

## 2 Design Evolution and Alternatives

### 2.1 Introduction

2.1.1 This chapter provides a description of the site selection process and design iterations that were undertaken prior to arriving at the final design which is described in Chapter 3.

### 2.2 Site Selection

2.2.1 The location of the site was selected as part of a review process undertaken by the Estate Owner seeking to diversify their operations, and to explore the potential for additional opportunities through energy and renewables, building upon the existing presence of significant hydro-electric infrastructure across large areas of the Estate. Around 2003 the Talladh-a-Bheithe estate owners, operating through a joint venture with the neighbouring estate Craiganour, jointly commissioned a development team to look into the possibility of wind farm development focussing on the landholdings of both estates. During the review and site selection stage of the development extensive wind data collection was undertaken and several detailed studies on ecology, landscape, transport/access amongst various other assessments were performed. Although the first results determined a possible site on the neighbouring Craiganour estate, ongoing technical studies made it clear later in the development that for reasons of landscape and other technical issues, the selected search area had to be marked as less favourable for the proposed development. Talladh-a-Bheithe estate therefore decided in 2007 to undertake a more detailed assessment focussing on alternative search areas which had not been assessed before. The Talladh-a-Bheithe Estate extends to approximately 56.9 km<sup>2</sup> and on part of which exists hydro energy infrastructure comprising power buildings, overhead power lines, large diameter pipework and roads. It is partially within the Loch Rannoch and Glen Lyon National Scenic Area (NSA) and the Coire Bhachdaidh Site of Special Scientific Interest (SSSI). The Estate Boundary is shown in figure 2.1 and the site boundary of the proposed development is shown in figure 1.2

2.2.2 A review of wind farm applications within the locality and relevant guidance from statutory consultees has been conducted to assess both successful and unsuccessful applications and provide an analysis of lessons learned and recommendations for potential assessment methods.

2.2.3 In addition, an initial desk study was undertaken of the estate using available environmental information to assess the potential risks associated with the development and identify any significant environmental issues or obstacles to the early consideration of the proposed development.

2.2.4 Initial consultations with key stakeholders was undertaken to gauge initial opinions on the location and design aspects of the wind farm. The outcomes from these consultations were included in an initial feasibility study.

2.2.5 Deutsche WindGuard Consulting GmbH (DWG) was appointed to perform a wind resource estimation and preliminary site classification for the site. As the layout of the proposed development had not yet been defined, the calculations were performed for five reference points which were taken as being representative of the area of the proposed development.

2.2.6 These potential locations were determined based upon wind speed, topography and proximity to access roads within the estate. The final placement of the wind turbines themselves required a design iteration process to best locate them based upon potential environmental impacts.

## 2.3 Site Description

2.3.1 The landscape is characterised by low acidic vegetation and intermittent coniferous plantation woodland. The Talladh-a-Bheithe Estate, where the site is located, is located partially within the Loch Rannoch and Glen Lyon National Scenic Area (NSA) and the Coire Bhachdaidh Site of Special Scientific Interest (SSSI).

**Table 2.1: Summary of Surrounding Land Uses**

North	Loch Ericht extends to the north of the estate. The small settlement of Dalwhinnie is located at the top of the Loch on the A9 road.
East	The Craiganour Estate borders the Estate. The A9 road lies approximately 20 miles to the east of the estate. A number of small settlements are located along the B486 between the site and Pitlochry, the nearest town to the site.
South	Loch Rannoch is located to the south of the estate.
West	Loch Ericht marks the western border of the estate. The Coire Bhachdaidh Site of Special Scientific Interest (SSSI) extends from the western portion of the estate over to the eastern shore of Loch Ericht. There are forestry areas to the south west of the estate.

## 2.4 Design Process

2.4.1 As part of the EIA process design iterations were prepared and considered for both the turbine locations and on-site infrastructure, including access tracks and the proposed substation location. In order to propose a development layout, which was considered to represent the most appropriate design; potential environmental impacts and their effects, physical constraints, and health and safety considerations were taken into account. Information was collated from desktop information, scoping opinions, local planning policy and recent consenting decisions and case law. This information provided the baseline from which site issues and sensitivities could be identified and highlighted for further detailed assessment and given priority in influencing the layout iterations of the Proposed Development. The design evolution process is described in detail below.

