NON-TECHNICAL SUMMARY

INTRODUCTION

Viking Energy Partnership has applied for permission to build and operate a large wind farm on Mainland, Shetland. In common with most wind farm proposals the application is accompanied by an Environmental Statement (ES). The ES is a comprehensive and very large document detailing the findings of the Environmental Impact Assessment (EIA) which informed the design process throughout the preparation of the proposals. This non-technical summary of the ES provides a brief outline of the main aspects of the proposed wind farm, the environmental context in which it will be built, the likely impacts which it will cause, and the ways in which the project design has addressed those impacts to remove, reduce or compensate for them.

For more detail, the reader is referred to the ES and its associated technical appendices.

The Applicant

The Viking Wind Farm originated as two projects, one promoted by Viking Energy Ltd and one by SSE Viking Ltd, a subsidiary of Scottish and Southern Energy (SSE). Viking Energy Ltd was formed in 2003 to represent the interests of Shetland Islands Council in developing renewable energy projects in the islands, while Scottish and Southern Energy is a large (FTSE 100) energy company whose major activities include the generation, transmission and supply of electricity throughout the United Kingdom and beyond.

Recognising the advantages of co-ordinated working, the two companies formed the Viking Energy Partnership in order to take the two projects forward as a single unit. The Viking Wind Farm will therefore be built and operated as a single project and the economic benefits which flow from it will be shared equally between SSE and the people of Shetland.

Background to the Application

Climate Change

Man made emissions of greenhouse gases, in particular carbon dioxide from the combustion of fossil fuels, are widely believed to be accelerating the process of climate change by reducing loss of heat from the atmosphere. There is global concern that such climate changes may cause significant environmental change. In response, the international community has taken various steps to promote a strategy to control greenhouse gas emissions. The most notable commitment is the Kyoto Protocol of 1997 which obliges signatories to meet reduction targets for greenhouse gas emissions. The UK target is to achieve a 20% reduction in carbon emissions (compared to 1990 figures) by 2010 and 60% by 2050, and the development of renewable energy generation in replacement of energy based on burning fossil fuels is a key element in the strategy to address this target. Scotland has adopted a further target of increasing the amount of energy generated by renewable sources to 40% by 2020, compared with a UK figure of 2 - 3% in 2008.

In May 2007 Jim Mather, Energy Minister for Scotland, stated that “we…must exploit the opportunities offered by Scotland’s abundant natural energy resources”, and identified onshore wind energy developments as being of continuing importance. He also said that “we want to see more projects - but good projects - not anywhere and at any price to the environment”.

Alternative Technologies Considered

Electricity supply companies are obliged to obtain a specified proportion of their total supply from eligible renewable sources or pay a penalty. The eligible technologies include biomass, wind energy (onshore and offshore), hydro-electric, solar, marine energy (wave and tide), and landfill gas, and each of these options was considered for use in Shetland.

The nature of the islands and the surrounding seas made onshore wind the clear choice for development. There is insufficient growing biomass (timber or other fuel, for example chopped straw) available to power a plant on Shetland, and fuel would therefore have to be imported; the offshore conditions do not allow development of offshore wind farms with currently available technology, although this situation is being kept under review; the rivers and streams on Shetland are too small to be useful for generating significant amounts of electricity; the solar energy resource is similarly limited; energy generation by wave and tidal power is not yet developed to a commercially viable degree for Shetland conditions; and the small amount of municipal solid waste generated on Shetland (and imported from offshore) is already used to generate power in a small incinerator in Lerwick.

An onshore wind farm was therefore selected as the technology to be taken forward.

Environmental Impact Assessment

Many development projects, from relatively small residential developments to major infrastructure projects such as the Viking Wind Farm, require EIA as part of the process of determining the planning application. In the case of a large wind farm the requirement is clear, and the Scottish Government provides specific guidance as to how the EIA should be conducted for wind farm projects. That guidance has naturally been followed in this study.

More specific best practice guidance has been followed by the individual consultants who have looked in detail at each assessment topic; often this guidance is provided by the relevant professional body. For example, our ecologists have worked to guidance provided by the Institute of Ecology and Environmental Management, while our landscape architects have used guidance provided by the Landscape Institute. In all cases we have endeavoured to ensure that the best possible methods have been used and reported clearly in the ES.

EIA does not simply look at the likely effects of a fully designed project. The EIA process begins right at the start of project feasibility studies and continues throughout the design process. Thus, environmental matters are taken into account right from the beginning, and the design of the Viking Wind Farm has been modified significantly several times in response to environmental issues as they have arisen. Interested parties have been consulted throughout the process, notably the Shetland Islands Council, Scottish Natural Heritage, Shetland Amenity Trust and the Royal Society for the Protection of Birds, amongst others.

THE APPLICATION SITE

The area which Viking Energy Partnership propose to develop as a wind farm is the central part of Mainland, Shetland, stretching from near Scatsta in the north to Weisdale in the south. For convenience the area has been divided into four quadrants, centred on Voe and divided by the A970 / A968 running north - south, and by the A970 / B9071 running east - west. The quadrants are known as:

- Delting (the north-west area, including Brae and Scatsta);
- Collafirth (the north-east area, including Susetter Hill, Dales Voe and Colla Firth);
- Kergord (the south-west area, including Weisdale); and
- Nesting (the south-east area, including Laxfirth and Catfirth).

See Figure NTS 1 at the end of this Non-technical Summary for an overview of the site extent.

Note that the wind farm will not cover all of the land within these quadrants; only eight turbines are proposed for the Collafirth quadrant, grouped in one relatively small area, and the turbines in the Nesting quadrant will be arranged in two groups (north and south) with a substantial open area between them. The process by which the layout has been arrived at is described later in this Non-technical Summary, and in more detail in the ES.

The planning application area (within the "redline boundary") is considerably larger than the area upon which turbines and other structures will be erected. The reason is that the planning application includes a number of works associated with the wind farm, for example construction compounds, component laydown areas, bridge strengthening works and junction improvements, which are required for the purposes of construction but which will not form part of the operational extent of the wind farm once it is complete.

THE PROPOSALS

Site Selection

The site was initially selected by the two partners independently. For Viking Energy Ltd, the focus was solely upon Shetland, while for SSE no such geographical constraint existed. However, having identified Shetland as a possible site for a wind farm, the SSE objective was the same as the Viking Energy Ltd objective: namely, to identify a single site for a wind farm at the optimum location.

The site selection process involved three stages. Firstly, the site needed to be shown to be commercially viable for the wind farm. This involved looking for a site where the wind resource was sufficient to justify the investment in infrastructure; where the opportunity existed to connect the wind farm to the electricity grid to export the energy generated; and where the environmental conditions had not resulted in designation under the highest level classifications (for example Special Protection Areas in respect of birds, or World Heritage Sites in respect of cultural heritage).

Secondly, it had to be technically feasible to construct a wind farm on the site. Important factors include ground and soil conditions; access studies to assess the local road network; consultation with landowner and occupier interests; more detailed assessments of the grid connection possibilities and the wind resource (including monitoring using on-site instruments); and consultations with relevant organisations including Shetland Islands Council, Scottish Natural Heritage, the Royal Society for the Protection of Birds, the Ministry of Defence, the Civil Aviation Authority, National Air Traffic Services and others. Because Viking Energy Partnership already knew that ornithological issues would be important an early programme of bird monitoring was instituted at this time.

