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1 INTRODUCTION

1.1 This Document

AMEC is applying to the Scottish Executive to construct a wind farm with an installed capacity of over 50 MW, consisting of forty seven wind turbines, a monitoring mast, site control building, local sub-station, and other associated infrastructure within a part of Clashindarroch Forest which is currently forested with commercial woodland. The site lies 6 km south west of Huntly in Aberdeenshire and is owned by Forestry Commission Scotland.

As the Clashindarroch proposal is over 50 MW it will be submitted to the Scottish Executive under Section 36 of the Electricity Act 1989, and in accordance with The Environmental Impact Assessment (Scotland) Regulations 1988 and the Environmental Impact Assessment (Scotland) Regulations 1999. In August 2002, a request for a Scoping Opinion was sent to the Scottish Executive who gave their first response in October 2002, and a revised response in December 2002.

AMEC has carried out an Environmental Impact Assessment (EIA) for the Clashindarroch wind farm proposal in consultation with the Scottish Executive, Scottish Natural Heritage (SNH) and Aberdeenshire Council. AMEC has documented this EIA in the form of an Environmental Statement (ES) for consideration by the Scottish Executive Energy Division under Section 36 of the Electricity Act 1989, and in accordance with The Environmental Impact Assessment (Scotland) Regulations 1988 and the Environmental Impact Assessment (Scotland) Regulations 1999, in support of a planning application for a wind farm development. There are four volumes:

- Volume 1 – an Executive Summary of the main findings of the Environmental Impact Assessment (EIA)
- Volume 2 – an Environmental Statement detailing all parts of the EIA
- Volume 3 - the associated figures, appendices and visualisations
- Volume 4 - a planning appraisal of the relevant local and national planning policies

The ES can be purchased from:

- AMEC Wind Energy, Bridge End, Hexham, Northumberland, NE46 4NU
☎ 01434 611300
 - Volume 1 Executive Summary: Free of Charge
 - Volume 2 Environmental Statement: £50
 - Volume 3 Figures and Visualisations: £100
 - Volume 4 Planning Statement: £50
 - Volumes 1, 2, 3 and 4 on Compact Disc: £10

The full ES can be viewed at these locations during normal office hours:

- Forestry Commission Scotland, Portsoy Road, Huntly, Aberdeenshire, AB54 4SJ
- Aberdeenshire Council, Viewmount, Stonehaven, AB39 2DQ
- Huntly Post Office, 16 The Square, Huntly, AB54 8AD

1.2 The Applicant

AMEC is an international engineering services company and its wind energy business is established as one of the UK's leading wind energy developers. AMEC has expertise in all aspects of wind farm design, construction, commissioning and maintenance. AMEC has been directly involved with the following sites:

Wind Farm	Location	Turbine Specification	Status
Clachan Flats	Argyll	9 x 1.75 MW	Has planning permission
Edinbane	Isle of Skye	27 x 1.75 MW	Has planning permission
Tees Wind North	Teesside	17 x 2.5 MW	Has planning permission
High Volts	Hartlepool	3 x 2.75 MW	Under construction
Hare Hill	Durham	2 x 2.75 MW	Under construction
Holmside Hall	Durham	2 x 2.75 MW	Under construction
High Hedley	Durham	3 x 750 kW	Commissioned December 2001
Blyth Offshore	Northumberland	2 x 2 MW	Commissioned December 2000
Kirkheaton	Northumberland	3 x 600kW	Commissioned May 2000
Great Eppleton	Sunderland	4 x 750 kW	Commissioned January 1997
Caton Moor	Lancashire	10 x 300 kW	Commissioned December 1994
Blyth Harbour	Northumberland	9 x 300 kW	Commissioned January 1993

Table 1 Existing AMEC wind farm projects

AMEC has several other projects at various stages of development both on and offshore including a feasibility study for a 600MW project on the Isle of Lewis, and a number of 50MW plus schemes in England and Scotland.

1.3 Compatibility with Planning Policy

Development Plans (DP) establish a planning framework for the local control of development. In the area of the proposed wind farm the adopted DP consists of The North East Scotland Together Aberdeen and Aberdeenshire Structure Plan 2001-2016 (NEST) and the Consolidated Aberdeenshire Local Plans 1998 (CALPs). The latter is due to be replaced by the finalised Aberdeenshire Local Plan (FALP), following a public inquiry in October 2003.

The adopted and emerging DP supports the Scottish Executive's drive to increase the proportion of electricity production sourced from renewables in Scotland to 40% by 2020. This local planning framework reflects National Planning Policy Guidelines, as embodied in

NPPG6, climate change policy and energy policy. These policies all identify a clear national need for projects of this type due to the pivotal role renewable energy, and wind energy in particular, will play in implementing Scotland's Climate Change Strategy.

The proposed wind farm is strongly supported by local and national policies and targets to promote sustainable development in general, and renewable energy in particular. It is carefully located so as to minimise its potential adverse environmental impact in visual, ecological and human terms. The proposal is fully compatible with the broad environmental and socio-economic ethos of the existing Development Plan and its existing and future land use planning framework in the area.

Policy 5 in the finalised NEST Structure Plan specifically concerns renewable energy facilities, stating that:

Proposals for renewable energy facilities shall be favourably considered subject to ecological, transportation, landscape and amenity considerations as set out in local plans. In addition, local plans shall outline the acceptable operating standards and restoration and aftercare requirements for new developments where appropriate. Wind farm proposals shall be based on a sequential exploration of tiered planning designations outlined in Policy 26.

Policy 26, in establishing these 'Tiers' states that:

Proposals for mineral extraction, landfill, land raise and wind farm proposals must conform to a sequential exploration of tiered planning designations;

- *Tier 1 – international Designations*
- *Tier 2 – National Designations*
- *Tier 3 – Local Designations*
- *Tier 4 – Other Preferred Areas*

The proposed Clashindarroch site lies predominantly within a Tier 4 preferred area, with a limited part of the north western edge of the site located within an Area of Regional Landscape Significance.

