Chapter 3: Site Selection and Design Strategy

Contents

3. Site Selection and Design Strategy

3.1 Introduction

3.1.1 This chapter provides details of the approach that has been taken to site selection and design of the Proposed Development in order to arrive at a layout for the purposes of assessment in the EIA. Details of how and why the turbine layout and associated infrastructure have been modified during the iterative EIA process are provided to explain how the Proposed Development described in **Chapter 4: Development Description** has evolved. This chapter also outlines the site selection process undertaken by the Applicant, and the alternative layouts which were explored in designing the Proposed Development as required by The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017 ('the EIA Regulations'), Regulation 5(2[d]) and Schedule 4.

3.1.2 This chapter is supported by the following figures which are referenced throughout the text:

- **EIA Report Volume 3a: Figures**
  - **Figure 3.1: Site Constraints;**
  - **Figure 3.2: Comparison of Proposed Development with Consented Larbrax Wind Farm;** and
  - **Figure 3.2: Design Layouts 1-5**.

3.2 The Site and Surrounding Area

3.2.1 The Site is located approximately 9 kilometres (km) west of Stranraer within a relatively remote area in the north-west of the North Rhins Peninsula (see **Figure 1.1**) and occupies an area of 345 hectares (ha). The Site slopes gently from east to west towards the coast and is therefore relatively low-lying. The eastern section of the Site undulates gently and is characterised by a pattern of smooth hills and valleys. This part of the Site includes various high points such as Hind Hill on Galdenoch Moor of 82 m Above Ordnance Datum (AOD) as well as an unnamed hill of 83 m AOD on Larbrax Moor. The northern and southern parts of the Site are characterised by steeper slopes. The western part of the Site lies on the coast and is characterised by sloping hills towards the coast with some steeper slopes present at Salt Pans Bay as well as steep cliffs of varying height.

3.2.2 Land cover within the Site primarily consists of improved pasture grassland associated with the working Meikle Galdenoch Farm, with some areas of boggy marshland in the east. Woodland coverage is limited to small coniferous plantations used as shelterbelts in the north and south, and broadleaf trees adjacent to the B738 in the east.

3.2.3 A number of minor watercourses and field ditches drain the Site, generally flowing west out to the North Channel. The Green Burn runs along the eastern boundary of the Site and eventually drains into the Galdenoch Burn north of the Proposed Development. The Galdenoch Burn flows along the northern boundary of the Site eventually draining to the North Channel north of Port Beg. Some areas of standing water, including Loch More and Loch Beg, are present due to the relative flat topography of the Site.

3.2.4 Properties within the surrounding area are mainly single rural dwellings farmhouses and holiday cottages which are scattered throughout the area. The closest properties to the Site include Greenburn, Meikle Galdenoch (north-east), Larbrax Lodge (east), Larbrax Cottages and Meikle Larbrax (south). None of these properties are within the Site. Within the wider area there are a number of small rural settlements including Portpatrick, approximately 8 km to the south and Leswalt, approximately 5.5 km to the east. Several camping, caravan and chalet sites are present in the wider surrounding area.

3.2.5 The Site lies within the Rhins Coast Regional Scenic Area (RSA) and the Salt Pans Bay Site of Special Scientific Interest (SSSI) is within the south-western part of the Site.

Inset Figure 1: Site Topography

3.3 Site Selection

3.3.1 The Proposed Development Site has been selected for a number of reasons including the following:

- The 'planning precedent' has already been established for wind energy development at this location through the Consented Larbrax Wind Farm;
- The Site has an excellent wind resource given its exposed coastal location. This presents the opportunity to develop without the need for government support or subsidy, whilst providing a contribution towards climate change and renewable energy targets;
- The Site is not within a National Park or National Scenic Area (NSA) which preclude development of wind farms according to national planning policy (NPF4 Policy 11);
- The nature of the Site allows for good opportunities to explore and provide extensive habitat management and enhancement in accordance with NPF4 Policy 3;
- There are no key environmental constraints which will preclude development, or which cannot be avoided through careful design and mitigation;
- Existing land use (improved pasture grassland) is compatible with the development of a renewable energy scheme;

- Access is possible to the Site from the public road network via the A77(T), A75(T) and B738 for construction traffic and turbine deliveries;
- The Site has good internal access through existing farm tracks which limit the need for new infrastructure and additional land-take;
- The Site is at distance from main settlements with the closest being the village of Leswalt approximately 4 km to the east. The distance to nearby properties, the closest of which is approximately 1 km from the nearest turbine, means that unacceptable noise and overbearing residential visual amenity impacts can be avoided; and
- There is a feasible local grid connection.