Stage 3 comprised the undertaking of an EIA to inform the detailed design of the wind farm and associated ancillary works, along with other technical considerations. The Environmental Impact Assessment has resulted in fundamental changes to the design of the wind farm, including reducing its overall size and the number of turbines proposed from 168 to 150.

Key Elements of the Wind Farm

Turbines

The wind farm will comprise 150 wind turbines, each of a nominal 3.6 megawatt capacity. They will be distributed across the site as follows:

Delting - 33 turbines

Collafirth - 8 turbines

Kergord - 47 turbines

Nesting - 62 turbines

The exact model of turbine to be used will be chosen closer to the construction date in the light of technical developments at that time. However, the turbines will consist of a conventional three-bladed rotor of 110m diameter, mounted on a tubular steel column 90m in height, giving a maximum overall height of 145m. Each turbine will be mounted on a concrete foundation 22m by 22m in area and approximately 1.5m deep (depending on individual site conditions), set into the ground and covered with a shallow course of soil or peat. A hardened crane pad, of compacted stone, will be prepared adjacent to each turbine site; and each turbine will be accompanied by a transformer, standing in an enclosed box adjacent to the foundation, whose purpose is to step up the voltage from the turbine from its output of 690 volts to 33,000 volts (33kV). (Depending on the model of turbine used the transformer may be housed within the turbine itself.)

Monitoring masts

Eleven permanent wind monitoring masts will be erected across the site. In order to minimise danger to flying birds they will be free-standing unguyed open lattice masts up to 90m in height on a concrete foundation.

Access tracks

The turbines and masts will be accessed using a network of tracks, some using existing moorland access routes but mostly newly built. The tracks will be constructed of compacted stone and fines, either cut down to bedrock or (in areas of deep peat) using a "floating road" construction technique which employs a geotextile membrane to spread the load of the track material across the underlying layers of peat. The tracks will be between 6 and 12m running width depending on their purpose, and will be carefully constructed with a view to maintaining or improving local hydrological (water and drainage) conditions.

Borrow pits

Material for the tracks will be obtained from approximately 14 potential borrow pits which will be opened on the site. Primary and secondary areas of search have been identified for these borrow pits, some of which make use of existing worked areas and others of which will be new. Final borrow pit locations will be selected following detailed assessment at the construction stage. Borrow pits are located close to site access points from the public road, so that material will be readily available for constructing tracks as the work progresses deeper into the site, and material will not have to be transported along the public roads. Borrow pits will be restored at the end of construction, for example by relaxing the angle of worked faces and by replacing disturbed soil and peat.

Substations

Buried cables from the turbines will follow the lines of the tracks and will gather at three electrical substations. The wind farm will thus be clustered into three main electrical sub-groups. The Delting quadrant will be connected to a sub-station at Wester Scord, about 3.5km east-south-east of Brae; the southern Nesting quadrant will be connected to a sub-station at Moo Field, about 3km north of Catfirth; and the balance (Collafirth, North Nesting and Kergord) will be connected to a larger substation at Upper Kergord. The substations will consist of control and switchgear buildings, storage for tools and materials, and welfare and amenity facilities for operational staff; and their purpose is to step the voltage up once again from 33kV to 132kV for onward transmission to the central converter station, co-located with the larger of the substations at Upper Kergord.

Transmission line

It is likely that the Delting substation will be connected to the converter station using a wooden pole mounted 132kV trident line, on a route to be determined by Scottish Hydro Electric Transmission Limited (SHETL), and that the South Nesting Sub-station at Moo Field will be connected to the convertor station by means of an underground 132kV cable.

Converter station

A converter station is planned for Upper Kergord, co-located with the larger of the three substations. The converter station is the subject of a separate planning application with its own EIA and ES. The intention is that power from the wind farm will be collected here for onward transmission to the mainland grid via a new subsea cable which will come ashore at the head of Weisdale Voe. The converter station will also provide a link to the local electricity distribution grid on Shetland.

Construction compounds

During the construction period a total of eight construction compounds will be operated as follows:

- Two in Delting quadrant, one at Houb of Scatsta and one at Fili Field near Brae;
- One in Collafirth quadrant at Susetter Hill;
- Two in Nesting quadrant, one at Hamarigrind Scord and one across the A970 from Sand Water;
- Two in Kergord quadrant, one at Hamarigrind Scord (across the road from the Nesting compound) and one at Scord of Sound; and
- One larger laydown area/construction compound at Sella Ness.

The compounds will be roughly 100m square, depending on available space, and may accommodate construction offices, parking for plant, welfare facilities for construction crews, component laydown areas, concrete batching areas and other facilities. They are likely to be less active during the winter months when construction activity reduces.

The Sella Ness compound will occupy an existing industrial area which is already surfaced. It will be used for temporary storage of turbine components, particularly turbine blades, when they are unloaded from ships at the port of Sullom Voe.

Construction Programme

Construction is scheduled to take five years. Civil engineering works (opening borrow pits, constructing tracks, building foundations, making improvements to the public road network) are likely to take place in years 1 - 4, with turbine installation taking place in years 4 and 5. Construction activity is likely to reduce during the winter when bad weather will make site access difficult.

Layout Design Evolution

The EIA process had a fundamental impact on the design of the wind farm, which went through eight major stages in the design of the track and turbine layout.

The initial layout was made on the basis of land ownership and wind farm modelling software which suggested the best locations for turbines based on wind yield, topography, proximity to other turbines, slope and ground conditions. Changes were then made to the layout in phases to account for environmental and other constraints as follows:

- Major landscape and visual constraints;
- Major red-throated diver constraints (see below for more information about this species);
- Optimisation of key views from Lunna, Voe, Aith, Brae, Laxo, South Nesting and Weisdale;
- Detailed constraints concerning noise, birds, cultural heritage, water resources, peat slide, ecology, turbulence analysis and further key viewpoint assessment;
- Track engineering criteria;
- Track peatland design strategy criteria;
- Location of additional infrastructure (monitoring masts, substations etc.)

The layout which emerged from this process was then subjected to ground truthing to confirm the validity of the assessments made, and was then used as the basis of the assessments made within this EIA.

Key Dependency

The Viking Wind Farm depends upon completion of the HVDC (high voltage direct current) connector project for export of electricity to the mainland grid, without which it is not economically viable. Conversely, the HVDC project has no economic justification without the Viking Wind Farm. The two projects are therefore intimately linked, although they are being promoted by different companies and are subject to separate planning applications and EIA.

ENVIRONMENTAL EFFECTS

Landscape Character

Introduction and methodology

In accordance with current Best Practice as set out in guidelines by Scottish Natural Heritage, the Environmental Statement evaluates the landscape character within 35km from the periphery of the proposed development. A detailed assessment of impacts has then been carried out within 15km of the development periphery, this being the area within which, after an initial site appraisal, it was considered that any significant landscape impacts would be likely to occur. The evaluation describes the key components, features and characteristics that contribute to the quality and perception of the landscape within the study area. The assessment provides a prediction of the implications of the proposed development in terms of direct impacts on key landscape components and features. It also considers the extent to which the introduction of the proposed wind farm and its associated infrastructure would influence perception of local landscape character within the study area and its implications for the wider, regional landscape character. The aim of the landscape impact assessment, therefore, is to identify, predict and evaluate potential key effects arising from the proposed development.

