrity of a valued ecological receptor.
Negative	The change adversely affects the valued ecological receptor, but there will probably be no permanent effect on its integrity.
Neutral	No effect.
Positive	The change is likely to benefit the receptor in terms of its ecological value.
Major positive	The change is likely to restore the integrity of a valued ecological receptor to favourable condition.

Assessing the significance of ecological impacts

6.15 Results from work on levels of ecological value and impact magnitude are both used to assess the significance of ecological impact. The IEEM guidelines use a matrix of ecological significance to relate ecological value to impact magnitude (Table 6.3), employing four classes of significance (critical, major, moderate, minor). The 2002 IEEM draft pilot methodology offers no further definition of these significance classes, in contrast to the first version which provided guidance on spatial significance classes named as high, medium, low and very low (Regini, 2000). Professional judgement must therefore be used to decide the degree of impact significance in relation to available information on habitat ecology and species trends in the local area, region, Scotland and Europe.

Table 6.3 Matrix of ecological significance of impacts

Impact Magnitude	*Value of Feature*					
	International	*National*	*Regional*	*County*	*District*	*Neighbourhood*
Major Negative	*Critical*	*Major or Critical*	*Major*	*Major*	*Moderate*	*Minor or Moderate*
Negative	*Critical*	*Major*	*Moderate*	*Moderate*	*Moderate or Minor*	*Minor*
Neutral	*No Impact*					
Positive	*Critical*	*Major*	*Moderate*	*Moderate*	*Moderate or Minor*	*Minor*
Major Positive	*Critical*	*Major or Critical*	*Major*	*Major*	*Moderate*	*Minor or Moderate*

Policy context

Nature conservation in the Highland Structure Plan (March 2001)

6.16 There is a presumption against development for statutory nature conservation sites in Highland Region. There is no statutory site within the proposed wind farm at Farr.

Biodiversity Action Plans

6.17 On a more general level, account should be taken of species and habitats covered by UK and Local Biodiversity Action Plans. At the national scale in the UK (1994) and Scotland (Usher, 1998) the key habitats of concern are blanket bog and heath. However, their importance at the regional and local scale has yet to be formally recognised in Highland Region, which lacks a Local Biodiversity Action Plan. If implemented, such a plan is likely to follow closely those developed elsewhere in Scotland and a suitable model, covering similar environments to the Highlands, has been developed for Argyll and Bute (Argyll & Bute Local Biodiversity Partnership, 2002). Policies of 'no net loss' are likely to be set for key habitats in Scotland and this is considered here as part of proposals for mitigation.

Survey methods

Baseline conditions

Consultation

6.18 SNH and the Scottish Wildlife Trust were approached for any existing data but none was available, apart from MLURI LCS88 digital data available for purchase from the Macaulay Land Use Research Institute (MLURI, 1992). The habitat survey methodology was discussed with SNH and it was also agreed that the SNH methodology for recording land management impacts on upland habitats would be applied to the wind farm site.

Existing data

6.19 The only published existing data at a scale of possible interest is habitat mapping as part of the Land Cover of Scotland 1988 project (MLURI, 1992). This was not considered worth purchasing due to its format (a classification not easily related to Phase 1 types or the NVC) and because much mapping is done as mosaics with little detailed information on the balance between mosaic components. An unpublished reconnaissance ecological survey has been carried out for the development area (David Hawker Ecological Consultancy, 1996) and this was read. It covers a single day visit and desk study in October 1996, with an account of the more widespread NVC types present on summit ridges. Little time was spent on lower ground and map information is very limited.

New survey data

Habitat survey

6.20 At the request of SNH, a survey based on the National Vegetation Classification (NVC, Rodwell 1991-2000) was undertaken by two experienced surveyors (Dr. T. Dargie, Mr. P. James). In addition, information on Phase 1 Habitat Survey categories (Nature Conservancy Council, 1988) was also gathered since this covered habitats not included in the NVC system (e.g. coniferous plantation). Again, at the request of SNH, the condition of several upland habitats (blanket bog, flushes, dwarf-shrub heath, wind-clipped summit heath) was assessed using the SNH guide to surveying land management impacts (MacDonald *et al.*, 1998).

6.21 A 0.5 m long peat probe was carried to assess peat depth in shallower peatlands and the location of records was noted either as a target note or marked on the base map. Peat depths >50 cm were recorded as an arbitrary figure of '99'. Soil sections were examined briefly wherever these were found. Much of the site was found to have >2 m of peat.

6.22 The major species in different NVC types were listed and the local abundance recorded on the DAFOR scale (D = Dominant, A = Abundant, F = Frequent, O = Occasional, R = Rare).

6.23 The access road routes were walked close to their centreline, mapping vegetation type and habitat for 50 – 70 metres either side of that line. An existing estate track south of the wind farm development was also included in survey because a borrow pit lies adjacent (NH734275). In this case survey was mainly restricted to 10 metres each side of the track. The attributes of each polygon were recorded as dominant Phase 1 habitat type and a target note listing the NVC and other Phase 1 types present, plus any other features of interest. The same approach was used for a corridor which will take underground cables west from the wind farm to a grid connection at NH700294.

Fauna

6.24 Observations on fauna were initially confined to non-systematic observation of species. However, observations indicated the presence of water voles and otters within the development area and as a consequence of this, detailed systematic surveys of water vole and otter have been commissioned and are ongoing. It is intended that reports of these surveys will be submitted as supplementary information to the Section 36 Application when they are completed.

Timing of fieldwork

6.25 Fieldwork was carried out on 16/5/02 and 21/5/02 to 24/5/02, with access routes in late June and July 2002, plus some supplementary mapping of the main site in early and mid August 2002. These timings were probably optimal for recording habitats and sufficiently spread in time to find plant species which might be restricted in seasonal growth and recognition.

Prediction methods for impacts on habitats

6.26 Road routes and other footprint locational data (mainly turbine, borrow pit, site office and temporary laydown area positions) were digitized and captured in GIS. These were then overlaid upon habitat layers and measurements calculated for areas of permanent habitat loss and temporary disturbance requiring restoration. All impacts were recorded as extents (square metres).

6.27 This stage was done in two steps. In the first step, some road routes were noted crossing wet, ecologically-sensitive habitats and one borrow pit was close to very wet peatland and might have altered drainage conditions. In these cases NWP changed the road routes to avoid crossing very wet ground, and the borrow pit position was abandoned and a new location out with the wind farm area was substituted (NH712306). The extents of impact were calculated after making these important changes which can be considered as forms of mitigation.

Baseline conditions

6.28 The wind farm survey area, potential access corridors, cable trench route and northern borrow pit area are all shown in Figure 30. Habitat types (dominant Phase 1 habitat) in the main survey area are mapped in Fig. 31, with site roads, turbine positions, borrow pits and lay down area superimposed on the coloured map. Dominant Phase 1 habitats are also shown for access routes and the cable trench corridor in Figures 32 and 33.

Wind farm survey area

6.29 Polygons recorded in the wind farm survey area total 1008 ha and include 29 NVC and other cover types such as open water, bare peat and bare rock (Table B1 – Appendix B). Blanket bog vegetation is dominant, covering 88% of the area. Dry heath (6%), wet heath (2%) and flush (2%) are locally common, and there are small extents of acidic grassland (1%) and juniper scrub - woodland (0.02%). Bare peat is locally common (1.6%). A summary of the descriptions of NVC communities is presented in Figure 31.

Habitat condition

6.30 Application of the SNH Upland Management Impacts methodology suggests that the condition of much blanket peat and heath is poor due principally to drainage and erosion. Burning and grazing impacts by Red deer and sheep are less severe, although grazing pressure is quite high over much of the site. Results are presented in Table B2 in Appendix B.

6.31 Dry blanket bog conditions (Table B2) are shown by 56% of this habitat being recorded with either moderate or heavy drainage and erosion impacts. Trend indicators suggesting a net increase in dryness of >6% and chronically heavy drying impacts amounting to 27% of blanket bog area. Relatively small extents of blanket peat are burnt as part of muirburn management. Shallow ditches are common in parts of the survey area and are clearly visible upon 1988 aerial photography. However, gully erosion is probably the major long-term cause of dry blanket bog, a factor which is not treated in detail in the SNH Upland Management handbook. Polygons were classified into a set of erosion classes on the basis of gully attributes and air photo interpretation, with the results mapped in Figure 34. Smooth bog surfaces with almost no gully dissection are rare (9% of survey area) and these tend to be surrounded by ground with a microbroken rilled surface which has small amounts of bare peat within the rill network (24% of survey area). A category of little dissection covers sparse gullies (9% of survey area). More than half of the survey area is covered by moderate (27%), heavy (17%) and very heavy (7%) dissection classes. Most of this ground has a cover of M17b blanket bog with a high lichen cover, often with a fringe of H12 heath on the edges of gullies. The key effect of gullying is a significant fall in the bog water table, allowing drier blanket bog and heath conditions to develop. *Sphagnum* moss becomes much rarer and tends to be confined to near-permanent pools in gully floors.

6.32 Dwarf shrub heath habitats (Table B3) show light effects from muirburn and moderate impacts from grazing are probably more important than fire as a factor affecting vegetation. This also applies to wind-clipped summit heath (Table B4). Grazing and trampling are important in affecting much flush vegetation (Table B5).

Fauna

6.34 Non-systematic observation of species (excluding birds) recorded mainly Mountain hare and amphibians (Common frog, Common lizard). Large Heath butterfly was observed in late July in the east of the site and this is likely to be widespread, since its main larval food source (Hare's-tail cottongrass *Eriophorum vaginatum*) is common throughout much of the area. This species is only on the wing for two to three weeks of the year and a detailed survey of its numbers was not possible. As previously stated systematic surveys for otter and water vole are ongoing

Access and cable trench corridors

Vegetation

6.35 The northern access routes can be broken into ten sectors (A to J) and these are mapped in Figure 32. Sectors A to F and sector I are located within conifer plantation and follow either existing tracks or open rides for much of their lengths. The sector A centreline crosses a relatively small area of M15 wet heath, H12 dry heath and M19 blanket bog. Sector D has a ride with M19 blanket bog and M6 flush vegetation. Sector E includes a wooded gully which can be avoided by a possible 200 m realignment. Sector G starts in conifer plantation and then follows open moorland with M19 blanket peat, M15 wet heath and M6 flush on lower ground, changing to mainly to M17 blanket peat at higher altitude at its eastern end. Sector H is similar to G, with M19 blanket bog dominant on lower ground, changing to M17 blanket bog with occasional M6 flushes on high ground at its eastern end. Sector J is dominated by H12 dry heath, with small extents of M19 blanket bog in the area of the grid connection.

6.36 The southern access route follows an existing estate stone track and passes through mainly dry heath (some showing signs of disturbance from track construction), with local occurrences of wet modified blanket bog (M19 vegetation). Muirburn for grouse management is common in this area. There are scattered occurrences of Juniper *Juniperus communis*.

6.37 The cable trench corridor crosses dry heath on steep slopes on lower ground, and then passes through blanket bog on gentler plateau slopes on high ground.

Fauna

6.38 Casually observed records were made for Fox in conifer plantation along the northern access route, plus Common frog, Common lizard and Mountain hare on blanket bog along sector H.

Predicted change

Identification of Valued Ecological Receptors (VERs)

6.39 The following features of nature conservation interest can be considered as VERs since they are present or probably present in at least part of the areas surveyed for the development:

- Blanket bog, bog pools and flushes (M1, M6, M10, M17, M18, M19) as forms of a habitat which are part of a peatland continuum extending far beyond the boundaries of the development site;
- Wet heath (M15) as forms of a habitat which are part of a patchy continuum within a blanket bog environment which extends beyond the boundaries of the development site;
- Dry heath (H12, H22) as forms of a habitat which are part of a patchy continuum within a blanket bog environment which extends beyond the boundaries of the development site;
- Unimproved grassland (U4, U6) as forms of a habitat which are part of a continuum extending far beyond the boundaries of the development site.

Valuation of VERs

Blanket bog

6.40 Blanket bog is listed as a European Priority Habitat (Active Blanket bog, supporting a significant area of vegetation with *Sphagnum* mosses and Cottongrass *Eriophorum* spp. that is normally peat-forming), as well as a non-priority habitat (by default, non-active) under Schedule 1 of the Habitats Directive. Most of the blanket peat in the surveyed area can be considered to be non-active blanket bog, due to the rarity of *Sphagnum* mosses.

6.41 It is also listed as a Key Habitat and Broad Habitat under the UK Biodiversity Action Plan (1994), covered by a Habitat Action Plan, representing a habitat which is globally threatened or declining. Total extent in Scotland is estimated at 1.1 million ha, with 25% of that area no longer supporting typical vegetation and fauna due to conversion to forestry and agriculture (Usher, 1998). Although Scotland has a very large extent, blanket bog is very restricted on a global scale and its European distribution is mainly restricted to the cool and moist northern Atlantic seaboard where it is found from sea level to quite high altitudes. Its biodiversity status in Highland Region is uncertain because there is no regional Biodiversity Action Plan at present, although any likely to be produced will reinforce these international and national classifications, e.g. as in Argyll & Bute (Argyll & Bute Local Biodiversity Partnership, 2001) where the objective is to maintain the area and quality of peatland, with a target of no net loss or reduction for this habitat type. This view is corroborated by a statement of importance by SNH for the Central Highlands Natural Heritage Zone, which contains a high proportion of the Scottish resource, particularly in the Monadhliath. The invertebrate populations of wetter ground are noted as important food for Red grouse and other moorland birds in the drier summer months, helping to underpin shooting estate management .

6.42 Applying a valuation to blanket peat within the development area is not easy. On the one hand, the habitat as a whole, within Europe, is regarded as of International importance. On the other hand, it is not part of a European site designated for this feature (i.e. cSAC), nor is it an SSSI. Under SSSI site selection guidelines (NCC, 1989; with material on bogs updated by JNCC, 1994), the development area would have been included in a preliminary stage of selection (identifying potential sites within the local Area of Search) but then rejected because it failed to reach the required standard in terms of

having a full range of microtopes and microforms (scales of bog microtopography), vegetational and faunistic types. In failing to meet the SSSI standard, the area thus falls below the National level of value in Table 6.1.

6.43 Highland Region has no formal structure of non-statutory sites, nor is there yet a Regional or Local Biodiversity Action Plan available for use. This makes it difficult to place the value of blanket bog at the regional, district or neighbourhood level. The SNH Natural Heritage Zone (Central Highlands) covering the development area lists blanket bog as a habitat of particular value (SNH, 2002), suggesting a level of interest which is regional – district in scale. Application of the SNH upland management impacts methodology (MacDonald et al., 1998) in the Farr survey area suggests that overall condition of the vegetation is only poor to moderate due principally to drainage and especially erosion, with grazing pressure an important secondary factor. Conversion to conifer plantation has also taken place around the northern access route.

6.44 These facts suggest that the blanket bog in the Farr area is unlikely to be of regional importance and is most likely to be of interest at the 'District' level of local interest. One remaining form of valuation is the use of viable area. The development area and potential access routes are dominated by blanket bog which is part of a much larger expanse in the Monadhliath. The likely area to be affected by development is very small as a proportion of the regional resource and, if it were to be completely lost as a result of wind farm construction (itself unlikely), it could not threaten the viability of the greater expanse unless it was part of a major process of cumulative impacts which is also unlikely. Indeed, loss and/or damage would be confined to the scale of 'Parish/Neighbourhood' in Table 6.1, and probably at a very local scale even in that category. **Overall, valuation for blanket bog, as a Valued Ecological Receptor, should be placed at the Local scale, probably at the 'District' level as a compromise between the low likely impact on viability of the regional blanket bog interest and the high intrinsic value of blanket bog in the region, Scotland and Europe.**

Wet and dry dwarf-shrub heath

6.45 These habitats are listed under Annex 1 of the Habitats Directive as forms of Temperate Heath and Scrub (Northern Atlantic wet heaths with *Erica tetralix*, including M15 vegetation; European dry heaths, including H12, H13 and H22). Neither is classed as a Priority Habitat. Both are listed as a Key Habitat and Broad Habitat under the UK Biodiversity Plan (1994), both are covered by an Upland Heathland Habitat Action Plan (representing a habitat which is globally threatened or declining). All heathland in Scotland is thought to cover 1.7 – 2 million ha (Usher, 1998). Wet heath is moderately extensive in the surveyed area.

6.46 The same valuation difficulties apply to these habitats as to blanket bog. Overall value in an international context is probably lower, since these are not classed as Priority Habitats. There is no SSSI designation and the areas present are very small, partly damaged by afforestation, or relatively poor examples of heath on high ground. Such heaths do feature as key interests in the local SNH Natural Heritage Zone and are likely to be part of Regional and Local Biodiversity Action Plans. Likely levels of loss due to development are not at all likely to threaten the integrity of these habitats in the Monadhliath. **Overall, wet heath and dry heath can be valued as a VER at 'District' level.**

Unimproved grassland

6.47 Unimproved acidic grassland (U4, U6 vegetation) is not listed in Annex 1 of the Habitats Directive. The dominant U4 type is also not listed as a key component in SSSI guidelines for lowland grassland but is part of a very wide suite of types under Upland habitats which could form grounds for designation as an SSSI (together with blanket bog in particular). However, given the relatively poor quality of adjacent blanket bog in the surveyed area where this grassland is found, designation is most unlikely. This habitat in Scotland (with perhaps <5000 ha extent) is the subject of a Lowland Dry Acid Grasslands Habitat Action Plan and is moderately common in the coastal regions of the north and west, providing important breeding areas for waders (Curlew, Lapwing), moorland songbirds (Meadow pipit, Skylark) and small mammals, as well as foraging areas for Merlin and Hen harrier (Usher, 1998). Any Regional or Local Biodiversity Action Plan covering the Farr area is likely to include this habitat as a target for no net loss. These grasslands are probably locally extensive on lower ground beyond the development area, though much has probably been improved by drainage, re-seeding and fertiliser application. **Overall, unimproved grassland can be valued as a VER at 'District' level, after taking account of its regional importance and its low, restricted area in the vicinity of the development and its potential access routes.**

Construction phase impacts

Details of impacts

6.48 The following impacts affecting habitats will occur in the construction phase:

- Excavation of borrow pits to provide stone for road construction. These will be located at NH712306 (150 x 50 m), NH711292 (150 x 50 m), NH725285 (100 x 50 m) and NH735276 (100 x 50 m). Habitats in these areas will be removed but the ground will be restored after all construction is complete, but not necessarily with the same vegetation type.

- Construction of access tracks to the development site and within the site, to involve a road corridor 6m wide covering running width, verge and ditches. This section of the road corridor will have all existing habitats removed and only limited restoration of verge vegetation will be attempted as restoration. Batters cut in or constructed upon adjacent vegetation will occupy further ground beyond road ditches. Most will be cut in peat (assumed average depth 2 m) at an angle of no more than 25 degrees to allow rapid restoration using peat turf excavated during construction. Peat in the road corridors will be removed and replaced by 1 m thickness of stone fill won from borrow pits. Additional ditches (of uncertain location and length) might be required to prevent sheetwash from higher ground reaching the road surface. The road surface might, in places, require water bars to divert wash into ditches.

- Construction of a temporary laydown area (100 x 50 m) for storage of wind turbine components, construction materials, equipment and fuel. Habitats in this area will be removed but the ground will be restored after all construction is complete, but not necessarily with the same vegetation type.

- Construction of 45 concrete wind turbine bases (each 17mx17m), involving excavation of all peat and some bedrock, replacement of materials after concrete curing is complete, to be followed by restoration of most of the base area after turbine erection and commissioning. Ditches might need to be excavated around the edges of restored ground to prevent sheetwash from higher ground running over restoration work.

- Construction of two crane pads (40 x 20 m, 20 x 20 m) at each wind turbine location, each within 20 m of the centre of the turbine. Access roads will run through the centre of each crane pad. Habitats in these areas will be removed.

- Burial of electrical connections in cable trenches inserted into the site road corridors, then into a cable trench running from close to the temporary laydown area (NH714298) to the grid connection at NH701294. Habitats in the immediate vicinity of the cross-country cable trench will be disturbed by excavation but immediate restoration will take place.