## 2.5 Design Principles

2.5.1 The following design principles were followed during the design iterations to ensure that the final design of the Proposed Development was the most suitable for the site:

- the Proposed Development should appear to relate well to the landform on which it stands;
- the Proposed Development should have a cohesive appearance;
- Minimise the potential visual effects upon National Scenic Area (NSA) and other designated land; and
- other environmental constraints and associated buffers are to be respected.
- Consideration of both Landscape and Visual Effects

2.5.2 In accordance with published guidance, the potential for landscape and visual effects have been considered separately in the design iteration exercise although the procedure for assessing each of these is closely linked. A clear distinction can be drawn between landscape and visual impacts as described below:

- Landscape impacts relate to the effects of the proposals on the physical and other characteristics of the landscape and its resulting character and quality.

- Visual impacts relate to the effects on views experienced by visual receptors (e.g. residents, footpath users, tourists etc) and on the visual amenity experienced by those people.

## 2.6 Turbine Layout Iterations - Phase One – Pre-EIA Scoping

2.6.1 Prior to the production of the EIA Scoping Report initial studies were undertaken which had given consideration to the potential size and scale of a wind farm at the site. These studies established that there was the potential for the site to accommodate a wind farm of around 75MW. As a consequence of the EIA process, there have been 3 main design iterations to the layout of the Proposed Development in order to avoid, reduce or offset the potential environmental effects associated with the Proposed Development. In addition to these three main design iterations there has been additional micro-siting (i.e. movement of turbines or other infrastructure by less than 100 m) performed to refine the design. The design iterations have also been undertaken in the context of maintaining a viable development proposal.

### Initial Feasibility Assessment

2.6.2 In September 2009 a feasibility assessment for wind energy generation at the site was undertaken. This study considered aspects such as:

- Ecology
- Landscape and Visual
- Air Quality and Climate Change
- Drainage and Water Quality
- Aviation
- Ground and groundwater
- Noise
- Traffic and transportation
- Archaeology & Cultural Heritage
- Socio Economic

2.6.3 Based on the feasibility study undertaken, it was determined that, pending more detailed study and assessment, there was potential for a viable wind energy project at the site. The wind turbine locations have evolved in response to the detailed assessment work undertaken, with consideration especially given to the landscape and visual impacts, ecological impacts (mainly with respect to birds and their habitats) and the access for transportation of turbine parts and construction traffic. The parameters of the Proposed Development are explicitly described within this ES.

### Study Areas

2.6.4 The formal EIA Scoping Report set out that it was expected that a wind farm of up to 75MW would be developed at the site. Utilising 3MW turbines it was therefore expected that 25 turbines would therefore be required at the site. During the preparation of the Scoping Report the site was considered with regard to three separate land parcels, known as the 'North Area' the 'South West Area' and the 'South East Area'. These separate areas had been defined such as to guide the ecology survey work which had taken place at the site. At the time of the Scoping submission each of the land parcels was considered to have the potential to accommodate turbines. The study area's are shown in figure 2.2

## Protected sites

- 2.6.5 A number of statutorily designated and protected ecology sites are within 5 km of the wind farm study areas. The nearest site, Coire Bhachdaidh Site of Special Scientific Interest (SSSI), is located immediately to the west of the North study area. Coire Bhachdaidh SSSI is nationally important for its assemblage of habitats, rare plants and breeding birds, including golden eagle, merlin and golden plover.
- 2.6.6 The River Tay SAC is located downstream of rivers within the Talladh-a-Bheithe Estate, 1.8 km to the south of the Southeast study area. The River Tay supports a high quality Atlantic salmon population which is an Annex 2 species. Other Annex 2 species present are sea, brook and river lamprey, although these are not primary reasons for designation.
- 2.6.7 The Drumochter Hills SAC/SPSA/SSSI, 2.5 km north of the North study area is designated for important vegetation and breeding birds including dotterel and merlin.
- 2.6.8 The Ben Alder and Aonach Beag SPA/SSSI, located 3.5 km northeast of the North study area is designated for its vegetation and breeding dotterel.
- 2.6.9 The Lochan Loin nan Donnlaich, part of the Rannoch Lochs SSSI, is located 5 km west of the Southwest study area. The Lochan is designated for its black-throated diver population.
- 2.6.10 Avoidance of the environmentally sensitive Coire Bhachdaidh SSSI was an important factor in determining the extent of the three study areas. Following a collection of baseline ecological and landscape data, and a preliminary assessment of the potential impacts of the proposed wind farm, environmental constraints and mitigation measures were identified. The information was used to refine the wind turbine areas, set design parameters for the turbines and inform the feasibility design and provisional site layout.
- 2.6.11 The locations of statutorily protected sites in relation to the Talladh-a-Bheithe Estate and wind farm study areas are illustrated in figures 2.3 - 2.12.