In addition to its location within a 'preferred area', it is predicted that the Clashindarroch wind farm will have no significant detrimental effect on areas of important environment, landscape, wildlife, archaeological or cultural interests. High operational and environmental standards will be maintained during the working life of the project and suitable, early restoration will be carried out when operations cease unless a subsequent application is submitted and approved.

The full Environmental Statement and Planning Appraisal conclude that the project will have no significant adverse impacts. Therefore due to its clear compatibility with national planning policy, the provisions of the Development Plan and the clear national need for renewable energy developments, it is considered to be an acceptable proposal.

2 DETAILS OF THE PROPOSED DEVELOPMENT

2.1 Site Location

The proposed wind farm site lies within Clashindarroch Forest, which is 6km south west of Huntly and some 6km west of Rhynie in Aberdeenshire. The forest is owned by Forestry Commission Scotland and lies within the authority of Aberdeenshire Council. The site is currently a multi-age class commercial forest dominated by Sitka spruce and Lodgepole pine with relatively small proportions of various other species. Open space within the forest accounts for around 16% of the total forest area. The site lies on complex terrain ranging from around 220 metres (m) to 525m above sea level.

2.2 Site Selection

To identify the most appropriate sites for the development of wind farms, a structured site selection process is undertaken which considers many factors such as wind speeds, environmental considerations, site access and grid accessibility. If the site satisfies the criteria set out in this selection process it will be considered for development.

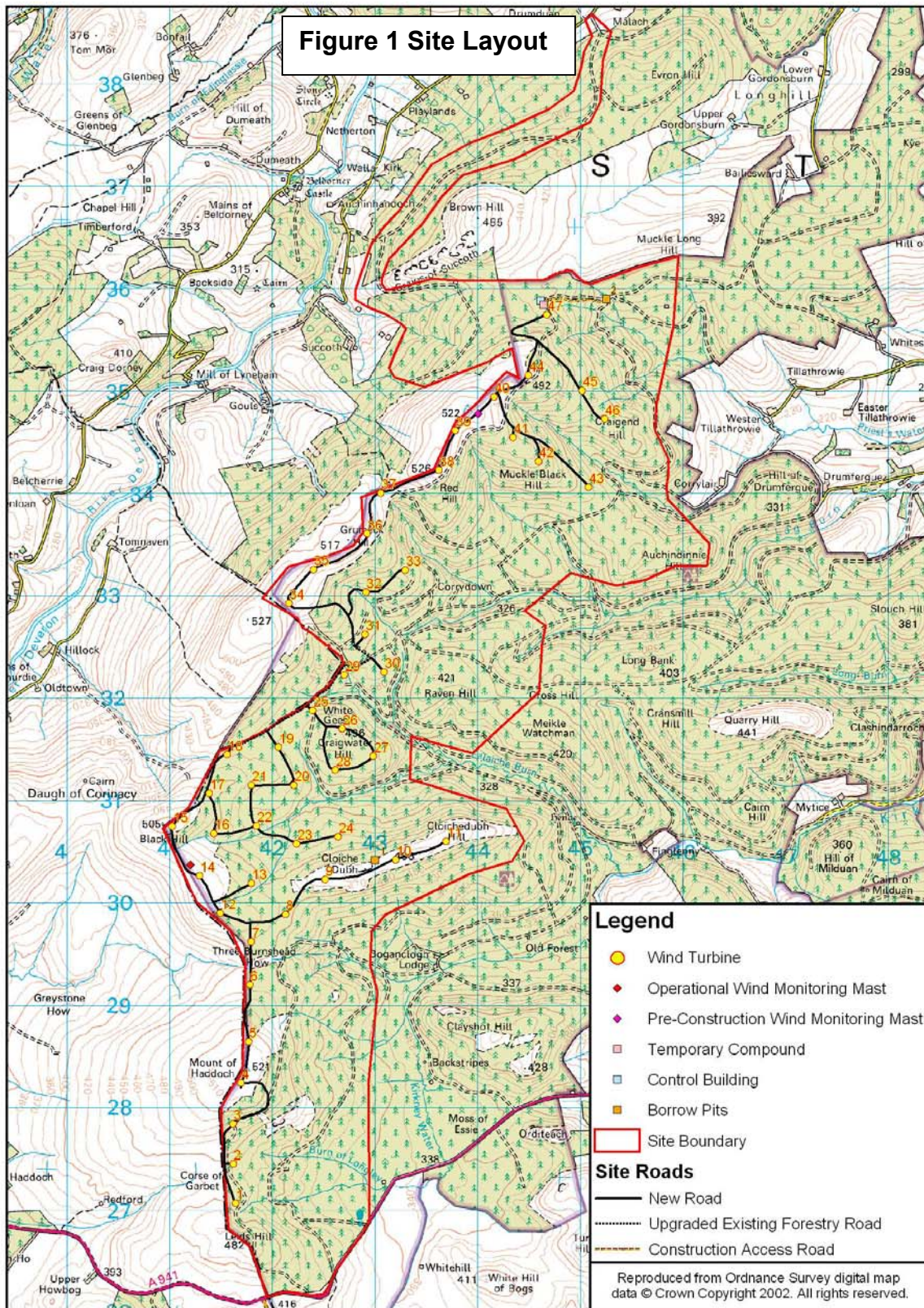
Beyond careful site selection, based on relevant criteria, it is not possible for an applicant seeking permission for wind farm development to eliminate alternative sites. The most that can be done (and all that is required to be done) is to indicate that what is proposed is in a suitable location and represents an acceptable form of development.

