

## CONTENTS

<b>INTRODUCTION .....</b>	<b>2-1</b>
<b>SITE SELECTION AND CONSIDERATION OF ALTERNATIVES .....</b>	<b>2-1</b>
Location .....	2-2
Technology, Size and Scale .....	2-2
<b>SITE LOCATION AND DESCRIPTION .....</b>	<b>2-4</b>
<b>SURROUNDING AREA .....</b>	<b>2-5</b>
<b>DESIGN CONCEPT AND APPROACH.....</b>	<b>2-6</b>
Constraints Led .....	2-6
Landscape and Visual.....	2-6
Efficiency Modelling.....	2-7
Design Workshops .....	2-8
<b>CONSTRAINTS AND IDENTIFICATION MAPPING .....</b>	<b>2-8</b>
Topography.....	2-9
Landscape Character and Visual Amenity.....	2-9
Ecology and Ornithology.....	2-10
Peat Depth.....	2-10
Hydrology and Hydrogeology .....	2-11
Cultural Heritage Features.....	2-11
Noise Sensitive Receptors.....	2-12
Shadow Flicker.....	2-12
Aviation.....	2-12
Recreation .....	2-13
Forestry.....	2-13
Telecommunications .....	2-13
<b>DESIGN EVOLUTION.....</b>	<b>2-14</b>
Turbine Layout Evolution.....	2-14
Other Site Infrastructure Evolution.....	2-16
<b>MICROSITING .....</b>	<b>2-18</b>
<b>CONCLUSION.....</b>	<b>2-18</b>
<b>REFERENCES .....</b>	<b>2-19</b>

### INTRODUCTION

- 2.1 This Chapter outlines the process undertaken in selecting the site as a potential location for a wind farm, provides a description of the site and surrounding area, and discusses the design evolution process.
- 2.2 The principles of the EIA process, that site selection and project design should be an iterative constraint-led process, have been followed as part of the Proposed Development. This has ensured that potential adverse impacts on the environment as a result of the Proposed Development have been avoided or minimised as far as reasonably possible through the design process.
- 2.3 This Chapter draws on issues considered in more detail in the relevant technical chapters (**Chapters 7 to 16**). This Chapter does not pre-empt the conclusions of the latter chapters but explains how potential environmental effects have informed the design of the Proposed Development.
- 2.4 The design for the Proposed Development is described in **Chapter 3: Description of the Development** and is shown on **Figure 3.1a-b**. This Chapter is supported by the **Design and Access Statement (DAS)** which is submitted separate from the EIA Report in support of the application.

### SITE SELECTION AND CONSIDERATION OF ALTERNATIVES

- 2.5 National Planning Framework 4 (NPF4) was adopted by the Scottish Government on 13 February 2023 and sets out the overarching spatial strategy for Scotland to 2045. The foundations for the spatial strategy as a whole are the global climate emergency and the nature crisis. NPF4 supports a large and rapid increase in electricity generation from renewable sources to meet Scotland's net zero emissions targets. It identifies that onshore wind energy development proposals will be supported in principle except for where located in National Parks and National Scenic Areas.
- 2.6 As noted in **Chapter 4: Policy Context**, NPF4 identifies that there are significant opportunities to capitalise on the natural assets of the North and West Coastal Area (which includes the proposed site) to significantly reduce greenhouse gas emissions through increased renewable energy generation. In addition to tackling climate change, the NPF4 identifies that such development also has the potential to bring opportunities to strengthen local communities, build community wealth and secure long-term sustainability in the region.
- 2.7 In accordance with the EIA Regulations, reasonable alternatives in terms of site location and characteristics of the Proposed Development have been considered. Schedule 4 (paragraph 2) of the EIA Regulations requires that an EIA Report should include *"a description of the reasonable alternatives (for example in terms of development design, technology, location, size and scale) studied by the developer, which are relevant to the proposed project and its specific characteristics, and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects."*
- 2.8 The main alternatives including design, turbine specification, location, size and scale have been considered for the site. This Chapter explores these options and explains how the final design of the Proposed Development has evolved.

## Location

- 2.9 A number of factors were considered when selecting the site for wind farm development including:
- there are no international or national statutory designations for landscape and nature conservation in, or within immediate proximity of the site;
  - the site is located within an area which the LDP previously has identified as having potential for wind farm development; within an area already characterised by wind turbines<sup>1</sup>. Although it is now noted that NPF4 removes the requirement for spatial frameworks for onshore wind. Instead, as identified above, wind energy developments will be supported in principle except in National Parks and National Scenic Areas. Further information on this is provided in **Chapter 4: Policy Context**;
  - initial desk-based studies and wind monitoring on site suggest that there is a very good wind resource and the site is available for wind energy development;
  - the wind farm will be connected to a new substation Edinbane Grid Supply Point (GSP), proposed to the south east of the site. Edinbane Grid Supply Point (GSP) will be delivered by SSEN as part of reinforcement works to the electricity grid from Fort Augustus to the Isle of Skye, currently in progress;
  - it has suitable access from the public road network, via an existing wind farm track and consented wind farm track;
  - the site is unpopulated and at an appropriate distance away from the nearest residential properties, minimising potential adverse effects on residential amenity; and
  - a willing landlord and crofters. The crofters approached Wind2 in the first instance about whether the Balmeanach and Caroy Common Grazings might be a suitable location for a wind farm development.

