

3 SITE SELECTION AND DESIGN

3.1 Introduction

This chapter provides a description of the Site, outlines the process undertaken in selecting the Site as a potential location for a windfarm development and articulates the design evolution process.

One of the principles of the Environmental Impact Assessment (EIA) process is that Site selection and project design should be an iterative and constraint-led process. This principle has been followed as part of the evolution of the Proposed Development. This has ensured that potential negative impacts, which may potentially result from the Proposed Development, have been avoided or minimised as far as reasonably practicable.

This chapter draws on issues considered in more detail in the relevant technical chapters (Chapters 6 to 16). This chapter does not pre-empt the conclusions of the later technical chapters but is intended to explain how potential environmental effects have informed the design of the Proposed Development.

The final design of the Proposed Development is described in Chapter 2: Development Description and is shown on Figure 2.1. This chapter is also supported by the following figures provided in Volume 2a - EIA Report Figures excluding Landscape and Visual Impact Assessment (LVIA):

- Figure 3.1 - On-site Constraints; and
- Figure 3.2 (a – e) - Site Design Evolution.

Finally, this chapter is accompanied by the following Technical Appendix documents provided in Volume 3 – EIA Report Technical Appendices:

- A3.1 – Scoping Opinion (February 2022).

3.2 Site Description

3.2.1 Overview

The Site covers an area of approximately 790 hectares (ha), as shown on Figure 1.2. The Site is situated approximately 4.7 km north of Inveraray centred on National Grid Reference (NGR) 210197, 715498. The Site lies wholly within the administrative boundary of Argyll and Bute Council (the Council).

The predominant land use within the Site consists of private forestry plantation used for commercial purposes with areas of upland moorland also present in the south and east of the Site.

The Development, consisting of 13 turbines with a maximum height to blade tip of up to 180 m, with a generating capacity of up to 58.5 Megawatts (MW) and a Battery Energy Storage System (BESS), with a generating capacity of up to 41.4 MW. The elevation of the Site ranges from 470 metres (m) Above Ordnance Datum (AOD) in the east of the Site and falls to around 100 m AOD in the west of the Site. There are a number of notable hilltops and ridges within and surrounding the Site including:

- Ceann Chreagan, in the south of the Site;
- Stuc Scardan, directly east of the Site; and
- Tom an Fheidh, directly north to the Site.

There are a number of watercourses within the Site, as well a number of small lochans within and surrounding the Site. These include:

- River Aray, flowing north to south in the west of the Site;
- Allt Sheileachan, in the north of the Site;
- Allt a' Mhadaidh, in the centre of the Site;
- Lochan Mhadaidh, in the east of the Site; and

- Lochan Sheileachan, directly east of the northeast area of the Site.

As well as Allt Sheileachan and Allt a' Mhadaidh, there are also numerous unnamed tributaries draining into the River Aray, flowing from the east of the Site to the west.

The nearby major roads include the A819 directly to the West of the Site and the A83 to the south. The B840 also joins the A819 approximately 4.9 km to the north of the Site.

There are several properties surrounding the Site, including (but not limited to):

- Ladyfield Farm, located approx. 1.1 km northwest of the nearest turbine (T11);
- North Tullich, located approx. 1.3 km west of the nearest turbine (T6);
- South Tullich, located approx. 1.5 km west of the nearest turbine (T11);
- Drimfern, located approx. 1.7 km west of the nearest turbine (T11);
- West Drimfern, located approx. 1.8 km west of the nearest turbine (T11);
- Druim Breac, located approx. 1.9 km west of the nearest turbine (T11);
- Stronmagachan, located approx. 1.9 km southwest of the nearest turbine (T11); and
- Linnieghluttain, located approx. 2.3 km southwest of the nearest turbine (T11).

3.2.2 Environmental Designations

The Glen Etive and Glen Fyne Special Protection Area (SPA) is located to the north and east of the Site, abutting the northern and eastern edges of Site boundary. There are also a number of ecological designations located within 10 km of the Development including:

- Glen Shira Special Area of Conservation (SAC), located approximately 2.3 km east of the Site boundary;
- Strone Point, North Loch Fyne Special Site of Scientific Interest (SSSI), located approximately 4.5 km south of the Site boundary;
- Ardchylene Wood SSSI, located approximately 6.0 km south of the Site boundary; and
- Beinn an Lochain SSSI, located approximately 8.6km southeast of the Site boundary.

Sensitive landscape receptors include the Inveraray Castle Garden and Designed Landscape (GDL00223) which is located approximately 380 m south of the Site at its closest point, and 2.18 km south of the nearest Turbine (T13); Ben Lui Wild Land Area (WLA) 4.3 km northeast. The Loch Lomond and the Trossachs National Park is located approximately 9.9 km southeast of the Site at its closest point.

There are several areas of Ancient Woodland surrounding the Site, with two small areas designated as Ancient Woodland to the west of the proposed turbine array.

There are 51 Scheduled Monuments within 15 km of the Site Boundary; the nearest Scheduled Monument is Inveraray Castle, Cross (SM253), located approximately 5.6 km south of the nearest indicative turbine location (T13).

