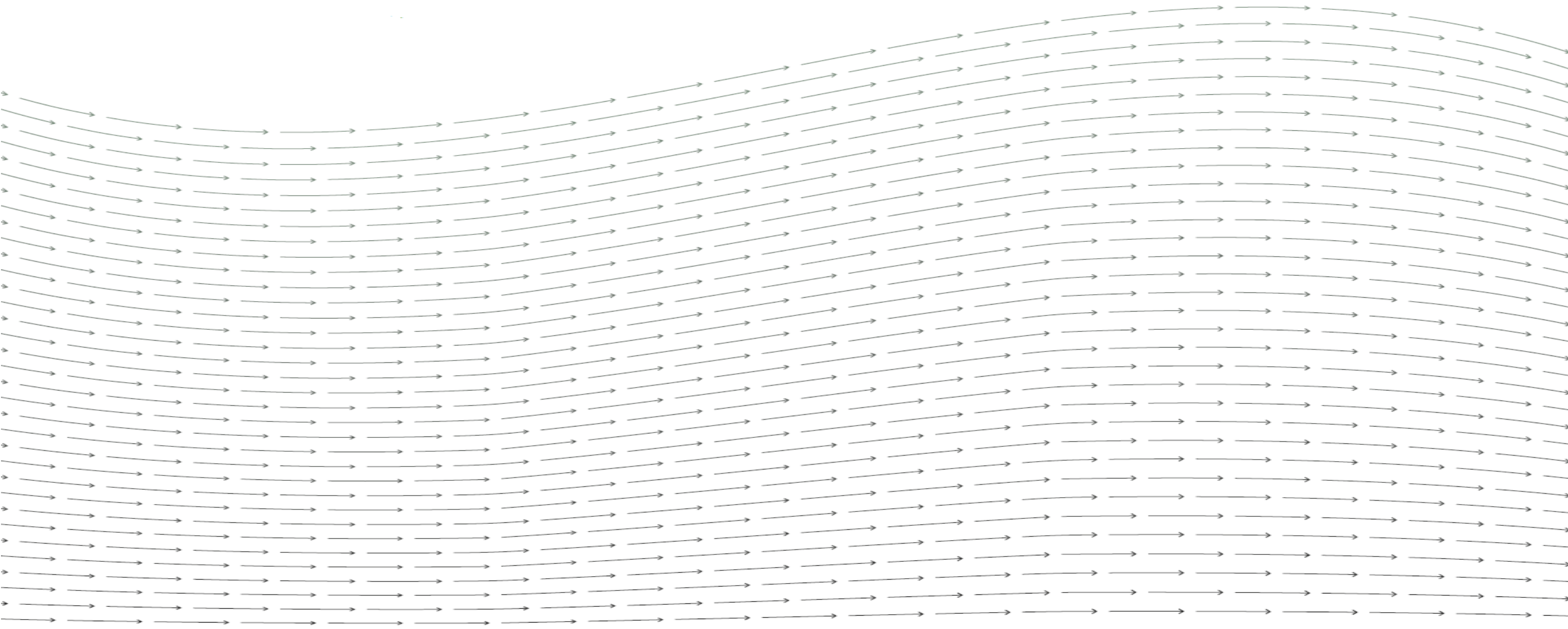


>> CRAIGINMODDIE WIND FARM
Design and Access Statement

Energiekontor UK Ltd
December 2020



Contents

	Section	Page
1.	Introduction	3
2.	Site Selection	4
3.	Design Influences and Layout Evolution	6
4.	Design of the Proposal	11
5.	Access	12



1 Introduction



Context

- 1.1 This Design and Access Statement has been prepared by Energiekontor UK Ltd ("the Applicant") to accompany an application under Section 36 of the Electricity Act 1989 for the construction, 35 year operation and subsequent decommissioning of a wind farm consisting of fourteen wind turbines and associated infrastructure ("the Proposed Development") at Craiginmoddie, South Ayrshire ("the Site").
- 1.2 This Design and Access Statement explains the design rationale behind the layout, providing an explanation of the design principles and concepts that have informed the Proposed Development (as described in Chapter 3 of the Environmental Impact Assessment Report) and how transport and access issues have been taken into consideration.

The Applicant

- 1.3 Energiekontor UK Ltd is a renewable energy development company with offices in Leeds, Glasgow and Edinburgh. The company was formed in 1999 and develops wind farms throughout the United Kingdom. The company has built eight wind farms in the UK with many more in the development process.
- 1.4 EK is part of the Energiekontor Group. The parent company, Energiekontor AG, was established in 1990 in Bremerhaven in Northern Germany. It has since grown to become one of the leading wind energy companies in Europe, having built more than 100 wind farms across the continent.