On the basis of this selection assessment, the Clashindarroch site was deemed to have the potential to be an excellent wind farm location for a variety of reasons including:

- excellent wind resource
- landowner co-operation
- located predominantly within Aberdeenshire Council's Tier 4 area of least sensitivity with a small part in a Tier 3 area
- minimal ecological impact due to location within commercial plantation
- opportunities for habitat and wildlife enhancement
- proximity of a suitable grid connection
- potential for visual impact to be minimised due to complex topography

2.3 Site Layout

The Clashindarroch site layout has evolved as a result of the environmental impact assessment (EIA) process. The EIA process involves survey work (see Section 4) which identifies potentially sensitive areas within which turbines should ideally not be placed. The layout of the Clashindarroch proposal (see Figure 1 below) has been designed to minimise environmental and visual impacts.



2.4 Number and Specification of Wind Turbines

It is proposed to erect 47 turbines on the site, with a typical individual capacity of 1.75 megawatts (MW). The dimensions of the turbines would typically be:

- Tower height 67 m (220 feet)
- Rotor diameter 66 m (217 feet)
- Maximum height to the tip of the blade 100 m (328 feet)

The turbines consist of a steel tubular tower with three glass-fibre blades attached to a nacelle. The nacelle contains the generator, gearbox and other operating equipment.

Typically, power will be generated by the turbines at wind speeds of between 4 m per second (9 miles per hour) and 25 m per second (56 miles per hour). When wind speeds exceeds approximately 25 m per second (56 miles per hour) the wind turbines will automatically shut down.

2.5 Construction Programme

The construction of the Clashindarroch wind farm would require the following:

- Felling of an area of coniferous plantation prior to construction
- Improvements to the public road
- Construction of site roads and hard-standings next to turbine locations
- Construction of a temporary site compound including porta-cabins, loading and parking areas
- Sourcing of on-site borrow pits
- Construction of the turbine foundations
- Construction of a site control building
- Construction of a sub-station compound of approximately 60m x 90m
- Erection of turbine towers followed by nacelles and blades
- Site reinstatement and removal of temporary compounds
- Habitat improvements post construction

The above phases are likely to be carried out in sequence, with some phases running concurrently. The total construction period is expected to last up to 24 months, subject to favourable weather conditions.

2.6 Borrow Pits

A study was carried out to identify potential areas for the development of borrow pits to provide sufficient roadstone material within the site boundary to construct site roads and hard-standings. It is proposed that the stone required would be sourced from two borrow pits within

the site boundary. The locations of the proposed borrow pits are shown on Figure 1. One is an existing Forestry Commission Scotland borrow pit and the other is located in the centre of the wind farm development area and gives rise to no visual impact. As a great deal of the site area is currently forested, alternative borrow pit locations may be revealed once felling has taken place, however the Council and SNH would be consulted prior to any works being carried out.

2.7 Turbine Foundations

Each wind turbine will require a steel reinforced concrete mass foundation, typically containing 260 cubic metres of concrete. The foundations are set 1m below ground level so that upon the completion of installation, the land can be reinstated right up to the base of each turbine (excluding the hard-standing area). This also means that the foundations can be buried and their sites re-vegetated upon decommissioning.

2.8 Grid Connection

The electricity produced by each wind turbine passes through a transformer within or next to the turbine before being transmitted via underground cables to the site control building. From the site control building (see Figure 1), the power is transmitted to the sub-station via underground cables. The sub-station will be in a small wooded area adjacent to the A920 which is currently owned by FE. The sub-station compound is adjacent to the main 275 kV tower line that runs from Keith to Kintore, therefore there is no requirement for additional overhead power lines.

2.9 Traffic Movements

The construction period is expected to last up to 24 months (with favourable weather conditions). During this time there will be an increase in the number of vehicles using access roads, and this will cause a time of increased pressure on the local environment. The Aberdeenshire Council's Roads Department have been fully consulted and no major concerns were raised.

2.10 Period of Operation

The Clashindarroch wind farm is designed to have an operational life of 25 years. After this time all turbines and towers can be removed leaving no visible sign that a wind farm was located on the site. Forestry Commission Scotland would regain sole control of the development area and revert to managing it as an integral part of the rest of Clashindarroch Forest.

2.11 People and Safety

The construction, operation and maintenance of the wind farm will be undertaken in accordance with relevant Health and Safety legislation, and will be carried out by reputable contractors employing competent trained staff. The turbines will be sourced from reputable manufacturers backed by independent certification that the equipment is safe for use as intended.

Shadow flicker is a phenomenon that occurs when a particular combination of conditions: geographical position and time of day and year coincide. It happens when the sun is low in the sky and shines on a building from behind a turbine rotor. This can cause the shadow of the turbine blades to be cast onto the building, which appears to flick on and off as the turbine rotates. When this flicking shadow is viewed through a narrow opening it is known as shadow flicker. A calculation of the extent of this effect can be carried out using the geometry of the machine and the latitude of the potential site. There are no dwellings present within the distance at which shadow flicker caused by the Clashindarroch wind farm may occur.

2.12 Decommissioning

At the end of the wind farm's operational lifetime all turbines and towers can be removed and the land restored to the requirements of Forestry Commission Scotland. The cost of decommissioning would be covered by the salvage value of the components.

At the end of the wind farm's operational lifetime it may be desirable to re-power the site with new machines. This would be classed as a new development which would require a new planning application and Environmental Impact Assessment.

3 THE NEED FOR AND BENEFITS OF THE PROPOSAL

The following section discusses the environmental and economic benefits of the proposed wind farm.

3.1 Environmental Considerations

Wind energy is a non-polluting form of energy generation. The generation of electricity from wind energy does not produce any harmful greenhouse gases or acid rain emissions, and requires no treatment of waste by-products.

The Clashindarroch wind farm would, over its proposed 25 year lifetime, save the emissions indicated in the table below, assuming an installed capacity of 82.25MW.