3.3.2 National Planning Framework 4 (NPF4)[1] was approved by the Scottish Parliament on 11 January 2023 and was adopted and published on 13 February 2023. However, the site selection exercise was undertaken under the planning policy in force at the time (Scottish Planning Policy (SPP) (June 2014)) which provided support for wind development in principle and encouraged local authorities to guide development towards appropriate lo*cations within their boundaries. Paragraph 161 of SPP highlighted the requirement for planning authorities to define a "spatial framework identifying those areas that are likely to be most appropriate for onshore wind farms"* based on the following criteria (set out in SPP Table 1, Page 39):

- Group 1: Areas where wind farms will not be acceptable.
  - National Parks and National Scenic Areas.
- Group 2: Areas of significant protection
  - Recognising the need for significant protection, in these areas wind farms may be appropriate in some circumstances. Further consideration will be required to demonstrate that any significant effects on the qualities of these areas can be substantially overcome by siting, design or other mitigation.
  - Group 2 areas include World Heritage Sites; Natura 2000 and Ramsar sites; Sites of Special Scientific Interest; National Nature Reserves; Sites identified in the Inventory of Gardens and Designed Landscapes; Sites identified in the Inventory of Historic Battlefields; areas of wild land as shown on the 2014 Scottish Natural Heritage (SNH) map of wild land areas; carbon rich soils, deep peat and priority peatland habitat; and an area not exceeding 2 km around cities, towns and villages identified on the local development plan.
- Group 3: Areas with potential for wind farm development
  - Beyond groups 1 and 2, wind farms are likely to be acceptable, subject to detailed consideration against identified policy criteria.

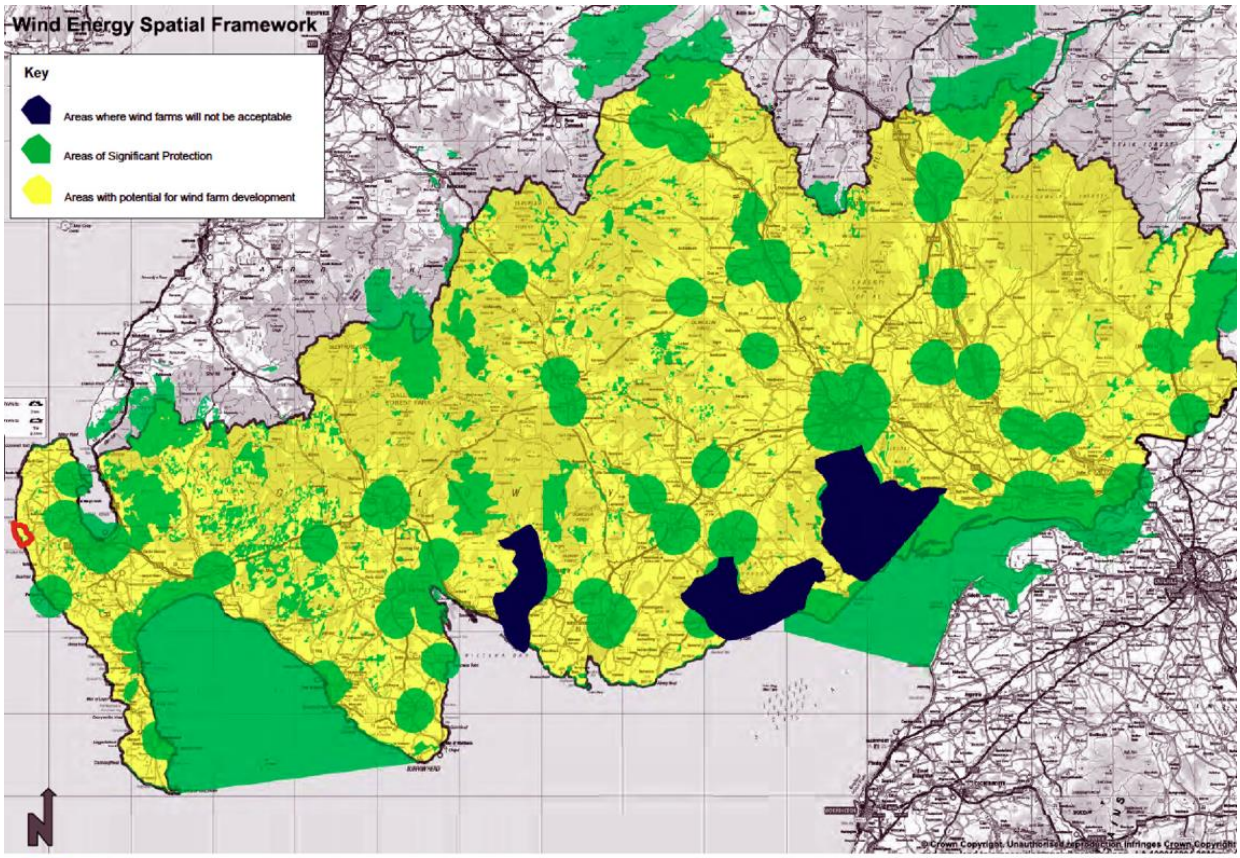
3.3.3 SNH's (now NatureScot) Guidance 'Siting and Designing Wind Farms in the Landscape'[2] states that *"Developers and those involved in wind farm design should also refer to the Spatial Frameworks being developed by planning authorities in response to Scottish Planning Policy (SPP). When considering an individual application, the adopted development plan, relevant supplementary guidance, wind energy capacity studies and SPP provide the framework within which the application should be considered".*