## Natural Heritage Sensitivity

- 2.6.12 Sensitivity maps produced by Scottish Natural Heritage identify areas of relative sensitivity to wind farm developments. These consider landscape designations, biodiversity interest, areas of value to birds and other aspects of natural heritage sensitivity.
- 2.6.13 There are three classifications as follows:
- Zone 1: Lowest Natural Heritage Sensitivity
  - Zone 2: Medium Natural Heritage Sensitivity
  - Zone 3: High Natural Heritage Sensitivity
- 2.6.14 Land on the Estate is predominantly in Zone 2: Medium Natural Heritage Sensitivity. The areas of highest sensitivity (Zone 3) have been avoided in considering where turbines may be sited to reduce possible effects on natural heritage.

## Summary of Preliminary Environmental Constraints by Study Area

### North Area

- 2.6.15 The collection of baseline survey data, initial assessment of environmental impacts and consultation with key statutory bodies had been taken place. It had been indicated that the North area possesses more constraints to the installation of turbines than the South East and South West areas.
- 2.6.16 From the preliminary landscape and visual assessment, positioning turbines on the higher ground within the North area will have the greatest potential visual effect. This is primarily because the North area rises to a maximum height of 683 m AOD which is 236 m above Meall Ban, the highest point in the South East area, and 267 m above Sron Bheag the highest point in the South West area. Turbines positioned in the North area will be theoretically visible from the Ben Alder and Loch Ericht forests on the west side of Loch Ericht. Turbines in the North study area are least likely to be visible from the loch sides, but will be visible from the upper slopes above the lochs.
- 2.6.17 The North area is also the closest of the three areas to Core Bhachdaidh SSSI, which is partly designated for breeding birds including golden eagle. Whilst the Talladh-a-Bheithe Estate is not considered to be a primary source of food for golden eagles, the North area does possess greater value for foraging golden eagles than the other two areas.
- 2.6.18 A breeding population of twenty two pairs of golden plover have been recorded in and around the Estate. Of the total, eighteen pairs were recorded in or to the northeast of the North area. From these observations, the importance of ensuring that golden plover continue to nest in and around the North area in similar numbers and distributions has been identified.
- 2.6.19 From the geological desk study and anecdotal evidence, peat is likely to be more prevalent in the northern part of the Estate which in turn will have the potential to increase the technical complexity of engineering solutions for the new access tracks and turbine foundations in the North area. The North area also presents topographical constraints due to the steepness of the slopes. The North area being the most distant of the three from a residential receptor would create the least noise impact from the proposed wind farm.

### South East Area

- 2.6.20 Positioning the turbines around and below the 450 m contour would reduce the visual impact. Whilst turbines in this area will be visible from the summit of Ben Alder views at a lower level in the Ben Alder and Loch Ericht forests will be restricted by the intervening high ground in the north part of the Talladh-a-Bheithe Estate. Careful siting of the turbines and layouts should be considered to minimise effects on views from Loch Rannoch and the southern end of Loch Ericht.
- 2.6.21 Very occasional hen harrier flight activity has been recorded along the woodland fringe within the South East area. A clear flight corridor between the South East area and the edge of adjacent plantation is therefore a proposed mitigation measure to minimise collision and displacement effects on hen harrier. This measure will also benefit lekking black grouse associated with the plantation edge.
- 2.6.22 The South East area is the closest of the three areas to a residential property (Ardlarach). However a preliminary assessment has been carried out from which it is demonstrated that the loss of amenity can be restricted to an insignificant level subject to careful siting and choice of wind turbine.