Methodology

- 1.6 The process involved in formulating the design of the Proposed Development has been led by a combination of environmental design and engineering requirements. The aim has been to arrive at an appropriate layout in terms of energy yield whilst seeking to avoid or reduce environmental effects.
- 1.7 The Environmental Impact Assessment (EIA) process also provides opportunities for positive design, rather than merely seeking to avoid adverse environmental effects. The Design and Access Statement is seen as having an important role in contributing to the design process through the clear documentation of design evolution.

- 1.8 Wind farms are a sustainable form of development and the potential environmental effects are usually associated with the construction period and the temporary effects during the operational period of wind turbines on landscape and visual amenity. The Proposed Development has therefore been developed with environmental considerations at the forefront of both site selection and site design.

The Application

- 1.9 The Craiginmoddie Wind Farm application is submitted in full and in addition to this Design and Access Statement is accompanied by the following documents which should be read together:
- Environmental Impact Assessment Report Vol I: Written Text;
 - Environmental Impact Assessment Report Vol II: Figures and Visualisations;
 - Environmental Impact Assessment Report Vol III: Technical Appendices;
 - Environmental Impact Assessment Report Vol IV: Non-Technical Summary; and
 - Planning Statement.

2 Site Selection



Introduction

- 2.1 This section of the Design and Access Statement describes the Site and the surrounding area before setting out the approach to site selection.

The Site

- 2.2 The Site is located within South Ayrshire and consists predominantly of extensive areas of plantation forestry and open moorland.
- 2.3 The Site lies along an undulating ridge adjacent to the existing Hayard Hill Wind Farm, which has been operational since 2006 and consists of 52 turbines. The Site lies between the Stinchar Valley and the Girvan Valley in an upland area comprising low to medium sized hills, where landcover mostly comprises open moorland and coniferous forestry.
- 2.4 The Site is located in a Landscape Character Type (LCT) classified as 'Foothills with Forest and Wind Farms'. This combines a subdivision of the broader Foothills with Forest LCT with a subdivision of the Foothills LCT to reflect the change in character in the area following the introduction of the Hadyard Hill Wind Farm. The LCT comprises a mix of improved grassland, unimproved grassland and commercial forestry plantations.
- 2.5 The local area is relatively sparsely populated, with a number of small settlements, hamlets and dispersed individual dwellings in the vicinity of the Site. The nearest settlements are (approx.) Barr (4km south/West), Dailly (4km north), Crosshill (6.5km north), Straiton (7.5km north east) and Maybole (9km north). The nearest town to the Site is Girvan, located 10.5km to the west.

Site Selection Criteria

- 2.6 The overall approach to wind farm site selection is to identify areas of land where the siting of a wind farm would result in minimal environmental effects, be free from overriding technical constraint and be viable on an economic basis. Some of these are considered below.

GIS Constraints Mapping

- 2.7 A Geographical Information System (GIS) "sieve mapping" exercise was carried out as part of the site selection process. This involved identifying and mapping constraints to wind farm development across south west Scotland, including:

- International natural heritage designations, including Ramsar sites, Special Areas of Conservation and Special Protection Areas;
- National and local natural heritage designations, including National Parks, National Scenic Areas, Regional Scenic Areas, National and Local Nature Reserves, Ancient Woodlands and RSPB reserves;
- Cultural heritage assets, including World Heritage Sites, Ancient Monuments, listed buildings, Conservation Areas, Registered Parks and Gardens and Registered Battlefields;
- The pattern of settlement, with all areas within 1km of residential properties excluded from further assessment;
- Aviation interests, including surface obstacle limitation surfaces, MoD Low Flying Areas, local aerodromes and visibility to radars, both military and civilian; and
- Existing, approved or proposed wind farms.

Review of Planning Context

- 2.8 Information on the planning context for renewables in South Ayrshire was reviewed as part of the site search exercise, focusing on the relevant Development Plans, national policy and other relevant material considerations.

Wind Speed Data

- 2.9 The predicted wind resource in any given location is an important consideration in identifying potentially suitable wind farm sites. The electricity that can be generated by a wind farm is directly affected by the wind speed. Wind speed increases with height above ground level and the amount of electricity generated increases disproportionately with increases in wind speed. This in turn affects the carbon emission savings and the commercial viability of a site.
- 2.10 The information on unconstrained areas from the GIS sieve mapping exercise was therefore compared with data on wind speed to identify suitable locations for wind farm development. This was done using the then Department of Trade and Industry (DTI) wind speed database NOABL which provides annual mean wind speeds on a kilometre grid square basis.