3.3.4 The Proposed Development falls wholly within the Dumfries and Galloway Council (DGC) administrative area. The statutory Development Plan for the DGC is the Dumfries and Galloway Local Development Plan 2 (LDP2) (2019)[3] as well as the adopted NPF4. Dumfries and Galloway Council have also produced the Wind Energy Development: Development Management Considerations[4] as supplementary guidance (adopted 2020) alongside the Local Development Plan. The supplementary guidance builds on Policy IN1: Renewable Energy and Policy IN2: Wind

[1] Scottish Government, 2023, National Planning Framework 4. Available [online] at: https://www.gov.scot/publications/national-planning-framework-4/
[2] Scottish Natural Heritage, 2017, Siting and Designing Windfarms in the Landscape (Version 3a). Available [online] at: https://www.nature.scot/doc/siting-and-designing-wind-farms-landscape-version-3a
[3] Dumfries and Galloway Council (2019). Dumfries and Galloway Local Development Plan 2019. Available [online] at: https://www.dumgal.gov.uk/media/21885/Adopted-Local-Development-Plan-2/pdf/Adopted_LDP2_OCTOBER_2019_web_version.pdf?m=1641567969937
[4] Dumfries and Galloway Council (2020). Dumfries and Galloway Wind Energy Development: Development Management Considerations – Supplementary Guidance 2020. Available [online] at: https://www.dumgal.gov.uk/media/22639/Wind-Energy-Development-Development-Management-Considerations/pdf/Wind_Energy_SG_Final_PDF_February_2020_Version.pdf?m=1582901680663

Energy with the Local Development Plan. In particular, the guidance outlines issues to be considered in assessing proposals for wind energy.

3.3.5 **Inset Map 3.2** below shows the Site superimposed onto Map 8: Spatial Framework (page 71) of LDP2 Policy IN2. According to the framework, the location of the proposed turbines is identified as being suitable for wind energy development. Whilst it is acknowledged that SPP has now been superseded with NPF4 which does not require the local authorities to prepare spatial frameworks, the spatial framework remains valid until such time as LDP2 is replaced.



3.3.6 As part of the Supplementary Guidance, a Wind Farm Landscape Capacity Study[5] (adopted 2019) was also produced which provides guidance with respect to siting and design of wind energy proposals and also the assessment of landscape, visual, cumulative and residential visual amenity effects within Dumfries and Galloway. According to the landscape and visual sensitivity, the Proposed Development is considered to contain large turbines (80-150 m to blade tip). The Proposed Development falls within an area of high sensitivity, however it is noted that the Proposed Development will need to be determined based on its own merits and compliance with wider policy of LDP2 and NPF4.

3.3.7 The NatureScot guidance on Landscape Sensitivity Assessment (2022)[6], discusses the replacement of the term "capacity studies" with "sensitivity studies", stating *"In the past, many "capacity" studies often dealt with susceptibility rather than capacity. Capacity is determined by the need for a target amount of development while sensitivity is not. Most studies should therefore be correctly referred to as sensitivity studies, unless such targets have been set at an appropriate scale" (page 4). Similar to the capacity studies above, the draft NatureScot guidance also states, "Sensitivity studies are never a substitute for a site- and proposal – specific Landscape and Visual Impact*

[5] Dumfries and Galloway Council (2020). Dumfries and Galloway Wind Farm Landscape Capacity Study – Supplementary Guidance 2020. Available [online] at: https://www.dumgal.gov.uk/media/22640/Part-1-Wind-Energy-Development-Development-Management-Considerations-Appendix-C-DGWFLCS/pdf/Wind_Energy_Appendix_C_Landscape_SG_LDP2_Adopted.pdf?m=1582902841210
[6] NatureScot, 2022, Landscape Sensitivity Assessment Guidance. Available [online] at: https://www.nature.scot/doc/landscape-sensitivity-assessment-guidance-methodology

Assessment (LVIA). These studies can inform strategic site selection for development, helping to steer it towards better locations and informing LVIA, but they should not be used to determine planning applications. Instead, they should be seen as a complementary source of information which can help inform the decision-making process and environmental assessment" (page 3).