- Construction of a site control building (10 x 20 m) adjacent to an access road at NH701298, and installation of a grid connection compound (60 x 60 m) at NH701294. Habitats in these areas will be removed.

Quantifying construction phase impacts

Habitat loss and restoration

6.49 GIS analysis was used to estimate the areas of different habitats likely to be affected during the construction phase. Road line lengths were measured through habitat polygons and recorded with the habitat types present in the polygon. An 8 m wide road corridor was assumed to calculate loss of habitat to road development, with a further 8.5 m width for batter construction and restoration. The maximum habitat loss and restoration values per habitat for any route are used here. The values presented are therefore probably overestimates of the amount of ground affected.

6.50 Turbine base positions were recorded in terms of habitat, as were borrow pits, laydown area, site office and grid connection facilities.

6.51 Permanent Habitat loss extents are shown in Table B6 in Appendix B, and habitat restoration estimates are given in Table B7 in Appendix B.

6.52 In addition to habitat loss and restoration, there will be disturbance to habitats within the cable trench corridor. Assuming a 2 m wide corridor, the following habitats will be affected: flush (143 sq. m.), dry heath (597 sq.m.), and blanket bog (2187 sq.m.).

Waste peat disposal

6.53 Road, crane pad and turbine base construction, plus the creation of borrow pits and laydown area, will all produce a substantial volume of waste peat. It should be noted that the volume of peat to be excavated will depend on the type of plant to be used and the width of access tracks required. Final site design will take account of the need to reduce the volume of peat which is disturbed and the choice of plant will also reflect this objective.

Operational phase impacts

Details of impacts

6.54 The following impacts upon habitat are likely during the operational phase of development:

- Habitat restoration work, some started in the construction phase, will be continued and will be monitored, feeding back results to ensure semi-natural vegetation types are established as quickly as possible on disturbed ground. Monitoring will involve slight trampling of vegetation.
- Management as grouse moor will continue, with muirburn being used to produce an age mosaic in moorland vegetation. Specific shooting areas have been delimited within the turbine layout, away from turbine positions, and in this manner, current land use will be continued upon the site.
- A blanket bog restoration project will begin as mitigation for habitat loss in the construction phase. This is discussed below under mitigation measures.

6.55 Normal wind farm maintenance operations are unlikely to have an impact on habitats.

Evaluation of effects

Construction phase

6.56 A maximum total of permanent habitat loss to development is estimated as 28.7 ha (Table B6 – Appendix B). of this 2.7 ha is conifer plantation, to be compensated financially. Blanket bog losses are the highest (21.2 ha), with only dry heath (1.9 ha) and wet heath (1.3 ha) then exceeding 1 ha in loss extent.

Blanket bog

6.57 The above losses for blanket peat are mainly due to road construction within the wind farm area (13.1 ha), plus land take for crane pad, borrow pits and laydown area. These losses are a small proportion (<5%) of total blanket peat in the development area (886 ha) and are a small fraction of the regional resource. They do not pose a threat to the integrity of the habitat. **The losses therefore have a negative impact magnitude and can therefore be classed as moderate or minor significance. Given the importance of blanket peat in a European context, moderate significance should be proposed for this impact.**

Dry and wet heath

6.58 Losses of these habitats mainly occur on access roads outwith the development area. They represent very small proportions of the local and regional resource and there is no threat to the integrity of these habitats. **The losses have a negative impact magnitude and can be classed as minor in significance.**

Flushes and unimproved grassland

6.59 Much unimproved grassland within the development area is associated with flushes. However, actual losses will be very small. There is no threat to ecological integrity. **The losses have a negative impact magnitude and can be classed as minor or negligible in significance.**

Cable trench disturbance

6.60 The additional disturbance to habitats within the cable trench corridor are not large and cable installation will use a method statement to ensure that actual disturbance is minimised, allowing vegetation to recover quickly. **The disturbance will have a negative impact magnitude and can be classed as minor or negligible in significance.**

Waste peat generation

6.61 Operations will create a considerable volume of waste peat. This will be temporarily stored in borrow pits after all stone is extracted and it is proposed it will then be used in the peatland restoration project where it will help restore the water table and integrity of blanket bog. **It will therefore be a major positive impact of moderate ecological significance in the long term.**

Operational Phase: Restoration and Monitoring

6.62 Restoration and monitoring operations will cover a total area of up to 27.4 ha, less than but close to that applying to total habitat loss. The areas being restored represent disturbed ground which will undergo an ecological succession to better semi-natural habitat over time (perhaps, in some cases, requiring at least 10 years to approximate precursor vegetation before development). Road batter restoration has the potential to be rapid, as turf will be replaced as quickly as roads are built. Turbine bases will take longer to restore because it is not possible to replace turf rapidly. Reinstatement here is likely to involve planting plugs of Cottongrass and Heather, aiming for rapid vegetative growth with a minimum of additional treatment (e.g. no fertiliser addition). The impact of restoration is not extensive (<5% of the wind farm area) and can be considered a positive impact magnitude. **Blanket bog is the main beneficiary (17.9 ha) and this work is probably of moderate positive ecological significance in the long term.**

Peatland restoration scheme

6.63 This habitat restoration scheme is proposed as mitigation for blanket peat habitat losses. Work will use peat excavated during development to fill gullies and raise the water table level within the eroded catchment. This will dispose of much waste peat and start the creation of blanket bog in favourable condition, hopefully with a high *Sphagnum* moss cover. **The project will have a major positive impact which will be of moderate ecological significance.**

Mitigation

Construction phase

6.64 Mitigation was applied to the design process at an early stage. Road routes within the wind farm site were changed to avoid crossing major flushes and one borrow pit was moved outside the site to eliminate the risk of reducing drainage to a good area of wet blanket bog.

6.65 Within the construction phase proper, method statements will be developed for road construction and batter restoration, aiming to achieve rapid replacement of excavated peat turf on to batter slopes as road building takes place. Techniques developed at Novar Wind farm will be used to reduce road visibility (McLellan, Nicolson & Dargie, 1997; Dargie, 2000). Turbine positions will be placed using micrositing to avoid any local sensitive habitats such as flushes.

Operational phase

Peatland Restoration Project

6.66 It is currently anticipated that this project will use moderately, heavily and very heavily dissected peatland (Figure 34) which forms small catchments in the west of the wind farm site. The intention is to agree areas to be restored with the landowner and SNH. This would form part a habitat management plan to be agreed with The Highland Council and SNH.

6.67 Restoration techniques will be based upon methods developed in last decade for raised bog and blanket bog habitat restoration, including blocking gullies, infilling with waste peat, reprofiling some areas to reduce slope angles, water table monitoring, and monitoring of vegetation re-establishment (Wheeler & Shaw, 1995; Brooks & Stoneman, 1997).

Restoration of disturbed ground

6.68 The borrow pits, laydown area and backfilled turbine base areas will use restoration techniques developed at Novar Wind farm, Ross-shire. These include planting plugs of Cottongrass and Heather to start vegetative growth. Re-seeding would be avoided because it performs poorly on moist bare peat surfaces (Dargie 2000, 2001, 2002).

Significance of residual effects

Construction phase

6.69 It is proposed that most of the 28.7ha of habitat lost in the construction phase will be compensated for by creating wet blanket bog within the peatland restoration scheme. This will utilise waste peat generated during development. The only residual effects will be minor losses of wet heath and dry heath vegetation, much of which will occur outside the wind farm site in access corridors. Overall, such residuals are of minor negative significance.

Operational phase

6.70 Disturbed ground subject to restoration will persist for some time, sometimes with an initially low vegetation cover. It might require up to ten years for good semi-natural vegetation to develop on disturbed areas (turbine bases, borrow pit and laydown area floors, restored ground within the peatland restoration area). There will be little opportunity to speed up ecological succession, since most vegetation types are typical of nutrient-poor environments and will not respond well to fertiliser application. The end point of succession should be a vegetation type close to that present in the area before development. Overall, the establishment of semi-natural vegetation should be regarded as of moderate positive ecological significance.

Chapter 7 Ornithology

Introduction

7.1 This chapter provides a summary of the potential ornithological impacts arising from the proposed development of the wind farm at Farr.

7.2 This assessment considers the following potential impacts arising from the proposed wind farm development.

- Direct impacts upon raptors arising from habitat loss;
- Direct impacts upon raptors through collision or interactions with turbine blades;
- Indirect impacts upon raptors through disturbance caused by construction and operation of the turbines;
- Direct impacts upon breeding upland waders arising from habitat loss through construction of turbines;
- Indirect impacts upon breeding upland waders arsing from disturbance caused by construction and operation of the turbines;
- Direct impacts upon upland breeding birds arising from habitat loss; and
- Indirect impacts upon upland breeding birds arising from disturbance caused by construction and operation of the turbines.

7.3 A confidential ornithological impact assessment report has been prepared and will be made available to The Scottish Executive, SNH, RSPB and any other relevant body during the determination period for the Section 36 application.

Breeding Bird Survey 2001

7.4 In 2001, baseline breeding bird data was collected for NWP. However, whilst the breeding bird survey followed the usual method used for upland bird surveys only a single visit was undertaken during the first week of June.

7.5 The 2001 study area covered 20 1x1km squares. Fourteen of these were within the proposed wind farm site, and six were in a nearby area selected as a control plot for a wind farm monitoring programme. Although the study area was large, it did not include some of the proposed wind turbine locations (from the preliminary site 2002 layout), and did not include a buffer zone around many of the outer turbines.

7.6 The 2001 results indicated that the site held important densities of breeding waders, particularly Golden Plover *(Pluvialis apricaria)*. There was no indication, however, that any particularly sensitive birds of prey (such as harriers) were breeding within the wind farm area. However, this latter conclusion must be treated with some caution as it was based upon only a single visit to the site.

Consultation

7.7 Subsequent consultations with SNH and RSPB following the initial ornithological study indicated that there were concerns over the potential impacts of the wind farm development upon raptors and breeding upland waders, most notably Golden Plover.

7.8 Detailed consultations were undertaken with the Highland Raptor Study Group (HRSG) and RSPB during the Scoping exercise carried out in 2002, who provided supplementary ornithological data for the study area. The HRSG also provided detailed information about a range of sensitive and

protected species within the vicinity of the proposed wind farm. Some of the data was provided on the strict understanding that the information be kept confidential and would not from part of any public documents produced for the wind farm development, hence, as already stated, a confidential ornithological report has been prepared.

7.9 SNH provided details of nearby sites protected by statutory nature conservation designations or candidate sites.

Bird Survey 2002

7.10 The initial work was assessed and recommendations were made for further ornithological survey work in 2002 to include the following:

- A standard Brown and Shepherd method (Brown and Shepherd 1993) breeding bird survey extending to 500m around the outermost turbine locations.
- A survey of the land within 2km of the outermost turbines for breeding raptors using the techniques recommended in Gilbert et al. (1998).
- Flight observations should be carried out during the breeding season from appropriate vantage points to quantify the use that Hen Harrier (Circus cyaneus), Red Kite (Milvus milvus) and other raptors make of the site using the Vantage Point Methodology (Madders 2001).

Methodology

Overall Approach to Assessment

7.11 The assessment approach adopted in completing the ornithological assessment is consistent with that advocated by SNH's 'Methodology for assessing the effects of wind farms on ornithological interests' (SNH 2000a) and produced in conjunction with the British Wind Energy Association. This recommends a three phase approach to the assessment of effects, as follows:

Phase 1

The first stage of the assessment is to establish whether there are any bird populations at risk from impacts arising from the proposed wind farm development.

For sites with no such populations the only data needed will be those that establish that this is the case. Any initial assessment should involve a desk study using available data and consultation with SNH/RSPB. This may be sufficient and no further assessment may be required. On sites where insufficient information is available, basic survey work appropriate to the species in question and at the appropriate time(s) of year may be required. It is usually helpful to discuss the species to be considered in this way, and the methodology of assessment, between the developer and SNH prior to commencing the assessment.

The initial studies prepared for this project and subsequent consultations with SNH and RSPB indicate that there was the potential for the scheme to impact upon a number of sensitive and protected species including Golden Plover, Hen Harrier, Merlin and Golden Eagle and that other sensitive species were present in the area including Dunlin and Curlew.

Phase 2

Where the presence of species potentially at risk has been identified in Phase 1, a Phase 2 assessment is required.

This will include evaluation of potential collision risk and direct and indirect disturbance for the relevant species. The aim during this stage is to seek to demonstrate, for each species potentially at risk, the significance of the potential impacts of the proposed development. For some species, this may be readily possible with minimal data, using 'worst case' assumptions. For other species where the outcome is less certain, detailed data collection on site may be required, coupled with careful analysis of collision and disturbance risks.

For species such as raptors, which occupy a territory, it will be important to understand the amount of time spent within the area of the wind farm. It will also be important to have information on flight heights, as this is crucial to an assessment of collision risk, unless it can be shown that the collision risk is not significant even assuming that all birds fly at at-risk height. For sites where a significant potential adverse effect is predicted there will be a requirement for a population analysis to determine the effects of the wind farm on the population, range and distribution.

Phase 3

If the assessment concludes that the wind turbines would have a significant impact on the population, options for amending or relocating the development to reduce the impacts should be explored, along with options for undertaking habitat enhancement measures which might mitigate any possible adverse effects. If a significant impact is predicted, ongoing monitoring arrangements should be developed as part of the proposal to enable a check to be made on the accuracy of impact predictions.

For some species that are likely to occur at a number of proposed wind farm sites, it may be appropriate to develop a specific detailed methodology, e.g. Golden Eagle.

Evaluation and Significance Criteria

7.12 The criteria used in this assessment for the evaluation of ornithological interest within the study area and the magnitude and significance of the potential impacts are those described in SNH guidance (SNH 2000a).

Policy Context

7.13 The proposed wind farm, including the 1km buffer zone does not lie within a site protected by a statutory nature conservation designation. A further 12 statutory protected sites lie within 12 km of the proposed wind farm as shown on Figure 9. The sites relevant to this assessment are those designated for their ornithological interest and these are:

- Kinveachy Forest SSSI, SPA & cSAC;
- Loch Ruthven SSSI & SPA; and
- Loch Ashie SSSI & SPA.

7.14 Kinveachy Forest SSSI, SPA & cSAC lies approximately 12km south east of the wind farm site and qualifies for notification as an SPA because it supports approximately 13% of the British breeding population of Scottish Crossbills *(Loxia scotica)* and about 3% of the British population of Capercaillie *(Tetrao urogallus)*. Both species are listed on Annex 1 of the European directive on the conservation of Wild birds. No raptors are noted on the SPA notification; however the SSSI schedule notes that the site provides feeding and nesting areas for several rare species of raptor.

7.15 Loch Ruthven SSSI & SPA lies approximately 10km west of the wind farm site and is the most important single breeding site for Slavonian Grebe *(Podiceps auritus)* in the British Isles and this is the only species mentioned in the SPA citation sheet.

7.16 Loch Ashie SSSI & SPA lies approximately 12km north east of the wind farm site and is the most important loch in Britain for adult Slavonian Grebes gathering pre and post breeding. This highest numbers occur in the autumn when the birds moult and become flightless for a short time.

7.17 Given that the Slavonian Grebes do not leave Loch Ruthven during the breeding season and that they congregate at Loch Ashie north of Loch Ruthven pre and post breeding they are not considered to be at risk from the wind farm development.

7.18 No sites within 20km of the proposed wind farm have been designated because of their raptor populations, with the exception of Kinveachy forest where feeding and nesting raptors are mentioned in the SSSI notification.

Survey Methods

7.19 After consultation with SNH and the RSPB, the following methodology was adopted for obtaining data on which to assess the potential impacts of the proposed wind farm upon the ornithological interest of the site. More detailed method descriptions are provided in the confidential ornithological report along with maps showing the study areas.

- Brown and Shepherd Breeding Bird Survey following the standard methodology covering an area up to 500m from the outermost turbine locations;
- Raptor Survey following methodologies in RSPB publication Bird Monitoring Methods (Gilbert et al. 1998). This survey covered an area up to 1km from the outermost turbines. An additional survey was completed in July;
- Flight Observations following the Vantage Point Survey methodology (Author Mike Madders). Detailed flight observations were carried out during the period April 28th to 24th July from three vantage points chosen to include sufficient vision across the core wind farm area and as much of the buffer zone as was possible;
- Wind Farm Access Tracks were surveyed by walking the route and recording bird activity using standard British trust for ornithology species and activity codes.

Baseline conditions

Existing Data

7.20 The following data and information relating to the local status of raptors and owls have been kindly provided by the Highland Raptor Study Group (HRSG). Other information, given under the condition of strictest confidence, has been restricted to the confidential ornithological report.

7.21 Their data indicated that a number of Schedule 1 raptor species including Northern Goshawk *(Acipiter gentilis)* and Peregrine Falcon *(Falco peregrinus)* had bred within the vicinity of the wind farm in recent years. However, the Northern Goshawks failed to breed in 2001 and the breeding area has been subsequently clear felled. Peregrines failed to nest at their usual site in 2000 and have not been recorded breeding in the area since.

7.22 Osprey *(Pandion haliaetus)* is not thought to breed within 10km of the wind farm site and Golden Eagle *(Aquila chrysaetos)* is not known to nest within 10km of the site.

7.23 A single pair of Long-eared Owl is known to have nested in the vicinity of one of the access tracks to the wind farm site; however the species is not thought to be uncommon within the area (HRSG personal communication).

New Survey Data—Wind farm Study Area

7.24 The following data relates to the surveys conducted for the core wind farm area, the 500m buffer zone and the 1km raptor study area. Records for the access tracks are discussed separately below. Figure 35 provides a summary of baseline survey as it relates to the wind farm site.

7.25 A total of 20 species of bird were recorded over all three-survey methodologies. Ten of these were species of Raptor, seven of which are listed as having special protection under schedule 1 of the Wildlife and Countryside Act 1981. Generalised flight paths as they realte to the wind farm are shown on Figure 35.

7.26 Osprey was recorded on three occasions with all records being outside the 1km raptor study zone.

7.27 An immature Golden Eagle in its third or fourth calendar year was recorded from Vantage Point 2 on 30 May and 7 July. These were the only records for this species and in both cases the bird was recorded whilst walking towards the Vantage Point.

7.28 Red Kite *(Milvus milvus)* was recorded on six occasions with most records coming during May but there was no evidence of nesting. All the records for this species came from the eastern edge of the study area adjacent to areas of Forestry Plantation. There is a well-known established population of Red Kites concentrates around the Black Isle (Inverness) where 93 birds of Swedish origin were released in 1989.

7.29 Hen Harrier *(Circus cyaneus)* was only recorded on 23 July 2002 with two records, which almost certainly relate to the same bird and included one flight through the core wind farm area followed by more extensive activity on the south east boundary of the 1km raptor study zone.

7.30 A single female Northern Goshawk was recorded on 9 May 2002. There was no indication from this single record that the species was breeding within or close to the study area.

7.31 A single male Peregrine Falcon was recorded from vantage Point 1 on 28 June 2002, but there was no indication that this species was breeding within or close to the study area.

7.32 Two records of an adult male Merlin on 23 July 2002 probably relate to the same bird and again there was no indication that Merlin was breeding within or close to the study area.

Species of Conservation Concern (Biodiversity Steering Group Conservation Concern List)

7.33 A minimum of 11 breeding pairs of Golden Plover *(Pluvialis apricaria)* were evenly distributed across the site with 8 pairs within the 500m buffer zone. Three pairs were recorded in active display in May and the species was recorded on all Brown and Shepherd survey visits.

7.34 Survey work in 2001 estimated that across the study area 16 pairs of Golden Plover were probably breeding and in 4 cases the status was unknown. However, these birds were counted in 14 x km squares which is a much larger area than that studied for the 2002 surveys, which concentrated in the core wind farm area and a buffer zone up to 1km from the outermost turbines only, and did not take in the full extent of each km square. Consequently the numbers of birds recorded are roughly equivalent

7.35 Dunlin *(Calidris alpina schinzii)* were recorded on all Brown and Shepherd survey visits and a minimum of 3 breeding pairs/territories were present, with most records coming from suitable habitat north of Carn Choire Odhair and Carn Odhar (Figure 35). Breeding birds were often recorded in close proximity with Golden Plover.