The assessment of predicted impacts involves:

- An appreciation of the nature, form and features of the proposed development in the context of the baseline landscape character. Landscape character is a composite of physical, biological and cultural elements. Landform, hydrology, vegetation, land use pattern and cultural and historic features and associations combine to create a common 'sense of place' and identity which can be used to categorise the landscape into definable units (character areas). The level of detail and size of unit can be varied to reflect the scale of definition required. It can be applied at national, regional and local levels;
- an evaluation of the sensitivity to change of designated sites and landscape character in relation to wind farm development. This is arrived at by a review of landscape value and scenic quality;
- an evaluation of the predicted magnitude of change experienced by designated sites and landscape character, assuming implementation of the proposed development. This is in the form of quantification and description of the direct or indirect impact upon the character of the various local landscape areas within the study area; and
- assessment of the degree and significance of the impact of the proposals on the designated site or landscape character under consideration by relating the magnitude of change to the sensitivity to change.

Site description

The proposed development is located in the centre of the Mainland of Shetland in four distinct areas, known within this ES as 'quadrants'. The two larger, southern quadrants are located on either side of the A970 road, in an area characterised by a distinct system of north-south ridges, typically between 100 and 200 metres in height, known as the West, Mid and East Kame. The area is dissected by numerous burns, water bodies and lochs. The moorland drops away to meet the irregular and varied coastline, with various voes, sounds and firths penetrating deep into the development area. The area is exposed in nature and barren in appearance, with panoramic views across Shetland, in clear weather.

Heather moorland and peat dominate the ground cover with man-made influences concentrated mainly along the coastline, voes and valleys but also extending to peat cutting, sheep grazing, fish farming and occasional masts and aerials. The northern quadrants of the proposed development are located in an area of similar elevated moorland character but without the distinct ridged landform. The village of Voe lies more or less in the centre of the proposals whilst around the coast, within 3 to 4km of the development boundary, are the communities of Vidlin, Brae, Aith and Mossbank as well as other scattered houses and small communities. The Sullom Voe oil terminal and Scatsta Airfield lie 2-3km to the north.

Predicted impacts

Landscapes can be ascribed international, national, regional or local designations that recognise the significance of the landscape for its outstanding scenic interest or attractiveness. There are a number of areas within the study area with ascribed statutory and non-statutory designations. These include four National Scenic Areas (NSAs) and four sites which are included in the Inventory of Gardens and Designed Landscapes. No significant landscape impacts are predicted for any of these areas.

Within the 15km detailed study area twenty-seven local landscape character areas have been identified. Seventeen of these character areas would not receive significant impacts as a result of the proposed development. However, there are ten areas where significant impacts are likely. Direct and substantial adverse landscape impacts would be experienced in both the East and West Kame and the Peatland and Moorland Inland Valley areas (Petta Dale and Kergord) where the proposed development would be located.

In addition to those areas receiving significant direct impacts a number of local character areas (LCAs) would receive significant indirect impacts as a result of intervisibility with the proposed development. These significant indirect impacts are generally limited to those areas in close proximity to the proposed development where intervisibility has the potential to have a greater effect on the setting and hence character, of a landscape.

However, there are a number of areas which, although in close proximity to the proposed development, have a reduced sensitivity to change and/or a reduced magnitude of change, due to the nature and context of the local landscape and landform, resulting in a reduced level of impact. This is particularly evident in the Developed Areas LCA, where the presence of existing development such as Sullom Voe Oil terminal reduces the sensitivity of the landscape to change of the type proposed and in a number of LCAs in the western mainland, where the partial screening effect of the foreground landform reduces magnitude of change and hence reduces and limits indirect impacts.

To conclude, all significant landscape effects would be found where direct change or large scale indirect changes (generally within 15km of the proposals) are predicted. The wider study area beyond 15km from the periphery of the proposals and all designated/ historic and designed landscapes would not receive any significant landscape effects, either during construction or operation.

Visual Impact

Introduction and methodology

The wind farm proposals would impact upon views of the existing landscape. In order to assist in this assessment, a Zone of Theoretical Visibility (ZTV) was produced to indicate those areas of land where the proposed wind farm might appear as part of a view. The ZTV provides a means of identifying potential receptors (viewers) in order that impact assessments can be undertaken. The envelope is not representative of visual impact in itself nor does the presence of a receptor within the boundary indicate that the development would necessarily appear in views currently experienced by that receptor.

A preliminary visual envelope generated during preparation of the Environmental Impact Assessment identified areas of potential intervisibility over a distance of 35km from the periphery of the proposed site on the assumption that the turbines would be of 145m overall height . This was used to establish potential receptor groupings within the study area.

Sensitivity of a receptor to the proposed development considers the nature of the receptor, for example the inhabitants of a residential dwelling are generally considered more sensitive to change than occupiers of a factory unit. The importance of the view experienced by the receptor also contributes to an understanding of sensitivity to change; scenic quality and value of the view are therefore also considered.

Predicted Impacts

The ZTV for the study area, confirmed by field survey, indicates that the majority of locations where significant visual impacts would occur are within 15km of the development periphery as generally, the sensitivity to the change and the magnitude of change to a view reduces as the viewing distance increases. As far as possible the development has been designed to minimise impacts on the larger settlements and other key receptors.

Out of a total of 3589 receptors or receptor groups assessed, 21 viewpoint receptors, 965 buildings or outdoor receptors or receptor groups, 11 road routes, 4 ferry routes and 4 walking routes are predicted to receive significant visual impacts as a result of construction of the proposed development. This would reduce to 20 viewpoint receptors, 939 buildings or outdoor receptors or receptor groups during the operation of the proposed development, with 11 road routes, 4 ferry routes and 4 walking routes remaining unaltered.

In general, settlement throughout Shetland is located along the coast with views from properties largely focused out over the water. The coastline is defined by a series of voes and inlets, often penetrating into the centre of the landmass. As a result these views tend to be open and panoramic but with no consistent direction of focus. This therefore results in a more scattered pattern of levels of impacts with those facing the development more likely to receive significant impacts. The settlements of Aith and Brae are good examples of this, with properties on the east side of the voe, and therefore west facing receiving only slight or negligible impacts and properties on the west side of the voe, therefore east facing, receiving moderate or substantial impacts.

That said however, there are some large areas where the nature of the topography and landform restrict visibility and therefore lessen potential visual impacts. The largest, and most significant of these areas are the west mainland (west of Bixter) and the south mainland (south of Gott/ Tingwall). The west mainland landscape consists of a series of broad rounded hummocks, rocky outcrops and lochs. This results in relatively restricted views, particularly from low lying areas, where most settlement is located. The south mainland landscape is dominated by a series of north east – south west ridges which would restrict views towards the proposed development, particularly from south east facing slopes and low lying areas, again, where most settlement is located.