3.3.8 In relation to NPF4, it should also be noted that the Site is not located within either a National Park or National Scenic Area, which are the only areas where NPF4 explicitly states that proposals for wind farms will not be supported (Policy 11). Policy 11 also sets out that *"significant landscape and visual impacts [emphasis added] are to be expected for some forms of renewable energy. Where impacts are localised and/or appropriate design mitigation has been applied, they will generally be considered to be acceptable."*

3.3.9 Further details in relation to the planning policy, and an appraisal of the Proposed Development's compliance with such policy, is provided in the **Planning Statement,** which accompanies the application.

3.4 The Design Strategy

3.4.1 There have been major technological advances in turbine design since the Consented Larbrax Wind Farm received planning permission in 2016. As such, between 2016-2024 a number of efforts have been made by the Applicant to make the project both technically and commercially viable, including discussions with turbine suppliers and network operator with regards to the procurement of the consented 100 m tip turbines and the proposed grid connection. The culmination of this work is the revised design for Larbrax Wind Farm which will significantly improve the efficiency and commercial viability of the project and will mean that roughly the same maximum output as the Consented Larbrax Wind Farm will be achieved by using fewer but larger more efficient turbines.

3.4.2 The aim of the design strategy has been to revisit the Consented Larbrax Wind Farm and re-design a layout which seeks to maximise potential renewable energy generation and biodiversity enhancement opportunities within the technical and environmental constraints of the Site, whilst not materially increasing the significance of the environmental effects that were previously identified but considered to be acceptable in planning terms. Key to the design strategy has been the consideration of the impact on landscape and visual amenity which resulted in the original refusal of the Consented Larbrax Wind Farm, and how these same issues could be minimised as far as possible.

3.4.3 The re-design process has been therefore been led by landscape and visual impact (LVI) considerations, including landform and scale, and to what extent the landscape is capable of accommodating larger but fewer turbines than the Consented Larbrax Wind Farm. The landscape and visual factors influence how the Proposed Development will be perceived by people within the surrounding area. The design of the Proposed Development layout has aimed to meet the guidance contained within NatureScot's Siting and Designing Wind Farms in the Landscape[7], in so far as possible.

Key Objectives of the Design Strategy

3.4.4 The overarching design objectives of the design strategy were as follows:

- To maximise the potential energy yield of the Site;
- To use the latest wind turbine technology consisting of more efficient and larger turbines where these can be reasonably accommodated within the landscape, as supported by the Onshore Wind Policy Statement (OWPS)[8] and NPF4;
- To explore opportunities for co-locating technology such as battery storage thereby enhancing the output capacity of the Site and providing back up to the local electricity network;
- To use a turbine size which avoids the need for visible aviation safety lighting at night;
- To create a layout and use a turbine scale which avoids breaching the residential visual amenity threshold from the nearest properties;

[7] Scottish Natural Heritage (2017) Siting and Designing Wind Farms in the Landscape Guidance, Version 3a
[8]Scottish Government, 2022, Onshore Wind Policy Statement. Available [online] at: https://www.gov.scot/publications/onshore-wind-policy-statement-2022/

- To provide a cohesive turbine layout with a simple form which relates as well as possible to the coastal landscape character of the Site and its surroundings, and limits the visual effects on views across the peninsula towards the coastline;
- To design a small and well composed group of turbines that is seen as a discrete development and does not materially increase the perceived extent of wind farm development across the peninsula from key views;
- To develop a layout that meets operational noise limits at the closest residential properties;
- To explore opportunities to restore and enhance biodiversity; and
- To develop a layout that fulfils the above objectives whilst respecting other environmental and technical constraints including noise; ecological, ornithological; hydrological and ground conditions (including peat) related constraints identified during the EIA process.

3.4.5 During the design process, computer modelling was used as a tool to aid design. Zone of Theoretical Visibility (ZTV) models and wireframes were generated and used to aid understanding of potential visual effects of the turbines and to 'test' the design iterations. Wind yield analysis was also used to determine the optimal locations of turbines in order to minimise wake losses.

3.4.6 Meeting operational noise limits and avoiding breaching the residential amenity threshold have been key design considerations. Throughout the design process, the layout of the Proposed Development has been 'tested' in relation to noise limits and views from key locations and the nearest properties, and the turbine locations have been optimised to minimise adverse effects.