Systematic List of Other Species

7.36 A single Black Kite *(Milvus migrans)* was recorded on 30 May 2002 from Vantage Point 2
Other raptor species recorded included Common Buzzard *(Buteo buteo)* and Common Kestrel *(Falco tinnunculus).*

7.37 Red Grouse *(Lagopus lagopus scoticus)* were recorded during all surveys and were evenly distributed throughout the site.

7.38 Common Skylark *(Alauda arvensis)* and Meadow Pipit *(Anthus pratensis)* were very thinly spread across the site.

New Survey Data—Access Tracks

7.39 During the survey of the access tracks a wide range of common woodland or woodland edge species were recorded including Tree Pipit *(Anthus trivialis)*, Winter Wren *(Troglodytes troglodytes)*, Hedge Accentor *(Prunella modularis)*, European Robin *(Erithacus rubecula)*, Willow Warbler *(Phylloscopus trochilus)*, Goldcrest *(Regulus regulus)*, Coal Tit *(Parus ater)*, Blue Tit *(Parus caeruleus)*, Treecreeper *(Certhia familiaris)* and Common Chaffinch *(Fringilla coelebs)* along with more upland species including European Siskin *(Carduelis spinus)* and Lesser Redpoll *(Carduelis cabaret).*

7.40 More notable records included an Osprey, which drifted south in the direction of Loch Farr and a Honey Buzzard *(Pernis apivorus)*, which flew from an area of plantation in a large circle before returning to the same spot. This species is not known or considered to be breeding within 10km of the site because of the high Common Buzzard population (HRSG, 2002).

7.41 A single pair of Golden Plover was recorded by a track at NH77398 27856 along with 2 adults and 3 juveniles from NH78434 27469 on 7 July 2002.

7.42 The possible presence of Scottish Crossbill *(Loxia scotica)* was noted. A single bird was heard briefly calling so identification was not certain. Although is probably unlikely due to their preference for mature Scots Pine forests.

7.43 The conservation status of species recorded during the field survey is contained within the confidential ornithological report.

Predicted changes

Construction Phase—Wind Farm

7.44 During the construction phase it is predicted that the disturbance caused by construction machinery will have some effects upon the ornithological interest of the site and of the woodlands through which the proposed access tracks pass.

7.45 Breeding bird activity in those parts of the site undergoing construction is likely to be suppressed particularly for more sensitive species such as Golden Plover and Dunlin.

7.46 A review of other work on wind farms suggests that zone affected by disturbance is likely to extend approximately 300m beyond the core wind farm area (Percival 2000). However, there is an increasing body of work in the UK that suggests that wind farms do not generally affect bird distribution (Percival 2000). Within the wooded areas, the disturbance is likely to be more confined due the density of the plantation.

7.47 Foraging Raptors are likely to avoid those parts of the site where construction is being undertaken. Construction works are also likely to displace prey items of raptors and this will affect their use of the site.

7.48 No breeding raptors have been noted within the 1km buffer zone around the wind farm development and none of the sensitive species are known to breed within 2km of site and therefore no direct affects upon breeding raptors are predicted.

Operational Phase

7.49 During the operational phase the ornithological interest of the wind farm site may be affected by the following:

Reduced breeding numbers of sensitive species due to loss of habitat

- Reduced breeding numbers of sensitive species due to disturbance caused by operation of turbines and maintenance activities;
- Death of birds through collision or interaction with turbine blades;
- Alterations in the foraging activities of Raptors due to presence of turbines.

7.50 Intermittent use of the wind farm access tracks is unlikely to cause any significant disturbance through the wooded areas.

7.51 The habitat survey and assessment has predicted that 28.7ha of habitat would be lost because of the construction of the wind turbines (of which 21.2ha is blanket bog). This equates to a loss of approximately 2.8% of the total habitat resources within the 500m buffer zone covered by the Brown and Shepherd survey. A further 27.4 ha will be disturbed and subject to restoration.

7.52 In developing the final turbine layout consideration was given to a range of factors including habitats and ornithological interests.

7.53 Data relating to the general movements of raptors within the study area and locations of areas where Golden Plover were noted breeding or holding territory was utilised in arriving at the final turbine and access track layout. Sensitive zones of 100m were drawn around clusters of Golden Plover records assessed to show breeding activity or territorial behaviour to assist in the re-location of turbines,

7.54 From this analysis it was noted that the main concentration of flight paths and Golden Plover breeding was along the eastern boundary of the wind farm and consequently turbines were removed from this area. Elsewhere turbines were moved, with regard to other constraints, to avoid areas where Golden Plover were recorded breeding or holding territory.

7.55 The early results of the ornithological surveys were fed into the iterative design process for the development and the final turbine locations and maintenance track layout was amended to take account of the ornithological interest of the site. Therefore, it is considered that the levels of impact have been minimised through the improved scheme design.

7.56 Considering that the turbine locations have taken into account locations of breeding waders, and that a relatively small loss of habitat is involved, it is predicted that the impacts upon breeding waders attributable to loss of habitat will be minimal.

7.57 Moreover, the peatland restoration proposed as part of the mitigation plans will create new areas of blanket bog, which in the medium term will provide additional nesting habitat or feeding areas for juvenile upland waders such as Golden Plover and Dunlin.

Evaluation of effects

Construction Phase

7.58 The construction period is expected to last for up to 30 months from commencement of construction site investigation.

7.59 During the construction period, disturbance levels within the site due to construction activity will result in temporary displacement of some ground nesting species within the main core of the wind farm during the breeding season. Those more susceptible to disturbance such as Golden Plover and Dunlin may not nest on site during the construction period. However, it was noted at the wind farm at Novar (Bioscan 2001) that Golden Plover was not breeding on the site prior to construction, but that a single pair held territory near turbines during construction, and in the year following construction, suggesting that this species is tolerant of some levels of construction disturbance.

7.60 Construction impacts would be restricted to the construction period lasting and would constitute a temporary displacement of some nesting species.

7.61 Monitoring of Golden Plovers at Ovenden Moor Wind Farm in Yorkshire, where numbers of breeding Golden Plover are similar to those at Farr, has shown that Golden Plover are tolerant of wind farms. At Ovenden, the number of breeding pairs of Golden Plover has increased in the years after construction (EAS 1997, Bullen Consultants 1999). Moreover, the studies have shown that there was no difference in distribution pattern in relation to the turbine positions and no evidence of any disturbance zone.

Operational Phase

7.62 The potential effects of the proposed wind farm upon birds because of disturbance or collision are considered for each species below.

Osprey

7.63 Ospreys flying through a wind farm area whilst carrying a heavy fish or being mobbed by other species are less manoeuvrable and therefore at risk from collision with turbine blades. Mobbing of intruders and early post fledging flights of juvenile birds would also place individuals at risk from collision with turbine blades.

7.64 However, this species was only recorded on three occasions with all records being well outside the 1km raptor study zone. Moreover, the species is not known to breed within 10km of the development site (HRSG 2002). Therefore, no impacts are expected for this species.

Golden Eagle

7.65 Two records of a juvenile bird suggest that the study area and wind farm site do not constitute important foraging ground for this species or that it lies within a core area. The HRSG and RSPB have confirmed that Golden Eagle is not known to breed within 10km of the wind farm site. Most records within this area tend to be of juvenile and sub-adult birds (RSPB) and this is supported by the fieldwork carried out in 2002.

7.66 Given the lack of foraging records for this species, and the lack of breeding records in the area, the wind farm site does not constitute an important foraging area for this species, and does not lie within the core range of a breeding pair of Golden Eagles (McGrady et al). Therefore, it is not expected that the development would have a significant effect upon this species through disturbance.

7.67 Concerning collision risks, studies in the US have shown problems with collisions involving Golden Eagles at the Altamont Wind Farm in California. The problems here were related to large numbers of birds passing through the wind farm area where there was a high density of turbines in sensitive parts of the site.

7.68 Moreover, this species' usual habitat of flying high over their foraging area reduces the risk of collision. Limited work elsewhere with other raptors has shown no collision problems (e.g. Tyler 1995) and upland sites have reported fewer collisions due to lower densities of birds. However some recent work has indicted that this species may be at risk from collision (Madders & Walker 2002).

7.69 Overall, it is considered that the collision risk for this species would be low.

Red Kite

7.70 This species was recorded on a number of occasions with most activity outside the core wind farm area and concentrated along the eastern boundary. Only a single flight was recorded in the eastern most part of the core wind farm area.

7.71 There is some limited information on Red Kite at existing wind farms including Bryn Tytli in Wales (Tyler 1995) where despite the presence of this potentially sensitive species (and Peregrine Falcon) no collisions have been reported. This supports other work, which indicates that raptors will forage in close proximity to wind turbines (Green 1995, Bioscan 2001) and that they are not particularly vulnerable to collision although again work in the US at Altamont wind farm showed that problems can occur in dense wind farm developments close to important migration and feeding areas (Percival 2000).

7.72 Nevertheless, Collision risk for Red Kite would be greatest close to nest sites where courtship behaviour, mobbing of intruders and post-fledging flights of juveniles could place birds at risk. Such activity would typically occur in close proximity to the nest site.

7.73 There is a well-known established population of Red Kites concentrated around the Black Isle (Inverness) where 93 birds of Swedish origin were released in 1989. The first successful breeding took place in 1992 with 32 pairs in 2000. Higher numbers of released birds have been recorded wandering from the core population of Scottish released birds compared with English releases, due to the greater genetic propensity in Swedish birds to wander away from their home range, compared with English birds originating from Spain (Carter 2001).

7.74 Winter and spring concentrations of birds within their first 2-3 calendar years prior to breeding are common within the range of breeding areas. There have been local reports (Personal communication A. Hodgson, local keeper) of such roosts within the Findhorn Valley in spring 2002. Records from the study area may relate to these wandering immature birds or prospecting/breeding birds from within the region.

7.75 Given that there are no known Red Kite nest sites within the 1km raptor study area and that HRSG and RSPB are not aware of any nest sites south of the Moray Firth and east of the Great Glen, it is

not expected that the development would have any significant impact upon this species, especially as only one flight path encroached slightly in the core area of the wind farm. Disturbance and collision risk would be low.

Hen Harrier

7.76 This species was recorded only once during the surveys conducted for this project and this was of probably the same adult female seen from Vantage Points 1 (NH 75148 28223) and 3 (NH 72490 28561) on 24 July 2002.

7.77 The bird flew through part of the core wind farm area before leaving in a south east direction where further flights were recorded on the boundary of the 1km raptor study area and where the bird was mobbed by two Kestrels. Given the lateness of this record it is probably as refers to post breeding season dispersion of adults.

7.78 Work completed elsewhere suggests that this species is not susceptible to collision with turbines (Green 1995, Tyler 1995, Bioscan 2001). Collision risk is generally though to be restricted mainly to certain activities such as display flights, mobbing of intruders and post-fledging flights of juveniles that occur close to (or within 500m) of the nest site (Madders 1996).

7.79 Given that there was no indication during the field survey that Hen Harrier were nesting within the 1km raptor study zone and there are no known records of regularly breeding birds within 10km of the wind farm (RSPB pers comm.) it is considered that the wind farm development would not have a significant impact upon this species. Moreover, given the lack of records, the wind farm does not appear to be an important foraging area.

7.80 Consequently, collision risk and disturbance would be very low.

Northern Goshawk

7.81 A single female was recorded in May. Historically this species has bred within 3km of the wind farm site and whilst the nest site remains, some clear felling has occurred nearby and it is suspected that the species is now nesting further away from the site and this would explain the lack of records for the site.

7.82 However, Goshawks become extremely secretive within the breeding season, with the majority of records of breeding evidence traditionally originating from mid March to May when displaying birds are most likely to be recorded. This single record probably relates to a local foraging breeding bird or a prospecting non-breeding bird.

7.83 Given the lack of records it would suggest that the wind farm area does not constitute an important foraging area for this species and therefore the impacts of the development are not likely to be significant.

7.84 Disturbance and collision risk would be low.

Peregrine Falcon

7.85 This species has not nested within the vicinity of the wind farm since 1999 (HRSG) and only a single male bird was recorded from Vantage Point 1 on 28 June 2002. Again, the lack of records for this species suggests that this likely to be non-breeding bird or that the wind farm site does not constitute an important foraging area for this species.

7.86 Elsewhere where Peregrine Falcons have been associated with wind farms no collisions have been recorded (Tyler 1995) and the species has been recorded feeding within the wind farm area.

7.87 Given the low level of site usage and the low incidence of collisions recorded in other studies the collision risk would be low. Moreover, at Bryn Tytli a pair of Peregrine Falcons nested successfully within 250m of a turbine (Philips 1994). Therefore, disturbance of the species is likely to be low.

Merlin

7.88 It is considered that only a single bird was recorded during the field survey on 23 July 2002 and it was considered that this was a hunting/migrating bird passing through the area post breeding.

7.89 There was no evidence of Merlin breeding within the 1km raptor study zone, although unlike many of the larger raptors, Merlin are known to breed within the wider area around the wind farm site.

7.90 However this species has been shown to be tolerant of disturbance at several wind farm sites and has been reported feeding within the Bryn Tytli wind farm (Philips 1994) and at Windy Standard (Hawker 1997). At Carno wind farm the species nested within the wind farm (Williams and Young 1997).

7.91 Given the species habit of hunting and flying at low level there is a reduced risk of collision and none has been reported at other sites (e.g. Tyler 1995 and Bioscan 2001).

7.92 Therefore, the risk of collision would be low and coupled with a low magnitude due to low levels of site usage the overall risk would also be low.

European Golden Plover

7.93 The Farr site supports a good population of Golden Plover within the core wind farm area and extending into the 1km raptor study area with an estimated of 11 pairs/territories noted during the 2002 surveys. 8 pairs/territories were within the core wind farm area. A survey in 2001 recorded 16 probable breeding birds in a larger survey area (14km^2).

7.94 Studies at Ovenden Moor wind farm have looked at how this species is affected by wind turbines. The work here has shown that the number of pairs of breeding Golden Plover have increased post construction of the wind farm whilst numbers at the control site have remained constant. Only a single collision was report at Ovenden during 2 years of collision monitoring (EAS 1997, Percival 2000).

7.95 The numbers of birds at Ovenden is similar to those at Farr, but the density of birds is greater. The Ovenden studies have also shown that there was no difference in distribution patterns of nesting birds in relation to the turbine positions and no evidence of any disturbance zone.

7.96 Given that the wind farm development has been amended to largely avoid areas where Golden Plover were recorded, the potential disturbance form the scheme would be considered low. Similarly, the collision risk would also be considered low.

7.97 A more detailed assessment is provided in the confidential ornithological report.

Dunlin

7.98 Dunlin was recorded in low numbers in broadly similar areas to Golden Plover and three pairs/territories were identified during the 2002 surveys. Two pairs were located within the core wind farm area and a third within the 500–1000m zone.

7.99 Studies on other wader species suggest that providing that the turbines in wind farms are sensibly located that they have little disturbance effects upon breeding waders as demonstrated by the work at Ovenden with Golden Plovers. At Näusudden in Sweden Percival (Percival 2000) noted a range of wader species nesting within 100m of turbines.

7.100 With 3 pairs/territories recorded within the approximately 11km^2 site the density of 0.3 pairs per km^2 is consistent with densities of 0.1–0.4 pairs per km^2 in upland UK (JNCC 1995 and Brown 1990).

7.101 Given the relatively low numbers of birds and their tolerance of wind turbines the disturbance and collision risk would be assessed to be low.

Mitigation

7.102 The proposed wind farm site does not contain any breeding Schedule 1 raptor species and does not lie within the breeding range of sensitive species. However, it is used by a moderate population of golden Plover and Dunlin and appropriate mitigation measure are required to minimise the impacts upon these species. Such measure would include the following:

- Maintenance of existing management regimes;

- Creation of new areas of blanket bog using appropriate restoration methods; and
- Soil stripping and vegetation removal for construction would take place outside the bird-nesting season, which is April to July inclusive.

7.103 Specific details of these proposals would be agreed in consultation with SNH and RSPB and a detailed habitat management plan prepared for the site.

Monitoring

7.104 A monitoring programme is proposed, which would most likely be over 3-5 years to provide further information on the distribution of breeding waders within the wind farm area and a zone up to 500m from the outermost turbines to assess the actual impacts of the proposed development. SNH and RSPB would be consulted on the detailed programme. Consideration would be given to monitoring of the control area surveyed by Ron Graham in the original ornithological study undertaken for this project to provide comparative data as has been done at Ovenden Moor, Yorkshire. Further detail is provided in the confidential ornithological report.

Significance of residual effects

7.105 A full assessment of the residual impacts is provided in the confidential ornithological report.

Construction Phase

7.106 During the construction phase, there will be some short-term displacement of breeding birds within the core wind farm area. It is recommended that soil stripping and vegetation removal be carried out in areas likely to be affected by construction work during the breeding bird season.

Operational Phase

7.107 During the operational phase, the overall impacts of the scheme would be low and would not be considered significant with respect to The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2000.

Chapter 8 Archaeological assessment

Introduction

8.1 The aim of the archaeological assessment was to establish the presence of recorded archaeological sites in the area of the proposed wind farm development, to prospect for further undiscovered archaeological remains and to propose appropriate mitigation measures to protect archaeological remains identified within the development area. An assessment of any residual effects has been made.

Site Context

8.2 The proposed development is located on an open area of heather moorland lying between Strathdearn and Strathnairn in Inverness-shire (see Figure 2). It lies to the east of the minor road linking Garbole with Farr and is divided at the watershed, which cuts across the survey area, between the parishes of Daviot and Dunlichity to the north and Moy and Dalarossie to the south. The topography of the site is generally undulating, with only very occasional rock outcrops. Between the summits are areas of deep peat. In the centre of the proposal area this has been heavily broken. The area is owned by a number of estates and is actively managed for sporting purposes. The south facing flanks of the hills, facing Strathdearn, have been extensively drained. The underlying geology consists of schist and gneiss, with a granite intrusion running in a north westerly direction from the south western boundary of the proposal area, across the area of the wind farm, towards Tomatin. This is overlain in the main by boulder clays, with peat on the higher ground, but there are also glacial sands and gravels and some moraine deposits on the river terraces between Inverarnie and Wester Lairgs, as well as along some of the major burns.

Site access

8.3 Initial site access will follow the line of an existing estate track, which runs from the Garbole Road at NH 7375 2555 in an approximately north then north westerly direction. When it reaches higher ground, it continues along the southern boundary of the proposal area, joining a path which is marked on the current OS map; the made track finishes close to the summit of Carn Odhar (NH 7254 2836).

8.4 The proposed northern access route, for transport of turbine components and both construction materials and vehicles, leaves the A9 at NH 7508 3470 (Figure 2). The route follows the line of General Wade's Military Road, before cutting upslope along a forestry ride until it meets the track from the north. The route continues through relatively young plantations, along a mixture of existing forest tracks and rides, across the north facing slopes above the farm of Wester Lairgs. It curves around the flank of Meall Mor, continuing to the south along the west facing slopes above the east bank of the river Nairn. At NH 6978 3118, a spur of the track follows the north bank of the Uisge Dubh upslope, continuing above the present tree line onto open ground. The proposed line cuts across the Uisge Dubh, finishing on the northern slopes of Cnoc na Saobhaidh (NH 7235 3070). Another stretch of track continues from NH 6978 3118 to the south, following the line of an extant forestry track, before passing through a young forestry plantation. It also finishes on open ground, where it meets a short stretch of existing track coming up from the Garbole Road, at the location of the site office (NH 7011 2985). The grid connection, from its starting point just to the south of the proposed site control building, curves up the southern bank of the Uisge Dubh and into the north western part of the wind farm area.

Aims and Objectives

8.5 The archaeological survey was intended to identify the presence or absence of archaeological features in the proposal area and assess the likely impact of the development upon them. The objectives of this study were as follows:

- to collate any known archaeological information on the proposal area;
- to identify any previously unknown archaeological sites through inspection of the aerial photographic record and the available cartographic and documentary evidence;

- to evaluate the archaeological significance of the area through field inspection;
- to assess the potential impact of development in this area and to suggest appropriate mitigation measures where these might be necessary.