Routes in Shetland follow a similar pattern to the settlements, with the majority following the coastline. The main views are therefore along the coast and across the voes and sounds resulting in panoramic views but with no consistent direction. As with the settlements this results in a more scattered pattern of levels of impacts, with those orientated towards the development more likely to receive significant impacts. The main exception, however, is the main north-south arterial road (A970) which tends to take a more direct route, along the centre of the island and through the centre of the proposed development. Inland routes tend to follow valley floors and therefore views from these are generally enclosed and focused along the valley, which results in the level of impact being more defined by landform and direction of travel. The majority of significant visual impacts on roads would be from within 5km of the development periphery. As might be expected, the greatest level of impact would be received by the A970 and B9071 as they pass through the centre of the development. The main cycle routes (National Cycle Route 1 and the North Sea Cycle route) are along the main roads and therefore have not been assessed separately.

Views from ferries tend to be low level, open panoramas of attractive coastal landscapes and therefore more visually sensitive and so, depending on magnitude of change, these would tend to receive greater impacts than road receptors. Significant impacts on ferry routes would generally be limited to those within 15km of the development periphery, with the highest level of impact being received by those within 10km of the proposed development.

There are few waymarked footpaths in Shetland. However a number of walking routes are promoted by Visit Shetland and these have been considered in this assessment. The majority of these routes are along the tops of the dramatic sea cliffs and voes. As with the ferry routes, views from walking routes tend to be of attractive coastal landscapes and so, depending on the magnitude of change, would tend to experience greater impacts than road receptors. That said however, the panoramic nature of the views result in the proposals appearing in a smaller proportion of the view and therefore the magnitude of change is often reduced because of this. Significant impacts on walking routes would generally be limited to those within 10km of the development periphery, with the highest levels of impact being experienced from those within 2km.

In conclusion, the majority of significant effects upon the visual amenity of Shetland would occur within 15km of the periphery of the proposed Viking Wind Farm. These would generally be located in the central and northern mainland and parts of Yell and Whalsay, where views are orientated towards the proposed development.

Cumulative Landscape and Visual Impact

Introduction

Cumulative impacts are effects resulting from additional development, or changes to the landscape or views, as a result of the proposed development in combination with other existing and/or future developments. These may be associated with, or separate to, the proposed development. Cumulative effects may also be as a result of intervisibility of a series of developments. The individual developments may not give rise to significant impacts when assessed singularly. However when viewed in combination effects may be increased and impacts may become significant.

Evaluation of Likely Cumulative Impacts

Due to the location of the proposed development within central Shetland and the relative isolation from other landmasses it was not necessary to create a baseplan covering an area 60km from the development periphery to identify potential cumulative sites. All wind farms, both existing and proposed, on Shetland were included in the cumulative assessment. Furthermore the scoping response identified the need to include the Converter Station (for the sub-sea link) in the cumulative assessment.

It was found that out of a total of 26 viewpoint and route receptors none would receive significant cumulative landscape impacts and only 2 would receive significant cumulative visual impacts. Both significant impacts would be moderate and as a result of combined visibility with Burradale Wind Farm. No significant cumulative impacts would be experienced from the selected viewpoints or routes as a result of combined visibility with Cullivoe Wind Farm or the Converter Station.

It is considered that the relatively small scale extent of the Burradale and Cullivoe Wind Farms and the Converter Station in comparison with the proposed Viking Wind Farm (and the relatively localised and limited simultaneous and sequential visibility) would have the effect of not increasing the overall significance of the adverse effects upon the landscape and visual resource of the study area.

Non-avian Ecology

All of the principal elements of the wind farm have the potential to affect non-avian ecology during construction or operation or both. Recognising this at the start of the assessment led to earlier consultation with stakeholders than usual, in order to ensure every concern was thoroughly addressed. This transparency continued throughout the stages of identifying and valuing the nature conservation interests of the site; assessing the magnitude of potential impacts; and assessing the significance of those impacts.

The study area is about 18,700ha in total, which includes the 314ha area upon which the proposed physical development will actually take place. The area is hilly, with several large lochs and numerous watercourses. Although upland in character, the area ranges from sea-level at the coast to a maximum of 281m above sea-level inland. Topography the varies considerably between gently sloping grassland and moorland (e.g. Valley of Kergord), to steep sided, occasionally rocky terrain (along Kames ridges, Scalla Field) and undulating blanket bog (e.g. Muckle Hill).

A relatively small number of upland habitats and vegetation communities are present and occur in complex patterns in relation to topographic features and corresponding depths of peat. The majority of the study area is blanket bog, which ranges from good to poor condition in terms of activity. The wet oceanic climate and impervious nature of the majority of underlying geology means that peat is present throughout most of the site, along with associated lochans and small burns.

The main land-uses are sheep grazing and peat cutting. Wet and dry heathland covers the steeper slopes and exposed ground with acid grassland forming isolated patches throughout the site where grazing pressure is high, or where erosion has occurred. There are lowland meadows and pastures near settlements at the periphery of the study area. Small areas of tree planting are found around Kergord.

There are no nature conservation designations within the 314ha area where the proposed physical development will actually take place, or in the adjacent 100m buffer zones. Two Sites of Special Scientific Interest (SSSI) lie within the wider 18,700ha study area, with three further SSSIs lying just beyond the edge of the wider study area. There will be no significant effects on these sites.

Habitat on the wind farm site mainly comprises regionally important blanket bog and mire communities of varying quality, including large areas of active blanket bog, but the vegetation has also been locally modified by peat cutting and grazing in large areas. Other widespread terrestrial habitats such as wet/dry heaths and acid grassland are considered to be of local importance and are heavily or moderately grazed. A range of other habitats, mostly in small patches or in mosaics with the main habitats, occur around the site and these are considered to be of local importance. Standing open and running freshwaters were considered integral to the blanket bog habitat and were therefore considered to be regional importance.

Non-avian species of conservation importance within the Viking study area include otter, assessed to be of local/regional importance. All terrestrial vertebrates present within the study area are non-native species and, other than otter, have been assessed to be of no importance. The assessment of terrestrial invertebrates interest suggests that two moth species of regional importance are present. The freshwater invertebrate communities present in the Viking watercourses consist mainly of common and widespread species and no rarities were found, so they were assessed to be of local importance. Brown trout were present in several watercourses and waterbodies and were assessed as being of local importance. Atlantic salmon were recorded in two watercourses, but the proximity of salmon fish farm cages raises some questions as to the origin and therefore evaluation of wild Atlantic salmon in the Viking site. There was no evidence of freshwater pearl mussel within the study area.

Significant negative effects are likely to be caused to the blanket bog and mire communities on the site, and it is partly for this reason that a Habitat Management Plan has been developed which will provide compensatory habitat enhancement elsewhere within the planning application area.

No significant effects on species are likely to occur, provided that best practice construction methods are followed and that a catastrophic pollution or peat slide event does not occur. Mitigation measures which will help to ensure this includes:

- Appropriate work programming (timing & scheduling of work);
- micro-siting of tracks and turbines during construction to avoid the most sensitive areas;
- demarcation of exclusion zones;
- control of pollution & sedimentation;
- carefully designed and located 'wildlife friendly' water crossings;
- habitat reinstatement;
- habitat restoration and creation – detailed within dedicated Viking Habitat Management Plan; and
- monitoring of reinstatement, restoration and habitat creation.