Access Suitability

- 2.11 An assessment is required to ensure that appropriate access to a potential wind farm site is available for the transportation of wind turbine components.

Grid Connection

- 2.12 The potential to connect a wind farm into the electricity network was also an important consideration in identifying suitable sites for wind farm development. The capacity of the local grid network to accept the likely output from a proposed wind farm is critical to the technical feasibility of a development.

Selection of Craiginmoddie

- 2.13 The information from the sieve mapping exercise was combined with relevant planning policy, wind speed data and details of the local electricity distribution network to identify suitable areas within the study area for potential wind turbine development. From the various land areas identified, Craiginmoddie was selected due to a number of factors, including:
- **Underlying landscape capacity** – the host landscape is likely to be suitable for accommodating wind farm development as evidenced by the operational Hadyard Wind Farm;
 - **Energy capture** – software modelling indicates that the Site offers a strong wind resource with few obstacles or areas of pronounced topography close enough to interrupt wind flow;
 - **Settlement** – the Site is well removed from any significant settlements, the closest being Barr and Dailly, both approximately 4km from the Site;
 - **Landscape** – the Site is sufficiently removed from any nationally designated landscapes;
 - **Transport infrastructure** – the Site benefits from suitable access for turbine component delivery; and
 - **Aviation** – it is anticipated that mitigation solutions would be available to avoid any adverse effects.



3 Design Influences and Layout Evolution



Introduction

- 3.1 Once a site has been selected, the design of the wind farm is optimised in order to produce a layout which maximises the use of land available for power generation, balancing this against the overall environmental, social and economic effects of the development. Optimising the layout of a wind farm in this way depends on a range of technical, economic, planning and environmental criteria.

Design Criteria

- 3.2 Technical requirements and constraints are parameters that can physically constrain wind farm design. For the Proposed Development these have included:

- **Energy capture** – the NOABL database indicates that the Site has a favourable wind resource.
- **Land availability** – as agreed with the landowner, the land available for the wind farm.

- 3.3 In addition to the technical requirements and constraints, a range of environmental considerations have also had an influence on the design of the wind farm. These include:

- **Landscape and visual** – the design of the Proposed Development seeks to match the scale of the turbines and the scale of the overall development with the scale of the landscape. Computer modelling was used as a tool to aid design and a 3D model/wireframes were generated for views from key design views around the Site.
- **Ecology** – the layout of the Proposed Development takes account of the ecological interests of the Site and the surrounding area.
- **Archaeology** – all on-site archaeological features have been plotted, assessed and avoided as far as possible.
- **Residential Properties** – the Proposed Development has been designed to ensure that no residential properties would experience unacceptable amenity effects, either as a result of visual dominance or noise.
- **Deep peat** – the Proposed Development has been designed to avoid the areas of deepest peat on the Site.

- **Hydrology** – all watercourses within the Site have been considered in the design, with appropriate buffers from all infrastructure provided in the design to safeguard the hydrogeology of the area.

- 3.4 In addition to the above considerations, planning guidance and discussions with statutory and non-statutory consultees and the local community have also had an influence over the evolution of the design.

Planning Policy

- 3.5 As set out in Planning Statement, a wide range of national, regional and local planning and renewable energy policy has been taken into account in the design of the Proposed Development.

Design Guidance

- 3.6 The design of the Proposed Development has taken into account a number of best practice documents in relation to wind farm design. In addition to taking cognisance of the suite of planning guidance discussed in the Planning Statement, the following documents are of particular relevance to the design of the Proposed Development:

- Siting and Designing Wind Farms in the Landscape, SNH (2014); and
- Planning Advice Note (PAN) 68: Design Statements

Design Consultation

- 3.7 The Applicant has undertaken an extensive programme of consultation prior to the submission of this application. This has included consultation with stakeholders including Nature Scot, Historic Environment Scotland and South Ayrshire Council which has influenced the final design of the Proposed Development.

- 3.8 A range of consultation has also taken place with the public. Host Community Council's Barr and Dailly were initially contacted and provided with a copy of the Scoping Report and an introduction to the Site and the Proposed Development. A link was also provided to the project website which contained further details of early site investigation work being undertaken.

- 3.9 An initial online public exhibition was established on the Applicant's website in autumn 2020 to provide the community with an opportunity to review the proposals, provide feedback and ask questions. The online exhibition included the presentation of exhibition boards which displayed information on a range of topics including:

- A description of the project;
- An introduction to Energiekontor;
- Details of the Proposed Development, the Site's location and on-site constraints;
- An explanation of the development and EIA processes;
- A full copy of the Scoping Report and accompanying appendices; and
- A questionnaire.