Emission	Over 25 year lifetime (tonnes)*
Carbon Dioxide (CO ₂)	4,647,000
Sulphur Dioxide (SO ₂)	54,000
Nitrous Oxides (NO _x)	16,000

Table 2 Emission savings

The use of renewable energy plays an important part in the strategy to reduce the threat of global warming arising from atmospheric pollution. This has been recognised at a global,

European and national level via legally binding targets for the reduction of carbon dioxide (CO₂) levels. The UK Government is committed via the Renewables Obligation to increasing the proportion of electricity generated from renewable sources.

3.2 Economic

The nature of the construction work will lend itself to the employment of local contractors and labour during the construction period. Over the longer term, the wind farm will require a modest level of servicing and breakdown cover, which may result in a direct contribution to the local economy.

AMEC will work with Aberdeenshire Council, the Community Councils and the local community to direct a community fund into projects which bring a direct benefit to the local economy and environment.

4 SUMMARY FINDINGS OF THE ENVIRONMENTAL IMPACT ASSESSMENTS

The EIA process requires a number of surveys and studies to be undertaken. These studies have been carried out in consultation with Scottish Natural Heritage (SNH) and Aberdeenshire Council.

4.1 Forestry

A forestry study was carried out to determine baseline information relating to the effects of the proposed wind farm on Clashindarroch Forest and the detailed proposals for the clearfelling and other forestry-related operations.

Clashindarroch is a multi-age class forest with a number of existing stands dating back to the early 1930's followed by a period of steady annual afforestation until a period between 1950 and 1970 when the majority of the forest was planted. Major restructuring and restocking programmes commenced in the 1980's and 1990's. The total area of Clashindarroch forest is 5,607 hectares and the proposal will be accommodated within a contiguous area of 966 hectares or 17% of the total forest area.

It is necessary to fell an area of trees around the turbines to prevent a loss of energy yield. The overall felling plan has been sub-divided to accommodate the following two distinct management regimes:

- clearfelling of 689 hectares (ha) of existing high forest crops to accommodate the requirements of the wind turbines
- an alternative management regime – whereby 50 ha (35ha of trees and 15ha of open ground) at the southern end of the development area will be “topped” to a height of around 5m to maintain snow holding for the cross country skiing club.

It is considered that the felling offers opportunities to achieve **net environmental and landscape gains** for Clashindarroch Forest, as a result of:

- rationalising the western flank of the forest by permanent removal of low yielding and relatively low value commercial crops (particularly Lodgepole Pine) that have in any event been grown at, or close to, their economic limit in terms of elevation, exposure and vulnerability to windthrow;
- improvement of otherwise rigid and visually unattractive forest boundaries particularly between Mount of Haddoch and Three Burnshead How at the south of the development area and a section north of Black Hill;
- introduction of biodiversity improvements as described in Section 4.2.

4.2 Ecology

A survey was carried out to assess the significance of impacts of the wind farm proposal upon the habitats, flora and fauna of the site in order to;

- Identify and value the nature conservation interest of the site in a systematic manner, establishing levels of interest for its main ecological features;
- Assess the likely magnitude of impact of the development on each feature of nature conservation interest;
- Assess the significance of ecological impact in relation to the level of ecological interest and impact magnitude.

This approach follows draft guidelines on ecological assessment which have been produced by the Institute of Ecology and Environmental Management (IEEM).

4.2.1 Habitats

The Clashindarroch survey area is dominated by conifer plantation. There is a modest amount of semi-natural habitat remaining in the site. A survey of such habitats was undertaken in June and July 2002. This recorded about 390 ha of ground with semi-natural or other non-conifer conditions. The main types present are acid dry dwarf-shrub heath, blanket bog, flushes and acidic grassland.

The semi-natural habitats present are locally common in northern Scotland. The development area does not fall within any statutory nature conservation designation. The area does not contain plant species which are nationally rare, but one nationally scarce species was found. The most important habitats present are dry heath and blanket bog, both of which are in moderate condition. Their total area is not large, occurrences are fragmented and they cannot be considered as examples of viable habitat extent. The blanket bog examples appear to be slowly drying out and forming dry heath vegetation. The condition of other semi-natural habitats is rather poor and is strongly influenced by the drainage and shading effects of the conifer plantation.

Impacts will arise from conifer tree clearance around the turbines, for up to 300 m radius, and from construction of roads and turbine bases. Little existing semi-natural habitat will be affected by the development with very little permanent habitat loss or temporary disturbance to such ground. The low amounts of permanent semi-natural habitat loss or temporary

disturbance is considered to be of **minor negative impact significance**, using guidance being developed by the Institute of Ecology and Environmental Management (IEEM).

4.2.2 Mammals

Non-systematic observation of species (excluding birds) during the habitat survey recorded only Roe Deer droppings and signs of Field Vole activity (runs) in rank grassland beside tracks. No evidence of Badger was found. Discussion with Forestry Commission Scotland staff confirmed this mammal is present at Clashindarroch but only present on lower ground, in areas adjacent to agricultural grassland. It is most unlikely that it is present in the wind farm development area.

The wind farm area probably does not contain large numbers of red squirrels at present. Ground immediately adjacent to the wind farm is planned as continuous cover and will comprise linked corridors of older conifers with good cone production. It is likely that the squirrel population will remain stable or even expand due to improved habitat connectivity. Controls on Grey Squirrel (not yet present) will also be needed in the long term. Squirrel surveys and provision of Red Squirrel feeding habitat along the forest edges of the wind farm are proposed as part of the Habitat Management Plan proposed in outline here. If implemented, there will be little or no long-term effect on the squirrel population and the development will have a **neutral impact significance**.

4.2.3 Habitat Management Plan

Land cleared of conifer forest for turbine development will be restored with semi-natural habitat. The likely areas are large and a detailed Habitat Management Plan covering restoration techniques and a phased programme of habitat creation will be produced if planning permission is granted. This management plan will be a condition of planning consent and will be developed by a formal management group which will include SNH and Forestry Commission Scotland.