Ornithology

Chapter 11 of the ES evaluates the effects of the proposed wind farm on birds. The proposed development site is not designated internationally or nationally for birds, although it supports strong populations of several species of high and moderate conservation importance, including red-throated diver, merlin, whimbrel, golden plover and dunlin.

Approximately 30 breeding pairs of red-throated diver are present within, or adjacent to, the proposed development site in spring and summer, representing approximately 2.4% of the UK breeding population. These birds are joined by 40 or so non-breeding birds. Care was taken to design the development in a way that minimised the potential for disturbing divers or impeding regularly-used flight corridors.

Up to nine pairs of merlins breed within, or adjacent to, the site, representing approximately 45% of the Shetland breeding population. As far as it was practicable, the development was designed in a way that minimised the potential for disturbance and collision effects on merlins.

Approximately 40 pairs of whimbrel breed within, or immediately adjacent to, the site, representing approximately 7.5% of the UK breeding population. Shetland supports most of the UK's breeding population of breeding whimbrels and there is evidence of a recent decline.

Approximately 90 pairs of golden plover and 57 pairs of dunlin breed within, or adjacent to, the site, representing approximately 0.4% and 0.6%, respectively, of the UK breeding populations.

Other species of conservation interest that breed within, or immediately adjacent to, the site include greylag goose (~49 prs), red grouse (~18 prs), lapwing (~65 prs), curlew (~227 prs), arctic tern (~12 prs), arctic skua (~30 prs), great skua (~53 prs), and skylark (~750 prs). A pair of whooper swan sometimes nests close by the proposed development site.

The site does not appear to lie on a route used regularly by migratory swans, geese and waders. Hen harriers roost adjacent to the site in winter.

Land take and habitat modification due to the proposed wind farm infrastructure would be small in the context of the area available to birds and any adverse effects would be non-significant and of negligible or low magnitude.

Displacement due to noise and visual disturbance during construction and decommissioning is predicted to have non-significant short-term adverse effects of negligible or low magnitude on all species except merlin and whimbrel. In the case of merlin, a potentially significant effect on two breeding pairs was identified as a result of loss of foraging. This would be mitigated by restrictions in the timing of construction works in sensitive parts of the merlins' foraging ranges. In respect of whimbrel, a potentially significant effect on 15 breeding pairs was identified as a result of the displacement of adults and young from critical foraging habitat. Again, this would be mitigated by restrictions in the timing of construction works in sensitive areas.

Displacement due to the presence and operation of wind turbines is predicted to have non-significant long-term adverse effects of negligible or low magnitude on all species except merlin and whimbrel.

Potentially significant effects were identified on two breeding pairs of merlin as a result of displacement from nesting territories. This would be partly offset by habitat management elsewhere on the site covered by the Habitat Management Plan. However, on its own this measure is unlikely to prevent the effect being significant.

Potentially significant effects were identified on 16 breeding pairs of whimbrel as a result of disturbance to nesting birds. This would be partly offset by increasing the site population of breeding whimbrel by restoring areas of degraded moorland to a more favourable condition. This work would also be covered by the Habitat Management Plan. However, on its own this measure is unlikely to prevent the effect being significant.

Increased mortality due to collision with turbine rotors is predicted to have non-significant long-term adverse effects of negligible or low magnitude on all species except whimbrel.

Potentially significant losses of approximately 10 whimbrels per year were predicted as a result of collision with the turbine rotors. The proposed habitat management has some potential to reduce the magnitude of these losses by increasing the overall population. However, on its own this measure is unlikely to prevent the effect being significant, not least because any increase in population would result in a greater number of birds at risk of collision.

The effects of the proposals on birds would be monitored during windfarm construction and in years 1-3 following final commissioning. Thereafter, dependent on the results of monitoring, it is proposed to undertake surveys at 5-yearly intervals. Monitoring would seek to determine the extent of disturbance and collision effects on the three key species identified as being at most risk from the proposed development: red-throated diver, merlin and whimbrel.

Noise

The assessment of noise impacts of the proposed development considered both the construction and operational phases of the development.

Noise from the operation of the wind farm will be generated both aerodynamically, from the effect of wind passing over the turbine blades, and mechanically from noise from moving parts in the turbine nacelle. The noise output of the turbines is a function of wind speed. Accordingly, the assessment considered the proposed layout of 150 Siemens 3.6MW turbines across the wind speed range 4-12 m/s.

The assessment considered residential receptors located within 1.5km of the nearest property and predictions of operational noise levels at each receptor was undertaken, by computer modelling, based on turbine sound power data provided by the turbine manufacturer.

The impact of the operational turbine noise was undertaken in accordance with the noise limits described in ETSU-R-97, Assessment and Rating of Noise from Wind Farms, the published recommendations of the Working Group on Noise from Wind Turbines, as referred to in PAN45, Renewable Energy Technologies. ETSU-R-97 proposes separate noise limits for night-time, designed to prevent sleep disturbance, and the recreational period of daytime, referred to as quiet daytime, designed to protect residential amenity. As noise from operational wind turbines vary with wind speed the ETSU-R-97 limits relate to background noise levels across a range of wind speeds, subject to lower noise thresholds during both assessment periods.

In order to develop specific ETSU-R-97 noise limits for the development measurements of background noise levels were undertaken over a two week period at sixteen noise receptors surrounding the development site, although only six were located in the final study area. The monitoring locations were identified in consultation with Shetland Islands Council Environmental Health department based on a preliminary turbine layout. Based on the measured background noise levels, appropriate operational noise limits were derived for each of the receptors located within the study area.

The predicted operational turbine noise levels at each wind speed were evaluated against the derived ETSU-R-97 criteria. The predicted noise levels at all receptors were below the lower ETSU-R-97 night-time limit. Predicted noise levels at all receptors were also within the ETSU-R-97 quiet daytime noise limits. Accordingly, no significant noise impacts are predicted as a consequence of the operational phase of the development.

Construction noise impacts will vary according to the plant used and the location of construction activity. The construction activities with the highest potential to generate noise include track laying, excavation and digging of borrow pits and laying of turbine foundations.

The precise nature of the construction activities are not yet known in detail, therefore and assessment of construction noise impacts was undertaken based on experience of construction activities on other wind farm sites using sound power data for construction plant obtained from plant manufacturers and other published data sources. Predictions of construction noise levels were undertaken for the closest receptors to the site (within 1.5km of a turbine or borrow pit) in accordance with the method described in BS5228 *Noise and vibration control on construction and open sites*.

No specific noise criteria exist for construction noise, therefore noise limits for the construction phase of the development were derived with reference to PAN50 *Controlling the environmental effects of surface mineral workings, Annex A: The Control of noise at surface mineral workings*.

The predicted construction noise levels at six receptor locations were above the PAN50 derived construction noise limits as a result of operations at potential borrow pits located close to these receptors. The borrow pits in question are small borrow pits which will provide the aggregate material for the initial track laying to allow access to the site. The duration of activities at these borrow pits will, therefore, be short and activities will be restricted to appropriate daytime hours to minimise disturbance. The predicted noise levels for construction activities at other receptors were below the derived noise limits and accordingly, no significant impacts are predicted.