- 3.10 A further online consultant event was held in early December 2020. This was advertised in the Ayrshire Advertiser and the Ayrshire Post. Barr and Dailly Community Councils were informed of the online event and provided with a web link to the updated project website.

- 3.11 The updated website presented details of the changes that had been made to the Proposed Development since the scoping exercise was undertaken including the reduction in proposed turbine height and turbine numbers.

- 3.12 This process of consultation has identified a number of potential design constraints which the Applicant has subsequently sought to address as part of the EIA and design process. Further details are set out in the various stages of the design iterations below and relevant chapters of the EIA Report.

Constraints Mapping

- 3.13 The starting point for the design of a wind farm is the preparation of a detailed constraints map which sets out all relevant buffer distances, key features and other factors that may constraint the location of wind turbines,

- 3.14 The process of EIA plays an important role in this process as it enables all the technical constraints to be identified which could restrict the location of wind turbines. The evolution of design has as such been informed by matters including standoff distances to residential properties, ecological buffers and separation distances between existing and proposed wind turbines.

Technical Constraints

- 3.15 The following technical considerations were taken into account in the design process:

- A minimum separation distance between the turbines of 3.0 rotor diameters in order to minimise turbulent interactions between wind turbines (wake effect);

- Distance from residential properties; and
- Civilian and military aviation radar coverage of the Site.

Relevant Planning Policies

- 3.16 The relevant policies identified in the Planning Statement have been taken into consideration in the site selection process and also subsequently, where relevant, in the design of the Proposed Development.

Landscape and Visual

- 3.17 The principal design objectives of the Proposed Development are as follows:
- Minimise effects on the more prominent steep-sided peripheral hills with well-defined summits.
 - Minimise effects on views towards the landmark hill of Glenalla Fell which forms a prominent high top seen from the Carrick Forest Drive and from parts of the Middle Dale and Genoch Inner Hill whose steep, rugged slopes form the backdrop to the Intimate Pastoral Valley at the head of the Water of Girvan.
 - Minimise effects on the Stinchar Valley and Water of Girvan Valley landscape units through the use of careful siting and topographic containment.
 - Achieve a simple, balanced, rational and coherent design when viewed in the local and wider landscape.
 - Minimise landscape and visual effects on views from local residential properties and communities.
 - Minimise landscape and visual effects from main transport routes.

Land Use

- 3.18 Consideration has been given to minimising the loss of forestry land and the effects on forestry operations during the construction and operational phases of the development.

Noise

- 3.19 The Proposed Development has been designed to ensure that the wind farm would be able to operate within acceptable noise criteria.

Ecology and Ornithology

- 3.20 The Site is not the subject of any statutory nature conservation designations. A full suite of ecological and ornithological studies have been undertaken which has allowed the layout to be designed around local sensitivities.

Archaeology and Cultural Heritage

- 3.21 There are no statutorily designated cultural heritage assets within the Site and no direct impacts have therefore been identified during the design process. However, there are a number of heritage assets in the wider area and potential effects on the settings of such assets have been considered as part of the design process.
- 3.22 All other non-designated assets within the Site have been avoided in the final design of the Proposed Development to minimise any direct effects on cultural heritage assets.

Design Iterations

- 3.23 The design process has been undertaken over a prolonged period and the proposal has been progressively revised and refined during this time to take account of the information arising from pre-application consultation and the findings of various EIA assessments.
- 3.24 Details of some of the key iterations of this design process are outlined below.

First Design Iteration

3.25 An initial layout was prepared based on the following desktop environmental and technical constraints:

- Residential buffer of 1km between wind turbines and residential properties.
- Watercourse buffers of 50m.
- Initial turbine ellipses used to position turbines.
- Buffer provided to the electricity transmission line running along the north western boundary of the Site.