## South West Area

- 2.6.23 Positioning the turbines on the west side of the area around and below the 480 m contour would reduce the visual impact. Whilst the turbines in this area will be visible from the summit of Ben Alder views at a lower level in the Ben Alder and Loch Ericht forests will be restricted by the intervening high ground in the north part of Talladh-a-Bheithe. Careful siting of the turbines and layouts were considered to minimise effects on views from Loch Rannoch and the southern end of Loch Ericht. The location of the South West Area already allows for a clear flight corridor for birds known to use this plantation habitat on the Talladh-a-Bheithe Estate, including black grouse, hen harrier and merlin.
- 2.6.24 From the preliminary studies a qualitative assessment of the environmental constraints associated with each of the three areas is indicated in Table 2.2 below.
- 2.6.25 These constraints were considered in the detailed EIA and the design iteration process Phase 2 and 3. A simple red, amber, green colour coding system has been used to compare the constraints by area and technical chapter, red being more constraining than amber and amber more constraining than green.

**Table 2.2 Comparison of Environmental Constraints by Area**

	North	South East	South West
Landscape and Views	Red	Amber	Amber
Ecology	Red	Amber	Amber
Noise	Green	Amber	Green
Ground Condition and Water Resources	Amber	Green	Green
Transport	Amber	Green	Green
Air Quality	Green	Green	Green

### Phase 1 - Conclusions on Design

- 2.6.26 The conclusions from the pre EIA Phase were used to refine the layout design for the proposed turbines. During development of the design the proposed search areas and positioning of individual turbines were to be optimised. There were possibilities recognised for further optimisation of the wind farm layout relative to the environmental constraints on the Estate by using specific parts within each study area. For instance, this could lead to a turbine layout with two of the study area's partly used with more sensitive locations within those study areas being avoided.

## 2.7 Phase Two – Post-EIA Scoping

### On-site Constraints

- 2.7.1 The design iteration process continued from Phase One to have had regard to potential on-site constraints in addition to landscape and visual issues. These principally relate to ecology matters and information was taken from the ecology survey work being undertaken to inform the design process. The key issue of note to this phase of the design iteration exercise is that the 'North Area' of the site was deemed an exclusion zone for turbines on ecology grounds.
- 2.7.2 In addition to the exclusion of the 'North Area' it was also considered that the Coire Bhachdaidh SSSI to the west of the site should also represent an exclusion zone. A 50m buffer around watercourses at the site has also been adopted as an exclusion area in the design iteration work as is common with many wind farm design iteration exercises as shown in figure 2.13.

- 2.7.3 All ecological constraints were fed into a 3D model (described in further detail below) so that turbines could be located away from the most constrained areas.

### **Conclusions on-site ornithological constraints per Study area**

#### **North study area**

- 2.7.4 Taking into account the various constraints associated with the North study area, particularly regarding the golden eagle nest site, the concentration of golden plover breeding territories and the close proximity of the Coire Bhachdaidh SSSI, a decision was made not to consider further the North study area for siting wind turbines. Therefore wind turbine positions have been restricted to the South West study area and South East study area.

#### **South West study area**

- 2.7.5 The only 'no-go' areas associated with the South West study area relate to streams which support water voles. No wind turbines have been positioned within 10m of any stream.

#### **South East study area**

- 2.7.6 The remaining 18 wind turbines were planned in the South East study area. No turbines have been proposed within the No-go areas so there will be no turbines within at least 500m of a black grouse roost or a hen harrier nest site.
- 2.7.7 The indicative preferred wind turbine layout ensures that there will not be any wind turbines closer than 1.3km from a hen harrier nest site. Furthermore the proposed wind turbine layout ensures that no wind turbines will be located within approximately 750m of the plantation edge therefore providing a wide safe flight corridor for commuting and foraging birds including hen harrier.
- 2.7.8 The indicative preferred wind turbine layout will potentially affect one of the five golden plover breeding territories associated with the South East study areas.
- 2.7.9 No wind turbines in the indicative preferred layout have been positioned within 10m of any stream to ensure water voles are protected.

### **Further considerations**

#### **Ecology**

- 2.7.10 The main community types recorded are blanket bog and heath types; data have been analysed to assess which upland vegetation types, as defined by the National Vegetation Classification (NVC), are represented across the three study areas.

#### **Cultural Heritage and Archaeology**

- 2.7.11 The consideration and assessment of potential effects on the setting of designated cultural heritage features were fed into the design process, and the iteration of the scheme design was undertaken with key cultural heritage features in mind. Consequently, turbines, access tracks and other infrastructure elements were to be located in order to avoid direct impacts upon designated and non-designated cultural heritage features.