There are also 190 Listed Buildings within 15 km of the Site Boundary, of which 45 are Category A Listed Buildings; the nearest Category A Listed Building is Inveraray Castle Estate, Maam Steading (LB11518), located approximately 2.7 km southeast of the nearest indicative turbine location (T13).

The nearest Listed Building is Category B Glen Aray School and Outhouse (LB11523), located directly south of the Site boundary, and 1.6 km southwest of the nearest indicative turbine location (T11).

Figure 3.1 presents the known environmental constraints.

3.3 Consideration of Site and Alternatives

The Applicant uses a range of criteria to select sites for the development of renewable energy projects. As part of the growth plans for the development of renewable energy projects, the Applicant is continually assessing potential sites. For obvious reasons, the pipeline of available

opportunities is confidential but such sites are not to be considered as alternatives to the Proposed Development. Alternative sites are not considered further in the EIAR. However, in accordance with Schedule 4(2) of the EIA Regulations, reasonable alternatives in terms of development design, technology, location, size and scale of the Proposed Development have been considered.

The Site was considered to be a suitable location for wind farm development by the Applicant as it met the following criteria:

- There are no international or national ecological, ornithological, landscape or cultural heritage designations within the Site;
- The Site has a viable grid connection (less than 5 km to the Point of Connection from the Site);
- The Site has suitable access on the public roads network from the Port of Entry at Corpach, near Fort William, to the Development;
- The Site has an existing quarry on site which can be utilised for material to construct or upgrade tracks within the Site to minimise construction traffic;
- The Site has a suitable wind yield;
- The Site has a limited Zone of Theoretical Visibility (ZTV), especially to the populated areas and restricted views on transport routes and recreational routes;
- The Site is currently a working timber landscape with limited development opportunity due to known Unexploded Ordnance on Site;
- The landowner is willing to host the wind farm Development; and
- The Site is sufficiently distant from the nearest residential properties to ensure compliance with ETSU-R-97 noise limits.

In addition, NPF4 and the Onshore Wind Policy Statement provides that, subject to compliance with NPF4 Policy 4, renewable energy developments will be supported in principle. Policy 1 of NPF4 now makes clear that when considering impacts, many of which are inevitable with onshore wind farms, "significant weight will be given to the *global climate and nature crises*".

In order to assist developers with maximising opportunities for renewable energy generation, Argyll and Bute Council has published the Argyll and Bute Landscape Wind Energy Capacity Study (ABLWECS) which includes a landscape and visual sensitivity appraisal of Argyll and Bute, and which identifies potential strategic capacity for wind energy development of different scales within each of 38 defined landscape character types. The majority of the Site, including the extent of which is occupied by the proposed turbines, is located within ABLWECS Landscape Character Type 6a (LCT6a): Loch Fyne Upland Forest Moor Mosaic. Areas of the western area of the Site may also be located within LCT20: Rocky Mosaic. LCT6a is identified as being of high landscape character sensitivity to very large-scale wind farm development.

The Argyll and Bute Landscape Wind Energy Capacity Study indicates that LCT6a is one of five LCTs that may be suitable for very large turbines (defined as turbines greater than 130 m tall), with Table 3 within the ABLWECS noting that:

"LCT's that may be suitable for very large turbines >130m:

Detailed Sensitivity assessments for the very large typology (>130m high) were only undertaken for landscape character types judged to have a medium or lower sensitivity to large turbines (80-130m) in the 2012 ABLWECS and/or landscapes where operational wind farms are already located. These are:

- Steep Ridgeland and Mountains (2)
- Upland Forest Moor Mosaic (6)
- Loch Fyne Upland Forest Moor Mosaic (6a)
- Knapdale Upland Forest Moor Mosaic (6b)
- Craggy Upland (7)."

This information together with NPF4, the OWPS, relevant development plan policies in the Argyll and Bute Local Development Plan and emerging policies in the LDP2 has played an important role

in informing the Site selection process and guiding the Applicant towards both the Site and final layout.

3.4 Site Design

3.4.1 Overview

The purpose of a wind farm development is to harness the power in the wind to generate electricity. The optimum design is therefore to locate wind farms in areas exposed to the highest windspeeds, with turbines located in the optimum position, generally the location with greatest exposure. However, this does not take into account the potential environmental effects of a wind farm. The design of a wind farm must therefore be a balance between achieving an acceptable level of environment effects and maximising energy yield. In addition to these factors, the technical limitations of constructing a wind farm must also be considered in the design stage.

The optimum layout of a wind farm is based on a range of technical criteria. A minimum distance must be maintained between wind turbines to reduce the effects of turbulence and associated increased turbine fatigue and reduction in energy yield. This separation distance is usually a function of rotor diameter and prevailing wind direction, with turbine manufacturers requiring turbines to be located typically between three and five times the rotor diameter apart. This distance determines the minimum achievable distance between turbines when designing a site. The following additional criteria must also be considered in the design of a wind farm:

- Wind speed;
- Existing infrastructure;
- Topography;
- Ground conditions;
- Local environmental issues; and
- Landscape and visual considerations.

The identification of environmental effects is an iterative process, running in tandem with the design process. As environmental effects and sensitivities have been identified, the layout of the Proposed Development has undergone a series of modifications to avoid or reduce potential environmental effects through careful design. This process has resulted in the layout of the Development presented in this EIA Report. This layout represents the optimum fit within the technical and environmental parameters of this project.