3.4.7 The main elements of the Proposed Development considered in the initial design iterations were the turbines. The locations of other infrastructure components were largely dictated by the positioning of the turbines and were designed around onsite environmental constraints (see Site Constraints section below). Later iterations to the turbine layout involved minor alterations to turbine and infrastructure locations, which were reviewed against all constraints.

3.5 Design Principles

Site-Specific Design Principles

3.5.1 Based on a review of the Site and its landscape context, identified environmental constraints, the Site's previous planning history/reasons for the original refusal, and advice contained in good practice guidance including NatureScot's Siting and Designing Wind Farms in the Landscape, the following site-specific design principles were adopted and considered throughout the design process:

- Arrange turbines as far as possible to form an evenly spaced group or array within minimal stacking when seen from key scenic viewpoints and routes on the peninsula, such as from Killantringan Lighthouse, the Southern Upland Way (SUW), the A77, A718 and B738 and views from the sea such as from the Cairnryan to Belfast ferry route;
- Limit the potential effects on the special landscape qualities of the Rhins RSA as far as possible;
- Use intervening landform to limit visibility to localised areas across the peninsula whilst not materially increasing visibility compared to the Consented Larbrax Wind Farm;
- Develop a well composed layout in views from key cultural heritage assets in the wider area where theoretical intervisibility is possible including Agnew Monument (SM 2001) (LB 10115);
- Seek to avoid peat deposits over 0.5 m wherever possible for turbines and infrastructure;
- Avoid unacceptable peat slide risk;
- Develop a layout which is compatible with current farming practices on the Site and minimises the sterilisation of farm land;
- Seek to improve the infrastructure layout from the Consented Larbrax Wind Farm as far as possible, such as minimising the need for new track and upgrading existing track wherever possible;
- Design a layout which minimises visibility from nearby settlements and areas including Leswalt, Portpatrick, Stranraer and Loch Ryan to the east by using intervening and undulating landform as screening;

- Limit the loss of forestry within the Site by avoiding scattered shelter belts thereby also reducing operational effects on bats; and
- Minimise watercourse crossings.

3.6 Site Constraints

3.6.1 A number of technical and environmental constraints have been considered in the iterative design process and have guided the positioning of both turbines and infrastructure (see **Figure 3.1**). These are outlined below.

- Ecology: Avoidance of highly sensitive habitats of conservation value such as blanket bog, observing appropriate separation distances with respect to protected species and associated habitat features (including bats and other protected species, watercourses and key bat habitat features and maintaining at least a 70 m buffer from the Salt Pans Bay SSSI in order to avoid direct and indirect effects.
- Residential Properties: Maintaining a suitable offset from the nearest residential properties to avoid breaching the 'residential visual amenity threshold' and exceeding noise limits.
- Hydrology and Flood Risk: Maintaining a 50 m buffer where possible from watercourses and avoiding private water supply sources and catchments. Minimising impact on flooding associated with the Green Burn through consideration of the design of the crossing structure needed at the Site entrance to minimise flood risk.
- Cultural Heritage: Avoiding cultural heritage assets within the Site.
- Peat and GWDTEs: Minimising encroachment into areas identified as likely Groundwater Dependent Terrestrial Ecosystems (GWDTEs) as well as avoiding areas of peat as far as possible (> 0.5 m).
- Topography: Avoiding steep coastal slopes to ensure constructability and reduce health and safety risk whilst reducing the need for significant cut and fill engineering works.
- Land Use: Minimising land-take and impact on current farming practices by using existing track and keeping to field boundaries as much as possible.
- Recreation: Avoiding impacting on recreational users by minimising encroachment onto core paths.

3.7 Turbine Design

3.7.1 The proposed turbines will be three bladed horizontal axis turbines. The EIA is based upon a maximum blade tip height 149.9 m. Turbines with a blade tip height of up to 149.9 m were considered to be the maximum height that could be accommodated at Site in terms of potential landscape and visual constraints. A decision was also made by the Applicant to limit the turbine tip height to less than 150 m to avoid the need for visible aviation warning lights in accordance with Article 222 of Air Navigation Order (ANO) 2016, thereby removing the potential for visual effects being extended into night-time.