## Geology, Hydrology and Hydrogeology

- 2.7.12 The assessment had involved the collection and interpretation of data and information from published material plus consultations relating to the local and wider hydrological environment with statutory bodies, principally SEPA.
- 2.7.13 A peat depth assessment was required to identify the most sensitive areas of mire habitat located within the South East and South West study areas. The findings of the detailed peat depth assessment would allow further refining of the proposed wind turbine layout ensuring that turbine sites avoid areas of deep peat where possible.
- 2.7.14 The location of access tracks required to construct and maintain the proposed wind farm would also be influenced by the findings of the peat depth assessment. A small number of bridge crossings will be necessary to connect the proposed jetty site on Loch Ericht with the wind farm. Bridge crossing points will be carefully chosen to avoid damage to areas of deep peat and to protect water vole and potential otter shelters associated with the watercourses.
- 2.7.15 The key recommendations from the assessment which influenced site design include the following:
- The number of watercourse crossings should be minimised;
  - With the exception of watercourse crossings and jetties within Loch Ericht, all development will be sited away from watercourses: 50m buffer zones will be established;
  - The wind farm layout where possible will avoid marshy areas;
  - The design will incorporate a buffer zone from private water supplies (these are yet to be identified); and
  - The layout will avoid areas of deep peat.
- 2.7.16 A peat slide risk assessment was to be carried out in accordance with the Scottish Government Best Practice Guide for Developers and turbine locations will be adjusted in the light of survey work on peat depth and nature. Roads were considered to be carefully aligned and designed with regard to peat habitats and depth.

## Noise and Vibration

- 2.7.17 The noise assessment is part of the design iteration process, and each turbine layout will be assessed and amended so that the noise emissions at representative monitoring points meet limits derived following the approach given in ETSU-R-97 'The Assessment and Rating of Noise from wind farms'.
- 2.7.18 The assessment carried out during scoping concluded that in a worst-case scenario with 25 turbines situated in the south east and south west turbine areas, closest to the nearest residential receptor, the impact on amenity on the nearest residential property was considered to be insignificant.
- 2.7.19 The assessment demonstrated that if the turbines are located 2 km from the nearest residential receptor, noise levels will meet all relevant noise criteria with careful choice of wind turbine.

## Telecommunications and Aviation

- 2.7.20 A number of organisations were consulted with regard to telecommunication and aviation operations including BT, NATS, Defence Infrastructure Organisation and the Ministry of Defence (MoD). None of the organisations anticipate any effects and these have not been an influence on the turbine layout.

## Access, Traffic and Transport

- 2.7.21 Access routes across the Estate were to be developed and finalised around the turbine layout. The proposed access tracks that serve the turbines will be routed so as to minimise effects on hydrology, ecology, landscape, cultural heritage and peat stability.
- 2.7.22 Access to the site in terms of construction traffic and abnormal loads was a key consideration in the context of all design iterations.

## Turbine Separation distances

- 2.7.23 The design iteration exercise has had regard to necessary separation distances for each of the candidate turbines in terms of technical performance. A turbine separation ellipse (see illustration below) has been used with dimensions 6x rotor diameter length by 4x rotor diameter length, which is a standard approach to turbine separation distances.