An outline management plan is proposed to indicate the scope of habitat creation. The outline plan uses existing soil information to decide the best habitat or combination of habitats to establish on ground cleared of forest. The following types of new habitat are proposed, although extents will depend on the degree of soil modification which has occurred under the conifer plantation:

- re-wetted blanket bog on hill peat soil, with a possibility that raised bog habitat could also be created;
- large extents of dry heath (some on dry deep peat), to form the commonest habitat in the wind farm area, including mosaics with acidic grassland;
- modest extents of wet heath, currently absent from the site;
- modest extents of wet ground in valley floors with rush flushes and tussocky wet neutral grassland, forming much more continuous features than at present;
- wet broadleaved woodland will be established as modest extents in valley floors on the lower ground on the eastern side of the wind farm, linking with planned **habitat network corridors** which will be much more extensive at Clashindarroch in the future

The total of restored semi-natural habitat (c. 700 ha) is very large. Using IEEM guidelines, this is considered to be a major nature conservation enhancement to the site and this is rated as a **major positive significant impact**.

4.3 Hydrology

An assessment was carried out to determine the existing hydrological conditions at the site and the potential impacts of the proposed scheme. Mitigation measures to ameliorate any adverse impacts are also identified.

The following key issues are considered in relation to the development:

- Modifications to natural drainage patterns
- Impacts on runoff and baseflow
- Impacts on groundwater
- Impacts on water quality and water supplies
- Impacts on flow in natural watercourses and flush zones
- Modification of stream channel morphology (erosion/deposition)
- Modification of site ecology.

Site visits were carried out between July and August 2002, at the same time as the habitat surveys. Stream courses in forest plantations were examined, together with soils in roadside sections.

A further visit was made in May 2003 to inspect a private water supply. Surrounding environmental conditions were also surveyed and the impact of development on the water supply was discussed with the users of the well.

4.3.1 Proposed Mitigation Measures during the Construction Phase

A number of mitigation measures will be implemented during the construction to minimise the hydrological effects of the proposed development. These take account of published guidance by SEPA (1999) and, especially, the guidance offered by the Forestry Commission (1998, 2000) in Forests and Soil Conservation and Forest and Water Guidelines. These mitigation measures include:

- Watercourses will not be blocked or equipment, materials or chemicals stored near them;
- Drip trays will be placed under standing machinery to avoid oil and petrol pollution during oil changes and maintenance operations
- All fuels, lubricants and chemical additives will be stored in a bunded area that is drained through oil interceptors and which meets the requirements of the Groundwater Regulations, which are enforced by SEPA.
- All repair and maintenance work to plant and vehicles will be within bunded areas, drained through oil interceptors, which meets the requirements of the Groundwater Regulations, enforced by SEPA.
- Cement and unset concrete will be kept out of watercourses during construction as they are highly toxic to stream life.

- Contingency plans and equipment will be in place in case of an uncontained spillage.
- Peat cut during construction of the tracks will be reinstated as soon as practicable to minimise the risk of desiccation of cut peat turfs and erosion of exposed surfaces.
- Any sediment generated during construction will be treated in such a manner that it does not enter the local watercourses. This will include the provision of a large number of silt traps and settlement ponds, located to intercept suspended solids moving via the extensive drainage ditches in the forest area.

If the construction is planned and undertaken with care following the appropriate mitigation measures, all of the impacts described will be **insignificant**, except for pollution. If pollution during construction was to occur it could potentially have a **significant** effect. However if the mitigation measures are implemented, the likelihood of occurrence is **minimal**.

4.3.2 Proposed Mitigation Measures during the Operational Phase

A number of mitigation measures will be implemented during the operation of the scheme to minimise the hydrological effects of the proposed development. These measures include:

- The access tracks will be constructed of inert material of suitable grade to withstand the expected traffic loading.
- Roadside drainage will be avoided where possible and where it is required roadside ditches will be designed to affect the natural hydrology as little as possible.
- The ditches will be kept to the minimum depth required for free drainage of the track.
- Individual drain lengths will be kept to a minimum to avoid significant disruption of natural drainage patterns and avoid accumulation of large volumes of water within an individual drain.
- Drains will not discharge directly into a watercourse but will flow out into a buffer zone which act as a filter strip, often with a sediment trap to intercept suspended solids.
- Where appropriate, a cut-off drain will be installed at the top of the track cutting to control seepage from natural ground into the cut.
- Pesticides will not be used to maintain the access tracks.
- Alkaline leaching from the turbine bases will be minimised by using a concrete mix designed to withstand sulphate attack, as detailed in the code of practice for concrete design BS5328. Sulphate resistant concrete will be used where appropriate in the construction of all turbine bases, reducing sulphate attack effects to a negligible level.
- Culverts and drainage pipes will be laid beneath the track whenever it crosses a flush zone, drain or gully to avoid disruption of natural drainage. Culvert inlets and outlets will be protected to avoid erosion.

4.3.3 Residual Impacts

Even with the above mitigation measures there will be some residual impacts associated with the operation of the proposed windfarm. However, the windfarm will be operated with care and by following the mitigation measures recommended above, all of the impacts described above should be **insignificant**, except for pollution effects. If pollution during operation was to occur it could potentially have a **moderately significant** effect. If the mitigation measures are implemented, the likelihood of occurrence is **minimal**.

4.3.4 Future Monitoring Requirements

The impact of the windfarm on the hydrology of the area will be reviewed as part of the maintenance regime. A residual inspection of the tracks, drains, sediment traps and surrounding land will be undertaken on a regular basis to ensure that the windfarm is not subject to, or causing, erosion, drying out of the surrounding land or flooding.