## Technology, Size and Scale

- 2.10 Onshore wind continues to be the lowest cost form of renewable energy, however the challenge is to meet the Scottish Government's ambitious 2045 Net Zero targets (see **Chapter 4**) within a context of limited UK Government financial support for onshore wind. During the period leading up to a consent and ultimately construction of the wind farm, it is expected that the design and manufacture of commercial wind turbines will evolve and result in a wider choice of turbines than is currently available. The ability to maximise the potential yield from the site through turbine choice at the point of procurement is important for the financial feasibility of the scheme in a time

---

<sup>1</sup> At the time of project identification and development, the Highland Council's (THC) Onshore Wind Energy Supplementary Guidance (OWESG) (2016) was in force which identifies landscapes which, in principle, have the capacity to accommodate wind turbines. OWESG identifies the majority of the site as a Group 2 area, which is an "area of significant protection", due to the site being located within areas of Carbon Rich Soils, deep peat and priority peatland habitat (CPP). However, this classification does not necessarily preclude wind farm development and THC note that further consideration is required to determine whether any significant environmental effects can be sustainably mitigated through careful siting, design, or other measures. A small part of the site (between proposed Turbines 9 and 10) is classified as Group 3 (Areas with potential for wind farm development).

of increasing financial uncertainty. Without the ability to optimise the project in such circumstances, it may adversely affect the viability of the Proposed Development.

2.11 The supply of smaller turbines across Europe is already reducing due to lack of demand as manufacturers are recognising that the world market is shifting to larger machines and are focussing their development work on increasing capacity and efficiency of the turbine technology to secure the highest yield.

2.12 If onshore wind development is to continue to make a contribution to both the UK and Scottish Government's renewable energy targets, the Levelised Cost of Electricity (LCOE)<sup>2</sup> for developments must be low enough to compete at market price for electricity. If the LCOE is low enough, an investment decision can be made and the development brought into the market to compete for electricity contracts (Power Purchase Agreements, otherwise known as PPAs). The LCOE can be established by a number of factors unique to each site:

- the wind resource and turbine technology selected for the site will determine the capacity factor for a wind farm. For the Proposed Development of 10 turbines, initial estimates based on wind monitoring onsite correlated against long term wind speed data, suggest that the Proposed Development could produce approximately 167,140 MWh per year (which corresponds to a capacity factor in the region of 42.4%). This capacity factor is considerably higher than the Scottish average, due to the frequent high wind speeds experienced at this elevated very exposed open site;
- the cost of turbines. As noted above turbine technology is evolving. Turbine manufacturers are known to be continuously improving the technology and efficiency, hence further advancements in the technology are expected prior to the wind farm implementation. In addition, turbine pricing is often influenced by the Sterling: Euro exchange rate which has been volatile in recent years;
- the cost of civils and electrical balance of plant works for the site. For an efficient site, the right balance between constraints on the ground and infrastructure requirements needs to be struck to ensure the site is appropriately designed and achieves good value in construction;
- the cost of grid connection for the site. Sites closer to available and unconstrained grid connection points will tend to have lower grid connection costs;
- site access constraints. The site access characteristics on both public and private roads the turbine components dimensions, transports specification and methodology would influence the level of complexity and associated costs of the logistic strategy required to deliver the turbines to site. the cost of land, community benefit, business rates and administration of shared ownership all have an impact on the LCOE.

2.13 The site benefits from:

- exceptional wind resource and the potential to deliver some of the highest energy yield and associated capacity factor from a wind farm site in the UK.

---

<sup>2</sup> LCOE is the net present value of the unit-cost of electricity over the lifetime of a generating asset. It is often taken as a proxy for the average price that the generating asset must receive in a market to break even over its lifetime.

- proximity to the main road networks suitable for the delivery of larger turbine components to site, allowing for the implementation of higher capacity turbines with enhanced efficiency to improve the viability of the project;
- the ability to create efficiencies in terms of the proposed infrastructure layout, by promoting the use of existing tracks and infrastructure on site from wind farms in operation and the consented Ben Sca Wind Farm to access the Proposed Development; and
- close proximity to existing and soon to be upgraded grid infrastructure which can provide a connection solution for the development.

2.14 Notwithstanding the LCOE factors, which create the prospect for a wind farm with potential to be brought forward without subsidy, those factors need to be balanced against the environmental constraints and effects of such a development to work toward an acceptable development. Prior to EIA Scoping stage, up to 12 wind turbines were considered for the site. This was reduced to 10 wind turbines at the EIA Scoping stage. Following the EIA Scoping stage, a multidisciplinary and iterative design process has been undertaken considering both environmental effects and site layout optimisation, resulting in a final 10 turbine wind farm with an estimated output in the region of 45MW (producing approximately 167,140 MWh per annum), as well as sensitively sited associated infrastructure. This process is described further in the Design Evolution Section of this Chapter with the various layout described in **Table 2-1**. The Proposed Development would make a significant contribution to the Scottish Government's 2030 target for 20GW of onshore wind (**Chapter 4**), with an output substantially above average for a development of this scale.

## SITE LOCATION AND DESCRIPTION

- 2.15 The site, which measures approximately 476ha, centred on NGR 133900, 846750 is located on moorland approximately 3km to the south of the settlement of Edinbane, approximately 8km to the east of Dunvegan and approximately 7km to the north of Struan on the north west of the Isle of Skye (**Figure 1.1**). The proposed turbines would be located across two landownerships – primarily on the Bracadale Estate, on ground which forms part of the Balmeanach and Caroy Common Grazings, and partly on the Coishletter Estate. Access to the site would be via the existing Ben Aketil Wind Farm access track from the A850, and then south east via the consented Ben Sca Wind Farm site access track onto the hillside.
- 2.16 The proposed site lies within an upland landscape that is characterised by a series of smooth moorland slopes incised by small watercourses. The land is grazed by sheep and deer. To the south, an area of forestry covers the lower slopes of Beinn a' Chleirich, to the east of the crofting township of Balmeanach.
- 2.17 For the main development area of the site, topography slopes to the south east from 283m above ordnance datum (AOD) at the summit of Ben Sca down to the lower slopes at approximately 160m AOD.
- 2.18 There are no environmental or landscape designations identified within the site (**Figure 2.1**).
- 2.19 Located in the west of the site is a commercial forested area of approximately 77.75ha which was planted in 1990. The quality of the planted trees is considered to be poor to very poor, due to the soil being unsuitable for tree growth (**Technical Appendix 3.3: Assessment of Potential Areas for**