3.26 Based on these constraints the first iteration comprised 17 turbines.

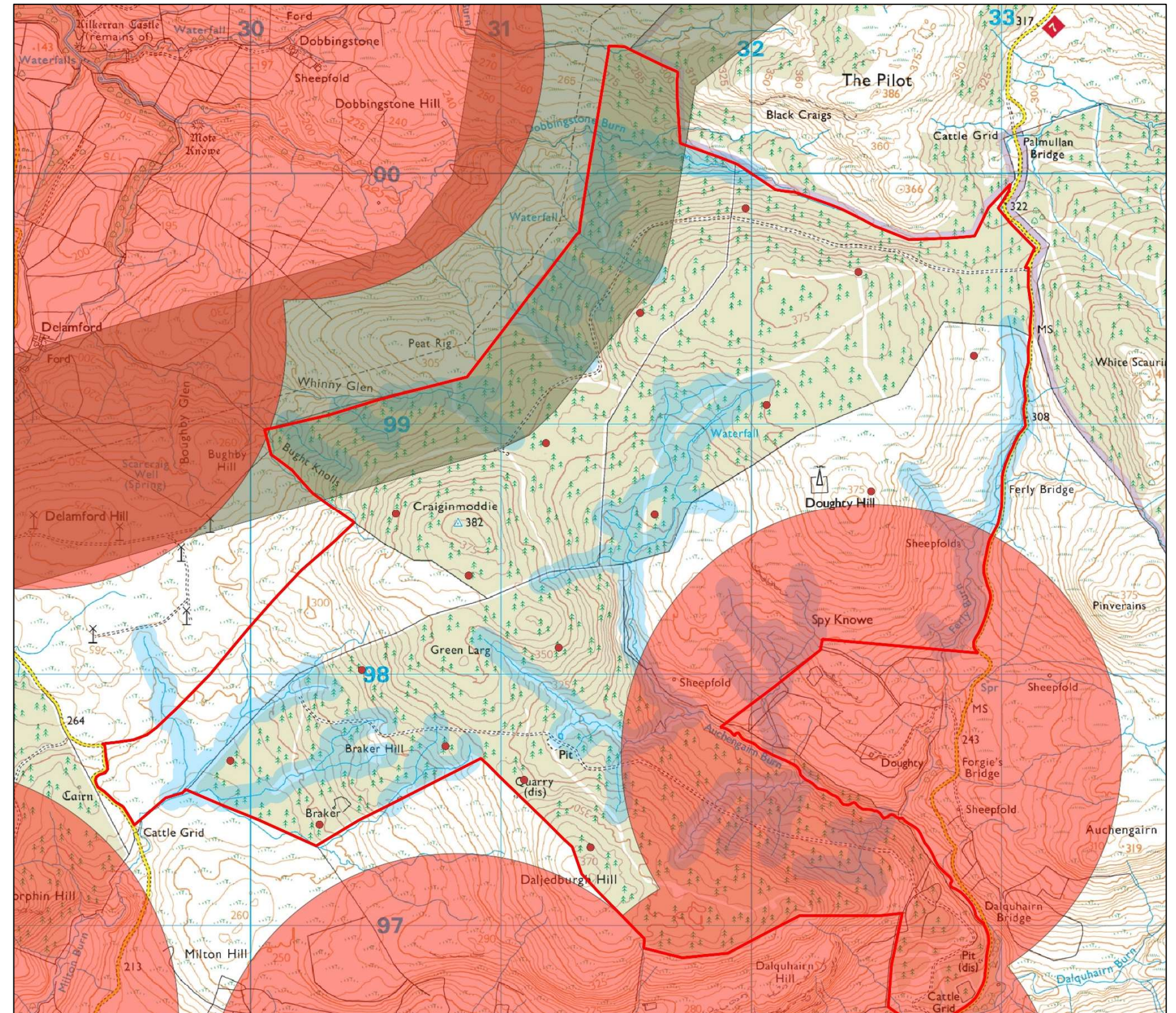


Figure 2.1: First Design Iteration

Second Design Iteration (Scoping)

3.27 The second design iteration incorporated environmental constraint information that was available following on-site survey work. This reduced the number of turbines from 17 to 16, with heights up to 230m, and this layout formed the basis of the Scoping request. The request was accompanied by a Scoping Report which set out a summary description of the Proposed Development, identified the issues proposed to be included in the EIA and proposed an approach to the assessment of effects in each case.