In addition to the turbines, the other elements of the Development which have been designed to minimise environmental effects include the access tracks, borrow pit, crane hardstanding areas, Temporary Construction Compounds (TCC) and the Substation and Battery Energy Storage System (BESS) Compound. The effects of these have been minimised through use of existing infrastructure where possible, careful design, siting, routing and construction methods.

3.4.2 The Design Strategy

The approach to the design of the Development has considered, wherever possible, to enhance the existing composition of the Development through an approach to design that includes:

- Limiting the number of turbines visible at key locations;
- Limiting the overall visibility of the wind farm as much as possible, especially on key cultural receptors;
- Maximising the use of existing tracks;
- Optimising the layout with respect to wind resource and environmental constraints;
- Optimising the layout with regard to topography;
- Limiting the physical extent of the wind farm; and
- Avoiding areas of deep peat.

Constraints were identified through desk study, site survey and analysis including consideration of the responses received from consultees during the early stages of the EIA process, predominantly during Scoping. The key constraints taken into account during the design process include:

- Visibility from sensitive receptors, including nearby properties, settlements and designated landscape. Wind farm layouts are designed to optimise aesthetics from key viewpoints, taking account of landscape character types and the topography in, and around, the Site;
- Presence of sensitive habitats and protected species;
- Presence of sensitive ornithological species and buffer zone from the Glen Etive and Glen Fyne Special Protection Area (SPA);
- Presence of watercourses, Private Water Supplies (PWS) and related infrastructure;
- Presence of cultural heritage features and the perceived interaction between these (e.g., sightlines);
- Proximity to noise sensitive receptors;
- Presence of deep peat;
- Ground conditions and topography; and
- Visibility from key recreational and tourist routes.

The principles of the design strategy were to maximise the number of turbines and wind energy capture, whilst minimising significant adverse environmental effects. Therefore, some of these constraints were given a 'hard' constraint value in design that was not breached and others were assigned a 'soft' constraint value that could be impinged with sufficient justification that effects were still acceptable. This led to a comprehensive process of constraints mapping.

Embedded mitigation was used to minimise any predicted environmental effects, and where applicable to a specific technical assessment, such mitigation is detailed in the relevant chapters within this EIA Report. This was particularly relevant to the avoidance of direct effects (e.g., on known protected species). By employing an iterative design process, undertaken in conjunction with the EIA process, a number of potential effects were avoided completely.

The design strategy has been informed by a number of general and site-specific design objectives relating to the siting and design of the turbines in the first instance, whilst acknowledging that the feasibility and appropriateness of other ancillary infrastructure locations (including access tracks) should also be considered throughout the design process.

The principles of the design strategy have been strictly adhered to. This is evident when looking at the original design of 22 turbines of 200 m tip height which extended considerably further to the south than the Development subject to this EIA Report. In comparison, the final layout (consisting of 13 turbines of 180 m tip height) is concentrated behind ridgelines which reduce visibility from the sensitive locations of Dun na Cuaiche, Inveraray Castle, and the settlement of Inveraray to the South. These are receptors which would have otherwise experienced significant visual impacts from the original design. Further assessment of these assets are provided in Chapter 6: Landscape and Visual Impact Assessment, and Chapter 9: Archaeology and Cultural Heritage. Areas of deep peat have been avoided where possible and the construction of new tracks has been minimised with the existing forestry tracks being used where possible. Buffer zones from the Glen Etive and Glen Fyne SPA have also been adopted to minimise interaction with habitats which support the qualifying features of this designation. Table 3.1 summarises mitigation by design.

This EIA Report and its conclusions constitute the outcome of the application of the design principles adopted for the Development.

3.4.3 Site Specific Environmental Constraints and Mitigation by Design

This section provides a brief description of the site-specific environmental constraints and what measures have been taken to mitigate potential for adverse environmental affects through amending the design or layout of the Development.

Figure 3.1 provides the key environmental constraints and mitigation by design is summarised in Table 3.1.

3.4.3.1 Landscape and Visual

Potential landscape and visual effects have been a key consideration in the iterative design process and have played an important role in shaping the final layout of the Proposed Development. A key principle in the evolution of the layout was to remove the southernmost turbines in order to reduce visibility from the sensitive locations of Dun na Cuaiche, Inveraray Castle, and the settlement of Inveraray which are of particular importance in cultural heritage terms. The iterative design focused on improving layout composition and removing or minimising turbine visibility in key views from these sensitive locations as well as from Loch Awe to the north and Loch Fyne to the south. Consideration was also given to the potential effects on residential visual amenity in Glen Aray and the importance of keeping a separation from properties in this area. Landscape and visual issues have been considered alongside other environmental and technical issues to ensure a balanced solution. For example, as part of the Chilled Layout, more elevated slopes were avoided in order to minimise visibility, and this approach also led to more practical solutions in forming new access tracks.

3.4.3.2 Ecology Receptors

Extensive ecological surveys undertaken across the Site generally recorded few protected species or sensitive habitats. The Phase 1 habitat surveys identified that the Site is predominantly either mature conifer plantation or areas of felled plantation (to be restocked under the Landowners Long Term Forest Plan (LTFP)), which is of low conservation value.