### Woodland Removal for Peatland Restoration).

- 2.20 On 03 March 2018, parts of the site were damaged due to a wild fire which spread from moorland to the south east of the site in the Glen Vic Askill area, aided by easterly winds. Much of the open ground and heathland habitat within the site was fire damaged but the fire did not burn into the peat, given that the ground was near frozen at the time. Approximately 20.5ha of Sitka spruce/lodgepole pine plantation to the north west were affected. This forms part of the area of trees which would be felled for the purposes of habitat management and enhancement.

## SURROUNDING AREA

- 2.21 The surrounding area is rural in nature, with land predominantly used for grazing and forestry. There is coniferous plantation to the north and west of the site. There are several residential properties and crofts located to the south and south west of the site towards the A863 and Loch Caroy; the closest being approximately 2.1km from the nearest proposed turbine (Turbine 8). The settlement of Edinbane is located approximately 3km to the north, Dunvegan approximately 8km to the west, Balmeanach approximately 2.5km to the south and Struan approximately 7km to the south<sup>3</sup>.
- 2.22 Directly to the east of the site is the operational Edinbane Wind Farm which comprises 18 turbines (100m tip height) extending in a north to south direction between Airgh Neil and Glen Vic Askill at approximately 150m to 160m AOD. These turbines are located between the lower slopes of Beinn a' Chearcaill and Cruachan-Glen Vic Askill (295m AOD) to the east.
- 2.23 To the south west of the site lies the operational Ben Aketil Wind Farm and its extension which comprises 12 turbines (100.5m tip height). Ben Aketil Wind Farm extends in a north west to south east orientation and is located to the north west of the summit of Ben Aketil (266m AOD). The southern extent of Ben Aketil Wind Farm is located at 200m AOD, and reduces in elevation to 90m AOD to the north west.
- 2.24 The closest environmentally designated sites are the:
- An Cleireach Site of Special Scientific Interest (SSSI) located approximately 1km to the south cited due to its geological importance;
  - North West Skye Special Landscape Area (SLA) located approximately 5km to the south west;
  - Greshornish SLA located approximately 5km to the north; and
  - Dunvegan Garden and Design Landscape (GDL) located approximately 9km to the west.

---

<sup>3</sup> Measurements taken from main development area including turbine array

### DESIGN CONCEPT AND APPROACH

#### Constraints Led

- 2.25 In EIA, constraint identification should continue throughout the design process in order to take cognisance of new, more detailed surveys revealing additional limitations to development. This allows the findings of technical and environmental studies to inform the design of a development and achieve a ‘best fit’ within the environment of the Proposed Development site.
- 2.26 This approach has been implemented in respect of the Proposed Development; where potentially significant effects have been identified, all efforts have been made to avoid these through evolution of the design positioning infrastructure outwith constraints. This is referred to within this EIA Report as mitigation embedded in the Proposed Development layout and design, or simply ‘embedded mitigation’. Information on embedded mitigation is explained further within each technical chapter of this EIA Report as appropriate. Several design principles and environmental measures have also been incorporated into the Proposed Development as standard practice.
- 2.27 ‘Embedded mitigation’ includes, but is not limited to:
- considering the size and scale of the Proposed Development appropriate to the location;
  - sensitive siting of the proposed infrastructure incorporating appropriate buffer distances from environmental receptors to avoid or reduce effects on the environment;
  - considering the appearance, finish and colour of wind turbines and the control buildings in accordance with NatureScot Guidance ‘Siting and Designing Wind Farms in the Landscape’, V3a (NatureScot, 2017);
  - design of the tracks to minimise cut and fill and promote the use of existing infrastructure on site, reducing the footprint of the proposed infrastructure and mitigating the landscape and visual effects;
  - inclusion and design of borrow pits to minimise the amount of the material required to be imported to site; and
  - potential for up to 50m micrositing of infrastructure during construction to ensure the best possible location is chosen based on site investigations.

#### Landscape and Visual

- 2.28 Throughout the design evolution of the Proposed Development layout, a key driver was the consideration of potential landscape and visual effects on receptors and how the Proposed Development would relate to the existing landscape character. In particular attention was given to the scale and number of turbines proposed, both in isolation and cumulatively with existing wind farms in the area. At the outset of the project in 2019, Dr Caroline Stanton, who is the author of the Skye and Lochalsh Landscape Assessment (SNH 1998) as well as SNH (now NatureScot) guidance on the design of wind farms in the landscape was engaged by SLR and Wind2 to provide advice on the initial Balmeanach feasibility study. This analysis highlighted the design objectives of integrating the project with the existing Edinbane Wind Farm and maintaining the distinct landscape feature

of the summit of Ben Aketil. The feasibility study informed the design presented during the pre-application consultation undertaken with THC in March 2021.

2.29 Different layouts were examined from key design viewpoints to assess and optimise the number, size and layout of the proposed turbines in relation to the landform of the site and surrounds as well as adjacent wind farm development. In response to this, turbines that were initially proposed in more elevated parts of the site were removed.

2.30 The proposals presented at the pre-application meeting in March 2021 comprised a layout that was broadly consistent with the southern part of Edinbane Wind Farm. THC expressed reservations about this layout rationale in the pre-application advice received since the general wind turbine development pattern in the area (of Ben Aketil Wind Farm and Extension and the consented Ben Sca Wind Farm and Extension) follows a linear form along ridgelines.