Methodology

8.6 An initial desk-top study involved consultation of known archaeological sites, recorded in the National Monument Record for Scotland (NMRS), held by The Royal Commission on Ancient and Historical Monuments of Scotland (RCAHMS) in Edinburgh, and in the local Sites and Monument Record (SMR) for Highland, held by The Highland Council Archaeology Unit in Inverness. All the cartographic sources held by the National Map Library in Edinburgh were examined, as well as the maps on the National Library of Scotland's website. Particular emphasis was placed on the First and Second Edition Ordnance Survey maps, but maps dating from the late sixteenth century to the early twentieth century were also consulted (Appendix D). The vertical stereo aerial photographic record, also held by The Highland Council Archaeology Unit, was examined for any sites of potential archaeological interest which might be visible as soil or vegetation marks. Various series of photographs, taken between 1944 and 1950, were consulted, as these predated the large forestry plantations, which now surround the majority of the northern access route. A brief search was conducted of the material contained in The Highland Council Archives, while readily available secondary material for the area was also consulted.

8.7 A walkover survey was conducted of the proposed wind turbine locations, as well as the proposed site access tracks. This was conducted over a number of days, between May and July 2002. On every occasion, except when the northern access track was examined, the weather conditions were good, although generally dull. The area of the wind farm comprises well-maintained grouse moorland, providing ideal conditions for the identification of archaeological sites. In consequence, it was felt that a fairly accurate picture of the topography and any potential surface remains was obtained. All of the archaeological sites identified was described, photographed and plotted on the 1:10,000 map using a Garmin hand-held GPS, as appropriate and is illustrated on Figure 36.

Baseline conditions and historical context

8.8 Consultation of both the SMR and NMRS revealed no known archaeological sites within the proposal area, although a number of sites - ranging from prehistoric settlement and burial monuments to the traces of much more recent land use and settlement - flank both river valleys. However, the present survey has identified twenty nine sites of archaeological significance. Many of these represent relatively recent use of the proposal area and the following section is intended to provide a historical context in which the physical remains can be understood. Full details of the sites identified are provided in the site gazetteer (Appendix D).

8.9 The present appearance of much of the survey area has clearly been determined by the recent recreational use of the upland parts of the site for sporting purposes, as well as the planting of commercial forestry plantations on the lower slopes. The most obvious evidence for this is the grouse butts recorded on the current editions of the Ordnance Survey maps and clearly visible on the aerial photographs taken just after WWII. On the ground, further lines of butts were identified, most of which have been recently improved (Sites 001-5, 007, 042, 044, 046). Although the grouse butts are not apparent on the earlier editions of the OS maps, it is not clear whether this is simply because they were not recorded or because they were not present.

8.10 Kyllachy, the name of the estate which once incorporated the majority of Strathdearn from Tomatin to Coignafearn, apparently means *coile achaigh*, 'the place of moorcocks' (MacBain 1907, 82; the first element can perhaps be more accurately translated as 'wood'). Kyllachy - referring to Glenkyllachy Lodge, rather than the present Kyllachy House - is described as a shooting lodge in the later nineteenth century, like many of the small estates along both the Nairn and the Findhorn (Name Book, Book 5, 134). The number of red deer which lived around the source of the Findhorn is also stressed in the Old Statistical Account, as are the number of roes at Moy and it seems likely stalking was equally important to the economy of the area. The non-residence of the majority of the proprietors within the parish of Moy and Dalarossie is taken to account for the fact that there was little control over poaching, particularly of fish, by the local people (McLauchlan 1836, 108). Intriguingly, a number of wolf traps are described as still evident in 1836 and are even shown on the First edition map (1869-1871) just to the north of Moy, although the last wolf was meant to have been killed in

Strathnairn about 1700 (Cumming 1981, 507). It is probable that the hunting of wolves may have been more to protect the sheep and cattle than for recreational reasons.

8.11 During the survey, a number of hollowways were noted running up from the settlements in the river valleys onto the open hill (Sites 008, 030-1, 033-037). Some of these can be identified on the earlier editions of the OS maps, while others are still in use as estate tracks. While many of these clearly serve as access routes for shooting or stalking, others may be of earlier origin.

8.12 *Carn nam Bò-airigh* and *Allt na-h-Airigh-Samhraich*, immediately to the north east of the wind farm area, both incorporate the element *airigh*, meaning shieling. The same element is also present in *Carn Ruighe Bhric*, written as *Càrn na Breac-airidh* on the First edition map, to the north of the *Allt Neacrath*. In the same area, *Carn a'Bhothain Duibh*, may also suggest the presence of shieling bothies. Although they cannot now be precisely located, on Pont's map, compiled at the end of the sixteenth century, two names - the *Burn of Ry* and *Ry Straherin* - also seem to incorporate the element *airigh*. However, the sole direct evidence for probable shieling practices in the area is the faint remains of a small turf-built hut, which lies adjacent to a more recent sheepfold on the Uisge Dubh (Site 041). Other hollowways must have served as peat roads and there is evidence of recent peat cutting over the lower slopes leading up to the survey area. One of the complaints made by the minister in the Old Statistical Account for Daviot and Dunlichity is the time his parishioners spent in cutting, drying and carting peats to supply the town of Inverness with fuel; this not only took up most of their time in the summer months, to the detriment of their own crops and the progress of agriculture, but was beginning to result in a lack of peat for their own use (Gordon 1791-3, 76-7).

8.13 More major routes also pass through the survey area. The northern access route follows the line of General Wade's Military Road (Site 026), where it runs in parallel with the present A9, through the *Stairsneach nan Gaidheal*, 'the threshold of the Gael' (M'Bean 1791, 228). The historical importance of this narrow pass suggests that the eighteenth century road does follow the line of a much earlier route. In 1746, in the March before Culloden, Donald Fraser, a blacksmith in Moy and four other men, managed to foil an attempt by government soldiers to capture Prince Charles, then resident at Moy, by giving the impression that the whole of the Highland army was guarding the mouth of the pass; the consequent flight of Lord Loudon's forces is known as the Rout of Moy (Site 029). Along Wade's Road were a number of inns, including *Badachreamh* (Site 027; NH 7287 3495), shown as unroofed on the First edition, but which is described as a former inn (Name Book, Book 5, 148). Just outwith the survey area, Dalmagarry, to the south of Moy and now a farmhouse, was also a King's House or inn, one of a network spaced out at regular intervals of 16km (10 miles) or so along the military roads (Meldrum 1983, 30). There was also an inn at Moybeg, which may be slightly later in date as it is named as such on the OS First edition map. Wade's Road remained in frequent use as a bridle and foot path, although it was too broken up for use by carriages (Name Book, Book 5, 36), even after it was replaced by later parliamentary roads (on the line of the old A9) at the beginning of the nineteenth century. To the north of the survey area, it is apparent as a deep track and remains in use as a public footpath; to the south of this point, even where it has been upgraded as a forest track, it is possible that the original metalled surface of the road survives underneath the present one. A cart road linked the Military Road with the farm of Wester Lairgs and is shown on the First edition map, crossing the larger burns by means of fords (Name Book, Book 5, 148).

8.14 Many of the routeways which remain in use, such as the Garbole road linking Strathnairn and Strathdearn across what the earlier maps suggest must always have been open country, originated as droving routes. *Badachreamh* came into being as a droving inn in the eighteenth century and may be a further indication that the military road followed an earlier line (Meldrum 1983, 31-2). These routeways again highlight the importance of animals to the economy of the upland parts of the parishes of both Moy and Dalarossie and Daviot and Dunlichity. Cattle appear to have provided the monetary element of an essentially subsistence economy, money needed to pay the rent and buy in any necessities which could not be grown or made locally (M'Bean 1791, 231). Of the seven fairs held in the parishes of Moy and Dalarossie at the turn of the nineteenth century, five were cattle trysts held at Free, to the north west of Tomatin (McLauchlan 1836, 115). The young people of the parish spent most of their time either herding the cattle or driving them to the southern markets (ibid., 107). The importance of the large areas of open hill ground to maintain the cattle is indicated by the relative value of arable and pasture land; in Moy and Dalarossie parish, the latter was worth 15 shillings more per acre at least (M'Bean 1791, 236; McLauchlan 1836, 109-110). However, potential differences between the two parishes are indicated by the fact that, by the time the New Statistical Acount was compiled, there was no common land remaining in Daviot and Dunlichity, while a 'considerable part' of the hill pasture was still common in Moy and Dalarossie (McLauchlan 1836, 109; MacPhail nd.

520). There are also traces of the importance of cattle in earlier times; *Ciste Creag an Eoin*, just to the south of General Wade's Road, is recorded in the Name Book as the traditional hiding place of local families, left behind while their menfolk went cattle raiding (Book 5, 144).

8.15 By the early nineteenth century, sheep were beginning to take the place of cattle as the most important element in the economy. In the Old Statistical Accounts for both parishes, it is clear that the new improved breeds of sheep were already present, although the minister for Daviot and Dunlichity indicates that their introduction was too recent to enable an accurate assessment of their success to be made (Gordon 1791-3, 73; M'Bean 1791, 231, 235). Black cattle had diminished in number 'since the eager desire of sheep farming has become so general in the neighbouring parishes, and particularly in this [Daviot and Dunlichity]; there being, from that cause, no way of pasturing them in the glens, in summer, as usual' (Gordon 1791-3, 74). The ever increasing need for grazing meant that of the 93,180 acres of waste, including hill pasture, in Moy and Dalarossie parish, there was 'little which could profitably be made arable, since sheep pay so well; and probably not more than 1300 acres are improvable with advantage' (McLauchlan 1836, 109). Within the survey area, there was again little direct evidence to indicate the influence of sheep in the nineteenth century; in addition to the sheepfold on the Uisge Dubh (Site 041), on the site of an earlier group of shieling huts, there is another, on much lower ground, just to the south of the farmstead of Lynroich (Site 040). This is shown on the First edition, but not the Second edition map, and was not located on the ground. The expansion of sheep was - at least to some extent - at the expense of the human, as well as the cattle, population of these areas:

8.16 'There have not been many new houses built for these several years; but of late some parts of the parish, which contained a great number of inhabitants, have been laid out in sheep farms, which has diminished the population very considerably; and if this sheep farming plan shall be extended here, as is proposed, it is thought it will occasion a still further diminution of the population' (M'Bean 1791, 235).

8.17 This may explain the abandonment of Lynroich, the only farmstead which lies within the survey area (Site 039). Although its layout around a courtyard suggests a degree of improvement, the Name Book describes the farmstead as in 'indifferent repair', suggesting that it was in decline by 1870 (Name Book, Book 13, 34); this is confirmed by the Second edition map on which only the surrounding enclosure is shown, suggesting that it had not long survived the compilation of the earlier map. The apparent date of this abandonment may in fact indicate the increased value of former hill pasture as habitat for deer and grouse in the latter half of the nineteenth century, which served to compound the already diminishing importance of sheep.

8.18 As the hut circles and clearance cairns extending along the south facing flanks of Creag Morile, Tom na Moine and Carn na Seanalaich indicate, settlement has probably always been confined to the lower slopes of the hills and along the main river valleys. The presence of a possible motte controlling the junction of the Garbole Road with Strathdearn suggests that this route may be of considerable antiquity (Meldrum 1983, 31; this is probably the *Castle Mattoch* recorded as NMRS/SMR no. NH72SW2, NH 748 247, although its NGR is different to that given by Meldrum). The name of the parish of Dalarossie derives from the 'dale of Fergus' (MacDougall 1895, 50), the saint to whom the parish church is dedicated and it, along with the other three churches within the now united parishes, seems to have early medieval origins. In the medieval period, the entirety of Strathnairn and Strathdearn belonged to the Bishop of Moray (M'Bean 1791, 228); the majority of the present settlement names - including *Kellachy, Moryll, Innernarn* (Inverarnie) and *Larg*, the latter now Wester and Mid Lairgs - first appear in a rental of 1456, when they are described as part of the Lordships of Stratherne and Strathnarne (Innes 1859, 22-3). This would seem to indicate that the present settlement pattern was already well established by this date, each of these names representing a small estate, many of which are still present in the documentary record in the nineteenth century. These areas are the homeland of the Clan Chattan, of whom Mackintosh of Moy was the chief; the Mackintosh family seem to have acquired lands in the area in 1336, first occupying the larger island in Loch Moy, before moving to the more comfortable Moy Hall in the post-medieval period (Shaw 1775, Vol. II, 198; M'Bean 1791, 229). The lands of Kyllachy were acquired by the Mackintoshes in 1616; the first Mackintosh to style himself of Kyllachy appears in a document of 1624 (Fraser-Mackintosh 1895, 99). Lairgs and half of Inverarnie were occupied by Macgillivrays (Fraser-Mackintosh 1898, 10; Macpherson 1977, 236), the other half of Inverarnie was held by MacPhails (Shaw 1775, Vol. II, 309; Cumming 1981, 516), while there were MacBeans at Tomatin (Fraser-Mackintosh 1898, 30, 49-51), and the Mackintoshes of Farr were descended from the Mackintoshes

of Kyllachy (Fraser-Mackintosh 1913, 92). The majority of these original families have not survived the economic upheavals of the eighteenth and nineteenth centuries.

Archaeological Sites and their Significance

8.19 The archaeology of the proposed wind farm area is classified according to its perceived archaeological significance in relation to the National Planning Policy Guidelines for Scotland and to the Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2000.

8.20 The Planning Advice Note, PAN 42, states that important archaeological remains are preferably to be preserved *in situ* (1994, 7). If this is not possible then preservation by record is the preferred option. The National Planning Policy Guideline, NPPG5, assigns three categories of importance to archaeological sites:

A. Sites of national importance;
B. Sites of regional importance; and
C. Sites of local importance.

8.21 For the purposes of this assessment, the three categories described above are the equivalent of High, Medium or Low in terms of their *sensitivity* value (see below).

Table 8.1 : Archaeological sites within the Farr wind farm area and their sensitivity categories

Table 8.1a : Sites within the wind farm area

Site Identifier	Name	Nature	NGR	Category
001	Carn na Sguabaig	Grouse butts	NH 72466 29085 - NH 72789 29130	C
002	Carn Dubh	Grouse butts	NH 74010 28933 - NH 73657 28781	C
003	Carn Dubh	Grouse butts	NH 73721 28314 - NH 73747 28648	C
004	Carn Odhar	Grouse butts	NH 72872 27702 - NH 72789 27254	C
005	Carn Odhar	Grouse butts	NH 72970 27707 - NH 72933 27401	C
006	Carn Odhar	Bothy	NH 72800 27700	C
007	Beinn Bhreac	Grouse butts	NH 74857 27252 - NH 74467 27015	C
008	Glenkyllachy	Hollowway	NH 7174 3037 - NH 7231 2631	C

Table 8.1b : Sites along northern access route

Site Identifier	Name	Nature	NGR	Category
026	General Wade's Military Road	Road	NH 7989 2783	A
027	Badachreamh	Inn; farmstead	NH 7287 3495	B
028	Uaigh an Duine-bheo	?Grave; cairn	NH 7272 3482	B
029	Rout of Moy	Battle site	centred NH 7298 3464	B
030	Creagan Bad Each	Hollowway	NH 77506 26642	C
031	Allt na Fuar-ghlaic	Hollowway	NH 7219 3460 approx.	C
032	Allt na Fuar-ghlaic	Farmstead	NH 7133 3445	C
033	Allt na Fuar-ghlaic	?Hollowway	NH 7112 3433	C
034	Allt na Fuar-ghlaic	?Hollowway	NH 7091 3432	C
035	Allt na Lairge	Hollowway; mill lade	NH 7054 3426	C
036	Blàr Bhuidhe	?Hollowway	NH 6906 3327 approx.	C
037	Allt a Chreagain	Hollowway	NH 6923 3197	C
038	Allt an Loin Eorna	Building	NH 698 312 approx.	
039	Lynroich	Farmstead	NH 69952 30494	C
040	Lynroich	Sheepfold; building	NH 6999 3023 approx.	C
041	Uisge Dubh	Sheepfold; shieling hut	NH 72093 31515	C
042	Carn Dearg	Grouse butts	NH 70389 30424 - NH 70760 30349	C
043	Carn Dearg	Marker cairn	NH 71214 30219	C

Table 8.1c : Sites along southern access route

Site Identifier	Name	Nature	NGR	Category
044	Carn Eitidh	Grouse butts	NH 73514 26184 - NH 73658 26749	C
045	Carn Eitidh	Grouse butts	NH 73855 26509 - NH 74171 26606	C
046	Caochan Dubh	Grouse butts	NH 74466 27015 - NH 74856 27252	C

Effects of the Proposal

8.22 The effects of the proposed wind farm on the archaeological resource has been assessed using standardised terminology.

8.23 In judging the impact of each issue, the *sensitivity* of the environmental interest affected should be determined. This can be defined as the importance of the individual feature being assessed and is defined as High, Medium or Low.

8.24 Possible impacts on the archaeological resource can be either:

- **Direct impact**: Physical damage to buildings, sites or remains (partial or total removal), including the severance of linear features.
- **Indirect impact**: Visual intrusion on buildings, sites or features affecting their setting. Other indirect impacts, for example those caused by disturbance from vibration, dewatering or changes in hydrology.

8.25 Impacts normally occur at the construction stage, during groundworks, such as topsoil stripping and/or excavation of foundations. Associated activities, such as the movement of plant, the excavation of borrow pits and soil storage, may also have an impact on the archaeological resource. Due to the nature of the proposed development and the finite nature of the resource, the direct impacts will be permanent and irreversible. Indirect impacts such as visual intrusion may only temporary (that is, during the construction phase), but could also be permanent (for example, impacts caused by changes in hydrology).

8.26 The significance of impacts on features of archaeological interest will depend on several factors. These will include the proportion of the site or feature affected, the integrity of the site or feature, dependent on whether it has been damaged in any way prior to the proposed development and the nature, potential and perceived heritage value of the site or feature affected.

8.27 The magnitude of the impact also required assessment and was determined in accordance with the following criteria:

High - total loss or major alteration to key elements or features of the pre-development conditions, such that its post-development character or composition would be fundamentally changed.

Medium - loss or alteration of one of the key elements or features of the pre-development conditions such that its post-development character would be partially changed.

Low - minor shift away from pre-development conditions. Changes arising from the loss or alteration would be discernible, but the underlying character, composition or attributes of its pre-development condition would be similar to pre-development circumstances and patterns.

Negligible - very slight damage from pre-development condition. Change barely distinguishable, approximating to the 'no change' situation.

8.28 The direct effects which individual turbines and ancillary services would have on the archaeological resource of the Farr proposal area is given in Table 8.2 below. This has been assessed on the basis of the proposed site layout as described within this ES. If subsequent changes to this plan mean that more archaeologically sensitive areas are forced to undergo ground disturbance, any groundworks necessary in this construction work may need to be subject to an archaeological watching brief. This should be maintained by an appropriately qualified field archaeologist and time and resources should be dedicated to the elucidation of any archaeological remains exposed during such works.