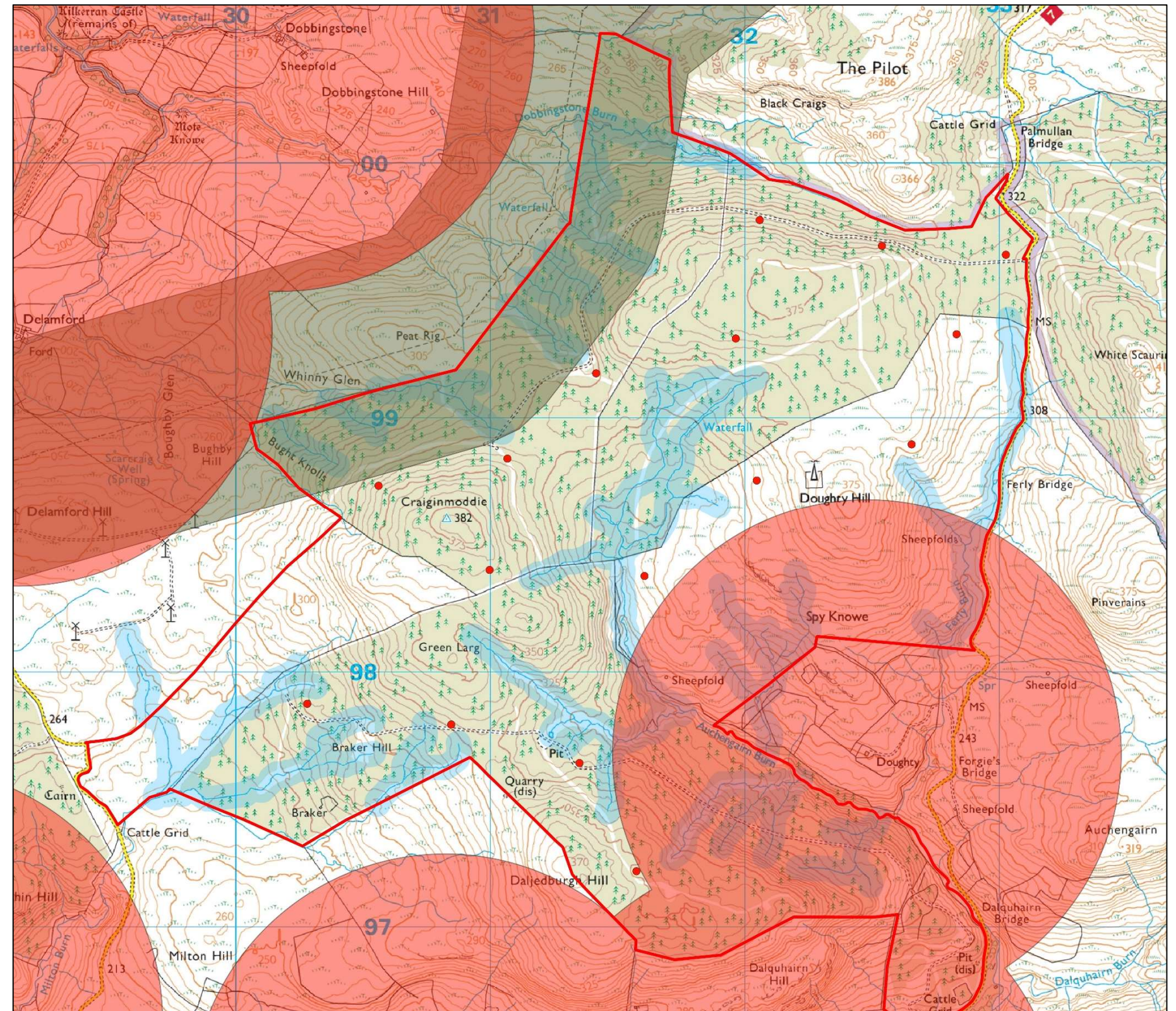


Figure 2.2: Second Design Iteration

Third Design Iteration

3.28 The final layout design reduced the number of turbines from 16 to 14. The following considerations were embedded within the design at this stage:

- Reduction in the proposed tip height of turbines from 230m to 200m in order to avoid any potential overbearing effects on the nearest residential properties, improve design fit with the adjacent Hadyard Hill turbines, and to provide a better design fit with the underlying landform.
- Reduction in turbine numbers from 16 to 14 in order to provide a greater offset from residential receptors to the south and pull back from the sensitive Stinchar Valley.
- Adjustments in turbine positions to maximise offsets from the nearest residential properties.
- Adjustments in turbine positions to achieve a balanced and coherent layout composition from viewpoints around the Site.
- Siting of the construction compound, substation and battery storage facility within the lower lying core of the Site, surrounded by retained forestry, to minimise visual prominence.
- Siting of borrow pit search areas on lower lying, inward facing slopes to minimise visual prominence.
- Minimising the requirement for forestry felling and the proposed restocking of forestry areas around turbines to minimise the appearance of keyholing.

3.29 Turbine positions were designed to take account of peat mapping which was prepared for the Site following intrusive survey work, with turbines sited away from areas of deeper peat.

3.30 The access tracks were also designed at this stage which sought to utilise existing forestry tracks as much as possible, avoid areas of deeper peat, minimise the amount of watercourse crossings required, and avoid areas with steeper slopes.