Cultural Heritage

89 sites of cultural heritage interest have been identified within the immediate vicinity of the Viking Wind Farm. They include one Scheduled Ancient Monument (Hill of Dale Chambered Cairn) and one Category B Listed Building (Grobsness Haa). However, only Catfirth Linen Industry area (which covers an area of nearly 2.5 x 1.0km in extent) and South Newing Mill are located within the 10m corridor of disturbance surround access tracks and turbine bases. Laxo Burn prehistoric settlement is located very close to the

proposed line of a track. Plant moving around the site during construction has the potential to damage known remains of archaeological significance.

Given the scale of known archaeological sites within and surrounding the proposed windfarm there is a possibility of encountering hitherto unknown remains, which may survive as subsurface features, during groundbreaking works in construction of the wind farm. To some extent this has been demonstrated by the discovery of the previously-unknown Laxo Burn site during field survey carried out for this EIA; and the issue will be addressed by employing an archaeological clerk of works during the construction period to supervise the works.

As well as the physical fabric of sites of cultural heritage interest, the settings of certain sites are also protected. Potential visual impacts on Scheduled Ancient Monuments and Listed Buildings and other protected sites within 10km of the proposed windfarm boundary have been assessed as part of this report. A total of 134 Scheduled Ancient Monuments, 91 Listed Buildings and one Designed Landscape were located within the 10 km search area. The majority of visually affected sites will sustain an impact of *Negligible* or *Minor* significance; 12 sites will sustain an impact of *Moderate* significance; and 13 an impact of *High* significance.

A number of measures will be taken to ensure the protection of cultural heritage interests as far as possible. They include:

- Complete avoidance of known archaeological sites, including Laxo Burn. This will be achieved by fencing off these areas (with a 10m-wide buffer) before construction commences.
- Where sites cannot be avoided they will be subject to archaeological excavation before construction starts.
- An archaeological watching brief will be maintained during ground breaking works supervised by an environmental clerk of works.

Soil and Water

The Soil & Water chapter provides an assessment of the potential impacts of the development on the existing soil, peat, hydrological (surface water) and hydrogeological (groundwater) features and resources of the development site. The assessment uses a catchment-based approach and therefore includes areas downstream of the development site.

The assessment involved desk study and analysis and a number of field visits between spring 2006 and autumn 2008, including specific site visits conducted to investigate issues such as peat depth, stream crossing locations, water supplies and borrow pits. Information was provided to the developer at regular and appropriate stages in order to minimise soil and water impacts at the design stage.

The assessment included the following elements:

- Description of current water environment, including catchment mapping and flow estimation;
- identification of specific receptors in relation to soil and water and evaluation of the significance of potential impacts caused by the construction and operation of the proposed windfarm and associated infrastructure;
- identification of mitigation measures to avoid, minimise or mitigate against any adverse impacts; and
- evaluation of the significance of any residual impacts during construction, operation and decommissioning.

Key effects investigated:

- Effects of modifications to natural drainage patterns;
- effects on flows in natural watercourses;
- effects on runoff rates and volumes;
- effects of increased erosion and sedimentation;
- effects on surface water and groundwater quality;
- effects on groundwater levels and recharge;
- effects on soil quality and soil loss; and
- effects on peatland stability conditions (within specific Technical Appendix).

As part of our Soil & Water study we have produced Technical Appendices giving additional details relating to the following specific issues:

- Peat stability;
- borrow pits;
- stream crossings;
- peat extraction volumes and reuse options;
- hydrochemistry surveys;
- a framework site environmental management plan / pollution prevention planning; and
- a framework site waste management plan.

The geomorphology of the local area has been assessed, discussing the key landscape characteristics. Associated with this, local geological features have been described.

Due to the impermeable nature of the bedrock there are extensive peat deposits across the majority of the study area, the average peat depth being around 1.5m. However, due to the nature of the landscape the depth of peat changes rapidly, with locations of exposed rock and areas of peat greater than 6m deep within relatively short distances of each other.

A peat slide risk assessment has been carried out using both a qualitative risk assessment method and slope stability calculations. Following a preliminary assessment 15 areas were identified within the vicinity of the wind farm infrastructure as representative areas of peat covering a range of conditions. At each of these 15 locations detailed ground investigation works were undertaken. Using these data, with the information previously collated, a detailed assessment of 54 locations of concern was made. In a number of cases it was found upon detailed inspection that there was little risk of peat landslide and no specific mitigation was required. In all other instances recommendations have been made for appropriate mitigation measures at each location in order to reduce the potential risk to an acceptable level. In addition to the location specific mitigation, site-wide best practice measures have been outlined, including the need for ongoing re-appraisal of the peat landslide risk assessment throughout the detailed design and construction stages. A geotechnical engineer will also be employed onsite during construction to undertake advance inspection, carry out regular monitoring and provide advice. Finally, the hazard ranking of the 54 locations identified for detailed assessment has been reappraised in reference to suggested mitigation.

These are 30 distinct hydrological catchment areas in the study area, aggregating to over 157km^2, with an extensive network of burns, lochs and lochans. These catchments incorporate over 500km of watercourses and loch frontage. The catchments have been mapped and details provided, with particular emphasis given to catchments with important receptors such as water supplies and Special Sites of Scientific Interest. Due to the underlying geology and the extensive peat deposits the site catchments display a 'flashy' response to storm events, although this response is attenuated to a certain extent in the catchments with lochs, which act as storage features. Some of these lochs are substantial water bodies and there are also a number of 'peat-dammed' lochans at varying elevations.

There are no public water supply sources within the study area. However, there are a small number of private water supplies. Only a single private water supply is within a hydrological catchment where development is planned and the intervening distance, topography and geology between infrastructure and source location makes it very unlikely that it will be adversely influenced by the proposed development.

Water quality has been evaluated via desk study and subsequent hydrochemical sampling and analysis at 30 locations. The majority of site watercourses display high water quality and this is reflected in the fact that many of the watercourses and lochs within the study area have fisheries interests.

High and low theoretical flows have been calculated for all site catchments. Flood risk has been considered against 1:200 year events. The development is not planned within areas liable to flooding and is not expected to contribute to any flooding elsewhere.

The proposed wind farm layout has been designed such that areas of deep peat and peatslide risk areas are avoided wherever possible. All wind farm infrastructure will be located at least 10m from all natural watercourses (with a project objective of 50m wherever possible), with the necessary exception of stream crossing locations. An assessment has been made of the 97 stream crossings required (including potential upgrade to 5 existing crossings), and suitable crossing types suggested for each. Stream crossings would be designed such that flows and fish migration are not impeded, with a rigorous pollution prevention plan to be implemented to minimise the risk of contamination of surface waters. At the detailed design and construction stage micrositing will be used to maximise the distance from all water features. Peat excavation will be minimised, with 'floating' roads suggested for areas where deep peat has been recorded. Borrow pit design takes into account the opportunity for restoration with peat carefully excavated during the construction phase.

Outline descriptions for site environmental management and associated waste management have been developed, designed to be further detailed with input from local stakeholders and becoming contractually binding for successful contractors, should permission be granted.

Best practice design and construction of all elements of the wind farm infrastructure are proposed. In particular, drainage systems would include silt traps, sediment ponds and buffer strips as necessary to minimise sedimentation and attenuate peak flows. Regular water quality monitoring throughout the construction phase is proposed for the surface waters. Visual monitoring and inspections of deep peat deposits and erosion features will also be carried out.