Table 8.2 : Direct Effects of the proposal on the archaeological resource

Table 8.2a : Sites within the windfarm area

Site Identifier	Nature	NGR	Category	Effect
001	Grouse butts	NH 72466 29085 - NH 72789 29130	C	Negligible effect
002	Grouse butts	NH 74010 28933 - NH 73657 28781	C	Negligible effect
003	Grouse butts	NH 73721 28314 - NH 73747 28648	C	Negligible effect
004	Grouse butts	NH 72872 27702 - NH 72789 27254	C	Negligible effect
005	Grouse butts	NH 72970 27707 - NH 72933 27401	C	Negligible effect
006	Bothy	NH 72800 27700	C	Negligible effect
007	Grouse butts	NH 74857 27252 - NH 74467 27015	C	Negligible effect
008	Hollowway	NH 7174 3037 - NH 7231 2631	C	Low effect

Table 8.2b : Sites along northern access route

Site Identifier	Nature	NGR	Category	Effect
026	Road	NH 7989 2783	A	*Medium effect*
027	Inn; farmstead	NH 7287 3495	B	Negligible effect
028	?Grave; cairn	NH 7272 3482	B	Low effect
029	Battle site	centred NH 7298 3464	B	*Medium effect*
030	Hollowway	NH 77506 26642	C	Low effect
031	Hollowway	NH 7219 3460 approx.	C	Negligible effect
032	Farmstead	NH 7133 3445	C	Negligible effect
033	?Hollowway	NH 7112 3433	C	Negligible effect
034	?Hollowway	NH 7091 3432	C	Negligible effect
035	Hollowway; mill lade	NH 7054 3426	C	Low effect
036	?Hollowway	NH 6906 3327 approx.	C	Negligible effect
037	Hollowway	NH 6923 3197	C	Negligible effect
038	Building	NH 698 312 approx.		Negligible effect
039	Farmstead	NH 69952 30494	C	Low effect
040	Sheepfold; building	NH 6999 3023 approx.	C	Negligible effect
041	Sheepfold; shieling hut	NH 72093 31515	C	Negligible effect
042	Grouse butts	NH 70389 30424 - NH 70760 30349	C	Negligible effect
043	Marker cairn	NH 71214 30219	C	Negligible effect

Table 8.2c : Sites along southern access route

Site Identifier	Nature	NGR	Category	Effect
044	Grouse butts	NH 73514 26184 - NH 73658 26749	C	Negligible effect
045	Grouse butts	NH 73855 26509 - NH 74171 26606	C	Negligible effect
046	Grouse butts	NH 74466 27015 - NH 74856 27252	C	Negligible effect

8.29 The indirect or potential effects on the archaeological resource are detailed in Table 8.3 below. Particular emphasis has been placed on possible disturbance during the construction phase of the

wind farm and visual intrusion into the setting of a nationally or regionally important monument or groups of monuments when the wind farm is in operation.

Table 8.3 : Indirect or potential effects of the proposal on the archaeological resource

Table 8.3a : Sites within the windfarm area

Site Identifier	Nature	NGR	Category	Effect
001	Grouse butts	NH 72466 29085 - NH 72789 29130	C	High visual effect/potential ground disturbance during construction work
002	Grouse butts	NH 74010 28933 - NH 73657 28781	C	High visual effect/potential ground disturbance during construction work
003	Grouse butts	NH 73721 28314 - NH 73747 28648	C	High visual effect/potential ground disturbance during construction work
004	Grouse butts	NH 72872 27702 - NH 72789 27254	C	High visual effect
005	Grouse butts	NH 72970 27707 - NH 72933 27401	C	High visual effect
006	Bothy	NH 72800 27700	C	High visual effect
007	Grouse butts	NH 74857 27252 - NH 74467 27015	C	High visual effect
008	Hollowway	NH 7174 3037 - NH 7231 2631	C	High visual effect/potential ground disturbance during construction work

Table 8.3b : Sites along northern access route

Site Identifier	Nature	NGR	Category	Effect
026	Road	NH 7989 2783	A	High visual effect/ground disturbance due to access road
027	Inn; farmstead	NH 7287 3495	B	Low visual effect
028	?Grave; cairn	NH 7272 3482	B	Low visual effect
029	Battle site	centred NH 7298 3464	B	High visual effect/probable ground disturbance due to access road
030	Hollowway	NH 77506 26642	C	High visual effect/ground disturbance due to construction of access road
031	Hollowway	NH 7219 3460 approx.	C	High visual effect/potential ground disturbance due to access road
032	Farmstead	NH 7133 3445	C	Low visual effect
033	?Hollowway	NH 7112 3433	C	High visual effect/potential ground disturbance due to access road
034	?Hollowway	NH 7091 3432	C	High visual effect/potential ground disturbance due to access road
035	Hollowway; mill lade	NH 7054 3426	C	High visual effect/potential ground disturbance due to access road
036	?Hollowway	NH 6906 3327 approx.	C	High visual effect/potential ground disturbance due to access road
037	Hollowway	NH 6923 3197	C	High visual effect/potential ground disturbance due to access road
038	Building	NH 698 312 approx.		High visual effect/potential ground disturbance due to access road
039	Farmstead	NH 69952 30494	C	High visual effect/potential ground disturbance due to access road
040	Sheepfold; building	NH 6999 3023 approx.	C	Low visual effect
041	Sheepfold; shieling hut	NH 72093 31515	C	Low visual effect
042	Grouse butts	NH 70389 30424 - NH 70760 30349	C	Low visual effect
043	Marker cairn	NH 71214 30219	C	Low visual effect

Table 8.3c : Sites along southern access route

Site Identifier	Nature	NGR	Category	Effect
044	Grouse butts	NH 73514 26184 - NH 73658 26749	C	Low visual effect
045	Grouse butts	NH 73855 26509 - NH 74171 26606	C	Low visual effect
046	Grouse butts	NH 74466 27015 - NH 74856 27252	C	Low visual effect

8.30 The significance of the direct and indirect or potential effects identified in this study and detailed in Table 8.4. The assigned significance is related to the perceived importance of the archaeology involved, and is intended as a guide in the assessment of the impact of the proposed wind farm.

Table 8.4 : Significance of the direct, indirect and potential effects of the proposal on the archaeological resource

Table 8.4a : Sites within the windfarm area

Site Identifier	Nature	NGR	Category	Significance (Nature of Effect)
001	Grouse butts	NH 72466 29085 - NH 72789 29130	C	Low significance (indirect and possibly direct)
002	Grouse butts	NH 74010 28933 - NH 73657 28781	C	Low significance (indirect and possibly direct)
003	Grouse butts	NH 73721 28314 - NH 73747 28648	C	Low significance (indirect and possibly direct)
004	Grouse butts	NH 72872 27702 - NH 72789 27254	C	Low significance (indirect)
005	Grouse butts	NH 72970 27707 - NH 72933 27401	C	Low significance (indirect)
006	Bothy	NH 72800 27700	C	Low significance (indirect)
007	Grouse butts	NH 74857 27252 - NH 74467 27015	C	Low significance (indirect)
008	Hollowway	NH 7174 3037 - NH 7231 2631	C	Low significance (indirect and probably direct)

Table 8.4b : Sites along northern access route

Site Identifier	Nature	NGR	Category	Significance (Nature of Effect)
026	Road	NH 7989 2783	A	*High significance (direct)*
027	Inn; farmstead	NH 7287 3495	B	Low significance (indirect)
028	?Grave; cairn	NH 7272 3482	B	Medium significance (indirect)
029	Battle site	centred NH 7298 3464	B	Medium significance (direct)
030	Hollowway	NH 77506 26642	C	Low significance (indirect and direct)
031	Hollowway	NH 7219 3460 approx.	C	Low significance (indirect and possibly direct)
032	Farmstead	NH 7133 3445	C	Low significance (indirect)
033	?Hollowway	NH 7112 3433	C	Low significance (indirect and direct)
034	?Hollowway	NH 7091 3432	C	Low significance (indirect and direct)
035	Hollowway; mill lade	NH 7054 3426	C	Low significance (indirect and direct)
036	?Hollowway	NH 6906 3327 approx.	C	Low significance (indirect and possibly direct)

037	Hollowway	NH 6923 3197	C	Low significance (indirect and direct)
038	Building	NH 698 312 approx.		Low significance (indirect and possibly direct)
039	Farmstead	NH 69952 30494	C	Medium significance (indirect and possibly direct)
040	Sheepfold; building	NH 6999 3023 approx.	C	Low significance (indirect)
041	Sheepfold; shieling hut	NH 72093 31515	C	Low significance (indirect)
042	Grouse butts	NH 70389 30424 - NH 70760 30349	C	Low significance (indirect)
043	Marker cairn	NH 71214 30219	C	Low significance (indirect)

Table 8.4c : Sites along southern access route

Site Identifier	Nature	NGR	Category	Significance (Nature of Effect)
044	Grouse butts	NH 73514 26184 - NH 73658 26749	C	Low significance (indirect)
045	Grouse butts	NH 73855 26509 - NH 74171 26606	C	Low significance (indirect)
046	Grouse butts	NH 74466 27015 - NH 74856 27252	C	Low significance (indirect)

Proposed Mitigation Measures and Recommendations

8.31 On the basis of the assessment of the significance of the individual elements of the archaeological resource and the potential impact of the proposed wind farm development, a range of mitigation measures are proposed. Mitigation measures which refer to specific archaeological sites are dealt with in more detail in the site gazetteer in Appendix D, but the more important issues are discussed below. In addition, a series of general recommendations relating to the proposal areas in general or to particular areas within them which may have archaeological potential are given here.

8.32 All the archaeological sites within the area of the wind farm will be subject to a high degree of visual impact. None of these sites are individually or collectively of enough archaeological significance in their local and regional context for this visual impact to be a concern.

8.33 Any groundworks necessary to improve the site access route along the stretch of General Wade's Military Road should be subject to an archaeological watching brief. This should be maintained by an appropriately qualified field archaeologist and time and resources should be dedicated to the elucidation of any archaeological remains exposed during such works.

8.34 If any of the recorded archaeological sites were to be affected by changes to the siting of access roads and other ancillary services associated with the wind farm proposal, their location would have to be taken into account. In all cases where the location of any of the works associated with the development would pass close to an area of identifiable archaeological activity, a 20m exclusion zone should be placed around the periphery of the site. These exclusion zones should be marked out on the ground by unique and readily visible means prior to the commencement of any works. In the case of Lynroich farmstead (Site 039), such exclusion zones will be unworkable as the existing access track, which is to be upgraded, passes very close to the site. Therefore, great care should be taken not to damage the still intact monuments and contractors working on the implementation of the scheme should be made aware of the identified sites and the potential for the discovery of additional features or finds within the topsoil. Any discoveries should be notified immediately to The Highland Council Archaeology Unit.

8.35 A similar procedure should be followed when each of the hollowways (Sites 008, 030-1, 033-037) which cross the line of the access routes, are encountered. Similarly, the possible building (Site 038) must also be taken into account, although it cannot be accurately located. Care should be taken to minimise disturbance in these areas, but none of the sites are considered to be of enough importance to be recorded archaeologically prior to work being undertaken in these areas.

8.36 Large areas of the proposed development area are devoid of 'visible' archaeological remains. While this may indicate a lack of past human activity in these areas, it must be stressed that the presence of blanket peat across the higher parts of the area makes it very difficult to be certain that there are no sub-surface remains present. If any archaeological features are discovered during groundworks, they would have to subject to an archaeological watching brief. It is, however, felt that the area of the wind farm lies above the potential zone for the discovery of any prehistoric settlement and that later use of the uplands will have been on a seasonal basis, which is likely to have left little recoverable trace in the archaeological record. It is doubtful, therefore, that any substantial archaeological remains will have been buried by the peat, rendering unnecessary archaeological supervision of groundworks during the construction work for the proposed wind farm. However, it seems possible that significant environmental deposits would be disturbed by groundworks associated with the development. Since areas of deep peat could contain a considerable amount of data (such as pollen) which would help elucidate the past land use of the area, some degree of protection or examination of any such deposits encountered may prove necessary and should be taken into account during the planning of the proposed development.

8.37 In order to minimise the potential for damage to the archaeological resource outside the immediate area of the wind turbines, construction sites and access roads, activity during the development of the wind farm should be restricted to the line of the site roads and to the immediate locations of the turbines and construction areas. Any other groundworks which are necessary in the construction work should be sited so that they do not have a direct impact on the identified archaeological resource.

Significance of Residual Effects

8.38 The development of the proposal area could lead to the excavation of currently unknown archaeological sites. The residual impacts of construction could include changes in drainage levels or possible damage to sites within the wind farm area through vibration. It is considered that these effects are negligible in all cases.

Assessment of Operational Impacts

8.39 There will be no threat to the archaeological resource during the operational phase of the wind farm. Although the access track will pass close to a number of sites, it is believed that operational traffic is unlikely to cause damage to these sites through vibration, even over a number of years.

Conclusions

8.40 The potential impacts of construction on known archaeological sites are limited, largely due to the general absence of sites within the area and the limited significance of those that are present. Apart from the sites along General Wade's Military Road, there are no archaeological sites of more than local significance within the area of the wind farm or along the possible access roads. A reasonable impression was gained of the surviving structural remains, though an equivalent impression of much of the area along the northern access road was not possible because of the age of the surrounding conifer plantations.

8.41 However, since development in this area largely involves the upgrading of an existing track or ride within the forestry plantation, the potential for recovering further traces of more ephemeral features, particularly evidence for past cultivation practices, is probably not a concern in this case. Given the comparative importance of sites 026, 028 and 029 within a local and regional context, any upgrading of this access route should be subject to an archaeological watching brief where this could affect potentially undisturbed archaeological remains.

8.42 The probability of sub-surface deposits, masked by the overlying blanket peat, makes it hard to assess the potential significance of the extant archaeological remains and is of some concern in assessing the archaeological impact of this proposal. On balance it is felt that, although these upland areas have been utilised fairly intensively over many hundreds of years, it is unlikely that traces of these activities will be easily recovered archaeologically. The possibility of carrying out a programme of environmental sampling should be considered.

8.43 The predicted impacts of the proposed wind farm development on known archaeological sites is not considered to be of high significance, apart from potential effects on the alignment of General Wade's Military Road. In this area, an archaeological watching brief would be maintained on construction stage operations and it is considered that within the 100m wide corridor included in the application for the 6m wide access track, it should be possible to avoid any direct effects on the site.

Chapter 9 Hydrology

Geology

9.1 Details of the geology of the proposed wind farm site and surrounding area have been obtained from Geological Map for Scotland No. 74 (Reference 1).

Drift Geology

9.2 The geological map shows most of the application site (shown on figure 2) to be covered in peat. A survey of the vegetation which comments on the peat was undertaken in 1996 (Reference 2). The report shows that the peat covers the whole site with the exception of the extreme tops of the hills. The peat was reported to generally be between 0.5 and 1.5 m thick but was over 2.5 m thick in the basins between the peaks. Two small areas of Boulder Clay and Undifferentiated Drift are shown on the geology map just to the north west and south of Carn Dubh.

9.3 The Soil Survey Map of Scotland (Reference 3) shows the site to be situated on blanket peat. The accompanying text describes this material as shallow peat and deep peat in varying proportions with the deep peat forming on the level and more gently sloping ground and shallow peat on the steeper slopes.

Solid Geology

9.4 The geology map shows that the solid geology of the site consists of Pre-Cambrian Pelictic Gneiss and Schist in the west and Undifferentiated Gneiss and Schist in the east. These are metamorphosed shales and sandstones and are of substantial thickness.

Hydrology

9.5 A survey of the hydrological status of the site is necessary to assess potential impacts and identify the baseline conditions against which any changes that may occur as a consequence of the development may be assessed. A desk study of the hydrology has been undertaken with information obtained from published sources and the Scottish Environmental Protection Agency (SEPA).

Surface water catchments and flows

9.6 The surface water features at the site are typical of the Highlands of Scotland with many small, relatively steep streams leaving the site (Photos 1 to 3 in Appendix E). Within the site itself there is approximately 5.5 km of stream as shown on Figure 37. No lochs or other surface water bodies have been identified on the site itself. It has been reported that there is no artificial drainage within the site (for example surface water ditches or land drains).

9.7 The site sheds water to two major rivers; the River Nairn to the north of the site and River Findhorn to the south and east of the site. Approximately 80% of the proposed development area (6.14 km^2) sheds its water to the North to the River Nairn with the remainder (1.53 km^2) discharging to the River Findhorn (Figure 37). Both rivers flow to the north west to discharge to the Moray Firth. Flows are gauged on the River Findhorn at Shenachie (NGR NH 826 337) and the River Nairn at Balnafoich (NGR 686 352, Figure 37).

9.8 The total catchment for the Nairn at Balnafoich is reported to be 128.1 km^2 (Reference 4). The area of the wind farm that discharges to the Nairn makes up approximately 4.8% of the total catchment for the Nairn at Balnafoich.

9.9 The total area of catchment for the River Findhorn at Shenacie is reported to be 415 km^2 (Reference 4). The catchment area of the works therefore only cover approximately 0.4% of the total catchment for the Findhorn at Shenachie.

9.10 The river flow data indicate that the River Findhorn is very "flashy" (i.e. it is liable to extremely rapid rises in level following rainfall) and there is minimal surface storage. The catchment of the River Findhorn is described as totally natural (i.e there are no sewage works or other discharges into it, or impounding reservoirs controlling the flow). The highest average daily flow recorded at Shenachie

was 270 m^3/day on the 17th December 1966 and the lowest average daily flow recorded was 1.078 m^3/day on the 27th August 1984.

9.11 Fewer details of the River Nairn are provided by SEPA as the gauging station is not one of their major gauging stations. The data received for the Nairn indicate similar flow characteristics as the Findhorn with a flashy nature. Peak average daily flow in the river was recorded at 106 m^3/day on 8th November 2002 following 103 mm of rainfall at Freeburn on the 7th and 8th of November. The lowest average flow recorded was 0.097 m^3/day on 2nd October 2000.

Meteorological data

Table 9.1 : Annual precipitation measured at two rain gauges within 5km of the site (Figure 2)

Location	Monitoring period	Minimum rainfall (mm/year) and year	Maximum rainfall (mm/year) and year	Mean over monitoring period (mm/year)
Freeburn (NH 795301)	1994 - 2001	597 (1994)	1042 (2000)	844
Flichity (NH 663289)	1994 - 2001	686 (1996)	1171 (1999)	978

9.12 The mean annual rainfall for the Findhorn catchment at Shenachie as measured for the period 1960 to 1995 is higher than the values reported for the rainguages at 1263 mm (Reference 5). The estimated runoff for the period is 1040 mm/year (Reference 5). The runoff is the equivalent depth of rain that runs into surface waters. The remaining rainfall (in this case 223 mm/year) provides a guide to annual average evaporative losses.

Surface water abstractions

9.13 Under the current SEPA regime surface water abstractions are not licensed and details of all surface water abstractions are not known. The local authority (The Highland Council) has also been approached to see if they maintain a register of abstractions, but they do not. However, The Highland Council has indicated that most, if not all, properties in the area are anticipated to be on mains water supply. The only known surface water abstraction is the distillery at Tomatin to the east of the site (NGR NH 790 295). The distillery abstracts water from the Alt-na-Frithe and the water is used in washing and processing and in the mash which makes up the final product. None of the site area sheds water to the Alt-na-Frithe.

9.14 The distillery has been approached to obtain any flow or quality data they have but none are available (flows are not metered). The distillery has indicated though that flows in the stream are very variable. In the winter flows are high and debris and silts can be a problem. In the summer (usually from the middle of June) production usually ceases for a period of approximately three months. Part of the reason for this stop is that flows in the Alt-na-Frithe are too low to obtain sufficient water.

9.15 It is understood that a redundant water abstraction point lies to the west of the site, but its status is not known.

Groundwater

9.16 The hydrogeological map for Scotland (Reference 6) shows that the site is situated on a rock type that is considered to be a region without significant groundwater flow. The map indicates that the crystalline Precambrian rocks offer little potential for groundwater storage and transport other than in cracks and joints that may be associated with tectonic features or surface weathering. Where these fractures are present, the groundwater emanating form springs are generally weakly mineralised.

9.17 The Groundwater Vulnerability Map for Scotland (Reference 7) shows the site to be situated on "weakly permeable" strata. These are formations of generally low permeability that do not widely contain groundwater in exploitable quantities. However, some formations can locally yield water supplies in sufficient quantities for private/domestic use.

9.18 Similar to the surface water abstractions, SEPA or the local authority do not maintain records of groundwater abstractions. No groundwater abstractions have been identified in the vicinity of the site.

9.19 As the site is underlain by the non-aquifer and there is little groundwater storage in the underlying solid strata the risk of site development affecting groundwater and groundwater receptors is considered to be very low. Shallow groundwater in the peat horizons will locally feed surface waters and therefore the effects that the development would have on this shallow groundwater are considered in the following section.

Potential effects of development on surface waters and proposed mitigation measures

9.20 The development of the area as a wind farm has the potential to impact on surface water during:

- construction of the site;
- use of the site; and
- decommissioning and restoration of the site.

Potential Effects During Construction

9.21 An outline of the proposed method for construction is provided in Chapter 3. It is considered that the greatest potential to affect water courses is during the construction phase of the development and the following activities could all impact on water courses if the appropriate mitigation measures are not taken:

- construction of roads within the site;
- construction of access road to the site and/or widening of existing roads;
- construction of bases for the wind turbines;
- construction of the electricity sub-station;
- laying of cables;
- construction and use of a temporary site storage compound; and
- excavation of borrow pits for road stone.