4.4 Ornithology

An independent study was commissioned by AMEC to provide information on all the ornithological interests of the proposed wind farm area. Surveys were undertaken to establish which species were using the area and to determine their level of use. The proposed Clashindarroch wind farm site currently includes both open ground moorland habitats and closed conifer forest habitats. The bird communities present include moorland passerines (song-birds) such as meadow pipit and wheatear, a range of common forest passerines, red and black grouse, forest raptors and other forest species such as carrion crows and jays. In total 92½ hours vantage point observation time was achieved, appropriately distributed within each of the four survey months from April to July.

4.4.1 Vantage Point Watches

4.4.1.1 Method

Vantage point watches were undertaken with the aims being to:

- Calculate activity indices for species of raptors and forest grouse known to occur within the forest, and any short-eared owl, geese and ducks that may occasionally use the survey area
- Collect data on target raptors (i.e. all species except sparrowhawk, buzzard & kestrel) and forest grouse that enable estimates to be made of the:
 - time each species spends flying over the survey area
 - proportion of flying time each species spends within the height range swept by approximately 100m high turbines (20-100m)

Vantage points were carefully chosen to permit all ridges and areas for possible turbine placement to be viewed from a distance of 2 km. Survey watches for target species and secondary species were conducted for three hours from each of the four strategic vantage points, twice per month from April to July 2002. Target species for vantage point watches were defined as rare raptors and forest grouse (black grouse and capercaillie). Secondary species for the vantage point watches during the breeding season were defined as other raptors, geese and ducks.

4.4.1.2 Results

Study Area Activity Indices (SAAI's) give a relative measure of the likelihood of birds being displaced from a wind farm site if they are disturbed by the construction or operation of wind farms. These are calculated from records of target and non-target species seen from vantage points. The bird activity indices are intended to give an objective measure of the intensity of use each species makes of the study area. Activity levels were generally low and results showed that buzzard and common gull had the highest activity levels over the study area.

Rotor Height Flight Activity Indices (RHFAI's) give a relative measure of the likelihood of birds colliding with the turbine rotors of a wind farm. These are calculated from the proportion of time that target species spend flying at rotor height. Rotor height flight activity indices provide a measure of how often particular species are theoretically at risk of collision with rotor blades. Target species were seen during the vantage point watches for a total of 850 seconds, indicating a very low level of use above the forest canopy by these species of the study area. For example, osprey were calculated to spend 0.01% of the time that ospreys are potentially active (i.e. daylight hours from 0900 to 2100 hours) within the turbine envelope at rotor height.

4.4.1.3 Mitigation

Prior to the construction of the wind farm it will be necessary to fell areas of forest beyond the turbine envelope. The timing of the felling operations should avoid sensitive periods for raptors). Normal forest felling operations in Clashindarroch are weather dependent but generally continue from mid-February to mid-December. Since this includes the breeding season and under the Wildlife & Countryside Act (1981) it is an offence to deliberately destroy any bird nest during the breeding season, mitigation is necessary. Prior to mitigation, this is considered to be of **moderate significance**. In accordance with FC Guidelines (Petty 1989, 1996 and Currie and Elliot 1997) felling during nesting periods should maintain a disturbance-free zone, which diminishes as the season progresses. For each forest-nesting species the size of these disturbance-free zones are set out in Currie & Elliot 1997. If these mitigation measures are followed the **significance goes from moderate to low**.

The most obvious impact of construction would be that most birds wholly dependent on the existing forest areas to be felled would move into other parts of the Clashindarroch and neighbouring forests. For some species however, there may be insufficient areas of suitable habitat for all displaced pairs to relocate. The bulk of these birds will be from common forest species, and will be replaced by an open habitat community, with affinities to the moorland communities they replaced when the forest was first planted.

Because activity levels for specially protected species within the turbine envelope are so low, the significance of any disturbance displacement are judged to be **moderate**. These may be reduced to **low** if mitigation following guidance contained in Currie & Elliot (1997) is followed. Activity levels at rotor height within the turbine envelope are even lower so the significance of any collision mortality of specially protected species (other than black grouse – see below) is judged to be even **lower**. These judgements allow for the slight underestimation of collision risk with turbines between Cloiche Dubh and Cloichedubh Hill due to the presence of observers there during one viewpoint watch out of each viewpoint visit.

4.4.1.4 Impact and Mitigation during Site Design

The Tips of Corsemaul and Tom Mor Special Protection Area (SPA) lies 5km to the north-west of the site. Common gulls are protected here as a breeding colony and occasionally crossed the northern-most area of the site area in April. Because of this, three turbines were removed from the site layout to reduce the likelihood of potential impact.

4.4.2 Forest Grouse Dog Surveys

4.4.2.1 Methods

Historically there have been records of black grouse and capercaillie at the western and southern edges of the Clashindarroch forest, outwith the area proposed for turbine placement. Because of the conservation importance of these species, specialist dog surveys were carried out to a method agreed with SNH.

4.4.2.2 Results

During the Forest Grouse Survey the team utilised four dogs to search areas within sufficiently open habitats for access to be possible. They worked systematically over the selected areas and although sometimes showing interest in scent, only found two positive contacts in the two days, one on black grouse and one on red grouse. The conclusions from this by the handler were that the presence of woodland grouse were very low.

4.4.2.3 Mitigation

The major ornithological concern arising from the proposed Clashindarroch wind farm is the potential for collision by black grouse if they are attracted into the open habitats within the turbine envelope (created by the tree felling), and fly above 20m. The significance of this if there were to be no mitigation would be **moderate**, however by implementing the mitigation measures described below the significance is **low**. Since collision risks without tree felling are estimated to be very low, it is possible that collision risks could increase once the wind farm is built, which could adversely affect the possibly declining black grouse population. Because the black grouse population is important in a regional context, and even low levels of mortality could change the composition of the population, a precautionary approach will be adopted. To make sure the population benefits overall, there will be positive management of habitat away from the turbines, with created woodland within the turbine envelope being of a high density. There is very high potential to improve the area outside the turbine envelope for the black grouse population. This is currently very low and may be declining, as the capercaillie population has been for some years. It is anticipated that over a 3 to 7 year period, Blackmiddens will develop into a more attractive area which can support at least as large a black grouse population as before. However, it is not possible to predict with any certainty, by how much such gains will exceed any losses due to collisions. The timing of any collisions, and the age classes affected would be expected to influence the outcome. For example any juvenile losses may be regarded as much less important than casualties amongst breeding pairs. Therefore for a period of up to 7 years AMEC will aim to keep the felled areas on the high ground and ridge open and less attractive to black grouse. This will be reviewed by a monitoring group which will be set up to review the habitat management plan proposed for the area.