Where there are open areas, most of the habitat is wet modified bog or wet heath, usually dominated by *Molinia sp* and/or cottongrass. There are some areas of blanket bog vegetation on higher ground outside of the forestry area, and some small areas that can be considered to be a mosaic of heath and acid grassland vegetation. There are also areas dominated by bracken, and broadleaved woodland, which are mainly confined to around watercourses.

Although forming only a minor part of the habitat mosaic across the Site, areas of acid neutral flush, blanket bog, broad-leaved semi-natural woodland and areas identified as having Ground Water Dependent Terrestrial Ecosystems (GWDTes) were generally avoided and treated as a constraint to avoid where practicable.

Good practice has been adopted to avoid disturbance to protected species or direct effects on sensitive habitats.

The effects on ecological receptors are fully assessed within Chapter 8 – Ecology.

3.4.3.3 Ornithology Receptors

Surveys were undertaken over two years on and around the Site in line with NatureScot guidance. Whilst the presence and activity rates of target species across much of the Site are generally lower than within the wider area, the Site is adjacent to a Special Protection Area, and the following set back distances have therefore been adopted, following detailed discussions with NatureScot, to avoid impacts on target species either during construction or operation:

- Locating infrastructure at least 350 m from any known nest site of a Schedule 1 breeding species;
- Locating wind turbines c.300 m from the Glen Etive & Glen Fyne SPA boundary, in order to avoid any direct habitat loss for golden eagles, or effective habitat loss within the SPA due to displacement; and
- Locating wind turbines at least 300 m from any known black grouse lekking location.

The effects on ornithological receptors are fully assessed within Chapter 7 – Ornithology.

3.4.3.4 Hydrological Receptors & Private Water Supplies (PWS)

During the EIA process desk-based studies and site surveys were carried out to inspect and identify all water features, including PWS, within the area with potential to be impacted by the Development.

The aim of the design process was to achieve a layout that avoids significant effects on sensitive hydrological receptors including PWS.

The Site has several watercourses dissecting numerous undulating hills. When designing the layout, infrastructure was sited outside of 50 m buffers from watercourse channels, where possible. It should be noted that a number of the watercourses shown on Ordnance Survey maps within the Site are ephemeral and/or have been altered by historic land use. As such, it may appear that access tracks are in proximity to watercourses but in reality, there will be a suitable buffer. Where it has not been possible to site infrastructure outwith the 50m buffer additional mitigation will be installed as required under the guidance of a suitably qualified Environmental Clerk of Works (ECoW). Watercourse crossings were minimised, as much as possible, with any watercourse crossings designed in accordance with best practice and SEPA guidelines, as well as in taking consideration of consultation responses.

A Private Water Supply Risk Assessment (PWSRA) has been undertaken for the Development and is provided in Technical Appendix A10.1. The PWSRA aims to identify all Private Water Supplies (PWS) within a 2 km radius of the Development and seeks to confirm the location of the source water for the supplies, through consultation with the Council's Environmental Health Officer (EHO) and residents, along with site visits. This process informed the risk assessment of the effects of the Proposed Development on the private water supply, source water, and associated distribution infrastructure.

The effects on the hydrology environment are fully assessed within Chapter 10 – Hydrology and Hydrogeology.

3.4.3.5 Noise

The potential for noise effects to arise at residential properties located in the surrounding area of the Site was an important consideration in the design process.

Each layout iteration was modelled to determine its noise impact on nearby receptors. Through the iterative EIA design process, turbines were moved away from noise sensitive receptors. As these receptors, and their associated noise buffers, were considered as a hard constraint throughout the design process, the Development does not breach the agreed noise limits established as per consultation below.

An assessment including noise modelling was undertaken in accordance with ETSU-R-97 and relevant Good Practice Guidance, with the methodology agreed with the Environmental Health Officer (EHO) of the Council.

The effects on the noise environment are fully assessed within Chapter 12 - Noise.

3.4.3.6 Cultural Heritage & Archaeology

There are no known designated archaeological features located within the Site. However, there are several designated assets located around the Site. Hence, any impacts on designated assets will be indirect impacts on setting. Following consultation with Historic Environment Scotland (HES), and Argyll and Bute Council (the Council), those of particular note include:

- Inveraray Castle Gardens and Designed Landscapes (GDL 00223);
- Inveraray Castle (LB 11552) & other associated listed buildings;
- Watch Tower, Dun Na Cuaiche (LB 11543);
- Carloon, Doocot (LB 11540);
- Garden Bridge, River Aray (LB 11544);
- Aray Bridge (LB 11545); and

- Ardanaiseig House GDL.

The design has sought to avoid indirect effects on the above features, as well as consideration of indirect effects to designated assets in the wider area, with impacts on the setting of Inveraray Castle a key consideration. There are a number of undesignated assets in the south of the Site. There will be no direct effects on any of these assets.

The effects on heritage receptors are fully assessed within Chapter 9 - Archaeology and Cultural Heritage.

3.4.3.7 Peat

The NatureScot carbon and Peatland Map (2016)¹⁴ detailed that there is no peat within the Site itself and that the areas surrounding the Site have some class 5 peat. Class 5 peat is described as *"Soil information takes precedence over vegetation data. No peatland habitat recorded. May also include areas of bare soil. Soils are carbon-rich and deep peat"*.