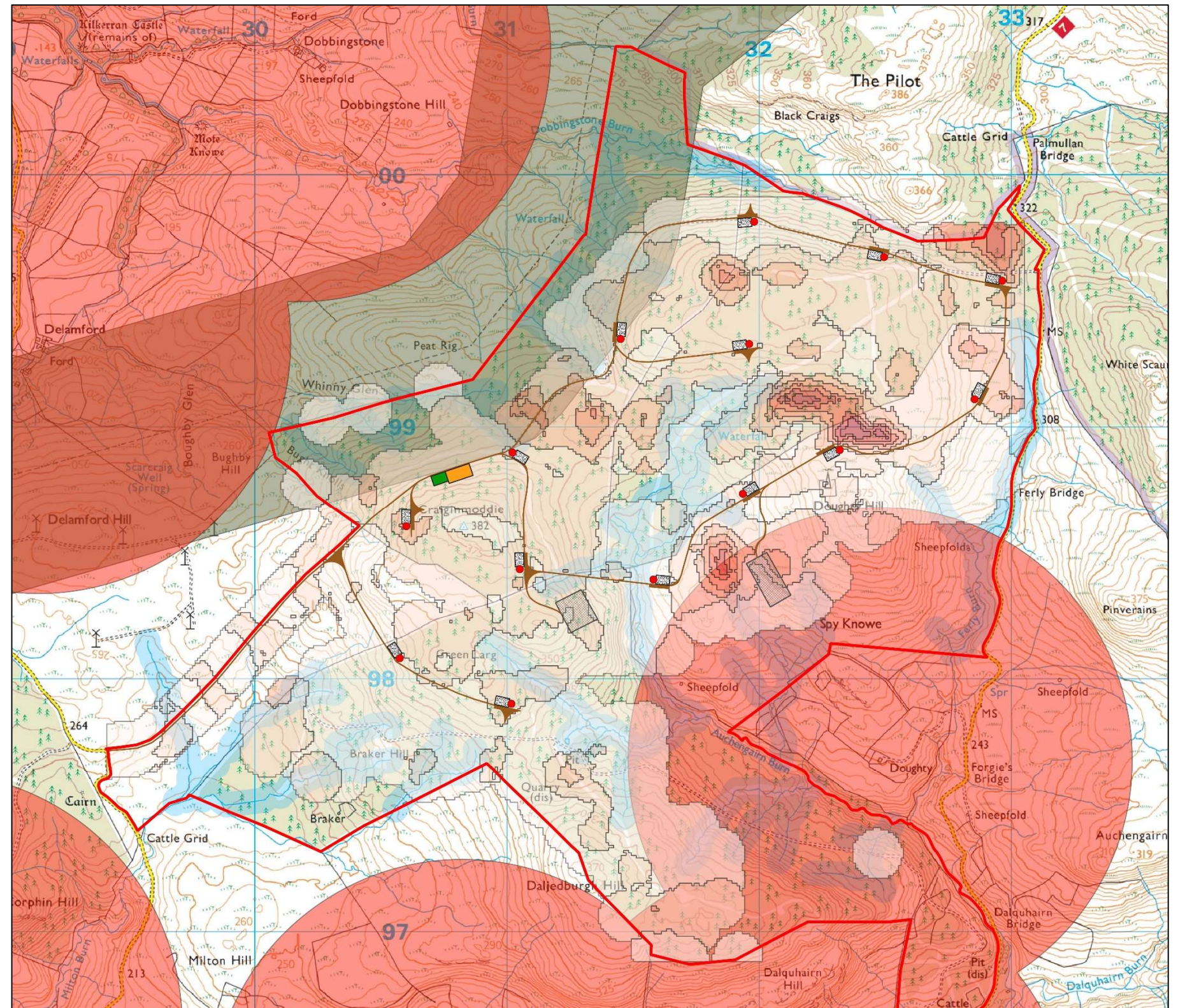


Figure 3.3: Third Design Iteration

4 Design of the Proposal



Introduction

- 4.1 The Proposed Development consists of the development of a wind farm of up to fourteen wind turbines.
- 4.2 The wind farm would provide approximately 92MW of generating capacity depending on the final turbine selection. This would be made following the grant of consent and be subject to a competitive tendering exercise.
- 4.3 The planning application includes an allowance for potential micro-siting of the wind farm infrastructure. If planning permission is granted, the Applicant would commission detailed ground investigations and geotechnical surveys to determine the overall ground conditions.
- 4.4 It is possible that there may be a requirement for micro-siting of other infrastructure following these investigations and any other pre-construction environmental surveys. Consequently, the application boundary seeks a potential micro-siting allowance of 100 metres for turbines and associated development such as tracks and crane pads.

