Chapter 4 Project Development Description

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4 Proposed Development

4.1 Introduction

4.1.1 This chapter provides a description of the Site and the geographical context. It presents a description of the Proposed Development for which permission is being sought, for the purposes of informing the identification and assessment of likely significant environmental effects. This includes the anticipated construction and operation activities connected with the Proposed Development.

4.2 Site Status and Context

Background and Site Description

4.2.1 The Applicant is proposing revisions to the 2011 Permitted Development (planning reference 2011/224/PPF). The Proposed Development will replace the two unbuilt, previously permitted turbines with one turbine and a Battery Energy Storage System (BESS) with a total installed capacity of 19.9 MW.

4.2.2 The Proposed Development boundary covers an area of around 66 hectares (ha) and is located on land approximately 1.2 km north of Gremista, Lerwick on the Hill of Gremista (**Figure 1.1**).

4.2.3 The existing land use of the Proposed Development Site includes one operational wind turbine and access track, forming part of the 2011 Permitted Development. Otherwise, the primary land use is occasional rough grazing by sheep. There is industrial infrastructure in the surrounding vicinity, including the Dales Voe Base of Lerwick Port Authority to the west, and Germista Waste Management facility to the east.

4.2.4 The nearest residential properties are located at South Califf, on the opposite side of Dales Voe approximately 1.1 km west.

Environmental Designations

4.2.5 **Figure 4.1** shows sites with environmental designations within 10 km of the Proposed Development. Full descriptions of these are provided in the relevant technical chapters of the EIA Report.

4.2.6 The following designations are situated outwith the Site boundary but within 5 km (distances noted below are from the Site boundary to the designation at the nearest point):

- Special Protection Area (SPA): East Mainland Coast (~100 m northwest);
- Site of Special Scientific Interest (SSSI): Eater Rova Head (~910 m east);
- SSSI: Loch of Tingwall and Asta (~3.8 km southwest);
- Important Bird Areas: Moorland Areas (~3.9 km northwest), South Bressay (~4.8 km south east);
- 11 Scheduled Monuments;
- 127 Listed Buildings; and
- Gardie House Inventory Garden and Designed Landscape (~3.3km southeast).

The following designations are situated between 5 km and 10 km of the Site:

- National Scenic Area (NSA): Shetland (5.7 km west);
- Sites of Special Scientific Interest: Loch of Girlsta (~6 km north), South Whiteness (~6 km west), Noss (~6.5 km southeast) and Sandwater (9 km northwest);
- Special Protection Area: Noss (~6.5 km southeast);

- Important Bird Areas: Noss (~6.5 km southeast);
- National Nature Reserve: Noss (~6.5 km south east);
- 48 Scheduled Monuments; and
- Numerous Listed Buildings.

Other Relevant Developments within 10km

4.2.7 Schedule 4, Regulation 5 (e) of the EIA Regulations states that cumulative effects should be considered as a part of the EIA. It is therefore important to consider the cumulative effects of the Proposed Development in combination with other developments in the local area, including those that are currently operational, permitted and in planning. The cumulative assessment also considers the cumulative effects of different elements of the Proposed Development on environmental media and sensitive receptors, and in particular, the cumulative effects upon individual and groups of receptors.

4.2.8 For those cumulative developments which have been permitted and which have within their respective cumulative assessments considered the previously permitted 2011 development, the cumulative assessment includes consideration of the change in impact from this permitted, cumulative baseline.

4.2.9 Cumulative wind farm developments within 10 km of the Site are illustrated in **Figure 4.2** and listed in **Table 4.1**.

Table 4.1 Cumulative Wind Farm Developments

Site Name	Status	Number of Turbines	Height to Blade Tip	Distance and Direction from the Site
Gremista (operational turbine)	Operational	1	121 m	Adjacent (within Site boundary)
Mossy Hill	Planning Permission Granted	12	145 m	1.4 km south-west
Hoo Field	Part-built, Planning Permission Granted	2	77 m	1.7 km south
Burradale	Operational	5	70 m	3.8 km south-west
Viking	Under Construction	103	155 m	10 km north-west

4.3 Description of the Development

4.3.1 The final Proposed Development layout is illustrated in **Figure 1.2** and comprises one three-blade horizontal axis turbine with a blade tip height of up to 149.9 m and a battery energy storage system (BESS) with a maximum installed capacity up to 19.9 MW. The Proposed Development will include the following associated infrastructure:

- Turbine and turbine foundation;
- Crane hardstanding;
- Site access and tracks connected to the existing infrastructure of the operational turbine;
- Up to 12 Battery storage containers and Power Control Units (PCUs); and
- Switchgear, substation and communications buildings.