2.31 Subsequently, various layout options were explored and discussed with THC at a design workshop in July 2021 with further follow up consultation in September 2021. Key feedback from THC included:

- THC's strategy is to continue focusing wind turbine development towards this area of Skye;
- the layouts presented were a significant improvement on the layout presented at pre-application;
- recommend removal of turbines close to Beinn a' Chlèirich, to the west of An Cleireach SSSI, due to their prominence from the south (particularly VP1: A863/Road to Feorlig);
- containment of the development to lower slopes and lower ground or attempt to create a more compact scheme and fit in with the character of the area, removing the 'step over' of the landform to the south east (Beinn a' Chlèirich), as also referred to above;
- explore potential available land to the north on the Coishletter Estate that could be utilised to shift development from the south and away from the A863 and the settlement of Balmeanach to provide an optimal layout not defined by land ownership boundaries;
- view from VP7: Greshornish is important as it would fill the gap between Edinbane and Ben Sca Wind Farms; and
- view from VP11: Macleod's Table North is important to maintain and fit with the existing pattern of development.

2.32 How each of these comments has been incorporated into the final design is provided in **Table 2-1**.

### Efficiency Modelling

2.33 Throughout the constraints led design process, wind and yield analysis was undertaken to ensure changes made to layouts did not adversely affect the output of the Proposed Development. The average prevailing wind direction is from the south west, with chosen site layout sitting perpendicular to this wind direction. This creates the most efficient layout possible on the site, whilst also being the favoured option from other technical perspectives.



- 2.34 In comparison to turbines with a 100m tip and 70m rotor (Ben Aketil and Edinbane Wind Farms and their readily available generation figures), the proposed 149.9m tip height assessed in the EIA offers approximately twice the generating capacity, allowing for a typical average capacity per turbine at 4.5MW versus 2.3MW.

### Design Workshops

- 2.35 Statutory consultees were invited to become involved in and input to the design process for the Proposed Development. THC major applications pre-application advice service was used for the Proposed Development. A pre-application meeting was held with THC and NatureScot on 10 March 2021. Feedback from this meeting was incorporated into the design evolution process.
- 2.36 A design workshop was held with THC planners and landscape architect on 22 July 2021 to discuss various turbine layout options for the scheme. This was followed up by some further layout options being explored and additional comments were received by email from THC on 08 September 2021 in response to the various options at that time. The feedback provided was used to inform the turbine layout which evolved from the pre-application design meeting, to scoping and subsequently finalised for the planning application.
- 2.37 Public consultation events were also undertaken in October to December 2022 which allowed members of the local community to comment on the design proposals. Feedback from these consultation events was incorporated into the design evolution process. Further details of the public consultation process can be found in the **Pre-Application Consultation (PAC) Report** accompanying this application.

## CONSTRAINTS AND IDENTIFICATION MAPPING

- 2.38 The design of any wind farm is driven by the key objective of positioning turbines so that they capture the maximum energy possible within a suitable area further informed by environmental and technical constraints.
- 2.39 The designations within the site and surrounding area were identified as the first part of the constraints mapping process. These are shown on **Figure 2.1**. The known environmental and technical constraints within the site were identified as part of this early stage constraints mapping. It is important to note that the identification of a constraint does not necessarily result in the exclusion of that area from the potential development envelope; rather it means that careful thought and attention was paid to the constraint and the design altered appropriately. The key constraints which were taken into account during the design process included:
- topography and ground conditions (particularly in relation to peat);
  - adjacent wind development including distance to the Ben Aketil and Edinbane operational wind turbines; and consented Ben Sca wind turbines.
  - identified landscape and visual constraints;
  - proximity to residential receptors (with regards to visual amenity, shadow flicker and noise);
  - presence of ornithology, protected habitats and species;

- presence of watercourses, private water supplies and related infrastructure;
- presence of cultural heritage features;
- fixed telecommunication links;
- recreation and forestry; and
- aviation and radar constraints.

2.40 The identification of constraints continued throughout the design evolution process as more detailed surveys refined the development envelope. In order to progress the wind turbine positioning, a ‘traffic light’ based constraints plan **Figure 2.2** was developed whereby each constraint was assigned a red or amber category depending on their significance (where red identifies an area unsuitable for proposed turbines, amber identifies an area that may be suitable subject to verification; areas not shown by either colour are unconstrained).

2.41 A description of how the various environmental and technical disciplines have contributed to the design through detailed assessment is described below. Information in respect of the survey work undertaken is provided in the technical chapters of this EIA Report.

### Topography

2.42 The steepest areas of the site (generally greater than 12% slope gradient) have been avoided for the development of infrastructure to ensure constructability.

2.43 Slope stability has been taken into consideration to understand whether infrastructure could be located within certain areas of the site. Where slope stability was identified as an issue, these areas were deemed to be unsuitable for infrastructure and have therefore been avoided due to the potential for slope instability and peat slide risk.

### Landscape Character and Visual Amenity

2.44 No international or national landscape designations occur within the site. However, within the 40km study area there are two national designations (**Figure 7.7**):

- Trotternish National Scenic Area (NSA), approximately 18km to the north east; and
- Cuillin Hills NSA, approximately 22km to the south east.

2.45 There are also a number of National non-statutory landscape designations and local landscape designations within the 40km study area, such as two Gardens and Designated Landscapes (GDL) and four Special Landscape Areas (SLA). These designations have been considered during the design process.

2.46 As described in **paragraphs 2.29 to 2.31**, various turbine layout options were discussed with THC at a design workshop in July 2021 and comments received in response to this have been taken into account. The feedback received included a shift in the core turbine envelope to the north/north east, utilising available land to the north and removing turbines in the south westerly part of the site.