A hydrological catchment based approach has been used throughout our assessment. Site catchments currently display limited development and no other plans for development have been identified. Given this, no cumulative effect is likely to occur in relation to soil and water issues.

It is concluded that with the proposed mitigation in place the majority of effects on the soil and water environment will be not significant. However, the assessment has identified that during the construction phase two currently active natural processes may be exacerbated by wind farm development. There is also an operational/decommissioning phase effect that has been identified as significant. These three effects are discussed below.

Given the current natural processes and seriously eroded peatland terrain in some areas of the site, there is the potential for construction activity to exacerbate soil loss and erosion. This should be carefully monitored and best practice measures employed to minimise losses. Taking a precautionary approach this has been evaluated as a significant issue (of moderate significance).

There are historical examples of peat instability on the Viking site and documented examples identified nearby. It was noted that there are a number of features associated with active peat instability on the site, such as tension cracks. The associated peat stability Technical Appendix concluded that the likelihood of a peatslide occurring, as a consequence of the wind farm construction, is unlikely. This assessment has evaluated that should a peatslide occur, given the high sensitivity of soil and watercourses, the impact will be significant (of moderate significance).

Groundwater levels may be lowered in the vicinity of borrow pits and cut tracks (and associated drainage features). Borrow pits have a limited distribution but the extent of cut access tracks is more widespread. These effects are mitigated by the use of floating track construction methods and best practice drainage features, but are considered likely to result in some localised lowering of groundwater adjacent to cut tracks which could have subsequent effects on habitat and erosive processes. This is a process that has occurred to varying degrees at other peatland developments and should be carefully mitigated against and monitored at this site. Following construction of tracks, this significant (moderate significance) effect is likely to become manifest over a longer-term than the other significant effects identified and may become evident during the operational phase and into the decommissioning phase.

Roads and Traffic

Constructing a wind farm places unusual requirements on a rural road network, in particular in regard to access for very long loads (the turbine towers and, particularly, the blades, which are 55 metres in length). The turbine nacelles and parts of the substation machinery are also very heavy. It will therefore be necessary to make some improvements to the local road network, but this work will be done at the expense of the Viking Energy Partnership. There will also be heavy goods vehicle (HGV) movements delivering sand, cement, ballast, civil engineering plant and machinery and other loads, and other daily traffic delivering the workforce to the site. Once construction is complete routine traffic is likely to consist only of light Land-Rover type vehicles carrying maintenance staff.

It is likely that nacelles and other heavy components will be imported to Sullom Voe, and long components to Sella Ness, from where they will be delivered to the site accesses. Other loads, for example plant and aggregates, will be delivered from other directions. Concrete mixing will be done on-site, using water from lochs and rivers, to avoid the need for repeated journeys by concrete mixers on public roads. Site accesses, which will be constructed so as to be passable by abnormally long loads, will be located at:

- Houb of Scatsta;
- Hill of Swinister;
- A970 south of Brae;
- Hill of Susetter;
- Hamarigrind Scord;
- Lamba Scord;
- Setta House; and
- A970 east of Sand Water.

Improvements will therefore be required to junctions at Firth, Voe and Sand Water.

Traffic density on Shetland is low compared with figures for mainland Scotland, and traffic congestion is therefore unlikely to be caused by wind farm construction activities.

Air and Climate

Dust emissions will be generated by construction activities, quarrying activities at borrow pits and through dust re-suspension on roads. There is the potential for some receptors to be adversely affected by dust emissions under certain meteorological conditions. The impacts of dust will be adequately mitigated by following best practice guidance for dust suppression, for example, minimise dust creation, control the escape of dust, remove dust from the atmosphere; and temporarily suspend the activity or operation if the creation of dust cannot be avoided.

The impact of the release of CO_2 emissions is assessed by calculating the payback period of the wind farm which is a measure of the time taken for the emissions released by the wind farm to be cancelled out by the emissions saved. The payback period for wind farms on peat bogs is highly dependant on the amount of drainage installed and the extent of drying that occurs as a result of the drainage. Three assessment scenarios were undertaken to account for the uncertainty in the effect of drainage. The payback periods obtained for the three assessment scenarios were 2.3 years, 3.7 years and 14.9 years.

Due to the assumptions used to calculate the payback period, and the nature of the assessment, the results should be regarded as indicative, rather than a definitive prediction of the actual payback period which would occur in practice. The payback period is highly sensitive to the hydrological characteristics and the extent of bog which will be affected by drainage. The results indicate that it is crucial that the peat bogs on site are disturbed as little as possible to prevent extensive loss of peat.

Mitigation measures which will be implemented to minimise disturbance to peat include: blocking drains upon decommissioning; excavating peat in large clumps to prevent drying; restoring habitat as soon as possible following excavation; and use of appropriate track design to minimise impact on water flow and drainage.

Socio-economic Effects

The social and economic effects of the proposed wind farm are unusually important in the case of the Viking Wind Farm compared with other wind energy developments, due to the partnership arrangement under which the project is being brought forward. Half of the profits of the wind farm will go to the local community, the bulk of which to the Shetland Charitable Trust. Shetland people currently enjoy relatively stable economic conditions with little unemployment and a high quality of life, but this is set against the decline in the value of investments held by the Trust and a decline in its revenue caused by the reduction in output from the North Sea oil industry.

Construction of the wind farm will provide opportunities for direct and indirect employment and training associated with the development. Negative impacts may be felt through displacement of employment, through effects on grazing land occupied by the construction site, and through reduction in the availability of tourist accommodation caused by its occupation by construction workers.

Operation of the wind farm will provide direct revenue to the Shetland Charitable Trust, and direct and indirect employment and training opportunities. There will be few if any negative socio-economic effects during the operational period.

Telecoms and Aviation

Extensive arrays of wind turbines have the potential to interfere with broadcast signals and with aviation activities. Assessment of these effects is therefore a central part of wind farm EIA, and they have been carefully considered in the design of the Viking Wind Farm.

Aviation may be affected in two ways. First, the turbines may simply act as a physical barrier to low flying, and may therefore impede military low flying training or increase the risk of collision by military and civil aircraft on approach to landing fields, particularly in bad weather or at night. Secondly, the turbines may interfere with radar operations, in particular approach radars at aerodromes which monitor (and in some cases control) the movements of aircraft as they approach the ground.

The broadcast signals which may be affected include TV and radio broadcasts; mobile phone signals; and microwave data links connected with the operation of water and power distribution. These links are operated by radio companies on behalf of the utilities.

The Viking Wind Farm assessment team has consulted the Ministry of Defence, NATS (National Air Traffic Services), Ofcom (who act as central contacts for a range of communication providers including mobile phone operators), the BBC (who are responsible for terrestrial TV and radio broadcasts including digital channels), JRC (Joint Radio Company, who operate radio links on behalf of the water industry), CSS Spectrum Management (who operate radio links on behalf of the electricity industry) and airport operators at Sumburgh, Tingwall and Scatsta.

Aviation interests at Sumburgh and Tingwall will be unaffected by the wind farm. It is possible that “missed approach” procedures at Scatsta may be affected by the proximity of turbines, however, and this issue is currently under review by the Civil Aviation Authority.