### Layout Option One

- 2.7.24 Following submission of the Scoping Report design iteration work continued, which led to the development of a 25 turbine layout. This layout, referred to in this design statement as 'Layout Option One' utilised the 'South West Area' and the 'South East Area' of the site and was prepared to illustrate the continuing design iteration process taking place at the site. This layout was considered with turbines at both 80m hub / 125m tip and also 100m hub / 145m tip. The layout is shown in figure 2.14.
- 2.7.25 Prior to the development of Layout Option Two, detailed analysis was undertaken of Layout Option One in terms of its potential for landscape and visual effects. The first observation with regard to Layout Option One was that this iteration of the layout had already achieved a ZTV which had low visibility from important designated landscapes including the Cairngorms National Park and the Ben Nevis and Glen Coe National Scenic Area. Indeed this iteration of the layout had already ensured that important viewpoints referred to in the Scoping Response, such as Queens View and Blair Castle would have no views of the proposed turbines.
- 2.7.26 The layout option was considered at the Interim Report Stage to have potential as a 125m or 140m to blade tip scheme. Both turbine options were reviewed and it was decided that 125m was a more appropriate scale for this site. It is acknowledged that turbines taller than 125m are beginning to achieve consents elsewhere in Scotland. However, it was considered that given the nature of the landscape that turbines of 125m would be the preferred approach at this site.
- 2.7.27 Initial ZTV modelling and site survey demonstrated that turbines in the northern study area, which is higher than the other two study areas (South East and South West), could affect views extending further north and toward the Cairngorms National Park. This influence, when considered together with potential ecological impacts discussed above, has led to a decision to focus further investigation of turbine siting in the two more southerly study areas (southeast and southwest).
- 2.7.28 The slopes in the South East and South West study areas are lower than in the north and offer acceptable wind resource. These areas also offer opportunity to utilise hills to the immediate north and southeast for screening and backgrounding. The design process since the scoping consultation has involved assessing the effects on landscape and views of moving turbines within the three study areas which were identified at the scoping stage. A 3D modelling exercise has helped to demonstrate that this could be effective especially in minimising effects on viewpoints including those from the shores of Loch Rannoch, Bridge of Gaur, Kinloch Rannoch and more distantly Rannoch Moor.

2.7.29 Currently the design strategy that has been developed for the site forms a group of turbines that appears as a coherent and compact group when seen from most angles. The positions of the turbines have been determined by a number of factors. The key aim was to ensure that the turbines are sufficiently spaced to appear regular in the context of the layout as a whole.

2.7.30 Turbine spacing was also designed to minimise turbulence and maximise generating outputs.

2.7.31 In addition to the overall appearance of the wind farm from the surrounding landscape, appropriate buffers have been applied during the design of the proposed wind farm. These buffers act to minimise effects on the key constraints identified which mainly relate to watercourses and ecological constraints.

2.7.32 The final layout was not to be decided until all of the assessments have been carried out and public consultation completed. The wind farm design continued to be developed with environmental considerations being at the forefront of site design.

2.7.33 It was observed with regard to Layout Option One that there was the potential for visibility in the immediate Loch Rannoch vicinity to be further reduced, which the design iteration work could seek to address in the development of the current Layout Option Two.

#### **Tools utilised in Phase Two of the Design Iteration Exercise**

2.7.34 In order to further develop the layout at the site to improve on that which had been developed as Layout Option One, a series of tools were used to aid the design iteration process including digital modelling and photomontage visualisations, including six locations chosen to represent important visual receptors in the vicinity of the site.

#### **Layout Option Two**

2.7.35 Layout Option Two sought to further develop the improvements made in Layout One, whilst avoiding the constrained areas of the site and having regard to the potential for effects on the designated landscapes in the study area. A 25 turbine layout had been developed, with each turbine 125m to blade tip, which is shown in figure 2.16. Particular regard was given to reducing views in the immediate vicinity of the site, several of which were modelled using photomontages, figure 2.15.

2.7.36 With regard to the importance of good scheme design, it was sought to develop a turbine layout which followed the principles of 'Siting and Design Windfarms in the Landscape' (Version 1 - SNH, 2009 and more recently Version 2, May 2014). In this regard consideration was given to the relationship of the turbines with the underlying characteristics of the landscape, 'skyline breaks' where turbines appear above the natural horizon in key views, and the general pattern of the layout in within the landscape. This resulted in turbines which are sited to more closely reflect the contours of the landscape of the site, rather than simply running in straight lines across the site.

2.7.37 A series of ZTV plans and visualisations are included in this ES to illustrate the development of the layout from Option One to Option Two.

#### **Phase Two conclusions on design**

2.7.38 Overall it was considered that the second phase of the design iteration process had continued to improve the proposed turbine layout at the Talladh-a-Bheithe, building on the design work which had fed into the Scoping Report. Layout Option Two has had regard to both on-site and broader scale constraints and sought to minimise potential effects where possible within the environmental and technical parameters of the site.

2.7.39 In particular ZTV for the Layout Option Two illustrated that there would be no visibility of the scheme from within much of the Cairngorms National Park and the Ben Nevis and Glen Coe National Scenic Area. No turbines have

been sited within the Loch Rannoch and Glen Lyon National Scenic Area and visibility from this area is for the most part restricted only to its northern extent.