Key Elements of the Proposal

- 4.5 The principal elements of the Proposed Developments include:
 - **Wind turbines** – fourteen wind turbines up to 200m in height to blade tip.
 - **Site tracks** – to provide access for construction and maintenance vehicles from the site access to the substation and wind turbines. They would have a running width of approximately 5m, with local widening on corners and would be surfaced with coarse aggregate.
 - **Construction compound/storage area** – to provide a secure area for site office facilities and storage of materials and components. This would measure 100m x 50m.
 - **Crane hardstandings and outrigger pads** – to provide a level and firm base for the cranes at the location of each turbine.
 - **Transformer housings** – the transformers to step up the voltage exported from each turbine would either be placed within the wind turbines

themselves, or in a small external transformer housing placed next to each wind turbine tower, depending on the final turbine choice.

- **High voltage and control cables** – to form power and control circuits linking each turbine to the on-site substation, cables would be placed in trenches (dimensions to be determined by the ground conditions, but typically 0.5m x 1m deep) routed alongside the tracks.
- **Substation building** – to house the switchgear and control equipment, plus secure storage space.
- **New or upgraded water crossings** – new water crossings are required on Site subject to detailed survey as part of the pre-construction process.

Wind Turbines

- 4.6 It is proposed to erect up to fourteen wind turbines on the Site. They would be of a typical modern design comprising a three bladed rotor hub mounted on a rotatable nacelle (containing a gearbox and a generator), a tower and foundation.
- 4.7 Research has shown that the best colour for turbines when seen against Northern European skies is light grey or off-white and that non-reflective finishes are the treatment for the surface of materials.

Associated Development

- 4.8 A grid connection would be required to feed the electricity generated by the wind farm into the distribution network for the operational period of the wind farm.
- 4.9 The final details of the grid connection, including the precise route and an assessment of any impacts on the environment, would be determined by the DNO at a later date. The new grid connection may be subject to a separate design and consent process under Section 37 of the Electricity Act 1989. Indicative details are provided in the Environmental Statement.

5 Access



Introduction

- 5.1 This section of the Design and Access Statement sets out the issues and options considered during the development of the proposals to ensure that the transport and construction of the Proposed Development causes the minimum disruption to the highway network and highway safety.
- 5.2 The site access point and accompanying internal track layout have been designed to accommodate the range of vehicles anticipated during the construction and operation of the Proposed Development.
- 5.3 Public access to the Site would be restricted during the construction period for health and safety reasons, but therefore public access would be unaffected.

Existing Highway Environment

- 5.4 The preferred option for access for turbine components to the Site is via the A79, A77(T), B734, B7035 and the U25. Although the vehicles used to deliver turbine components are large, the delivery route is considered suitable for commissioning of the Site.
- 5.5 The main transport movements during the construction phase would be associated with the movements of Heavy Goods Vehicles (HGVs) to and from the Site. Vehicle movements would be associated with delivering turbine components, concrete and the travel of workers to and from the Site.
- 5.6 Once the development is operational, it is envisaged that the amount of traffic would be minimal. Occasional visits may be made to the Site for maintenance activities. The vehicles used for these visits are likely to be a 4x4 or similar and there may be occasional need for a HGV to access the Site for maintenance and repairs.

Access Design Process

- 5.7 Swept Path Analysis assessments were undertaken to identify whether the delivery route could accommodate the swept path of the abnormal load delivery vehicles carrying components such as the turbine blades and nacelle. This type of analysis is consequently used to identify any necessary works.
- 5.8 The design of the Proposed Development has taken into consideration the movement and subsequent access of

vehicles involved with the construction and operation of the wind farm. The initial site selection considered potential access restrictions associated with the movement of vehicles required to transport large turbine components.

- 5.9 The internal access roads have been designed to take into consideration technical and environmental constraints. The layout for the site access roads has been designed to meet engineering requirements in terms of gradient, drainage and vehicle turbine circles. All site tracks have been located in areas identified during the EIA process as not being environmentally sensitive.

ENERGIEKONTOR UK LTD

SCOTLAND
11 Somerset Place
GLASGOW
G3 7JT
T: +44 (0)141 354 6544

ENGLAND
4330 Park Approach
Thorpe Park
LEEDS
LS15 8GB
T: +44 (0)113 204 4850

info@energiekontor.co.uk
www.energiekontor.co.uk