Micro-siting

4.3.2 Whilst the location of the infrastructure described above has been determined through an iterative environmental based design process, there is the potential for these exact locations to be altered through micro-siting allowances prior to construction. A micro-siting allowance of up to 50 m in all directions is being sought in respect of the turbine and associated site infrastructure in order to address any potential difficulties which may arise in the event that pre-construction surveys identify unsuitable ground conditions or unforeseen environmental constraints that could be avoided by relocation.

4.3.3 No micro-siting will be undertaken that results in an increase in the significance of adverse effects. It is proposed that the final positioning will be addressed through an appropriately worded planning condition.

4.3.4 The assessments within this EIA Report have included the considerations of this 50 m micro-siting and it does not alter the conclusions formed as to worst case effects.

Turbines and Turbine Foundations

4.3.5 The Proposed Development will comprise the construction and operation of one turbine with a maximum ground to blade tip height of 149.9 m, battery energy storage system units, site access tracks and associated infrastructure. The combined installed capacity of the proposed generating station would be 19.9 MW (5MW wind turbine and 14.9 MW BESS).

4.3.6 The specific turbine manufacturer and model has not yet been selected as this will be subject to a pre-commencement tendering exercise and will be confirmed post consent. Therefore, for the purposes of the EIA, the maximum turbine dimension and operational attributes have been established as the development scenario.

4.3.7 The turbine parameters for the Proposed Development will be one turbine with a maximum overall height (to blade tip) of 149.9 m and an indicative hub height of 82 m. The indicative rotor diameter will be 136 m.

4.3.8 These dimensions are indicative and final turbine dimensions will be determined based upon turbine availability and procurement prior to construction. The tip height of the chosen turbine will not exceed a blade tip height of 149.9 m.

4.3.9 The proposed final location of the turbine has been defined in order to enable the EIA Report to describe fully the Proposed Development for which permission is being sought. The British National Grid coordinates denoting the proposed turbine location is given in **Table 4.2.**

Table 4.2 Wind Turbine Coordinates

Turbine	X-Coordinate	Y-Coordinate
T1	446349	1145229

4.3.10 The turbine comprises the following components:

- Blades;
- Tower;
- Nacelle;
- Hub; and
- Transformer and switchgear.

4.3.11 The wind turbine will have a nacelle mounted on a tapered tubular steel tower. The nacelle will contain the gearbox or direct drive, the generator, the transformer and other associated equipment. The hub, and rotor assembly, including three blades, will be attached to the nacelle. The turbine will be of a typical modern, three-blade, horizontal axis design in semi-matt white or light grey with no external advertising or lettering except for statutory notices.

4.3.12 A full ground investigation will be completed prior to construction; however, typical foundations would comprise concrete and steel reinforcement. For the purposes of the EIA Report, it has been assumed that the turbine will have a typical gravity base foundation with an indicative diameter of approximately 20 m and 4 m in depth.

4.3.13 The area above the foundation will be backfilled up to the turbine with topsoil and seeded, with a native seed mix to encourage re-vegetation.

4.3.14 The final foundation design will be specific to the turbine selected and the site conditions as verified during detailed site investigations undertaken before construction commences. In the unlikely event that ground conditions are unsuitable for the standard foundation design described above, a piled foundation design may be required, involving the installation of a series of concrete piles, with each pile being bored or driven until the underlying bedrock is reached.

Crane Hardstanding

4.3.15 To enable the construction of the turbine, a crane hardstanding area and turning area at the turbine location will be required to accommodate the assembly crane and construction vehicles. This will comprise a crushed stone hardstanding area measuring approximately 80 m long by 40 m wide. The actual dimensions will be subject to the specifications required by the selected turbine manufacturer and crane operator and following detailed site investigations prior to construction commencing.

4.3.16 The crane hardstanding will remain in place during the lifetime of the Proposed Development to facilitate maintenance work.

4.3.17 Detailed construction drawings with final dimensions will be provided prior to commencement once the final turbine model has been selected.

Site Access Tracks and Site Tracks

4.3.18 The tracks will have a typical 5 m running width, wider on bends and at junctions.

4.3.19 It is proposed that there will be a micro-siting allowance of 50 m in all directions for all access tracks to allow for potentially unsuitable ground conditions or unforeseen environmental constraints identified by pre-construction surveys. It is proposed that the final positioning will be addressed through an appropriately worded condition.

4.3.20 As part of the 2011 Permitted Development a Transport Assessment was undertaken in support of the application. This Transport Assessment provides detail on access routes to the Site for construction vehicles and provides an estimate of trip generation during construction. The Transport Assessment includes a review of the proposed route, construction traffic impacts, and an abnormal load route review. Traffic and transport effects are discussed further in **Chapter 10**.

4.3.21 Prior to construction, any required improvements to public roads will be undertaken and appropriate highway safety measures will be agreed with Shetland Islands Council (SIC) and Transport Scotland, with necessary signage or traffic control measures implemented throughout the construction phase on the agreed basis.