- 2.47 Several layouts were considered during the design process, with the layout evolving to respond to landscape and visual constraints such as key views from Edinbane, Roag and Greshornish. The key design viewpoints (VPs) were: VP1 (A863), VP2 (Edinbane Top Road), VP3 (A863), VP4 (Roag), VP5 (A850), VP6 (B884), VP7 (Greshornish) and VP11 (Macleod's Table). Wider landscape character and visual sensitivities have also been considered in the design process including potential effects on landscape designations, properties, settlements and key routes in the area.
- 2.48 Where possible, proposed excavation for new access tracks and other infrastructure has been minimised. The location of the substation compound and construction compound has been reviewed to minimise landscape and visual effects. In order to position the substation in an area which would not be visible to the local communities of Balmeanach or Edinbane, a Zone of Theoretical Visibility (ZTV) was generated to work out where within the site a building 5m high would not be seen. This principle, as shown on **Figure 2.4** clearly shows that the substation would be hidden from view from these local settlements as well as Struan.

### Ecology and Ornithology

- 2.49 Ecological surveys have been carried out across the site from 2019 to 2022, including a UK Habitat Classification (UKHab) survey, a National Vegetation Classification (NVC) Survey and protected species surveys (including otter, pine marten, reptiles, and fish), in order to identify any broad areas of constraint to wind farm development. Constraint mapping included the identification of sensitive ecological features, including habitats present within the site and species which use the site.
- 2.50 Areas with the potential to be Groundwater Dependent Terrestrial Ecosystems (GWDETs) were found to be limited in extent within the site and mainly confined to watercourses. The hydrology survey and assessment has confirmed that there are no groundwater fed areas to be avoided.
- 2.51 Despite the fire in 2018 which damaged much of the habitat on site, a precautionary approach has been taken during the EIA, which assumes that blanket bog and wet heath habitats will recover and may potentially represent Annex 1 habitat. As a result, much of the site is identified as being Annex 1 habitat. Due to the majority of the site comprising Annex 1 habitat, it was not possible to avoid these areas during the design of the Proposed Development, however areas where the blanket bog has formed bog pools have been avoided where possible (**Chapter 8: Ecology**).
- 2.52 Ornithology surveys have been carried out across the site between 2020 to 2022, including vantage point watches, moorland breeding wader surveys, breeding raptor surveys and diver lochan surveys. Suitable buffers were considered during the design evolution process and no turbines are proposed within 100m of any known nest sites.

### Peat Depth

- 2.53 As defined on NatureScot's Carbon and Peatland 2016 Map (NatureScot, 2016), the site is shown to be within Class 1 Priority Peatland Habitat.
- 2.54 Peat probing was undertaken in October 2020 (Phase 1), November 2022 (Phase 2) and March 2023 (Phase 2 follow up) to ensure that the footprint of the Proposed Development was fully covered by detailed onsite information. Site visits have confirmed the presence of peat, of variable condition and depth across the site. Peat thickness within the site varies from zero to 4.7m with an average depth of 0.8m. Thin peat was classed as being 0.5m to 1.5m thick, with deposits in excess of this being classed as thick or deep peat. A review of the survey data in conjunction with slope gradients

allowed areas of deep peat (typically greater than 1.5m) to be avoided for development at an early stage. The peat data is discussed in **Technical Appendix 10.1: Peat Landslide Hazard and Risk Assessment** and shown on **Figures 10.1.6 and 10.1.7 of Technical Appendix 10.1**.

- 2.55 Detailed constraints advice was provided to the project team during the iterative layout design process for the turbines and associated infrastructure features. At various stages during the determination of the design, fieldwork was undertaken to provide feedback to the team. This approach identified site constraints in order to minimise a number of potential effects (such as minimising development infrastructure close to or crossing water features and undertaking initial peat depth and stability studies to avoid deeper peat areas). The design principle followed for the Proposed Development has been to try to avoid any areas of peat greater than 1m (with no infrastructure proposed within areas of 1.5m peat depth or greater) and aim to position the majority of the infrastructure within areas less than 0.5m depth. The depth of peat at the proposed turbine locations varies from 0.3m to 1.2m.
- 2.56 All turbine locations, access tracks, the substation compound, the construction compound and borrow pits have been designed to avoid any areas which may be subject to peat slide risk. The ground condition constraints that were taken into account in the design of the Proposed Development were:
- identification of peat depths in excess of 1.5m – to minimise incursion, protect from physical damage, minimise excavation and transportation of peat, reduce potential for peat instability and minimise potential soil carbon loss;
  - identification of steep slope angles greater than 12% – to minimise soil loss and potential instability; and
  - avoidance of areas where initial peat stability concern was identified (factor of safety values less than 1.4) where possible – to avoid areas with possible instability issues and associated indirect effects on surface water.

### Hydrology and Hydrogeology

- 2.57 A 50m buffer zone has been applied around all watercourses which traverse the site. These buffers were used to ensure that turbines and infrastructure were not located in close proximity to hydrological features in accordance with wind farm construction best practice guidelines. This reduces the risk of run off and water pollution into existing watercourses. In some cases, the use of existing tracks, which are already less than 50m to a watercourse, have been identified as the best option for design, thereby minimising the need for new tracks.
- 2.58 Watercourse crossings have been avoided and no crossings are proposed.
- 2.59 Data on private water supplies (PWS) was obtained from THC and verified on site through discussions with local residents within the settlement of Balmeanach. There are no PWS located within 1km of the proposed turbines.

### Cultural Heritage Features

- 2.60 There are no designated heritage assets of regional or national importance within the site.