However, peat depth surveys were undertaken across the Site and peat was found to be present. Stage 1 peat probing was undertaken across the Site on a 100 m by 100 m grid, which consisted of 1,047 probes with an average depth of 0.41 m.

Following design freeze targeted peat probing was undertaken in February 2023. This probing was generally at 50 m intervals along the centre lines of proposed tracks with probes 10 – 25 m on either side of the tracks to provide a corridor for micro-siting. In addition, probing at turbine locations were recorded at 10 m intervals and detailed probing also took place at the proposed substation and BESS compound. This stage of peat probing consisted of 2,098 points, which along with the phase one probing finds the average peat depth to be 0.5 m.

Areas of peat that are greater than 1 m in depth were considered as a hard constraint for new infrastructure as a result of the Development. Areas of peat less than 1 m in depth were considered as a soft constraint and avoided as far as possible.

Where probing had identified areas of deep peat, design changes were proposed and implemented to reflect the approach to avoid either deep peat or the deepest peat in proximity to turbines. Also, the track alignments were largely designed in areas of shallow peat or no peat.

Impacts on peat were taken into consideration during the iterative design process and the following mitigation measures are included within the Application, including: Technical Appendices A11.1 - Outline Peat Slide Risk Assessment; A11.2 – Outline Peat Management Plan (oPMP); and A10.1 - Outline Construction Environmental Management Plan (oCEMP).

Further information on peat and other ground conditions of the Site is contained within Chapter 11 - Geology and Peat.

3.4.3.8 Forestry

A desk-based assessment and site walkover was undertaken at an early stage to establish the type and age class of forest and woodland cover within the Site to gain an understanding of potential effects the Development may have on the forest structure. These established the Site was predominantly covered by commercial conifer plantation, which was covered by the Landowners LTFP.

The Development is not considered likely to start construction earlier than 2025. Therefore, for future baselines within assessments in this EIAR, felling scheduled for 2025 or earlier has been assumed to have been undertaken and completed. Any forestry compartments scheduled for felling beyond 2025, are assumed (within future baselines) to be existing at the point of construction and thus could be affected by the Development.

¹⁴ Scotland's Environment, Carbon & Peatland 2016. Available at: https://map.environment.gov.scot/Soil_maps/?layer=10 (Accessed 02/03/2023)

As the precise timescale for felling is not within the control of the Applicant, this approach is considered a worst-case scenario. The Applicant would have been content with a targeted approach of differential or 'keyhole' felling to facilitate the Development but given the intentions of the Landowner, this worst-case scenario has been adopted for all assessments.

In accordance the Landowner's LTFP, restocking will take place within areas felled under their LTFP, whilst taking account of the wind turbine keyhole areas, tracks and associated infrastructure undertaken as part of the Development.

For the purposes of this EIAR, the areas of felling considered to be covered by the Landowners LTFP and the felling considered as part of the Development is provided in Figure 2.14.

Further information on Forestry is contained with Chapter 14 – Forestry.

3.4.3.9 Socio-Economics, Recreation and Tourism

A desk-based study of socio-economics, recreation and tourism receptors was undertaken at an early stage to establish the socio-economic make-up of the local area and gain a full understanding of the recreation and tourism receptors within the wider area.

The desk-based study established that the wider area is host to many different tourism and recreation receptors, based around the natural and built environment. These receptors were considered fully within the design process. Furthermore, core paths and local recreational routes were also considered.

As demonstrated by the Pre-Application Consultation Report submitted with the application the Applicant has undertaken extensive consultation to enable the local community to be fully informed throughout the project development process. Consultation with local stakeholders has been important in shaping the design of the Development to minimise the potential for adverse effect on the community. In addition, the Applicant has provided financial assistance to the community as part of their fund raising to purchase the pier at Inveraray.

The effects on the socio-economic, recreation and tourism resources are fully assessed within Chapter 15 - Land Use, Socio-Economics, Tourism & Recreation. Additionally, Chapter 6 - LVIA also assesses the visual impact of the Development on key receptors which relate to tourism and recreational assets.