9.22 Construction of roads on the site and turbine bases could potentially cause some localised modification of the hydrological flow paths and hence cause changes to the soil moisture regime in these areas. The proposed site covers an area of approximately 7.67km^2. If it is assumed that there are 18 km of road 6 m wide on the site and up to 45 turbines each with a base of 17 x 17 m then the area of ground to be covered by the wind farm will be approximately 121,000 m^2. The developed area therefore covers an area of only approximately 2.85 % of the whole site and it is likely that given the relatively small area of construction such effects on local flow paths will be extremely limited as the overall water balance for the site would not be significantly affected.

9.23 Without adequate consideration of drainage, construction of access roads could cause more significant disruption to flow paths by intercepting streams and ditches. Culverts of an appropriate size will be installed where roads cross streams and ditches. Cross drains would be constructed beneath the roads to ensure water movement down the slopes. These would be constructed at intervals of not less than 30 m. In order to minimise site disturbance, cable runs will run alongside the roads where practical. The proposed construction methods for cable runs are described in Chapter 3.

9.24 Track construction would use best practise methods developed at other wind farm sites and attention would be given in particular to track construction methods used at Novar and Bheinn Ghlas wind farms. A detailed construction method statement would be submitted prior to construction.

9.25 Where site construction operations are undertaken adjacent to surface water courses it is possible that the works could cause a short-term increase in export of both suspended solids and dissolved solids, further increasing the conductivity of the waters draining from the site. There may also be an increase in the amount of surface runoff. This will have the greatest impact on the small streams which leave the site and feed the Nairn and Findhorn as dilution within the larger rivers will be high.

9.26 The site construction compound location is shown on Figure 3, and covers an area of approximately 100 x 100 m. The storage compound will hold plant and equipment used in the construction of the site and will be the refuelling point for all machinery used on site. Oil and fuel contamination are therefore potential pollutants from this area.

9.27 If contamination of surface waters does occur then it could potentially impact on surface waters abstractions (although the only identified abstraction at the Tomatin distillery is outside of the works area) or flora and fauna in the rivers and streams. The Tomatin Distillery does filter water it uses and does periodically have problems with silt and debris in the water during times of high winter rainfall. Fish spawning would be a particularly sensitive receptor. Trout spawning occurs from September to January and salmon from October to January with a peak in November and fry emerge from gravel beds usually in early May (Reference 8).

Proposed Mitigation Measures During Construction

General

9.28 There are a number of mitigation measures that can be employed to ensure that derogation of the water courses does not occur during the works and these are detailed below. All works would be undertaken with respect to Pollution Prevention Guidelines and other codes of best practice, the most relevant being:

PPG2 – Above Ground Storage Tanks;
PPG4 – Disposal of Sewage;
PPG6 – Working at Construction and Demolition Sites;
PPG5 – Works in, near or liable to affect water courses;
PPG23 – Maintenance of Structures Over Water;
PPG 21 – Pollution Incident Response Planning;
The Forests and Water Guidelines, 3rd Edition (Reference 9); and
Scottish Executive – River Crossings and Migratory Fish: Design Guidance (Reference 10).

9.29 The environmental mitigation measures that would be required for the work would be clearly stated at the tendering stage of the process and all appointed sub-contractors working on the site would be made aware of site specific concerns and the environmental mitigation measures that would be required. The contractor would produce a pollution incident response plan prior to the start of the works as outlined in the template in PPG21.

9.30 Many considerations would be required as to the time of year that works are undertaken. In general, as far as the impacts on water courses are concerned, the works should be undertaken in the summer months when flows in the streams would be lower (or none existent) and fish would not be spawning.

Road, turbine base and electricity sub-station construction

9.31 To prevent the runoff of suspended solids in water leaving the site, silt traps would be required where appropriate and would be regularly inspected and cleaned if required. Temporary soil and peat stockpiles would be sited away from watercourses and drains as far as is reasonably practicable. These design measures are discussed in more detail in Chapter 3.

9.32 In the design of the road layout every effort would be made to prevent roads from crossing water courses. Culverts or small bridges would be constructed where the site roads cross the rivers and these would be designed in accordance with guidance provided by the Scottish Executive (Reference 10) and where necessary would include the use of baffles or other structures to reduce the flow rates leaving the culvert, thereby reducing peat erosion. Silt traps would be installed downstream of the works to prevent silt from moving off site.

9.33 The pouring of alkaline concrete could have the potential to impact locally on water within the peat which would be acidic. An outline of the proposed construction method to be employed for turbine bases and the grid connection compound is given in Chapter 3. The use of shutters would reduce the contact that wet concrete has with the peat and any groundwater within it. No concrete washings would be disposed of on the site.

Laying of cables

9.34 Cable runs would generally be located alongside the site access tracks and would connect to the National Grid to the west of the site. The construction methods to be employed for the laying of cables are described in Chapter 3. Where cable runs have to cross streams or ditches, the water course would be temporarily dammed if required and a straw bail filter placed downstream to avoid sediment polluting the downstream watercourse. The used bails would then be disposed of off site. Where cables cross the gullies they would be installed in a split duct 1m below the invert.

Site Storage Compound

9.35 All fuels and oils would be stored in the storage compound in accordance with PPG2. Fuels and oils would be stored on site in above ground tanks which conform to the appropriate British Standard. The tanks would be situated at least 10 m from any water course or 50 m from a well or borehole. All above ground tanks would be sited on an impermeable base and within a bund which would provide storage of at least 110% of the tank's maximum storage capacity. In accordance with PPG11 all loading and unloading areas would be designated and the routes for movement of materials would be identified so that any necessary protection can be incorporated. Deliveries of fuels and oil would be supervised and tankers would discharge via a lockable fixed coupling within the bunded area.

9.36 Plant operators would check machines daily for oil and fuel leaks and take appropriate action if leaks are found. Where possible, machinery would be refuelled within the site storage compound within a bunded area. Where refuelling outside of the compound is required this would be undertaken by mobile fuel bowser using a suitable pump and hose and would only take place over spillage trays. The bowsers would be stored at the construction compound when not in use. No chemicals, fuels or oils would be stored outside of the compound. Absorbent material (spill kits) would be available on site to contain drips and small spillages. It is unlikely that any parts of the site would be connected to mains drainage. Therefore welfare arrangements for workers on site would be provided in accordance with PPG4. Chemical toilets would be used.

Excavation of borrow pits

9.37 The borrow pits would be excavated in areas away from surface water courses and surface water inflow to the pits would be minimised by use of perimeter drains.

Proposed monitoring of surface waters

9.38 A programme of monitoring surface waters, if required, would be agreed with SEPA prior to construction commencing on the site. If the results of the testing do show that the site works are having a detrimental impact on the water quality, then works would cease in the area of concern and alternative working methods would be adopted or mitigation measures installed (for example additional silt traps).

Potential Impacts During Site Use

9.39 It is considered that during use of the site, the impacts that the wind farm development would have on surface water and groundwater would be minimal. The greatest impact is likely to be from slightly increased runoff from roadways and turbine bases. However, as shown earlier, the area that these cover as a percentage of the total site area is small and monitoring data for the area shows that runoff is naturally high. Drainage channels and culverts would periodically be inspected and maintained to ensure that they are functioning correctly and that erosion is minimised.

Potential Impacts During Site Demolition and Restoration

9.40 Details of decommissioning procedures are outlined in chapter 3. The potential impacts that the decommissioning could have on water resources would be very similar to those detailed above for site construction and the procedures as outlined for site construction would be adopted. If new guidelines are published prior to decommissioning of the site then these would be incorporated into the decommissioning procedures.

Chapter 10 Noise assessment

Introduction

Context

10.1 This chapter describes the potential noise impacts of the proposed wind farm in the vicinity of Strathdearn.

10.2 The chapter is set in the context of existing planning guidance (PAN 45: Renewable Energy Developments, PAN 56: Planning and Noise) and best practice as published by ETSU for the DTI (The Assessment and Rating of Noise from Wind Farms, ETSU-R-97). The assessment of potential noise impacts was carried out according to the guidance in ETSU-R-97, which takes as its starting point the principles of British Standard BS 4142: 1997 (Rating Industrial Noise Affecting Mixed and Industrial Areas).

Acoustic Terms and Concepts, Relating to Wind Farm Noise

10.3 The PAN 45, PAN 56 and ETSU R-97 guidance documents, and all other British Standards, refer to noise levels in decibels (dB). The decibel scale is logarithmic rather than linear, hence a 3 dB increase in the sound pressure level is equivalent to the doubling of the sound power passing through a given area in space (as measured in W/m2).

10.4 Judgement of the loudness of a sound is subjective, but as a general guide nothing less than a change of 2 decibels on a sound meter reading would be readily perceptible, and a change of 10 decibels would be perceived by the human ear as being twice as 'loud'.

10.5 The A-weighted sound level, dB(A), takes this response into consideration and is the scale that is used for measurement of environmental sound in the UK. It can be used to indicate the subjective human response to sound.

10.6 Environmental sound usually varies continually from second to second. It is impractical to specify the sound level for each second. In practice, human response has been related to various units, which include allowance for the fluctuating nature of sound. These include:

$L_{Aeq,t}$ The "A" weighted equivalent continuous sound pressure level. A representation of a continuous sound level containing the same amount of sound energy as the measured varying noise, over the measurement period, t.

$L_{A90,t}$ The "A" weighted sound pressure level that is exceeded for 90% of the measurement period, t. As well as being the main descriptor for wind farm noise, it is also commonly used as the "Background Noise Level" for assessing the effects of industrial noise in Britain.

10.7 The ETSU guidance states that the $L_{A90,10min}$ descriptor should be used for both the background noise and the wind farm noise. The use of the $L_{A90,10min}$ descriptor for wind farm noise allows reliable measurements to be made without corruption from relatively loud, transitory noise events from other sources.

Planning guidance

Planning Advice Note (PAN) 45 Renewable Energy Technologies

10.8 PAN 45 (Jan 2002) provides the following advice on noise emissions from wind farms:

'There is a perception that noise from wind turbines is a significant problem. This is not necessarily the case however and the issue is discussed in detail in the relevant section of this PAN.'

'Well designed wind turbines are generally quiet in operation. The table10.1 below gives an indication of the noise generated by wind turbines compared with other everyday activities.'

Table 10.1 : Noise generated by wind turbines

Source / Activity	Indicative noise level dB(A)
Threshold of pain	140
Jet aircraft at 250m	105
Pneumatic drill at 7m	95
Truck at 30mph at 100m	65
Busy general office	60
Car at 40mph at 100m	55
Wind farm at 350m	**35-45**
Quiet bedroom	35
Rural night-time background	20-40
Threshold of hearing	0

'Wind generated background noise increases with wind speed, and at a faster rate than wind turbine noise increases with wind speed. The difference between the noise of the wind farm and the background noise is therefore liable to be greatest at low wind speeds. Varying the speed of the turbines in such conditions can if necessary, reduce the sound output from modern turbines.'

'The Report, 'The Assessment and Rating of Noise from Wind Farms', describes a framework for the measurement of wind farm noise and gives indicative noise levels thought to offer a reasonable degree of protection to wind farm neighbours, without placing unreasonable restrictions on wind farm development or adding unduly to the costs and administrative burdens on wind farm developers or planning authorities. The report presents a series of recommendations that can be regarded as relevant guidance on good practice.'

Planning Advice Note 56 Planning and Noise

10.9 PAN 56 provides the following advice relating to noise from wind farms:

'There are two sources of noise from wind turbines; the mechanical noise from the turbines and the aerodynamic noise from the blades. Mechanical noise can be reduced through engineering design. Aerodynamic noise depends upon rotor speed which varies with wind speed. Noise from the wind normally increases at a faster rate than the turbine noise. This means that aerodynamic noise of wind turbines is generally greatest at low wind speeds. However, in sheltered positions where "wind shadow" occurs, such as in leeward valleys, existing noise levels may remain low when turbines on adjacent higher ground are operating at higher wind speeds. Equally, noise levels at properties affected by prevailing winds may well be greater than in other areas. Good acoustical design and siting of turbines is essential to ensure that there is no significant increase in ambient noise levels as they affect the environment and any nearby noise sensitive property.'

Assessment Procedure

10.10 Noise from the wind farm has been assessed according to the recommendations contained within ETSU R 97 The Assessment and Rating of Noise from Wind Farms.

10.11 The current practice on controlling wind farm noise is by the application of noise limits at the nearest noise-sensitive properties and this has been defined by the guidance as the most appropriate approach;

10.12 The report presents a series of recommendations that can be regarded as relevant guidance on good practice, including the following:

- The current practice on controlling wind farm noise by the application of noise limits at the nearest noise-sensitive properties is the most appropriate approach;
- Noise limits should be applied to external locations and should apply only to those areas frequently used for relaxation or activities for which a quiet environment is highly desirable;

- Separate noise limits should apply for day-time and for night-time as during the night the protection of external amenity becomes less important and the emphasis should be on preventing sleep disturbance.

- A fixed $L_{A90,\ 10\ min}$ limit of 43dB(A) is recommended for night-time, to avoid sleep disturbance, whilst in **low noise environments** the day-time $L_{A90,\ 10\ min}$ level of the wind farm noise should be limited to an absolute level within the range of 35-40dB(A) or 5 dB above the background noise levels, whichever is the greater.

- For single turbines or wind farms with very large separation distances between the turbines and the nearest properties, a simplified noise condition may be suitable. If the noise is limited to an $L_{A90,10min}$ of 35 dB(A) up to wind speeds of 10m/s at 10m height, then this condition alone would offer sufficient protection of amenity, and background noise surveys would be unnecessary.

Description of Baseline Conditions

Introduction

10.13 The initial phase of the noise impact assessment identified the nearest noise-sensitive properties. These properties were then assessed as to their requirement for a background noise survey. The purpose of baseline noise monitoring is to determine any requirement for modifying the fixed limits for protection of sleep disturbance and daytime amenity, based on background noise levels. The guidance from the ETSU-R-97 report is that where it can be demonstrated that the expected levels of wind farm noise would not exceed 35 dB(A) at a property for wind speeds of up to 10 m/s at 10 m height then no background noise survey is required for that property.

10.14 An initial calculation based on the number of turbines, the agreed sound power level and the distance attenuation was used to give a worst case assessment of the likely noise levels at the nearest receptors and to determine whether any background noise assessment is required.

Sensitive Receptors

10.15 The following residential (or potential for future residence) properties within 5 km of the proposed wind farm were identified.

Table 10.1 : Location of Nearest Noise-Sensitive Receptors

Receptor	*Status*	*Distance*	*Direction*
1. Flichity House	*Residential*	*3.6 km*	*W*
2. Mains of Flichity	*Residential*	*3.6 km*	*W*
3. Farr House	*Residential*	*3.3 km*	*NW*
4. Unoccupied Bothy	*Future/ occasional Residential*	*4.3 km*	*NE*
5. Tomatin Distillery	*Nearby Residential*	*4.2 km*	*E*
6. Tomatin	*Residential*	*5.4 km*	*E*
7. Kyllachy House	*Residential*	*5.0 km*	*SE*

10.16 Compliance with noise limits is a requirement for all areas frequently used for relaxation or activities for which a quiet environment is highly desirable, regardless of whether baseline monitoring has been undertaken.

10.17 Preliminary calculations were then undertaken to determine which of the above areas might experience wind farm noise levels of 35 dB $L_{A90,10min}$, hence triggering the requirement for a background noise survey.

10.18 The results of the prediction of noise levels at a wind speed of 10 m/s are shown in contour form in Figure 38. None of the identified receptor locations are predicted to experience noise levels of greater than 35 dB(A) $L_{A90,10min}$ at 10 m/s wind speed and so this criterion has been applied for assessment purposes

Noise Level Predictions

Generic Factors Influencing Noise Prediction

10.19 The noise levels at the nearest residences have been predicted in accordance with the guidance given in ISO 9613-2 1996 `Attenuation of sound during propagation outdoors'. The interpretation of individual elements of this method are described below.

10.20 The noise from a specific noise source at any receiver position depends on a number of factors:

- Source sound power level
- Geometric spreading
- Atmospheric absorption
- Ground effect
- Refraction by meteorological gradients
- Barrier losses

10.21 These factors are described below:

Source Sound Power Level

10.22 The sound power level that has been used for the noise predictions is based upon information provided by the turbine manufacturers, Bonus, for their 2.0 MW machine. This is a candidate noise turbine, since the final specification has yet to be determined, but these are values based on monitored noise levels from existing turbines. The reference sound power level of these turbines have been determined to be:

$L_{WA, ref}$ = 105.5 dB(A) re 1pW at a wind velocity of 8 m/s at a height of 10m .

10.23 The reference sound power levels at various octave band frequencies have also been provided as shown in Table 10.2 below:

Table 10.2 – Reference Sound Power Levels

Octave Band Centre Frequencies (Hz)	31.5	63	125	250	500	1000	2000	4000	8000
Sound Power Level, dB(A)	75.2	85.1	93.7	96.6	100.3	100.3	97.0	92.2	83.5

10.24 Tonal noise from older wind farms have previously been linked to gearbox noise being transmitted into the turbine supporting structure. Modern turbine manufacturers now ensure that sufficient forethought is given to the design of quieter gearboxes and to the means by which vibration transmission paths may be broken. National Wind Power's policy is to specify wind turbines which do not emit any clearly distinguishable tones and so do not incur tonal penalties when assessed according to the guidance in ETSU-R-97. No tonal penalties have therefore been applied to the predicted noise levels.

Propagation of sound waves

10.25 The noise source is considered as a single point in free space and the sound energy is assumed to spread out equally in all directions, resulting in a reduction of noise level of 6dB per doubling of distance from the source.

Atmospheric Absorption

10.26 Sound propagation through the atmosphere is attenuated by the conversion of the sound energy into heat. This attenuation is dependent on the pressure, temperature and relative humidity of the air through which the sound is travelling and is frequency dependent with little attenuation at low frequency. The reduction is proportional to the distance between receiver and source.
The atmospheric absorption coeffeicent in decibels per limotere for each octave band at the midband frequency are provided in ISO 9613 and are shown in Table 10.3 below. These have been used for this assessment.

Table 10.3 – Atmospheric Attenuation Factors from ISO 9613 at 15°C and 80% Humidity

Octave Band Centre Frequencies (Hz)	63	125	250	500	1000	2000	4000	8000
Atmospheric Attenuation Coefficient, dB/km	0.1	0.3	1.1	2.4	4.1	8.3	23.7	82.8

Ground Effect

10.27 Ground effects are caused by the interference of a reflected sound wave from the ground with the direct sound wave from the source. This may result in destructive or constructive interference at the receiver position.

10.28 However, the existing published data is based on relatively still conditions at the test sites, with no temperature variations vertically or horizontally along the propagation path.

10.29 The conditions likely to be experienced here would result in the phase relationships, which exist between the direct and reflected waves being muddled through the effects of wind and temperature and are likely to result in the averaging out of the effect.

10.30 Investigations comparing predicted and actual measured levels, undertaken for the International Energy Agency for their recommended practices for wind turbine testing and evaluation, indicate the inclusion of these ground effects normally results in greater errors in the predicted levels. We have, therefore, not included them in our calculations.

10.31 However, if one assumes the ground is acoustically hard then the effect is to increase the sound levels by 3 dB and so this effect has been incorporated into the assessment.

Refraction by Meteorological Gradients

10.32 The way in which a sound wave travels through the atmosphere to a receiving position is dependent upon the way temperature and wind velocity change with height above ground level. As temperature and wind velocity, and thus sound velocity, change with height above ground level, so a sound velocity profile is created bending the sound waves towards or away from the ground depending on exact conditions.

10.33 Decreasing temperature with height results in the sound being sent away from the ground and increasing temperature with height results in sound waves being bent towards the ground. Similarly, the propagation of sound up-wind results in the bending of the sound waves away from the ground and down-wind the sound waves are bent back towards the ground.

10.34 Temperature inversion effects are fairly unpredictable and, although they have been noted to increase noise levels over the expected calculated levels quite significantly under certain very infrequent conditions, they have not been included in our model as wind effects are normally more dominant around wind farm sites.