- 2.61 Non-designated heritage assets within the site include post-medieval and undated shielings, raised mounds and clearance cairns. Heritage assets of this nature are commonly found in the Scottish rural landscape. None were found to be exceptionally preserved examples of their class, or to have high group value in relationship to other monuments, or to have strong historical, cultural or social associative characteristics. Nor does any hold a significant place in the regional or national conscious. The post medieval and undated sheilings were given a buffer of 10m during the design process.

### Noise Sensitive Receptors

- 2.62 For the purposes of early constraints mapping, avoidance buffers of 1km were applied to residential properties in the vicinity of the site. These buffers were further refined during the design process based on expert noise advice.
- 2.63 Noise modelling was undertaken for the proposed turbine layout at various stages of the design process, to predict the likely sound level which would result from the Proposed Development at nearby residential properties. The difference between measured background noise levels and predicted noise levels needs to be compliant with ETSU-R-97: 'The Assessment and Rating of Noise from Wind Farms' (Department for Trade and Industry (DTI), 1996) to avoid a significant impact. Applying design criteria in accordance with ETSU guidance, therefore, ensures that no exceedances of acceptable noise levels would occur for the Proposed Development.
- 2.64 During operation, the closest properties to the proposed wind turbines would be in the settlement of Balmeanach: 9 Balmeanach and Allt Ruairidh, approximately 2.1km and 2.5km from proposed Turbine 8 respectively. The closest property to proposed Turbine 1 in the north at Edinbane would be 23 Upper Edinbane at approximately 3.2km. During refinement and finalisation of the design, the maximum distances possible were employed between these properties and the proposed turbines so that no noise exceedances would occur.

### Shadow Flicker

- 2.65 Shadow flicker has the potential to be an issue for properties which are closer to a wind turbine than a distance of eleven times the diameter of the turbines blade length. Potential shadow flicker effects were a consideration during the constraints mapping process. The final turbine layout for the Proposed Development has a distance between turbines and residential properties of considerably more than eleven times the diameter of the turbine blade length, and as such shadow flicker effects are not expected to be an issue. Shadow Flicker is considered further in **Chapter 15: Other Considerations**.

### Aviation

- 2.66 Aviation operators were contacted as part of the EIA consultation process.
- 2.67 Highlands & Islands Airports Limited (HIAL) initially identified that Turbine 8 (of the Scoping layout, Layout D, **Figure 2.3**) may impact upon the safeguarding criteria and operation of Benbecula Airport. However, after further consultation HIAL has confirmed that the final design layout would not conflict with the safeguarding criteria.
- 2.68 The MOD has concerns with the Proposed Development relating to the potential of the turbines to

create a physical obstruction to air traffic movements. The Proposed Development falls within Low Flying Area 14 (LFA 14), an area within which fixed wing aircraft may operate as low as 250 feet or 76.2m above ground level to conduct low level flight training. However, aviation safety lighting (infrared, non-visible) is proposed on the turbines to ensure that no effects would result on low flying aircraft.

- 2.69 Consultation is ongoing with NATS Safeguarding regarding the potential visibility of the proposed turbines to their radar on Tiree; as they believe that without suitable mitigation an adverse impact would result on their air traffic operations. For Ben Sca Wind Farm and Extension an agreement was entered into between NATS (En-Route) Plc, NATS (Services) Ltd (NATS) and the Applicant for the design and implementation of an identified and defined mitigation solution in relation to the consented wind farm that will be completed under agreement. It is hoped that a similar agreement can be reached for the Proposed Development.
- 2.70 It is accepted that planning conditions relating to aviation and infra-red lighting for the Proposed Development could be employed to ensure no significant effects.

### Recreation

- 2.71 There are no core paths or rights of way within the site. There is a core path which runs parallel to the A850 as it passes the site entrance. Strava heatmaps, which provide an illustration of the intensity of recreational use of an area illustrate usage of the Edinbane and Ben Aketil Wind Farm access tracks but no usage of the Balmeanach wind farm site area (reference <https://www.strava.com/heatmap>). These informal routes are shown on **Figure 14.2.1** which accompanies **Technical Appendix 14.2: Preliminary Access Management Plan**. The effects of the Proposed Development on this and other recreation infrastructure is considered in **Chapter 14: Socio-economics and Land Use**.

### Forestry

- 2.72 There is no forestry to be avoided in the main development area of the site. In order to provide compensation for the priority habitat that would be lost as a result of the Proposed Development and due to the poor quality of planted trees in the west of the site boundary (to the north of Ben Aketil Wind Farm), it is proposed that approximately 77.75ha of the forested area (20.5ha of which are already dead trees) would be felled and not replanted. This would allow for habitat restoration and biodiversity net gain.
- 2.73 The trees in the west of the site that have been identified for felling as part of the Proposed Development, are located in an area of predominantly deep peat (>50cm). The nature of the soil is the suspected cause of the poor quality and stunted growth of the planted trees. These factors make this area particularly suited to being restored to blanket bog habitat.

### Telecommunications

- 2.74 Consultation with telecommunications operators identified several links which could potentially be affected by the Proposed Development operated by Arqiva, BT, MBNL, JRC and Vodafone, crossing through the southern part of the site west to east. Link paths and buffers have been used as constraints to development and informed the final turbine layout. Early turbine layouts were identified to conflict with link paths and buffers resulting in the shift northwards of the Proposed Development infrastructure onto the Coishletter Estate.

- 2.75 Further consultation with each operator was undertaken where relevant to understand if there would be likely to be any potential operational issues. The final turbine layout avoids direct impact on the identified links by ensuring proposed infrastructure is located outwith the buffers identified.
- 2.76 The closest operational link is a FM radio link which is managed by Arqiva. Arqiva has confirmed through consultation that the final turbine layout would be acceptable and not cause interference issues to the link.