Construction Compound

4.3.22 The Operational hardstanding for the operational turbine will be temporary utilised as a construction compound as shown in **Figure 1.2**. The ability to utilise the operational hardstanding removed the need to construct a new construction compound. The operational hardstanding would be utilised for constructing the wind turbine elements only.

Battery Energy Storage System

4.3.23 The Proposed Development will include up to 12 battery energy storage units which will contain batteries, inverters, transformers and control and safety equipment, housed in steel containers approximately 12 m in length by 3 m in width by 3 m in height. The type of battery technology is still to be determined. The installed capacity of the battery storage containers will be up to 14.9 MW. **Figure 4.4** shows the indicative BESS layout and elevations.

4.3.24 PCUs will be required, providing an interface between the Direct Current (DC) of the batteries and the Alternating Current (AC) of the electricity grid, and transformers similarly to interface between the lower voltages of the batteries and higher voltages of the grid. The PCUs will be approximately 6 m in length by 3 m width by 3 m in height.

4.3.25 The electrical power produced by the battery containers will be fed to an on-site substation via underground cables. The design of the substation will be agreed with SIC prior to construction. The electricity generated from the Proposed Development will be connected into the wider electricity network.

4.3.26 A control building and communication building will be required in order to house the electricity metering, switchgear and the main site transformers.

4.4 Construction

4.4.1 The Proposed Development will be constructed over a period of approximately 12 months, anticipated to commence in 2025. Construction would include the principal activities listed below:

- Mobilisation;
- Access & site tracks;
- Foundations;
- On-site cabling;
- Crane hardstandings;
- Installation of transformers, switchgear, buildings and battery units;
- Turbine erection; and
- Site reinstatement and commissioning.

4.4.2 Normal construction hours will be between 07:00 and 19:00 Monday to Friday and 09:00 and 13:00 on Saturdays. These times have been chosen to minimise disturbance to local residents. It must, however, be noted that out of necessity due to weather conditions and health and safety

requirements, some generally quiet activities, for example abnormal load deliveries (which are controlled by Police Scotland) and the lifting of the turbine components, may occur outside the specified hours stated. Any construction out with these hours, will be in line with the noise limits as assessed in **Chapter 9** and advance warning of any works out with the agreed working hours will be provided to SIC and local residents.

Summary of Development Areas

4.4.3 **Table 4.3** below summarises the approximate areas for which aggregate material will be required for each of the main infrastructure elements described in **Section 4.3**. The Transport Assessment in **Chapter 10** has been prepared on a "worst-case" basis that all construction aggregate will be imported to Site.

Table 4.3 Proposed Development Areas

Infrastructure	Area (m^2)
Site Tracks	3,730
Crane Hardstanding	2,700
BESS	2,020

Construction Materials

4.4.4 The main materials likely to be required in part or total for the construction of the track and turbine foundations, and hardstanding areas are described below:

- Crushed stone;
- Geotextile;
- Cement;
- Sand;
- Concrete;
- Steel reinforcement;
- Electrical cable; and
- Timber – plus other material for a control building.

4.4.5 Necessary excavations will be made, initially by stripping back the soil from the area to be excavated. This soil will typically be stored separately either in a mound adjacent to the excavation area for backfill, if required, or stored at a designated area onsite for further use or reinstatement of temporary works areas. The handling of soils will be undertaken in accordance with best practice techniques.

4.4.6 Should surface water run-off or groundwater enter the excavation during construction of the turbine foundations, appropriate pumping measures away from watercourses will be implemented to ensure the works are safely carried out and the excavation is sufficiently dry to allow concrete placement. Once the concrete is cast, the excavated material will be used for backfill and compacted to the required design density. Once this backfill is completed, the crane hardstanding area will be constructed.

4.4.7 The proposed method for constructing the turbine is as follows. The turbine will be erected using a large mobile crane or crawler crane, positioned on the hardstanding adjacent to the turbine base. A smaller tail crane will be positioned adjacent to the delivery position of the turbine components.

The two cranes will lift the tower sections and blades into their assembly positions, and the main crane will lift the tower sections, nacelle and blades into their operational positions.

4.4.8 As soon as practical, once installation is complete, the immediate construction area will be restored to its original profile, although the crane hardstanding will be retained for future maintenance. The soils will be replaced and reseeded where appropriate and as advised by an onsite Environmental Clerk of Works (ECoW). Any surplus soils will be used to restore track edges after construction. This progressive reinstatement has been found to assist with re-establishment of the local habitats as it minimises the time soils are in storage.

4.5 Environmental Management

Construction Environmental Management Plan (CEMP)

4.5.1 As part of the construction contract, the contractor responsible for undertaking the construction and/or decommissioning works (the Contractor) shall sign up to produce, and adhere to, a CEMP (**Appendix 4.1** of the EIA Report). The CEMP shall be developed in accordance with 'Good Practice During Wind Farm Construction' (Scottish Government et al., 2019).