3.8 Infrastructure Design

3.8.1 The design of the site components was based on the following objectives, which fundamentally sought to balance environmental objectives by making the Proposed Development footprint as small as possible, whilst ensuring health and safety objectives for site working are maintained:

- To use/upgrade existing access tracks as far as possible thereby minimising the necessity for new excavations;
- To keep overall new track length to a minimum thereby reducing stone requirements, excavations and associated potential environmental effects;
- Minimise the ancillary infrastructure needed to support construction of a wind farm of this scale, such as the number of construction compounds and size, in order to reduce land take;
- Make use of existing onsite quarries (borrow pits) for the winning of stone to construct tracks thereby reducing the need for imported materials;
- To reduce the loss of farmland by keeping to field boundaries as closely as possible;
- Minimise the need for new watercourse crossings, and, where necessary, ensure any new crossing structures minimise the impact on biodiversity and flood risk;

- To facilitate safe access to each turbine, avoiding steep slopes and ground with potential instability;
- Avoid peatland habitats as far as possible;
- Choose a site access point which will minimise the loss of trees/vegetation along the B738 and provide the most direct and shortest route to the turbine locations whilst meeting the standards required to maintain road safety; and
- To build health and safety aspects into track design from as early a stage as possible, including avoiding slopes which are too steep for access.

3.8.2 A comparison of the components of the Consented Larbrax Wind Farm with the components of the Proposed Development is provided below in **Table 3.1** and shown on **Figure 3.2**. The changes to the sizes and locations of the proposed infrastructure were dictated by the design objectives above. Larger turbine foundations and hardstandings reflect the candidate turbine manufacturer's specifications.

Table 3.1: Comparison of Consented Larbrax Wind Farm with the Proposed Development

Component Details	Consented Larbrax Wind Farm	Proposed Development
Turbines	Eight of up to 100 m to blade tip 2.5 MW capacity	Four of up to 149.9 m to blade tip Approximately 5 MW capacity
Turbine foundation	346 m^2 per turbine based on 21 m diameter	491 m^2 per turbine based on 25 m diameter
Turbine hardstanding	880 m^2 per turbine	2819 m^2 per turbine
Battery Energy Storage System (BESS)	None	Approximately 10 MW
Visible Aviation lighting	None	None
Access tracks (new)	5.31 km	1.90 km
Access tracks (upgraded)	None	1.05 km
Access track width	5.5 m	6 m
Construction compounds	One CC1: 10,125 m^2 (75 m x 135 m)	One CC1: 1,500 m^2 (30 m x 50 m)
Substation	One 1,375 m^2 (25 m x 55 m)	One 1,500 m^2 (30 m x 50 m)
Borrow pits	Two BP1: 1,034 m^2 (47 m x 22 m) BP2: 19,950 m^2 (190 m x 105 m)	One BP1: 6,400 m^2 (80 m x 80 m)
Watercourse crossings	Eight	Eight (four new and four upgraded)
Met mast	1 (60 m high)	None
Cable trenches	1 m x 1 m	1.5 m x 1.5 m
Land take (permanent)	4.04 ha	3.45 ha
Site area	558.4 ha	345 ha

3.9 Design Alternatives

3.9.1 Regulation 5 (2)(d) of the EIA Regulations states that an EIAR should include "*a description of the reasonable alternatives studied by the developer, which are relevant to the development and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the effects of the development on the environment*". This is not a requirement to detail alternative sites, but rather a requirement to indicate why a particular design choice is made, and what environmental effects result, in cases where alternatives have been considered.

Do-Nothing Alternative

3.9.2 The "do nothing" scenario is a hypothetical alternative considered in the EIA Report as a basis for comparing the Proposed Development with what would reasonably be expected to happen onsite in the absence of the Proposed Development. This scenario is considered to represent the current and future baseline condition of the Site as described in the individual chapters of this EIA Report.

3.9.3 In the absence of the Proposed Development, the Site will continue to be used for farming purposes. The three existing operational turbines at Meikle Galdenoch Farm (10/P/1/0495) and the two existing turbines at Meikle Larbrax (08/P/1/0240 and 10/P/1/0496) will continue to operate until such time as their current planning permission lapses.

3.9.4 Habitat management and enhancement measures proposed in **Technical Appendix 7.5: Outline Biodiversity Enhancement and Management Plan** are unlikely to be implemented in the absence of the Proposed Development.

Design Evolution

3.9.5 The design strategy and principles outlined above have been taken into account as the design of the Proposed Development has evolved. The design process involved workshops with technical team members to address potential constraints associated with one or more of the turbines or elements of the associated infrastructure. Each team member also summarised feedback from the relevant technical stakeholders as appropriate to the design process, and comments received through consultation with the local community and organisations were given due regard during the evolution of the project design. This design process and consideration of feedback is described in further detail below and shown in **Figure 3.3**.