### DESIGN EVOLUTION

- 2.77 The initial potential development area (for wind turbines) within the site boundary was established using constraints mapping. Constraints such as deep peat (>1.5m depth), steep slopes (>12%), watercourses and fixed communications links were mapped as hard constraints, whereas others such as shallower peat depths between 1m and 1.5m were mapped as soft constraints. This constraints mapping was used to identify the areas within the site which may be suitable for wind turbines (**Figure 2.2**). Initially the site area was restricted solely to the Bracadale Estate, on the Balmeanach and Caroy Common Grazings land. Further constraints investigation and design consultation with THC resulted in the site expanding northwards onto the Coishletter Estate. The site boundary has therefore shifted northwards and been reduced in size for the application, moving away from the settlement of Balmeanach.
- 2.78 All known constraints gathered throughout the EIA process were used to inform the evolution of the location of the proposed turbines and associated infrastructure. During design optimisation, the locations of infrastructure and track design was refined in order to minimise the amount of earthworks and cut and fill required to construct the Proposed Development.

### Turbine Layout Evolution

- 2.79 The design optimisation process was iterative, involving review of multiple turbine layouts and related wirelines from key landscape and visual receptor locations in the study area, and adjustment to turbine locations to minimise potentially adverse landscape and visual impacts insofar as possible, whilst also taking into consideration the energy generation, particularly seeking to maintain wake loss expectations, other environmental, technical and economic considerations.
- 2.80 Several different turbine tip heights were explored during the design process ranging from 135m to 149.9m with rotor diameters from 115m to 138m.
- 2.81 Six of the key design iterations for the Proposed Development are shown on **Figure 2.3** and detailed in **Table 2-1**.

**Table 2-1: Design Iterations**

Layout	Stage	No. of Turbines	Description
A	Feasibility Layout	12	Generated during the feasibility stage.  Turbines were located on the slopes on the south east side of Ben Sca and Ben Aketil summits ranging from approximately 155m AOD to 260m AOD.

## SITE DESCRIPTION AND DESIGN EVOLUTION 2

Layout	Stage	No. of Turbines	Description
<b>B</b>	Pre-Application Layout	10	<p>Discussed with THC and NatureScot at the Pre-Application Consultation Meeting in March 2021.</p> <p>Turbines were relocated away from the top of the slope ridgeline (of Ben Sca and Ben Aketil) due to greater prominence and relationship with other development, reducing the Proposed Development to 10 turbines.</p>
<b>C</b>	Option Review	9	<p>Generated as one preferred option during a detailed optioneering process subsequently discussed with THC at the design meeting in July 2021 with follow up in September 2021.</p> <p>Turbine 10 removed and Turbine 8 (of Layout B) relocated in the north of the site on the Coishletter Estate in response to THC landscape and visual comments. THC noted that from VP1 the varying hub heights was more recessive for this layout than other options at this time. This layout was considered by THC to be the most preferable from VP1, VP3 and VP4 and further recommend the removal or relocation of Turbines 5 and 9 focusing development further north away from the A863 and settlement of Balmeanach, minimising the ‘step over’ of landform (Beinn a’ Chlèirich) to the south west.</p>
<b>D</b>	Scoping Layout	10	<p>Presented in the EIA Scoping Report August 2022.</p> <p>Further identified telecommunications link constraints and consideration of landscape and visual effects relocated Turbine 9 (from Layout C) from the south near Beinn a Chleirich to the north of the site on the Coishletter Estate. In order to maximise the available land and capacity of the site, a tenth turbine was considered feasible.</p>
<b>E</b>	Design Chill Layout	10	<p>Almost finalised layout to be used as the basis for the phase 2 peat probing around proposed infrastructure.</p> <p>Turbine spacing was optimised in line with all known on the ground constraints. All ten turbines from Layout D were micrositied to produce the most efficient yield. The phase 1 peat data and topography was reviewed to ensure that all proposed turbine locations were located on the most suitable areas of the site. The locations and orientation of possible infrastructure including crane hardstanding, laydown areas, construction compound and substation were identified.</p>
<b>F</b>	Final Layout	10	<p>Minor refinement to locations of turbines and infrastructure based on the results of the hydrology survey, phase 2 peat probing and peat slide risk assessment.</p> <p>This final layout addresses the comments received from THC as follows:</p> <ul style="list-style-type: none"> <li>• the Proposed Development is located within an area already characterised by wind farms;</li> <li>• turbines would be located away from Beinn a’ Chlèirich, containing the Proposed Development to the north and not creating a ‘step-over’ of the landform;</li> <li>• a layout balancing the environmental and technical constraints with energy yield has been created not defined by land ownership</li> </ul>



Layout	Stage	No. of Turbines	Description
			boundaries; <ul style="list-style-type: none"> <li>• containment of the Proposed Development further north reduces the potential prominence of the turbines from the south – particularly from VP1: A863, VP3: A863 and VP4: Roag; and</li> <li>• the proposed turbines would be balanced from the view from VP7: Greshornish and VP11: Macleods Table in the context of the baseline wind farm developments.</li> </ul>

### Other Site Infrastructure Evolution

#### Site Access

- 2.82 The site would be accessed from the A850, utilising a site entrance that was built for Ben Aketil Wind Farm. This is also the site entrance to be used for the consented Ben Sca Wind Farm and Extension. Access would then be gained onto the site via the existing Ben Aketil access track and via the consented Ben Sca Wind Farm access track (**Figure 3.2**).
- 2.83 Use of this site entrance as well as a section of the existing and consented access tracks would minimise the amount of upgraded or new track required to be built for the Proposed Development.