Under native woodland planting and current FE plans for new native woodlands outside the turbine envelope, black grouse habitat to the south of the turbine envelope is being and will continue to be enhanced. This should serve to attract black grouse away from the turbine areas, and thereby reduce collision risks for this species. The native woodland plantings around the traditional black grouse lekking site at Blackmiddens should be tailored to benefit black grouse with raised bog establishment (Dargie 2003). Such measures would create desirable habitats contributing to achieving the Aberdeenshire Biodiversity Action Plan (BAP) and UK BAP priorities. In November 2002 the Blackmiddens site (along with two others

around Clashindarroch totalling 360 hectares) received funding from the Scottish Forestry Alliance, comprising FC, BP, the RSPB and the Woodland Trust Scotland.

The study area activity levels per hectare are very low for all species, except buzzard and common gulls. If the appropriate mitigation methods described above are implemented then the overall ornithological impact of the wind farm proposal will be **low**.

4.5 Landscape and Visual Assessment

This assessment examines the potential effects of the proposed Clashindarroch Wind Farm on the landscape and visual amenity of the surrounding area. The assessment is based on a study area within a 25km radius and concentrates on the key landscape and visual issues identified during the scoping stage of the assessment.

4.5.1 General Approach

The landscape and visual assessment has been based on guidelines provided in the Advisory Booklet on Landscape Assessment Guidance (Countryside Commission 1993); the Landscape Institute's Guidelines for Landscape and Visual Assessment (Landscape Institute and Institute of Environmental Assessment 1995 and Second Edition 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).

The assessment has drawn on information provided by consultations with Aberdeenshire Council and SNH. It has involved a desk study, fieldwork, data processing and analysis, and interpretation using professional judgement. The assessment comprises the following:

- A zone of visual influence (ZVI) to identify the extent of the proposed wind farm's visibility over the 25km radius study area. This is done using a computer based visibility analysis package compiled using Ordnance Survey digital height data, and a three dimensional digital model of the proposed wind farm.
- A visibility assessment to describe the general extent of visibility of the proposed wind farm
- A selection of viewpoints chosen in consultation with both the Aberdeenshire Council and Scottish Natural Heritage. These viewpoints are considered to be representative of the main sensitive receptors in the study area.
- A viewpoint analysis of the potential effects on 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 and photomontages to predict the views of the proposed turbines from each of the agreed viewpoints.
- 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.

4.5.2 Conclusions

The landscape and visual assessment has established that the proposed wind farm development at Clashindarroch would change the landscape and visual baseline conditions during its construction and operational phases. The proposed wind farm would introduce a group of 47 turbines, each 100 metres in height to blade tip, within the extensive Clashindarroch Forest to the south west of Huntly in Aberdeenshire

The construction phase of the proposed wind farm is relatively short lasting approximately 24 months and will have only temporary, minor effects on landscape and visual amenity within the local area.

The proposal would involve clear felling an area of 689 hectares of existing plantation woodland. The woodland to be removed is predominantly Sitka spruce and disturbed ground would be fully restored, extending the existing open moorland on the ridgeline summits of Red Hills/ Grumack Hill and Cloiche Dubh/ Cloichedubh Hill together with high ground adjoining the summits of Black Hill, Mount of Haddoch, and Leids Hill, with landscape and nature conservation benefits.

Detailed attention has been given to landscape and visual effects during the design of the project and the layout has been optimised from seven key viewpoints including Tap O'Noth, Clashmach Hill, The Buck, Backside, Cabrach and A96(T) between Huntly and Keith. The number and layout of the turbines has been adjusted to reduce the potential impact on receptors in close proximity to the site, and to achieve a balanced composition from views in the surrounding area.

The application site at Clashindarroch is predominantly within a preferred Area of Search for wind energy development as outlined by Aberdeenshire Council in the Structure Plan (2001). The north western edge of the proposed site lies within an Area of Regional Landscape Significance.

There are no National Scenic Areas within the 25km radius study area around the proposed wind farm. The Cairngorms NSA, is the nearest, but lies at a distance of 30km south west of the site and the assessment has found that there would be no significant landscape or visual effects resulting from the proposed wind farm within this NSA.

There are Areas of Regional Landscape Significance to the north west and south of the site, and the assessment concludes that significant effects within these locally designated areas would primarily be limited to within a 5km radius, with a few local hills offering hill walkers more open, elevated views towards the proposed development. An extensive area to the east of the site is designated as an Area of Great Landscape Value, and the assessment concludes that significant effects would be limited to the sparsely populated Upper Deveron valley and adjoining rolling uplands, within a 4-5 km radius. Within this range however there would be significant variations depending on individual circumstances (for example the screening effect of afforestation, which limits visibility from much of the area within a 5km radius).

There are four sites listed in the Inventory of Gardens and Designed Landscapes within 20km of the proposed wind farm, including Leith Hall, Kildrummy Castle, Candacraig House and

Tillypronie. The assessment has found there would be no significant landscape and visual effects resulting from the proposed wind farm within these designed landscapes.