Layout 1: Consented Layout

3.9.6 The starting point for the design was the Consented Larbrax Wind Farm layout comprising eight turbines of up to 100m to blade tip which set the planning precedent for a wind farm in this location. Orsted commissioned a landscape and visual feasibility study to determine potential turbine tip increases in order to improve the commercial viability of the Proposed Development and to reflect the advance in turbine technology since planning permission was granted. The study sought to determine the 'tipping point' at which a greater number of likely significant effects (or potentially overbearing effects on residential visual amenity) would occur compared to the Consented Larbrax Wind Farm when considering different tip heights for the eight turbines, within the range of 125 m to 139 m. The location of the turbines remained as per the consented layout. Key to the study were the landscape and visual considerations for why the Consented Larbrax Wind Farm had been refused initially in order to minimise consenting risk. The study found that there would be marginal changes to theoretical visibility between the two ranges, and any changes to the significance of effects on landscape character and designated landscapes would be marginal. In terms of visual effects, the study stated that consideration would need to be given to the relationship between turbine height and the scale of the coastal edge landscape. Eight larger turbines, between 125 m and 139 m were also noted as having the potential to breach the residential visual amenity threshold from the closest properties.

Layout 2: EIA Scoping and Round 1 Public Consultation Layout

3.9.7 Background noise monitoring and modelling was subsequently undertaken to determine if noise limits could be met at the closest residential properties using eight larger turbines. Noise limit exceedance was determined to be likely at several nearby properties when operating alongside other single turbines in the surrounding area, and this represented a high consenting risk. As such, the decision was taken to reduce the number of turbines to five. The turbine tip height was increased to 149.9 m, however, to maximise the energy yield of the Site and offset the loss of three turbines. It was considered that a smaller scheme with larger tip heights would not materially increase the

potential landscape and visual effects identified in the previous feasibility study. Keeping turbines below 150 m to blade tip also removed the need for visible aviation lighting. The Site also reduced in size due to the reduced scale of the Proposed Development, but areas of peatland in the eastern part of the Site were retained in order to maximise opportunities for onsite peatland restoration. This five-turbine layout with tip heights up to 149.9 m was taken forward to EIA Scoping and also presented at the Round 1 public consultation events in November 2023.

Layout 3: Design Optimisation 1

3.9.8 Further design work was undertaken to seek to improve the composition of the layout from key viewpoints such as Killantringan Lighthouse where a gap was apparent between T1-3 and T4-5 in Layout 2. The aim was to ensure that the layout did not appear as two separate schemes by removing the gap from coastal views and was more compact and cohesive. T1-3 were pulled back from the coastline, T4 was moved closer to T1, and T5 was relocated north of T3. This resulted in a single array of five turbines which responded more positively to the landscape and visual design objectives. This layout was also re-tested in relation to meeting noise limits.

Layout 4: Design Optimisation 2

3.9.9 Following landowner discussions and concerns regarding the loss of farm land, T5 was removed from the layout which had the benefit of reducing the horizontal extent in views to the east and west. T1 was moved further south to increase the distance from the boundary of Salt Pans Bay SSSI and ensure that all infrastructure (including earthworks) were at least 60 m from the SSSI boundary to avoid direct and indirect effects. The movement of T1 also improved layout composition in views from Killantringan Lighthouse. T3 was moved south to avoid a watercourse buffer. T2 was moved further east closer to the existing track to minimise the length of the new access track spur required, although this move was limited to minimise the increase of the gap between T3-4 and T1-2 in key coastal views which had been achieved in previous layouts.

3.9.10 At this point, a detailed infrastructure layout was prepared comprising tracks, site junction, turbine hardstandings, substation/Battery Energy Storage System (BESS), construction compound, and borrow pit which reflected the infrastructure objectives noted above. Key constraints taken cognisance of included Salt Pans Bay SSSI, proximity to watercourses, deep peat/blanket bog habitat and GWDTEs. This infrastructure layout was subject to detailed Phase 2 peat probing and hydrological walkover survey.

Layout 5: Round 2 Public Consultation and Application Layout

3.9.11 Changes to the design at this stage related solely to the infrastructure and took into account the findings of the Phase 2 peat probing. In this way, the substation and the track spurring off the access junction were moved south to avoid deeper peat. The access junction also moved further south to achieve the minimum visibility splays required. The Site was amended to incorporate the amended site access junction and the trees/vegetation removal extents.

3.9.12 The final layout comprises four turbines of up to 149.9 m to blade tip and associated infrastructure and is shown on **Figure 3.3.** This layout is assessed in this EIA Report and is the subject of the application for planning permission by the Applicant.