#### Site Tracks

- 2.84 The onsite access tracks and associated drainage have been carefully designed to avoid areas of deep peat, potential peat slide risk and minimise cut and fill requirements as far as possible in order to reduce the amount of ground disturbance, amount of material required for construction, loss of sensitive habitats and landscape and visual effects, particularly during construction. The possible track routes were probed extensively as part of the phase 2 peat probing exercise and re-routed as appropriate to avoid any deep peat areas and areas of potential peat instability.
- 2.85 All access tracks have been designed with cognisance of the topography of the site to ensure constructability and permit safe delivery of turbine components and associated parts.
- 2.86 There are two possible access track options proposed (A and B as illustrated on **Figure 3.1a-b** and described fully in **Chapter 3**), depending upon land access rights and further geotechnical investigation at the time of construction. Each option has been carefully designed to ensure that construction vehicles could approach and access the turbine locations and hardstanding areas appropriately.

#### Turbine Foundations and Hardstanding Areas

- 2.87 The turbine foundations and adjacent crane hardstanding and laydown areas have been located and orientated appropriately to ensure they are positioned on peat not greater than 1.5m and in accordance with contours to minimise the amount of cut and fill required.
- 2.88 These areas were probed extensively as part of the phase 2 peat probing exercise and where deep peat was found relocated as appropriate in accordance with the most suitable positioning of the

proposed turbine and foundation. Peat stability has also been taken into account in the location of this infrastructure.

- 2.89 The crane hardstanding area for proposed turbine 4 has two possible orientations based on the possible approaches of access track to be constructed (either option A from the north or option B from the west).

### *Borrow Pits*

- 2.90 Borrow pits would be required as a source of rock to be used in the construction of the tracks and hardstandings. On site borrow pits have been sought in order to reduce the need to transport large quantities of aggregate across Skye, and search area locations for the borrow pits have been identified based upon a review of geological mapping and site reconnaissance by a geological specialist. The location of each borrow pit was considered and refined with respect to the site infrastructure and environmental constraints.
- 2.91 The scale of the three borrow pit search areas have been selected to meet the estimated volume of rock required in the construction of the proposed tracks and hardstandings.
- 2.92 Further intrusive geotechnical investigation would be carried out to identify which of the three borrow pit search areas would yield the required quality of rock for each aspect of the infrastructure. It is not anticipated that all three borrow pit search areas would be needed, but this gives flexibility in case there is low yield identified at any location.

### *Construction Compound*

- 2.93 The construction compound would be located to the north of the site, close the end of the Ben Sca Wind Farm, with its centre point at NGR 133405, 847515. This location is considered appropriate as it:
- has appropriate topography;
  - is located in an area of shallow peat and low peat slide risk; and
  - avoids sensitive habitat areas ensuring that appropriate buffers from known features would be maintained.

### *Substation Compound*

- 2.94 The proposed substation compound would be located opposite the construction compound in the north of the site, with its centre point at NGR 133350, 847485. This location is considered appropriate as it:
- has appropriate topography;
  - is located in an area of shallow peat and low peat slide risk;
  - avoids sensitive habitat areas;
  - would not be visible from the residential properties in Balmeanach, Edinbane or Struan (**Figure**

2.4); and

- is close to the point of connection at Edinbane GSP.

2.95 The control building, within the substation compound, would be located greater than topple distance from the proposed turbines. The internal site grid connection cables would be undergrounded within the site from each turbine to the control building, therefore avoiding visual impact.

### *Permanent Met Mast*

2.96 A permanent met mast is proposed to the south of the turbine array at NGR 133568, 845564. This location is considered appropriate as it:

- is located in an area of shallow peat and low peat slide risk;
- avoids sensitive habitat areas; and
- would capture accurate wind speed data without interference from the proposed turbines.

## MICROSITING

2.97 In order to be able to address any localised environmental sensitivities, unexpected ground conditions or technical issues that are found during detailed intrusive site investigations and construction, it is proposed that agreement is sought for a 50m micrositing allowance around wind farm infrastructure. The technical assessments (presented in **Chapters 7 to 16**) have considered the potential for horizontal micrositing and it is considered that the proposed infrastructure could be microsited within 50m (except within watercourse buffers or closer to telecommunication links) without resulting in potential significant effects, except where notable deep peat is identified. During construction, the need for any micrositing would be assessed and agreed with the onsite Environmental Clerk of Works.

## CONCLUSION

2.98 The final proposed layout (described in detail in **Chapter 3: Description of the Development** and shown on **Figure 3.1a-b**) comprises up to 10 turbines, which has been determined by taking into consideration the feedback received through the pre-application consultation process, maximising project benefits and efficiencies consistent with the grid capacity available, meaning that it would be feasible for the Proposed Development to contribute towards the 2030 target for 20GW of onshore wind, offsetting of CO<sub>2</sub> carbon emissions working towards net-zero.

2.99 The EIA process has been an iterative one, so that constraints identified throughout the EIA and design process could be avoided, and potential impacts of the Proposed Development avoided or reduced.

2.100 The assessment of potential impacts of the resulting layout is addressed in **Chapters 7 to 16** of the EIA Report.

### REFERENCES

NatureScot (2016). Carbon and Peatland 2016 Map. Available at: <https://www.nature.scot/professional-advice/planning-and-development/advice-planners-and-developers/soils/carbon-and-peatland-2016-map> [Accessed 29 March 2023].

NatureScot (2017). Siting and Designing Wind Farms in the Landscape (Version 3a).

Scottish Government (2022). Onshore Wind Policy Statement.

Scottish Government (2023). National Planning Framework 4 (NPF4).

Town and Country Planning (Scotland) Act 1997.

Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017.

The Working Group on Noise from Wind Farms (1996). ETSU-R-97, The Assessment and Rating of Noise from Wind Farms.