Table 3.1: Mitigation by Design

Environmental Subject Area	Mitigation
Landscape and Visual	<ul style="list-style-type: none"> Remove the southernmost turbines in order to reduce visibility from the sensitive locations of Dun na Cuaiche, Inveraray Castle, and the settlement of Inveraray. Improving layout composition and removing or minimising turbine visibility in key views from these sensitive locations as well as from St Conan’s Kirk and Loch Awe to the north, and Loch Lomand and Trossachs National Park Loch Fyne to the east and south. More elevated slopes avoided in order to minimise visibility, and this approach also led to more practical solutions in forming new access tracks.
Ornithology	<ul style="list-style-type: none"> Surveys were undertaken over two years on and around the Site in line with NatureScot guidance. Appropriate buffers have been used to avoid impacts on target species, and henceforth the qualifying interests of the Glen Etive and Glen Fyne SPA either during construction or operation.
Ecology	<ul style="list-style-type: none"> Areas of acid neutral flush, blanket bog, broad-leaved semi-natural woodland and areas identified as having GWDTEs were generally avoided and treated as a constraint to avoid where possible. Good practice has been adopted to avoid disturbance to protected species or direct effects on sensitive habitats.
Archaeology and Cultural Heritage	<ul style="list-style-type: none"> The design has avoided known non-designated features located within the south of the Site. The design has sought to avoid indirect effects on the key features, as well as consideration of indirect effects to designated assets in the wider area, with impacts on the setting of Inveraray Castle a key consideration.
Hydrology and Hydrogeology	<ul style="list-style-type: none"> Desk-based studies and site surveys were carried out to inspect and identify all water features, including PWS, and infrastructure was sited outside of 50 m buffers from watercourse channels, where possible.
Geology, Soils and Peat	<ul style="list-style-type: none"> Peat depth surveys were undertaken across the site and peat deposits were found. The PSRA process was also used to inform the design. Where areas of deep peat or potential for peat slide were identified, design changes were proposed and implemented to reflect the approach to avoid either deep peat or the deepest peat in proximity to turbines. Also, the track alignments were largely designed in areas of shallow peat or no peat.

Environmental Subject Area	Mitigation
Noise	<ul style="list-style-type: none"> • Each layout iteration was modelled to determine its noise impact on nearby receptors. • Through the iterative EIA design process, turbines were moved away from noise sensitive receptors. As these receptors, and their associated noise buffers, were considered as a hard constraint throughout the design process.
Forestry	<ul style="list-style-type: none"> • The design development sought to minimise the requirement for felling by using existing infrastructure as far as possible, whilst maximising the potential for restocking within the Site. • The design also took safe clearance distances for infrastructure and any known or suspected protected species into account.
Land Use, Socio-economics, Tourism and Recreation	<ul style="list-style-type: none"> • A desk-based study of socio-economics, recreation and tourism receptors was undertaken at an early stage to establish the socio-economic make-up of the local area. • The Applicant has undertaken extensive consultation with the wider community which has helped inform the design process and layout of the Development, which is detailed below in section 3.5.

3.4.4 Site Specific Technical Constraints

3.4.4.1 Wind Resource

Wind resource can be affected by various site characteristics, such as the prevailing wind direction, and local topography. As a rule, the more elevated areas of Site have the greatest wind resource, and this must be balanced against the landscape and visual effects that may arise at higher elevations.

3.4.4.2 Topography and Ground Conditions

The suitability of ground conditions was considered during the design of the Development, which principally considered areas of steep slope and peat.

Where gradients of greater than 14% were identified, these areas were not considered suitable for wind turbines. The presence of steep slopes is also a key consideration in the design of the site infrastructure including access tracks and hardstanding areas.

As noted in Section 3.4.3.7, the presence of peat has been assessed and avoided where possible both from an environmental and technical perspective.

3.5 Turbine Layout Design Iterations

3.5.1 Overview

The final layout as assessed in the EIA Report has been the subject of a number of iterations and refinements which sought to avoid, or minimise, predicted adverse effects as far as reasonably practicable via design embedded mitigation. The resultant proposal balances the environmental and technical constraints, whilst producing an economically viable project. Design changes made as a consequence of the key constraints are considered to be mitigation which is 'embedded' within the design of the scheme.

Whilst the Development has undergone numerous design iterations, a selection of the key turbine layout design iterations are described below and shown in Figure 3.2 (a - e) which demonstrates how the layouts have evolved throughout the EIA process.

Each of the turbine layout iterations was devised based on the following technical parameters and constraints detailed below:

- Minimum turbine spacing/separation of approximately 5 x rotor diameter downwind and 3 x rotor diameter crosswind and a south-westerly prevailing wind direction (approximately 225 degrees);
- Hard constraints:
 - Slopes of 14% or greater;
 - Where possible 50 m buffers around the banks of watercourses for turbine locations and infrastructure (Figure 3.1);
 - Avoid all known archaeological records on-site;
 - Avoid sensitive ecological habitats;
 - Avoid siting turbines in deep peat (> 1 m);
 - 1 km buffers around the residential properties for turbine locations;
- Soft constraints:
 - Minimise peat depths at turbine locations in areas of shallower peat (< 1 m) where feasible;
 - Balance visual composition that respects the original design objectives and minimises visual effects on key receptors.

3.5.2 Scoping Layout (June 2021) – Up to 22 Turbines & Max Tip Height 200 m

The Site comprised land initially covering 844 ha centred National Grid Reference 210500, 715500, consisting of 22 turbines with a maximum tip height of 200 m and a total generating capacity of over 50 megawatts (MW).

The turbine tip height and general dimensions were chosen to reflect current trends in wind turbine technology. The need to produce lower costing renewable electricity has generally led to wind turbines becoming taller, where substantial improvements in yield are achieved by using longer turbine blades.

As such, the initial layout maximised potential turbine numbers, reflective of known constraints at the time (Figure 3.1) which were not necessarily subject to detailed site work or technical assessments. The following key known on-site constraints were adhered to:

- Suitable separation distances between turbines based upon anticipated rotor diameters and prevailing wind direction, in order to reduce wake loss and issues associated with wind turbulence;
- 800 m buffer of Residential Properties; and
- 500 m buffer of the Glen Etive and Glen Fyne Special Protection Area (SPA).