The landscape character assessment of the study area around the proposed wind farm at Clashindarroch has found that of the 14 landscape character areas which were identified, significant landscape effects were confined to approximately a 5km radius around the development within limited areas of the Upland Forestry Plantation/ Moorland, Open Uplands, Straths and Valleys and Farmed Moorland Edge types.

The ZVI and viewpoint analysis has confirmed the limited number of settlements which would experience visibility of the wind farm. Up to 20 turbines would be potentially be visible from Haugh of Glass, Rhynie, Huntly, Kennethmont and Keith, however in all instances actual visibility on the ground is likely to be limited due to intervening buildings and tree cover. The main roads that may experience views of part of the wind farm from short sections of the route within the study area include parts of A96(T), A95(T), A97, A920 and A941. The ZVI has confirmed it is unlikely there would be the opportunity for any views of the proposed turbines from the main Aberdeen to Inverness railway line except perhaps for glimpsed views over a short section in the vicinity of Kennethmont, some 10km east of the site, however views from this area would be limited by intervening tree cover.

The assessment of potential cumulative effects has identified a pattern of cumulative visibility split between two halves of the study area. To the east, cumulative effects would be experienced in relation to the approved wind farm at Glens of Foudland, located approximately 15km to the east, while to the west cumulative effects may arise in relation to the more distant approved projects at Cairn Uish and Paul's Hill, both at distances in excess of 28km from Clashindarroch. The assessment concludes that significant cumulative effects would be limited to potential effects from the east in relation to Glens of Foudland, confined primarily to a few upland locations and restricted by the effect of distance and different orientation of the two sites in views from this area.

The proposed wind farm at Clashindarroch will introduce a group of man made structures into a large scale area of plantation woodland. While the introduction of the turbines will be a new landscape feature, the layout is considered to be well designed and sited with due consideration to the potential landscape and visual effects.

Having considered the potential landscape and visual effects in detail it is concluded that the proposal is acceptable in this location.

4.6 Noise

The predicted noise levels for the wind farm indicate that there will be no loss of amenity in the local area due to noise in accordance with established assessment methods. The method used to predict the noise from a wind farm is described in the Statutory Order from the Ministry of the Environment No 304 of May 14, 1991 on Noise from Windmills, Translation by LK 1991, Denmark. This method is used as there is no relevant British Standard. This report will be referred to as The Noise from Windmills Report.

The method of assessing the impact of the wind farm locally is described in The Assessment & Rating of Noise from Wind Farms, ETSU-R-97 by the Working Group on Noise from Wind

Turbines Final Report September 1996. This report is the most recent UK work on the subject. This report will be referred to as The Assessment of Noise Report.

Noise levels at the surrounding dwellings have been kept well within the recommended levels of 35 to 40dB(A) as follows:

LOCATION	PREDICTED NOISE LEVEL (dB(A))
Bogancloch House	35
Bogancloch Lodge	35

Table 3 Noise levels at closest dwellings

4.7 Archaeology

A desk-based archaeological investigation was undertaken on the area of the proposed wind farm site in consultation with Aberdeenshire Council's Archaeology Service.

The assessment demonstrated that there are eighty-eight archaeological sites, including post-Medieval sites, recorded over the whole of Clashindarroch Forest. Of these eighty-eight sites, only twelve actually occur within the proposed site boundary with the majority occurring more than 30 m away from any proposed construction activities.

Despite the concentration of archaeological remains within the forest, there are no listed buildings or conservation areas within the forest, although, approximately 1.5 km to the east of turbine 11 lies Wormy Hillock, which is a Neolithic Henge monument of regional importance. Wormy Hillock is classified as a scheduled ancient monument and thus must not be destroyed or adversely affected by the development (Consolidated Aberdeenshire Local Plan 1998).

The proposed development will have no impact on the majority of the sites identified during the archaeological search, including the scheduled monument at Wormy Hillock. A 30-100 m buffer zone around eighty-one of the sites will ensure that these archaeological and historic remains are left completely undisturbed and *in situ*, in line with Planning Advice Note 42 (PAN 42). This is also in keeping with Forestry Commission Scotland's policy that 'sites of archaeological importance should be conserved' (Forestry Commission 1995:1).

Only one site (the Corrydown Mill lade) faces direct effects as a result of the development, although the effects are considered to be **not significant** according to the criteria outline in EIA Regulations. Appropriate mitigation measures should protect six additional sites from disturbance during tree felling.

The construction of the wind farm could also have an indirect affect on the cultural resource of the area, by altering the landscape setting of the monuments. Indirect visual effects have been predicted in relation to the setting of nine sites in total. However, the monuments already stand within a heavily human-modified environment, and following appropriate mitigation measures (if and when required), it is considered that the wind farm will have **no significant** affect on the setting of the monuments within the forest. Neither will the wind farm significantly affect the setting of any sites of scheduled importance e.g. Wormy Hillock.

Effects upon currently unidentified buried archaeological remains are difficult to predict, but are considered to be minor due to the relatively low density of pre-medieval sites that are known from the area.

An appropriate mitigation strategy has been proposed to offset any predicted direct or indirect effects, and a number of recommendations have been made for the construction phase of the wind farm.

In overall terms, it is concluded that the proposed development will have **no significant, irreversible effects** upon cultural heritage interests and does not conflict with the aims of national, regional and local planning policy as regards cultural heritage.

4.8 Electro-Magnetic Interference

The relevant consultees have been contacted with respect to microwave routes, air traffic and cable and pipe routes. Neither the Civil Aviation Authority nor The Ministry of Defence have an objection to wind turbines on the site. Any concern of consultees over the effect on television reception for dwellings in the vicinity of the site would be approached through the signing of a legal commitment by the developer to rectify any such problems that may be caused by the development.

5 CONCLUSIONS

The full Environmental Statement carries out a detailed Environmental Impact Assessment of the project, based on the requisite legislation and the relevant planning policy framework. It supports the conclusions that the project will have no significant adverse environmental impacts.