3.9.13 A summary of the modifications made to the turbine layout is provided in **Table 3.2** and shown in **Figure 3.3**. These modifications have been made in response to the design strategy and site-specific design principles.

Table 3.2: Summary of Modifications to Turbine and Infrastructure Layout

Layout	Details	Changes to Previous Layout and Outcome
Layout 1 (Preliminary Layout)	Turbines: 8 Max Tip Height: 100 m	
Layout 2 (EIA Scoping and Round 1 Consultation Layout)	Turbines: 5 Max Tip Height: 149.9 m	Variation to Layout 1 Following background noise surveys and modelling, the turbine layout was reduced from eight to five turbines in order to meet noise limits. Redline boundary also reduced due to change in scale of

Layout	Details	Changes to Previous Layout and Outcome
		wind farm but retained areas of peatland to maximise opportunities for onsite restoration. The turbine tip height increased to 149.9 m in order to maximise the energy yield of the Site and retain a commercially viable scheme. Output was five turbines seen as two arrays.
Layout 3 (Design Optimisation 1)	Turbines: 5 Max Tip Height: 149.9 m	Variation to Layout 2 Focus of design work was to improve composition of layout in key coastal views, especially from Killantringan Lighthouse, by reducing stacking, creating a more balanced layout in terms of spacing and reducing gap between turbines 1-3 and turbines 4-5. This was achieved by relocating T5 800 m north-east, moving T4 150 m south-west and moving Turbines 1-3 up to 50 m north-east, east and south-east respectively. Noise modelling was also undertaken to ensure that noise limits continued to be met. Output was a single array of five turbines which better reflected the landscape and visual design objectives.
Layout 4 (Design Optimisation 2)	Turbines: 4 Max Tip Height: 149.9 m	Variation to Layout 3 T5 removed to avoid impact on most productive farming land. T1 moved 70 m south to increase distance to Salt Pans Bay SSSI whilst also avoiding watercourse buffer to the south which improved composition in views from Killantringan Lighthouse. T3 was moved 40 m south to increase distance from watercourse. T2 was moved 25 m east closer to the existing track to minimise the length of the new access track spur required. Turbines re-numbered 1-4 from south-to north. Redline boundary also increased to incorporate site junction. Output was a single array of four turbines and a draft infrastructure layout which was subject to detailed peat probing.
Layout 5 (Round 2 Public Consultation and Application Layout)	Turbines: 4 Max Tip Height: 149.9 m	Variation to Layout 4 Substation moved 50 m south-east to avoid deeper peat.

Layout	Details	Changes to Previous Layout and Outcome
		Access track in vicinity of site junction moved south to avoid deeper peat. Access junction moved 60 m south to achieve the visibility splays required to maintain road safety. Trees/vegetation removal identified to facilitate access junction construction. Redline boundary amended to incorporate new junction position and trees/vegetation removal extents.

3.10 Design Outcome

3.10.1 This chapter sets out the process undertaken to identify the Site and the design strategy, objectives and evolution of alternative layouts to design the Proposed Development.

3.10.2 The inherent nature of wind turbines as tall, modern structures means that the form of the Proposed Development as a whole is important, and a clear design strategy was necessary. The overall aim of the design strategy was to re-design a layout which continued to be commercially viable through maximising potential renewable energy generation, whilst not materially increasing the significance of the environmental effects of the Consented Larbrax Wind Farm, and where possible, seek to maximise opportunities to conserve and enhance biodiversity. Responding positively to the reasons for the original refusal has been key to deriving the key design strategy objectives and site-specific design principles in so far as they relate to landscape and visual amenity.

3.10.3 The reduction in the number of turbines from the consented eight to four has resulted in the avoidance or reduction of a number of potentially significant effects including noise. It is considered that the Proposed Development, as presented in Layout 5, is the optimal layout for the Site in order to retain a commercially viable scheme and which takes cognisance of the environmental constraints as far as reasonably possible. The Proposed Development will have an output capacity of 29.2 MW (including 10 MW of battery storage) compared to the consented 20 MW and will have a reduced land take of 0.59 ha. Despite the reduction in turbines now proposed but owing to their larger size, capacity and efficiency, it is estimated that the Proposed Development will achieve a 30% increase in the number of homes powered (approximately 24,200 compared to 18,600[9]) compared to the Consented Larbrax Wind Farm.

[9] Based on the latest Department for Energy Security and Net Zero (DESNZ) and Digest of UK Energy Statistics (DUKES) figures, which provide an average UK annual household electrical consumption of 3,239 KWh. Site specific wind data and modelling found that the consented proposal had a capacity factor of 34.4% and the revised proposal, with larger and more powerful turbines, has a capacity factor of 46.6%