The Scoping Layout is presented on Figure 3.2a.

3.5.3 Public Consultation 2 layout (February 2022) – Up to 18 turbines & Max Tip Height 200 m

Taking into consideration responses received from scoping and following the completion of several of the baseline surveys and with the environmental constraints digitised and analysed by the technical assessors, an 18-turbine layout with up to 200 m to blade tip was shown at the second round of public consultation events.

Turbines T8, T18, T19 and T22 were removed from the Scoping Layout and the remaining turbines were re-located to create a balanced scheme whilst avoiding known constraints where possible. This revised layout was driven by current known onsite constraints, as well as landscape and visual expert advice, with turbines in the south removed to reduce visual impacts. With this layout, Loch Lomond & the Trossachs National Park was largely shielded from theoretical visibility. Theoretical visibility did exist within the Inveraray Castle GDL however, with natural screening this was expected to be significantly less in reality.

Figure 3.2b provides the layout presented during the second round of public consultation in February 2022.

3.5.4 Pre-chilled layout (May – August 2022) – Up to 16 turbines & Max Tip Height 180 m

The Pre-Chilled Layout comprised 16 turbines each of 180 m tip height.

This iteration took place between the Public Consultation 2 Layout and the Chilled Layout, taking into account ecology, hydrology, noise and peat constraints identified through surveys (Phase 1 peat surveys, National Vegetation Classification (NVC) surveys, Noise monitoring etc.) and analysis of existing GIS data. The hard constraints taken into account in this design included:

- 1 km buffer of Residential Properties;
- 275 m buffer of known bat roosts;
- 250 m buffer of PWS;
- 220 m buffer of public roads;
- 220 m buffer of SSEN overhead transmission lines;
- 100 m over sail buffer;
- 75 m buffer of SPA's;
- Schedule 1 habitats; and

- Peat depths greater than 1 m deep.

During the second round of public consultation in February 2022, it was clear that the number and height of turbines and visual impact was a key concern for some members of the community, particularly for residents along A819. The residents along the A819 also raised concerns regarding the proximity of the turbines.

Subsequently, it was decided to remove turbines T17 and T21. The remaining 16 turbines were re-located, removing turbines from the south and western areas of the site, reducing further landscape impacts and to create a balanced scheme whilst avoiding known constraints where possible. The reduction in tip height from 200m to 180m resulted in small reductions in visibility, and also reduced the land take necessary for infrastructure associated with taller towers.

The Pre-Chilled Layout is presented on Figure 3.2c.

3.5.5 Chilled Layout (November 2022) – Up to 13 turbines & Max Tip Height 180 m

The Chilled Layout comprises of 13 turbines with a tip height of 180 m, with the Site now covering 764 ha, with a large area to the southeast of the Site removed.

The Chilled Layout is presented on Figure 3.2d.

LIDAR surveys were carried out to determine the precise location of watercourses and gain a more accurate understanding of the topography within the Site. The complex topography of the Site and the numerous watercourses that traverse it were also a key consideration during design work. This factored heavily into the positioning of the turbine access tracks, which re-use existing forest tracks where possible and avoid sensitive areas on site as far as practicable.

A number of iterations took place between the Pre-Chilled Layout and this Chilled Layout, considering constraints identified during ongoing environmental surveys, with a specific focus on landscape and visual, and cultural heritage. One of the key amendments at this stage was to alter the Site boundary to remove access tracks from within the Inveraray Castle Garden and Designed Landscape to prevent any physical impacts or indirect impacts through traffic movement during construction and/or operation.

A number of discussions were also held with NatureScot regarding proximity of the turbines to the adjacent Glen Etive and Glen Fyne SPA. The original 500m buffer was reduced to 75m in line with separation distances between some operational windfarms and neighbouring SPAs. Following discussions with Nature Scot, it was decided to increase the buffer to c.300m as this distance provided sufficient buffer to the SPA to minimise the likelihood for significant effects whilst maximizing the opportunity for the generation of renewable energy on site.

3.5.6 Frozen Layout (January 2023) –13 turbines & Max Tip Height 180 m

The Frozen Layout comprises of 13 turbines with a tip height of 180 m. The turbine layout changed slightly from that of the Chilled Layout, with the Site now covering approximately 790 ha.

The Frozen Layout incorporates infrastructure elements which are not present on the Chilled Layout, including a temporary construction compound, substation compound, and access tracks. Provision is also included for a Battery Energy Storage System (BESS) which will be located beside the onsite substation. This is expected to have a capacity of up to 41.4 MW. The BESS and Substation compound elements are located approximately 0.66 km west of turbine T6. There are two Temporary Construction Compounds (TCC) included as part of the Development, one located in the south of the Site, adjacent to the existing MoD kiosk and quarry, and the other located in the north of the Site to the north of the Substation and BESS compound.

Phase 2 peat probing has been undertaken at the proposed infrastructure, including new access tracks, Turbines and turbine hardstanding areas, BESS, and Substation and Temporary Construction compounds. As a result of the findings of the phase 2 peat probing, there were minor

alterations in locations of three of the turbines, and some small sections of access track to move infrastructure out of areas of deep peat.

The Frozen Layout is presented on Figure 3.2e.