The only data transmission signals which might be affected are operated on behalf of SSE, who are joint promoters of the wind farm project. Therefore solutions will be found to any problems which arise.

Construction of the wind farm, if approved, will commence after the switchover from analogue to digital television broadcast, due to take place in Shetland in June 2010. Currently available tools for assessing the impacts of wind farms on TV signals are inadequate for a wind farm the size of the Viking Wind Farm, and the broadcast regime will in any case be different following the digital switchover. For example, the digital signal is more robust and less prone to interference from wind turbines than the analogue signal. For these reasons Viking Energy Partnership commits to monitor TV reception quality and to deal with any adverse effects of the wind farm, by provision of either improved digital reception equipment or alternative means.

Recreation and Tourism

The potential impacts of the Viking Wind Farm on recreation and tourist attractions were assessed using a qualitative approach and were classified on their impact magnitude and significance. The main recreational activities and attractions identified in visitors' surveys from Shetland were general sightseeing, walking, bird watching, short walks, beaches and scenery, historic and archaeological sites, painting and photography. The majority of these tourism and recreational activities are located outside the proposed Viking Wind Farm boundary. However, the wind farm would be visible from many of these attractions and residents and visitors travelling between locations on Shetland would also have views of the wind farm whilst en route. The impact of the wind farm on recreation and tourism would therefore affect Shetland as a whole in addition to the central mainland where the proposed Viking Wind Farm would be situated. The assessment of effects on recreation and tourism has established that the Viking Wind Farm is unlikely to result in any impacts of high significance on recreation and tourism during the construction and operation phases of the wind farm.

The main impacts identified during the construction and operation phases of the wind farm were: restriction of access; effects on visitors' perceptions of landscape character and visual amenity; and the disturbance of recreational activities. The majority of these effects were classified as having a minor impact on recreation and tourist attractions, two effects were classified as having a moderate impact, none was classified as having a high impact and one was classified as having a moderate positive impact. The effects of moderate impact were identified as visitors' perceptions of the landscape character and visual amenity during construction and the visibility of the turbines leading to a loss of landscape value and visual amenity during operation. The effects of these impacts could lead to a loss of tourist income in Shetland as well as a loss of recreational amenity to the local residents. The creation of recreational amenity by increased access provision was perceived to have a positive impact.

The Viking Wind Farm project has developed a set of mitigation measures to reduce the potential impact of these effects on Shetland's recreation and tourism attractions. Changes to the landscape amenity have been considered and assessed from the first design phase. This has resulted in a reduction of the proposed number of turbines from 167 to 150, combined with an extensive review of the layout design for areas where the wind farm would be visible from specific recreational and tourist receptors, such as Lunna House which is set in a designated landscape.

A communications strategy has been developed to ensure that Viking Energy provides consistent and regular updates to the public and interested parties during the construction phase. In addition, vehicle movements would be controlled through a traffic management plan to minimise disruption and an extended construction phase would reduce the pressure on local accommodation and reduce the effect on tourism.

Viking Energy have also made commitments via an access management plan to maximise the potential benefits through provision of public access and organised tours and the development of mountain biking and walking routes away from restricted areas. Viking Energy have also committed to promoting Shetland as a sustainable community and green energy tourist destination.

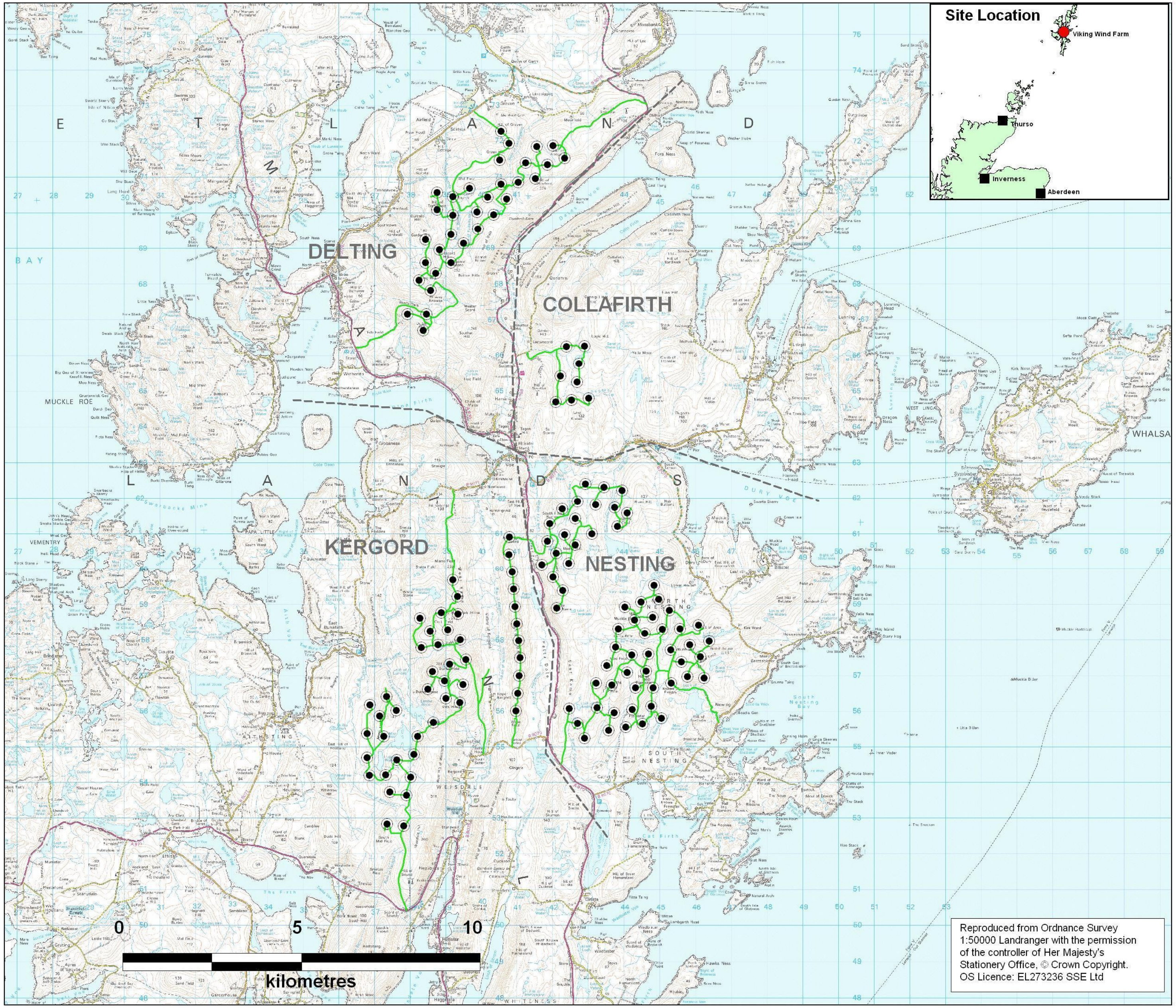

Figure NTS 1

Key

- Proposed turbine locations
- Proposed access roads

Client:	viking energy — Harnessing Shetland's natural resources
Project:	Viking Wind Farm
Title:	Site Location
Scale: see scale bar	Date: 22/01/09

BMT Cordah