2.7.40 In the more immediate vicinity of the site, Layout Option Two has now removed potential views of the turbines from much of the area around Loch Rannoch and sought to ensure the turbines fit well with the landscape in remaining views.

### **Phase Three – Ongoing Design Iteration on Layout Option Two**

2.7.41 At this stage of the design iteration process, the site was no longer considered solely in relation to the three separate areas and the entire land holding has been utilised in the design iteration work.

2.7.42 Technical and environmental information has continued to evolve in relation to the site with new constraints and parameters considered. At this stage in the process the layout development had begun to have greater regard for potential visual effects in the immediate vicinity of the site and also for the design criteria set out in 'Siting and Design wind farms in the Landscape'.

2.7.43 Further layout iterations for 'Layout Option Two' were undertaken, and this also included selective micro-siting and this is discussed further in subsequent sections of the ES.

### **Iteration workshops**

2.7.44 The initial layout for the Proposed Development was used for the purposes of initial consultations and was developed prior to the baseline environmental and technical assessments being conducted. Once the initial consultation was undertaken, the baseline conditions on site were collated and mapped within a comprehensive Geographical Information System (GIS) model, specific to the Proposed Development.

2.7.45 The Applicant held a number of iteration workshops were held throughout the EIA assessment. These were attended by the technical and environmental specialists in the project team. The purpose of these workshops was to refine the layout and to minimise, reduce or offset the potential environmental effects associated with the Proposed Development.

2.7.46 Following the peat assessment T1, T8, T16, T18, T21, T22, T23 and T25 have been slightly relocated in order to reduce effects regarding slope stability and peat slide risk. Generally there will also be a lesser impact on the more interesting/sensitive areas of vegetation and areas of bare peat.

2.7.47 A total of four borrow pit search areas have been identified. Search areas have been selected following a detailed ground condition walkover survey. This work was undertaken simultaneously with detailed peat survey and stability assessments.

2.7.48 During the micro siting GIS design stage T5, T6, T7, T10, T13, T14, T15, T17, T18 and T22 were further revised. These relocations were all within approx. 50m of the previous locations.

- T5 was repositioned closer to the road, approximately 50 meters in order to reduce slope angle.
- T6 repositioned in order to further reduce peat depth.
- T7 was relocated slightly in order to further reduce steepness and peat depth.
- T10, the route from T5 was optimised in order to avoid sensitive H10 habitat, the turbine position slightly changed due to this
- T13, very slight repositioning to reduce slope

- T14, relocated to avoid sensitive habitat
- T15, slight repositioning to further improve peat conditions
- T17, was repositioned westbound In order to optimise in between turbine distances, considering T20
- T18, further optimisation on peat conditions
- T22, micro sited to improve peat conditions

#### 2.7.49 Further considerations on design

- T14 was sited around the group of shielings, but outside the constrained archaeological buffer. T14 has been repositioned westbound, closer to the Garragher Plantation, away from the buffer zones.
- The access to T14 from the north potentially passed through the buffer for one of the shielings. The access track has been changed. T 14 now connects with T9, instead of connecting with T10 previously. This required a turning head at the location for T14. The turned head at T9, has been removed.
- The access track between T13 and T17 seemed to pass through a buffered shielings group. The access track has been relocated avoiding the buffer zone. It's also avoiding the forest this way.
- Due to difficult terrain conditions and landscape and visual improvements, it was decided to drop T22..

#### Final on-site review

2.7.50 A final on-site review has been held in order to review amended design changes and to implement the final micro siting optimisation possibilities in the design.

- Review of using existing site road to access turbines opposed to new tracks
- Turbines locations, associated tracks, hard stands and water crossings have been reviewed
- Review of bridges on existing site roads
- Review of borrow pit locations
- Review construction compound location

#### Iteration considerations

- The turbine locations remained unchanged during this iteration step.
- The track layout has been revised utilising the existing site road where possible to reduce the need for new track between T1 and T5. The increased use of the existing access track is an improvement as areas of bare/eroded peat present (particularly between T3 and T4) will impacted upon to a lesser degree.
- The track from T5 to T10 ("loop") has been slightly shortened.
- The construction compound has been relocated north of proposed location due to topography
- The track to T9 and T14 has been amended. The track continues from T4 to T9. The change in access track layout leading to Turbine 14 will result in less disturbance to the wet flushes.
- Eastern track section (T24 to T25) dropped for construction purposes. The connecting track could be useful during the operation of the wind farm. If this optional track was to be constructed (possibly 4x4 track only) then ease of access around the site would be increased.