10.35 With regard to wind velocity profiles, current research indicates that positions upwind of the wind turbines are likely to have lower incident sound pressure levels than predicted for distances greater than 5.25 times the nacelle height with little or no effect to the predicted levels at downwind positions.

Barrier Losses

10.36 The effect of any barrier between the noise source and the receiver position is that noise will be reduced according to the relative heights of the source, receiver and barrier and the frequency spectrum of the noise.

10.37 It has been shown, however, that wind effects can greatly alter the efficiency of any barriers between the source and receiver. Our initial predictions have therefore been carried out without including the effects of any screening from the topography. It should be noted, however, that the effects of wind blowing in any direction other than from the development towards the residencies will have the effect of reducing the noise levels below those predicted where there is significant screening between the residencies and the turbines.

Predicted Noise Levels

10.38 The factors described above have been used to predict the noise levels at each of the identified receptors. These predictions for each site are included in Appendix F.

Assessment of Significance

10.39 In order to assess the significance of predicted noise levels from the proposed development, the predicted noise levels were compared with the fixed noise criteria of 43 dB(A) during the night and 35 dB(A) during the day.

10.40 Figures F1 to xF7 within Appendix F show the predicted noise levels at the seven sites in the scenario of all 45 wind turbines operating simultaneously under normal conditions. The wind turbine noise level refers to the noise level that is generated due to the combined effect of all wind turbines. A typical wind to noise gradient of 0.4dB per m/s was provided by the client and this has been applied to the source sound power levels.

Receptor 1 – Flichity House

10.41 Figure F1 shows the daytime and night time noise criteria compared to the predicted noise levels resulting from the wind farm at Flichity House. It can be seen that the predicted levels are below the criteria during the day and the night at all wind speeds.

Receptor 2 – Mains of Flichity

10.42 Figure F2 shows the daytime and night time noise criteria compared to the predicted noise levels resulting from the wind farm at Mains of Flichity. It can be seen that the predicted levels are below the criteria during the day and the night at all wind speeds.

Receptor 3 – Farr House

10.43 Figure F3 shows the daytime and night time noise criteria compared to the predicted noise levels resulting from the wind farm at Farr House. It can be seen that the predicted levels are below the criteria during the day and the night at all wind speeds.

Receptor 4 – Unoccupied Bothy

10.44 Figure F4 shows the daytime and night time noise criteria compared to the predicted noise levels resulting from the wind farm at the unoccupied bothy. It can be seen that the predicted levels are below the criteria during the day and the night at all wind speeds.

Receptor 5 – Tomatin Disillery

10.45 Figure F5 shows the daytime and night time noise criteria compared to the predicted noise levels resulting from the wind farm at Tomatin Disillery. It can be seen that the predicted levels are below the criteria during the day and the night at all wind speeds.

Receptor 6 – Tomatin

10.46 Figure F6 shows the daytime and night time noise criteria compared to the predicted noise levels resulting from the wind farm at Tomatin. It can be seen that the predicted levels are below the criteria during the day and the night at all wind speeds.

Receptor 7 – Kyllachy House

10.47 Figure F7 shows the daytime and night time noise criteria compared to the predicted noise levels resulting from the wind farm at Kyllachy House. It can be seen that the predicted levels are below the criteria during the day and the night at all wind speeds.

Construction Noise Impacts

Construction Phase Methodology

Scottish Statutory Instrument 2002 No. 104

10.48 The Control of Noise (Codes of Practice for Construction and Open Sites) (Scotland) Order 2002 states that BS 5228 `Noise control on construction and open sites' is approved as being suitable for the purpose of giving guidance on appropriate methods for minimising noise from construction activities.

Planning Advice Note PAN 56

10.49 Planning Advice Note PAN 56 `Planning and Noise, 1999, provides advice on construction site noise and also advises the use of BS 5228 as the appropriate assessment methodology.

British Standard BS 5228

10.50 BS5228: 1997 *Noise and Vibration Control on Construction and Open Sites* provides guidance relating to the prediction and control from open sites where noise from fixed plant and mobile plant has the potential to be an issue with regards to the potential disturbance of residents.

10.51 In particular, this document provides guidance that is relevant to this noise assessment relating to:

- noise, its potential for affecting neighbours of open sites;
- the prediction of environmental noise levels associated with fixed and mobile plant;
- criteria for setting noise control targets;
- the control of noise emissions from open sites; and
- the calculation of noise levels associated with plant which does not operate continuously.

10.52 Additionally, this document includes reference noise level data for various types of plant commonly associated with activities on open sites. It also discusses the potential for personnel on such open sites to be exposed to noise from plant on the site. Where appropriate, the guidance provided by BS5228 has been followed where noise from activities at the proposed development site has been predicted and assessed in this report.

10.53 Noise levels generated by construction activities are regulated by guidelines and subject to local authority control. Guidance is contained within BS5228 but no fixed limits are suggested within this document.

10.54 The World Health Organisation's publication "Guidelines for Community Noise" states that general daytime outdoor noise levels of less than 55 dB $L_{Aeq,t}$ are desirable to prevent any significant community annoyance and so this level has therefore been adopted as an acceptable design target for noise from general construction activities at the nearest receptors, in order to avoid significant levels of disturbance.

Sources of Noise

10.55 Likely construction phase activities have been addressed, based on previous experience. The precise nature of the construction activities will not be known until more detailed engineering design has been completed.

10.56 Within the development area, initial site operations will involve activities associated with the access tracks and site infrastructure. Site preparation would involve the arrival of equipment on site and

preparation of the construction compound. The cable installation would be in trenches adjacent to the access tracks. Erection of the wind turbines would then be followed by turbine commissioning.

10.57 Noise associated with the construction of the proposed wind farm will occur from a number of sources. There will be different sources depending on the activity. These can be considered in two phases: installation of the turbine support structure, followed by construction of the turbine tower and assembly of the turbine.

10.58 The development of the site will generate noise during the building construction and eventual decommissioning at the end of the site's working life. The major phases of construction with respect to noise and vibration are:

- Excavation of borrow pits to provide aggregates for track and turbine base construction - subject to separate minerals application;
- Upgrading of existing access roads and construction of new access roads;
- Construction of turbine foundations;
- Excavation of trenches and cable laying;
- Erection of the wind turbines and the wind monitoring mast; and
- Commissioning of the wind farm.

10.59 Many of the operations described above will be carried out concurrently, although predominantly in the order identified. The development will be phased so that at different parts of the site, civil engineering work will be continuing whilst wind turbines are being erected.

10.60 Construction would generally take place during normal working hours on weekdays and for limited periods at the weekend. Typical construction plant would be used on site, including:

- earth moving plant such as excavators, dump trucks;.
- lifting equipment, such as cranes and hoists;
- crusher and grader;
- concrete batching plant to include mixers and pumps;
- miscellaneous equipment including compressors, hand tools, generators; and
- heavy goods vehicles delivering equipment.

Construction Noise Mitigation

10.61 The distances from the proposed working area to the nearest properties are large enough (greater than 3km) for the likelihood of disturbance due to construction noise to be negligible.

10.62 However, in all cases the best practicable method of minimising noise on the site will be adopted and in this respect guidance is given in British Standards BS 5228: Parts 1, and 2 (1997) and entitled 'Noise Control on Construction and Open Sites'. The following examples are applicable:-

a) For any particular job, the quietest plant and/or machinery will be used. Where appropriate it must be constructed to meet the requirements of EEC Directives

b) All equipment will be maintained in good working order and fitted with the appropriate silencers, mufflers or acoustic covers where applicable;

c) Stationary noise sources will be sited as far away as possible from noise sensitive developments and where necessary acoustic barriers will be used to shield them;

d) The movement of vehicles to and from the site will be controlled and employees will be supervised to ensure compliance with the noise control measures adopted.

e) Disturbance due to noise from blasting will be controlled by means of liaison over suitable hours with the local authority and by means of consultation with the local residents prior to likely blasting periods

Summary

10.63 An assessment has been performed of the noise impact that is predicted to occur due to the construction and operation of the proposed Farr Wind Farm. The proposed development has been sited and designed to minimise noise levels at the residential properties that are located nearest to the site.

10.64 The assessment has taken account of current guidance which is contained in Planning Advice Note (PAN) 56: `Planning and Noise', Planning Advice Note (PAN) 45: `Renewable Energy Technologies', ETSU Report ETSU-R-97: `The Assessment and Rating of Noise from Wind Farms' and relevant British Standards and other documents relating to noise and its effects upon humans.

10.65 This noise assessment shows how noise from the proposed wind farm, assuming that all turbines are operating at normal speed at the same time, would not exceed any of the target criteria defined in ETSU-R-97. Separate target criteria have been developed for both night time and daytime periods, in order to protect both the sleep of local residents and to protect the outdoor amenity of the area.

10.66 Predicted levels at all identified sensitive receptors are below these strict criteria during day and night, ensuring an acceptable level of protection to the amenity of local residents. Properties that are more remote from the development will experience even lower levels of noise.

10.67 In terms of construction noise, the distances from the proposed working area to the nearest properties are large enough (greater than 3km) for the likelihood of disturbance due to construction noise to be negligible. Guidance given in BS 5228 will be used to ensure that best practicable method of minimising noise on the site will be adopted.

10.68 As a result, it is not anticipated that there will be any significant disturbance from noise at properties within the vicinity of the proposed wind farm.

10.69 All predicted noise levels are shown with the criteria curves in Appendix F.

Chapter 11 Socio Economic Assessment

Introduction

11.1 This chapter represents an independent socio-economic impact assessment of the proposed Farr wind farm located within the local authority of The Highland Council, at Farr near Tomatin, Inverness-shire. This assessment was recommended in order to identify the social and economic benefits from the proposed development as recommended by NPPG 6.

Wind Energy in Scotland

11.2 Renewable energy sources in the UK currently generate almost 3% of the total electricity supply, approximately one tenth of this comes from wind energy alone. Wind energy is one of the best placed technologies to be utilised within the UK, with the UK being the windiest country in Europe with over 40% of the available resource, which is enough to meet the country's needs at least twice.

11.3 The British Wind Energy Association identify that in the UK there are now 69 wind farms operating with 941 turbines generating over 470 megawatts MW of electricity, thus meeting the average electricity needs of almost 322,000 homes.

11.4 The information below in Table 11.1 and 11.2 illustrates that in Scotland there are now eleven wind farm projects with over 190 turbines generating over 130 MW of electricity meeting the average electricity needs of nearly 84,000 homes.

Table 11.1 - Total Wind Farms Operating in the UK January 2002[11]

Number of Projects	Number of Turbines	Capacity (MW)	Homes Equivalent	CO_2 Reductions	SO_2 Reductions	NO_X Reductions
69	941	473.6	321,869	1,226,713 t	12,793 t	3838 t

Table 11.2 - Wind Farms operating in Scotland, January 2002[11]

Date	Wind Farm	Location	Project Capacity (MW)	Annual Homes Equivalent
Scotland				
Dec 01	Beinn an Turc	Argyll and Bute	30	18,000
Dec 01	Myres Hill	Galloway	1.9	1140
Nov 01	Deucheran Hill	Kintyre	15	10,000
Dec 00	Burradale	Shetland	1.98	1500
Nov 00	Hare Hill	Ayrshire	13	10,000
Nov 00	Sigurd, Burgar Hill	Orkney	1.3	1000
Jun 00	Dun Law	Borders	17.16	10,737
Apr 00	Thorfinn, Burgar Hill	Orkney	3.5	2190
Jun 99	Beinn Ghlas	Tayside	8.4	5256
Oct 97	Novar	Highlands	17	10,637
Sept 96	Windy Standard	Galloway	21.6	13,515

[11] British Wind Energy Association, 2001

The Local Economy[12]

11.5 The whole of the area of the Highlands and Islands stretches for over 640km from the Shetland Isles in the north, to Campbeltown at the southern tip of Argyll. The Highland and Islands has a total area of just over 39,050 square kilometres and a coast line of over 9,000kms. The Highlands and Islands are an area of outstanding environmental quality. Sites of Special Scientific Interest (SSSI) have been designated over 14% of the area and represent two thirds of Scotland's SSSIs, The quality of the landscape is illustrated by the fact that a fifth of the area is classed as a National Scenic Area, and is therefore of national significance. Other conservation designations include Ramsar wetland sites, National Nature Reserves, Biosphere reserves and St Kilda World Heritage Site. There are four Environmentally Sensitive Areas (ESAs) in the Highlands and Islands and in addition there are twenty seven sea lochs and islands classified as Marine Consultation areas.

Local Industry

11.6 The Highlands and Islands economy is still characterised by the importance of primary industries such as agriculture, forestry and fisheries. The mountainous terrain of the region and the short growing season impose difficulties for agriculture and economic activity. Remote rural areas and islands in particular are highly dependent on agriculture and fisheries. In the Highlands and Islands as a whole, the service sector accounts for over two thirds of employment and is characterised by the importance of tourism and public administration. Inverness is the regional centre and is a centre for services, retail, tourism and manufacturing. Farming is the main primary activity in the area. There have also been strong developments in fish processing. Inverness and Nairn Enterprise are seeking to develop technology and knowledge based industries as well as continuing to promote tourism.

Tourism

11.7 Many of the strengths of Scottish tourism are demonstrated powerfully in this area, including, for example, the distinctive Highland culture, colourful history, built heritage and opportunities for quality recreation within the natural environment. Tourism is one of Scotland's largest industries, employing 8% of the workforce (193,000, including approximately, 15,100 self employed). UK and overseas visitors expenditure in the area totals £693m (revised 2001 figure), and leisure day trips generate some £90m (1998 figure), giving a total expenditure of £783m. In the Highlands and Islands area, tourism is an important sector of the local economy with over a quarter of jobs in Distribution, Hotels and Restaurants. This figure is even higher in the Inverness and Nairn area, which includes 5 out of the top 20 paid admission visitor attractions in the Highlands and Islands, and 3 out of the top 20 free admission attractions. Locally to the site, 43,000 people visited the Tomatin Distillery in 2001.

Forestry

11.8 Forestry is a significant land use within the Highlands. Productive forests cover about 12% of The Highland Council area. In terms of income generation and employment it is the most important sector of the rural economy after tourism and agriculture. In 1991 the industry employed about 1000 people directly, and a further 700 in saw milling and timber processing, with jobs being concentrated mainly around the Moray Firth, Strathspey and Fort William. Forests increasingly serve a variety of purposes besides commercial timber production. In addition to the landscape benefits of well-designed forests they provide an important network of recreational facilities throughout Highland.

The Highland Council

11.9 The Highland Council recognise the emphasis on the development of renewable forms of energy in Government guidance and the Scottish Renewables Obligation. In Highland all local electricity generation is already derived from renewable sources, comprising hydro and wind energy. The Council recognises the presence of renewable resources but aims to reconcile the use of these with environmental issues and with the capacity of the electricity distribution network to accept more generation load.

[12] Based on information from Highlands and Islands Enterprise, Inverness and Nairn Enterprise and The Highland Council Structure Plan Written Statement 2001.

Local area statistics

11.10 The site area is located in the Inverness and Nairn Enterprise (INE) within the Highland and Islands network. The INE area covers a total of 322,213 hectares and lies at the northern end of the Great Glen on the shores of the Moray Firth.

11.11 With a population of 373,000 and an area of 39,050 square kilometres the Highlands and Islands is one of the most sparsely populated parts of the European Union. Its population density of 9 persons per square kilometre compares with an EU average of 116 per square kilometre, and is on a par with the northern parts of Finland and Sweden. In addition to a very low population density, 30 percent of the population of the Highlands and Islands live on more than ninety inhabited islands. Inverness is the largest settlement with more than 40,000 people, Fort William, situated at the foot of Ben Nevis being the second largest settlement. The inner Moray Firth (Nairn, Inverness, Dingwall, Alness and Invergordon) contains approximately 70,000 people, or nearly 20 per cent of the Highlands and Islands population. With such a dispersed population, 61 percent of Highlands and Islands residents live in rural areas or settlements of fewer than 5000 people. The population of the Inverness and Nairn area is generally increasing at a rate higher than that for the rest of the Highlands and Islands. It is also a younger population than the rest of the Highlands. According to latest estimates, during the period of 1991 to 1998, Inverness and Nairn experienced a population growth of 3.9%, bringing the population total to 75,940. This accounted for 20.5% of the total HIE area population.

Table 11.3 : Resident Population[12]

	1998	Change 1991-1998	% Change 1991-1998	Population Density (persons per sq km
Inverness	64,910	2,430	3.9	23.2
Nairn	11,030	420	4.0	26.1
Inverness and Nairn	75,940	2,850	3.9	23.6
HIE Area	370,376	1,058	0.3	9.5
Scotland	5,120,000	13,000	0.3	65.5

Employment

11.12 Over 30% of employees working in the INE area are employed in the Public Administration. Education & Health sector. This reflects Inverness's importance as the main service centre for the HIE area and highlights its prominence in the Highland economy. The town is host to development bodies such as HIE and INE, The Highland Council administration building, and Raigmore Hospital – which provides the main NHS Health Service for the Highlands.

11.13 These statistics also demonstrate the importance of retail and tourism related activities in the INE area, with almost a third of jobs in Distribution, Hotels and Restaurants in 1997.

11.14 Agricultural Census indicates that in 1997 there were 1,248 people engaged in agricultural activity in the INE area. Agricultural output was valued at approximately £10.6 million for the period between 1995-1997, with an average of 23.5% of this output being subsidies.

11.15 There are fewer people employed in manufacturing and construction in the INE area compared to the HIE area. However, the INE area is home to many of the larger manufacturing and construction companies in the Highlands & Islands, for example, Tulloch Construction, Morrison Construction, Inverness Medical, CSC Forest Products and BARMAC (Ardersier).

Social Impacts

11.16 Social impacts arising from the proposed wind farm development are likely to be directly related to the economic impacts. Direct employment for the wind farm operators and associated service requirements may contribute towards stemming the depopulation of Strathdearn that has been a recurring problem for many years. The provision of jobs in rural areas such as Strathnairn and Strathdearn may help to slow down the population migration into Inverness.

11.17 As part of their "good neighbour" policy, it is NWP's practice to establish local community funds at each of its operating wind farms, in consultation with local councillors. The same practice would

[12] GRO (S) taken from HIE website www.hie.co.uk

apply to Farr wind farm. The funds are often provided to local community councils for assisting local community projects such as local schools, sports clubs, youth clubs and other projects.

11.18 In addition to local community fund payments, NWP would be liable for local business rates estimated at a level of £1,000 per year per installed MW which would generate additional local authority revenue funding from the Farr wind farm development amounting to £90,000 – 110,000 for 20 years.

Economic Impacts

11.19 The development of this project has the potential to have a beneficial impact on the areas of the local economy such as employment during the construction and operational phases, community investment, the tourist industry and other indirect benefits to local services.

11.20 NWP will encourage the use of local contractors, operation and maintenance work wherever possible.

Effects on Tourism

11.21 There is no conclusive evidence about the effect that wind farms may have on tourism. In some areas, in particular Cornwall, wind farms have provided a unique visitor attraction in addition to educational facilities on renewable energy. Visit Scotland has commissioned independent research on the impact of wind farms on tourism, the results of which are expected later this year.

Opportunities for Highland firms

11.22 The main items of the capital expenditure associated with the proposed wind farm would be the towers, blades and electrical equipment. Local sourcing of equipment is preferred by NWP, but will be constrained by the specialist nature of much of the equipment and also by the competitiveness of Scottish firms in relation to their Danish and German counterparts. However, there are established suppliers in the UK, such as Cambrian Engineering in Bangor, North Wales, who construct towers, and Aerpac in Kirkcaldy in Fife, who manufacture glass fibre blades. Vestas, the Danish wind turbine manufacturer, is able to build wind turbines for the UK and Irish markets from their base in Argyll.

11.23 Based on experience at the Beinn Ghlas and Novar wind farms, the turbines and other equipment would account for about 70% of the capital expenditure and the construction work about 30%. For the Farr wind farm development, unless turbine components are manufactured locally, the split is likely to be about £43.4 million imports (70%) and £18.6 million (30%) local expenditure.