3.6 Infrastructure Design

3.6.1 Overview

The Turbine Freeze Layout incorporates infrastructure elements that were not present on the Scoping Layout, including the access tracks, Substation and BESS Compound, TCC and borrow pit which are shown on Figure 3.2e. The design rationale for these elements is outlined below.

A description of associated infrastructure is described in Chapter 2 - Development Description of this EIA Report.

3.6.2 Access Tracks

The Site will be accessed via two access points off the A819. A new access junction is proposed at NGR 209101, 716517, to be constructed in the north of the Site, as part of the Development. Secondly, an existing access junction at NGR 208923, 713010 would be upgraded and the existing crossing over the River Aray would be removed and a new bridge installed.

Both access points would be capable of accepting turbine blades and components and although it is likely that only one would be used for turbine component delivery, both are assessed as such within this EIAR.

Using existing tracks wherever possible has been a key design criterion with approximately 4 km of the access tracks associated with the Development consisting of existing track.

4 km of existing forestry tracks to be utilised by the Development will be upgraded to facilitate the delivery of turbines. Localised areas of substantial upgrades may be required to accommodate larger turbine components.

A total of approximately 9.7 km of new track will be required to access the turbine locations.

To facilitate construction of the Development, 10 existing watercourse crossings will need upgrading as well as the creation of 20 new watercourse crossings.

The internal on-site access track layout for the Turbine Freeze Layout was developed so that it meets the following criteria:

- Use of existing tracks where possible;
- Minimisation of the variation in the vertical alignment of the tracks;
- Minimising the overall length of new tracks;
- Ensuring a safe and efficient layout to facilitate wind farm construction;
- Minimisation of incursion into environmental constraint areas (e.g., deep peat, sensitive habitats, watercourse buffers); and
- Minimisation of the number of watercourse crossings and alignment of tracks so that crossings are approximately at right angles.

3.6.3 Substation and BESS Compound

The Substation and BESS Compound (approximately 65 m x 135 m) is included as part of this Application however, any subsequent application for a grid connection for the Development will be subject to a separate planning application.

The Substation and BESS Compound is located on relatively flat ground in the north of the Site approximately 0.66 km west of T6. The compound avoids known environmental and technical constraints and will include a Substation and Control Building of approximately 30 m x 20 m with the BESS located adjacent to this.

3.6.4 Temporary Construction Compounds

Two temporary construction compounds will be required during the construction of the Development. These both will measure approximately 45 m x 30 m. One TCC is located in the north of the Site, adjacent to the north of the compound housing the Substation and BESS. The other TCC is located in the south of the Site, adjacent to the existing MoD kiosk and Quarry.

3.6.5 Borrow Pit

The borrow pit has been selected to avoid environmental constraints and was selected due to the existing quarry where an extension could be added for the purposes of this development. The proposed borrow pit is located adjacent to existing track in the south of the site, approximately 1 km southwest of the proposed T11 (approximately centred on NGR 209388, 714716). The aggregate from the borrow pit will be used in the construction of site access tracks, crane hardstanding areas, upgrades of existing forestry tracks, and potentially concrete batching.

The proposed borrow pit has been selected based on its:

- Topography;
- Current and Previous uses;
- Accessibility from existing or proposed access tracks;
- Orientation with respect to visibility;
- Potential aggregate volume; and
- Proximity of rock to the surface.

Steeper topography is preferable for quarrying, where soils coverage will be limited. Careful consideration was given to proximity to watercourses, places of archaeological interest, and forestry.

Prior to the construction of the Development, design and best practices, and any required mitigation measures, would be set out in full within a CEMP and agreed with the statutory bodies.

3.7 Summary

Various technical and environmental factors were considered in the iterative design process to develop the design of the Development for which the Applicant seeks consent. The changes made to the design of the Development were informed through a variety of desk-based studies and site surveys, technical assessments as well as consultation with a range of statutory, non-statutory and local stakeholders.

This chapter details the steps that have been taken by the Applicant to address key concerns raised to minimise the potential for adverse effects on receptors. The initial Scoping Layout (Figure 3.2a), consisting of 22 turbines with a maximum tip height of 200 m, was selected to reflect current trends in wind turbine technology and site constraints known at the time. Following responses received during EIA Scoping and the completion of initial site surveys, an 18-turbine layout with a maximum tip height of 200 m was developed and shown at the second round of public consultation events (Figure 3.2b).

Following the second round of public consultation in February 2022, it was clear that visual impact remained a key concern for stakeholders. Subsequently, 2 further turbines were removed with the remaining turbines relocated, and the turbine height was also reduced to a maximum of 180 m, thus reducing potential landscape impacts further.

A number of design iterations took place between the Pre-Chilled Layout (Figure 3.2c) and the Chilled Layout (Figure 3.2d), considering constraints identified during ongoing environmental surveys and further discussions with stakeholders.

Following further development of the design the Frozen Layout, which includes a BESS and associated infrastructure as assessed in this EIA Report (Figure 3.2e), has been carefully developed through an iterative process. The development of the design has taken a number of factors into

account and is considered to balance the requirement to maximise the renewable energy generation capacity of the Site whilst minimising the introduction of adverse environmental effects on receptors.