2.7.51 Overall, changes to the Proposed Development layout during Phase Three were made as a result of the findings of the baseline survey work and consultation undertaken with the consultees and the public. The changes included both the relocation and reduction in the number of turbines into a proposed scheme of 24 turbines as shown in figure 4.1.

## 2.8 Summary

- 2.8.1 Based on the feasibility study undertaken, it was determined that there was potential for a viable wind energy project at the site. The wind turbine locations have evolved in response to the detailed assessment work undertaken, with consideration especially given to the landscape and visual impacts, ecological impacts (mainly with respect to birds and their habitats) and the access for transportation of turbine parts and construction traffic.
- 2.8.2 During the preparation of the Scoping Report the site was considered with regard to three separate land parcels, known as the 'North Area' the 'South West Area' and the 'South East Area'. These separate areas had been defined such as to guide the ecology survey work which had taken place at the site.
- 2.8.3 It had been indicated that the North area possesses more constraints to the installation of turbines than the South East and South West areas. The conclusions from the pre EIA Phase were used to refine the layout design for the proposed turbines. During development of the design the proposed search areas and positioning of individual turbines were to be optimised.
- 2.8.4 Possibilities for further optimisation of the wind farm layout relative to the environmental constraints on the Estate by using specific parts within each study area. For instance, this could lead to a turbine layout with two of the study area's partly used with more sensitive locations within those study areas being avoided.
- 2.8.5 The key issue of note to the next phase of the design iteration exercise is that the 'North Area' of the site has been deemed an exclusion zone for turbines on ecology grounds.
- 2.8.6 In addition to the exclusion of the 'North Area' it was also considered that the Coire Bhachdaidh SSSI to the west of the site should also represent an exclusion zone.
- 2.8.7 Following submission of the Scoping Report design iteration work continued, which led to the development of a 25 turbine layout. This layout, referred to in this design statement as 'Layout Option One' utilised the 'South West Area' and the 'South East Area' of the site and was prepared to illustrate the continuing design iteration process taking place at the site.
- 2.8.8 Prior to the development of the following Layout Option Two, detailed analysis was undertaken of Layout Option One in terms of its potential for landscape and visual effects. The first observation with regard to Layout Option One was that this iteration of the layout had already achieved a ZTV which had low visibility from important designated landscapes including the Cairngorms National Park and the Ben Nevis and Glen Coe National Scenic Area. Indeed this iteration of the layout had already ensured that important viewpoints referred to in the Scoping Response, such as Queens View and Blair Castle would have no views of the proposed turbines.
- 2.8.9 The final layout was not confirmed until all of the assessments had been carried out and public consultation completed. The wind farm design continued to be developed with environmental considerations being at the forefront of site design.
- 2.8.10 Layout Option Two sought to further develop the improvements made in Layout One, whilst avoiding the constrained areas of the site and having regard to the potential for effects on the designated landscapes in the study area.

- 2.8.11 Overall it was considered that the second phase of the design iteration process had continued to improve the proposed turbine layout at Talladh-a-Bheithe, building on the design work which had fed into the Scoping Report. Layout Option Two has had regard to both on-site and broader scale constraints and sought to minimise potential effects where possible within the environmental and technical parameters of the site.
- 2.8.12 In particular, the ZTV for the Layout Option Two illustrated that there would be no visibility of the scheme from within much of the Cairngorms National Park, Ben Nevis and Glen Coe National Scenic Area. No turbines have been sited within the Loch Rannoch and Glen Lyon National Scenic Area and visibility from this area is for the most part restricted only to its northern extent. In the more immediate vicinity of the site, Layout Option Two has now removed potential views of the turbines from much of the area around Loch Rannoch and sought to ensure the turbines fit well with the landscape in remaining views.
- 2.8.13 Overall, changes to the Proposed Development layout during Phase Three were made as a result of the findings of the baseline survey work and consultation undertaken with the consultees and the public. The changes included both the relocation and reduction in the number of turbines into a proposed scheme of 24 turbines.