11.24 There seems little doubt that there will be substantial growth in wind farming in Scotland. The Government is committed to an increased proportion of electricity supply coming from wind power and other renewable sources. Improvements in technology have also resulted in the cost of wind power falling to close to the costs of conventional sources of electricity.

11.25 The Scottish Enterprise report on "The Renewable Electricity Business in Scotland"[13] indicates that about 400 turbines will be required for other projects agreed under the Scottish Renewables Obligations (SRO), although not all of those are expected to proceed. The report forecasts 1460 MW of wind farm capacity in Scotland by the year 2010 and 3772 MW capacity in the UK as a whole.

11.26 Whether or not these forecasts prove to be accurate, there can be little doubt that there will be substantial growth in the number of wind farms and consequently the demand for turbines and other equipment.

11.27 A feature of the industry to date is the reliance on imported equipment, notably from Denmark and to a lesser extent from Germany. Danish firms Bonus, Vestas and NEG Micon have supplied all the turbines operating in Scotland and about 75% of those in the UK.

11.28 The Scottish Enterprise report states that *"given the estimated potential for a further 185 (or more) wind turbines to be imported for existing SRO wind energy schemes and the relatively low proportion of wind farm capital expenditure which is placed with Scottish companies, there is a strong case for stimulating local manufacture of wind turbines in Scotland. Such manufacturing capacity could service all the markets throughout the UK and Ireland"*.

[13] Scottish Enterprise (2001) The Renewable Electricity Business in Scotland.

11.29 Further, "*the current state of the art in wind turbine design and the international market has progressed such that it is very unlikely that a Scottish company could successfully design and develop its own new wind turbine and then enter the international market in competition with the established manufacturers. A more realistic strategy would be to attract an established manufacturer to begin manufacture in Scotland to service the UK and Irish markets. Similarly, support could be given to Scottish manufacturers to encourage them to become component suppliers to existing turbine manufacturers*".

11.30 It is notable that the components provided by Scottish suppliers rose from 22% to 36% between the construction of Novar (1997) and Beinn Ghlas (1999) as capacity built in the Highland area to service these sub-contracts.

11.31 Consistent with NWP's objective to source supplies and services locally, there would be important immediate impacts and longer term benefits to Highland businesses arising from the proposed Farr Wind Farm.

11.32 The immediate impacts for local businesses relate to their existing experience and capabilities, in wind farm construction and operation. Longer term benefits relate to the development of their capabilities to supply and service this expanding market, both regionally, nationally and internationally in the future.

Construction Stage

11.33 The capital cost of the Farr Wind Farm is estimated at £62 million. The construction would be a very significant development in Highland, requiring about 60 people over 24 - 30 months and generating work for a range of contractors and suppliers.

11.34 Based on the actual experience of the Beinn Ghlas and Novar wind farms, it is estimated that about 30% of the £62 million - that is £18.6 million - would be spent in Highland on the construction work. The figure would be higher if local firms were able to supply goods and services. To the extent that equipment and supplies can be sourced locally, the local impacts would be increased correspondingly.

Operational Stage

11.35 The annual operating expenditure at Farr is estimated at £280,000, most of which would be for maintenance and repairs. This would require four to six full-time employees. Associated work for sub-contractors would also be expected.

Conclusions

11.36 The Farr Wind Farm would have positive economic and social impacts. These include the following;

- employment generated during both the construction and operating phases;
- the opportunities for local businesses to supply goods and services; and
- the generation of up to £11.25 million worth of electricity and associated green certificates each year.

Chapter 12 Transportation

Introduction

12.1 This Chapter considers the effects of traffic generated by the proposed wind farm on users of existing, improved or new transport infrastructure. It also considers the implications of providing the means of access required to support construction and operation of Farr Wind Farm and its associated infrastructure. The proposed access road is described in Chapter 3 and illustrated on Figure 3.

12.2 The movements generated by the proposals are considered for the construction period and during normal operation. These movements can be grouped into the following categories of trips:

- Work trips by the construction and operational work forces;
- Supply of equipment and materials; and
- Abnormal loads, including turbine tower sections, nacelles and blades.

12.3 The main demands for road access would arise during the construction period when the peak work force would be present and when equipment and materials need to be delivered to the wind farm site. In contrast when operating, the wind farm workforce would be very small.

Access Routes

12.4 A road access strategy for the wind farm site has been developed to deal with the demands of the construction and operational periods and to determine the road improvements required to accommodate the daily and cumulative volumes of traffic estimated over the construction and operational periods. Road improvements, as outlined in Chapter 3, would be carried out before work started on the wind farm. They would provide an access road to an appropriate standard with structures, such as culverts and bridges, designed to suit the loadings imposed by the estimated volume and weight of wind farm traffic.

12.5 Access to the site would be made from the A9 Trunk Road via an existing forestry access point at Aultnaslanach on a stretch of single carriageway near the village of Moy (Figure 2). This has the advantage of being accessible to vehicles travelling from both the north and the south on the A9. In addition, the access lies opposite to a southbound lay-out that would provide additional road space for turning manoeuvres. The location of the access point on a single carriageway means that vehicle speeds on the A9 are generally lower and the amount of overtaking is limited. This would have significant impact on the relative safety of the site access.

12.6 The access leads directly onto forest tracks that would be upgraded and extended to the wind farm site. In order to allow smooth turning of abnormal loads onto the access track, the access mouth would require widening. The improved junction would be designed to meet the requirements of the Highway Authority with regard to visibility, construction materials, surface water drainage and gradient. General signing would also be provided on the A9 to indicate that there would be heavy vehicles turning at the access point.

12.7 The general width of the access road would be a minimum of 6m and the maximum allowable gradient 1:9. Bends on the road would be constructed to fulfil the demands of the longest vehicle, typically the top tower section and blades. Bend radii are shown in Table 12.1 below. The tower would be brought to the site in two or three sections, on a truck with steering on the rear axles. The width of the tower would be a maximum 4.2m and the height of the highest vehicle 5.2m.

Table 12.1: Radii required for a 47m extendable trailer for blade transportation.

Inner Radius	Outer Radius	Road Width
15m	31m	16m
20m	34m	14m
25m	38m	13m

Existing Traffic Levels

12.8 Existing traffic levels on the A9 Trunk Road and B851 Fort Augustus Road for the period May to June 2000 were obtained from The Highland Council. Tables 12.2 and 12.3 indicate the daily and 5/7-day average traffic levels on the A9 between the Tomatin and Daviot junctions and the B851 between Inverarnie and the A9 at Daviot respectively. These traffic figures indicate a daily traffic flow of around 7-8000 vehicles and a peak hour flow of around 600 vehicles on the A9 and around 500 vehicles and a peak hour flow of around 50-60 vehicles on the B851.

Table 12.2 : Existing traffic flows on the A9 between Tomatin Junction to Daviot Junction

Time	Mon	Tue	Wed	Thu	Fri	Sat	Sun	5 Day	7 Day
24 hr	7678	7338	7494	7606	8973	6628	7818	7818	7620
Am	10:00	10:00	10:00	10:00	11:00	11:00	11:00		
Peak	622	550	605	584	580	659	475	588	582
Pm	16:00	17:00	17:00	17:00	16:00	12:00	16:00		
Peak	591	611	611	615	797	684	625	645	648

Table 12.3 : Existing traffic flows on the B851 between Inverarnie and the A9 at Daviot

Time	Mon	Tue	Wed	Thu	Fri	Sat	Sun	5 Day	7 Day
24 hr	-	491	512	507	552	567	478	413	526
Am	08:00	08:00	08:00	08:00	08:00	10:00	11:00		
Peak	-	53	49	62	57	74	46	36	59
Pm	17:00	17:00	1700	17:00	16:00	13:00	15:00		
Peak	-	40	52	48	52	52	41	46	49

Demands for movement

12.9 The proposed wind farm would generate road traffic which could lead to environmental impacts, of varying significance, both from the traffic itself and from the consequences of works to construct the improved junction with the A9 and access track to the site.

Site establishment

12.10 Movements expected during this period are associated with the construction of the access roads and site establishment on the hill. Initial access with light vehicles and vans would be gained from the C-class Garbole Road. This is likely to involve a limited number of light vehicles during the site investigation and detailed design phase of the development.

12.11 Construction of the northren access road is expected to commence from its junction with the A9 Trunk Road near Aultnaslanach, working towards the wind farm site. The traffic would be expected to include the arrival of basic road construction/upgrading plant on a once only basis. Stone for construction of the road would be obtained from the existing Forest Enterprise sources to the north of the site.

Construction Loads

12.12 Construction plant such as excavators, bulldozers and dump trucks would be transported to the site on low loaders using the northern access road from the A9. Construction of the on-site access tracks would then take place, followed by the movement onto site of large cranes for construction of the wind turbines and delivery of wind turbine components. There would be two or three major crane movements and up to 30 associated lorries onto the site. The crane specification would be all-terrain or crawler type with lifting capacities of up to 850 tonnes.

12.13 Construction of the turbine bases would take place during this period. The aim would be to maximise the use of on-site stone and thereby minimise off-site vehicle movements. Table 12.4 summarises the estimated construction traffic for the proposed wind farm

Table 12.4 : Estimated construction traffic for the Farr Wind Farm

Load Type	Total Number of Loads	Average Deliveries Per Day
Forest felling	110	8
Turbine and transformer foundations concrete deliveries	1800	12 - 16
Reinforcement steel	50	
Turbine components	300 – 360	8
Cable	16 – 20 low loaders	
Sub-station compound and site buildings	25 concrete and gravel (8 – 12 articulated vehicles) 2 low loaders	
Personnel during construction		30 car/van journeys
Cranes	3 mobile cranes up to 30 articulated lorries	
Misc	20 articulated lorries	

Abnormal Loads and Turbine Erection

12.14 The erection of the wind turbines is expected to take 45 weeks spread over a period of two years. Each wind turbine would comprise the following estimated load characteristics.

Table 12.5 : Load characteristics for 2MW – 2.5MW wind turbines.

Load	Quantity	Length	Weight
Tower	2	30m/39m	79/68 tonnes
Nacelle Power Unit	1	35m	120 tonnes
3 No. Blades	1 or 3	47m	75 or 25 tonnes
Cables/controllers	1	Standard HGV	40 tonnes

12.15 With the erection of one wind turbine per week this could lead to between five and eight abnormal loads per week and possibly between 300 and 360 abnormal loads during the overall construction period, depending on the combination of the number of blades delivered. It is anticipated that wind turbine components would be shipped to the Port of Inverness and then moved to the site using the A9 Trunk Road.

12.16 Movement of abnormal loads would be escorted by the Police to control other traffic during the passage of the load. The nature of the loads and vehicles means that travel speeds would be low. It would not be practical to escort convoys of vehicles along single carriageway sections of the A9 as it would be difficult to control overtaking past the convoy. Each abnormal load would therefore be escorted separately. Movement of abnormal loads would be restricted to outside peak periods (07:30 – 09:30 and 16:00 – 18:00) and no movements would be permitted on Saturday afternoons when Inverness Caledonian Thistle football team is playing at home. The Police would prefer the movement of abnormal loads to be in the evening and night when traffic is at its lightest. The abnormal loads would be held at the end of the dual carriageway until the Police stop all other traffic and they would then proceed directly onto the site.

Operational Traffic

12.17 Traffic movements during the operational life of the wind farm would consist mainly of cars or vans used by staff servicing the turbines. Access to the site would be made via the B851 and Garbole Road. Infrequent deliveries by large vehicles would be made using the A9/northern access road.

Impacts of Traffic

Construction Traffic

12.18 The construction of the proposed wind farm would involve approximately 2400 deliveries of materials and construction vehicles to the site over a period of 12 – 18 working months. This would give rise to an average additional number of 12 – 18 lorry movements per working day (taking a single delivery as two movements) on to the site from the A9.

12.19 It is anticipated that turbine deliveries would travel south down the A9 from the Port of Inverness. Other heavy goods vehicles are also likely to come from the direction of Inverness. Daily traffic flows on the A9 would increase by some 0.24% or less. It is unlikely that such a small increase would be perceptible to other drivers.

12.20 The capacity of the A9 section affected by construction traffic exceeds the hourly base and forecast traffic flows. Despite the increase in traffic flows during the construction period there would be no significant delays or effects to other drivers using the A9 south of Inverness, except when abnormal loads are moved to the site. Although the movement of abnormal loads during construction would cause short-term disruption, these movements would take place outside times of peak traffic flow and therefore the overall effect is regarded as minor.

12.21 The greatest impact on traffic using the A9 would occur where the abnormal loads turn off the main road onto the northern access road and would result from traffic management required to ensure safe turning at this junction. It is not envisaged that the road would need to be closed fully, but restricted flow due to road management may be required. Suitable traffic management systems would be agreed with the Highways Authority and Police prior to the commencement of construction to ensure safe use of the effected stretch of the A9 during the construction period. The long and wide vehicle deliveries would total up to 360 deliveries over a 45 week period. The remaining wind farm traffic would largely comprise concrete deliveries that would not require management.

12.22 Video footage, photographs and recorded description would be taken of the condition of the A9 adjacent to the wind farm access junction as well as at the entrance to the Port of Inverness. Any deterioration of the highway at these locations, due to construction traffic turning off or on to the public road would be repaired to the Highway Authority's standard as soon as reasonably practicable.

Operational Traffic

12.23 During the operational life of the wind farm there would be regular but limited traffic movement consisting mainly of cars and vans required for service and maintenance staff to access the site. The number of vehicles is so low that the magnitude of traffic increases would be negligible and impacts on no section of the local road network would be significant. Operational traffic to and from the site is therefore not considered to be significant with respect to the EIA regulations.

Summary

12.24 The detailed studies carried out have determined the road improvements required to accommodate traffic generated by the development and have assessed the impact of this traffic on other road users. Although there would be an increase in traffic flows on the A9 leading to the wind farm site, this would be very low. The flows would remain well under the capacity of the road. The increases in traffic would result in minor impacts on other road users during the construction period, which is short term in nature. Once the wind farm becomes operational the effects of generated traffic would be minor and have no significant impact on other road users and local communities.

Chapter 13 Electromagnetic Interference and Other Issues

Introduction

13.1 This chapter addresses issues relating to Electromagnetic interference (radio, TV, radar, mobile telecoms), shadow flicker and public access.

Telecommunications facilities

13.2 A total of 73 telecommunications transmitter/receiver sites were identified within 30km of the Farr wind farm site. These are listed at Appendix G. A search by the Radiocommunications Agency found no existing fixed radio link facilities which might be affected by the proposed Farr wind farm. Individual radio facility operators were contacted. Their responses were as follows:

BT
The proposed wind farm should not cause electromagnetic interference or related problems to BT's current and presently planned point-to-point microwave radio links and satellite radio networks.

BT Cellnet O2
The Farr wind farm proposal will not pose any problems for any BT Cellnet O2 equipment within the area.

Cable & Wireless
Cable and Wireless have no fixed radio links north or west of Aberdeen and Glasgow.

Crown Castle International (CCI)
CCI has responsibility for providing the BBC's transmission network and re-broadcast links (RBLs) in this area. The proposed wind farm is unlikely to affect any RBLs and CCI does not wish to object to the development.

The Highland Council
The Highland Council fixed radio link network includes sites at Craggie, east of Farr, and Achnabat, west of Farr. This network is also used by Scottish Water and the Northern Constabulary. The proposed wind farm at Farr is not expected to interfere with these facilities.

Ministry of Defence
A Ministry of Defence (MoD) microwave link from Fort Augustus, through Foyers and Dunain Hill to Fort George, east of the Farr site, was well beyond a range which could be adversely affected by wind turbines. This network has recently been closed down permanently. There are no other potentially affected MoD telecommunications facilities in the area.

Northern Constabulary
Police microwave link sites in the area use The Highland Council facilities at Craggie and Achnabat. None of the links from these sites pass through the wind farm area. Consequently the proposal would create no problems for police radio fixed links.

Scottish Water
Scottish Water uses the microwave radio network operated by The Highland Council for network control and other functions. The Authority has no independent facilities which might be affected.

NTL
No problems are anticipated with any NTL radio links, the nearest of which lies 17km from the proposed wind farm site.

T-Mobile
The Farr wind farm project will have no impact on existing or planned One2One fixed radio links.

Orange
Orange have no concerns with the proposed wind turbine site. The company currently has no radio links in this area. All links are located well to the east and west.

Scottish & Southern Energy (SSE)
SSE's radio facilities in the area include Dunain Hill, Slochd and Tom a'Chait. Neither SSE nor the operators who share these sites with SSE have any microwave links with lines of sight passing through the wind farm area.

Thus
Thus provides the microwave link facilities between BT Cellnet and Vodafone base stations in the Inverness area. The nearest such links run from Meall Mor to Achnabat, Achnabat to Dunain Hill and Tomatin to Slochd (see Appendix G). These are well clear of the wind farm site boundaries.

Transco
Transco has no operational telemetry communications sites which would be affected by the proposed wind farm.

Vodafone
The proposed wind farm is in an area of poor coverage by Vodafone and there are no in-service or planned Vodafone radio links near the wind farm location or with lines of shoot crossing the wind farm area.

Broadcast VHF FM radio

13.3 Public and commercial FM radio is broadcast from the Rosemarkie transmitter, 33km north of the proposed wind farm site. Crown Castle International advise that wind turbines are not regarded as having any impact on FM signal reception quality.

Mobile radio

13.4 Operators of Private Mobile Radio (PMR) and other mobile radio equipment in the area include the emergency services, utility operators and a wide range of private companies. Most hilltop radio transmitter/receiver sites support PMR antennae. Mobile radio performance is not considered to be significantly affected by wind farms since interference and signal reflection effects are continually present from a variety of sources and are generally dynamic and fleeting in nature.

Aviation telecommunications facilities

13.5 National Air Traffic Services (NATS) operate a VHF Omni-Range (VOR) navigation beacon located at Inverness Airport, 22 km from the proposed wind farm site. The safeguarding consultation zone for VOR beacons extends to 10km radius. NATS would not, therefore, expect to be consulted on the Farr wind farm development and wind turbine effects on the Inverness VOR are unlikely.

13.6 MoD guidelines request consultation on wind farm proposals within 67 km of a radar-equipped military airfield. The MoD have been consulted about the potential impact of the project on the air traffic control primary surveillance radar at RAF Lossiemouth, 60km NE of Farr. Following an initial finding of no objection, the MoD has requested further details of the proposal. An MoD response to this further consultation, including a revised analysis of the visibility of the wind farm from the RAF Lossiemouth radar, is awaited.

Shadow Flicker

13.7 'Shadow flicker' as discussed in this section is the flickering or strobing effect that the moving shadows of rotating blades can cause when perceived by humans. Published material indicates that the factors outlined in the following paragraph are relevant to shadow flicker effect.

13.8 Frequencies of shadow flicker that may produce disturbance are less than 1.5Hz. In addition, seven physical circumstances need to apply simultaneously before shadow flicker effect can occur:

- the sun must be shining;
- the wind turbine must be operating (wind speeds must therefore be in excess of 4-5 m/s);
- the moving shadow cast by rotating blades must be seen from within a building, and through a narrow window;
- the orientation of a turbine and its angle of elevation to the observer must coincide with the angle and the position of the sun to the building so that the shadow falls onto the building. This will most likely occur in the months between October and February;
- since the origin of the effect is the sun, dwellings which may be affected must lie to the north of the point where the sun rises and sets; and
- shadow flicker effect becomes insignificant at a distance of more than 10 rotor diameters from a wind turbine. As the turbine diameter for the proposed site is 84m, a dwelling would have to lie within 840 m of the proposed development to experience shadow flicker. There are currently no dwellings within this range from the proposed wind turbines.

13.9 Shadow flicker is not, therefore, considered to be a potentially significant impact.

Public access

13.10 Public access to the site will not be restricted, with the exception of access to high voltage switchgear in the grid connection compound (which will be surrounded by an appropriate security fence) and the site control building.

Conclusions and recommendations

13.11 No radio facilities have been identified which might be negatively affected by the Farr wind farm development. There may be some potential for impact on the air traffic control radar at RAF Lossiemouth. The scale and nature of any such impact would require separate study. Consultation with the MoD is ongoing.