4.5.2 The CEMP (**Appendix 4.**1) shall describe how the Applicant will ensure suitable management of, but not limited to, the following environmental issues during construction of the Proposed Development:

- noise and vibration;
- dust and air pollution;
- surface and ground water quality and quantity;
- ecology (including protection of habitats and species);
- agriculture (including protection of livestock and land);
- cultural heritage;
- waste (construction and domestic);
- pollution incidence response (for both land and water); and
- Site operations (including maintenance of the construction compound, working hours and safety of the public).

Battery Fire Safety Management Plan

4.5.3 An appropriate outline fire safety management and response plan will be provided and agreed with SIC prior to installation. This will also be included as part of the Operational Environmental Management Plan (OEMP) for the Proposed Development and will be subject to the final technology chosen. An Outline Battery Safety Statement is provided as **Appendix 4.2**.

Pollution Prevention & Health & Safety

4.5.4 Prior to commencement of construction activities, a pollution prevention strategy, contained within a CEMP, will be agreed with the Scottish Environment Protection Agency (SEPA) to ensure that appropriate measures are put in place to protect watercourses and the surrounding environment.

4.5.5 As with any development, during the construction stage there is the potential for threats to the quality of the water environment in waterbodies, watercourses and local ditches. These mostly arise from poor site practice so careful attention will be paid to the appropriate guidance and policies to reduce the potential for these to occur.

4.5.6 Any fuel or oil held onsite will only be of an amount sufficient for the plant required. This will be stored in a bunded area to prevent pollution in the event of a spillage. There will be no long-term storage of lubricants or petrochemical products onsite at the Proposed Development.

4.5.7 High standards of health and safety will be established and maintained. At all times, all activities will be undertaken in a manner compliant with applicable health and safety legislation and with relevant good practice, as defined under applicable statutory approved codes of practice and guidance.

4.5.8 Further details of site-specific storage and management of fuel and oil and protection of watercourses during construction are presented in **Chapter 11** of this EIA Report.

Traffic & Transportation

4.5.9 A detailed Transport Assessment has been undertaken which provides details regarding transport and access to the site (refer to **Chapter 10**).

4.5.10 Traffic associated with the construction and maintenance of the Proposed Development falls into two main categories, namely Abnormal Indivisible Loads (AIL) and Construction/Maintenance Loads. The abnormal loads are those that will require an escort, either by private contractor or by police escort. Construction/maintenance loads are those that do not require any special escort or permissions and are only influenced by normal traffic regulations.

4.5.11 The Applicant will ensure that the vehicles will be routed as agreed with SIC, Transport Scotland and Police Scotland, to minimise disruption and disturbance to local residents and road users. Further details regarding transport and access can be found in **Chapter 10** of this EIA Report.

Pre-construction Surveys

4.5.12 Detailed surveys have informed the design process of the Proposed Development. However, certain design elements are dependent on turbine model and manufacturer, therefore detailed construction details will be decided once the turbine has been selected.

4.5.13 Pre-construction surveys will be undertaken to update the ecological and ornithological baseline and to perform detailed geotechnical ground surveys, further details of these are provided in the relevant technical chapters.

4.5.14 The Applicant will engage an ECoW and Archaeological Clerk of Works (ACoW) on-site during the construction phase. The ECoW and ACoW be responsible for preconstruction surveys and will monitor the construction process onsite to provide advice and ensure that the measures within the CEMP are followed.

4.6 Operation and Maintenance

4.6.1 The lifetime of the Proposed Development is envisaged to be 25 years from the final commissioning to commencement of decommissioning.

4.6.2 The Proposed Development would be maintained throughout its operational life by a service team. The service team would comprise operation management, operations technicians and support functions undertaking the scheduled and unscheduled maintenance throughout the year. This team would either be employed directly by the developer or by the turbine manufacturer. Management of the turbine would typically include turbine maintenance, health and safety inspections and civil maintenance of tracks, drainage and buildings. Turbine maintenance includes the following:

- Civil maintenance of tracks and drainage;
- Scheduled routine maintenance and servicing;
- Unplanned maintenance or call outs;
- HV and electrical maintenance; and
- Blade inspections.

4.6.3 In the unlikely event that a major turbine component requires replacement, vehicles will use the new access tracks and crane pad, which will be retained during the operational phase to allow access.

Battery Energy Storage System

4.6.4 The specific BESS installed will have suitable fire suppression system and will be compliant with UL9540A standard which tests the fire safety hazards associated with propagating thermal runaway within battery systems in both cell module and rack level.

4.6.5 The BESS layout will be compliant with NFPA855 in particular with regards to the layout of battery containers and associated equipment to ensure the lowest possible risk of fire propagation in the unlikely event that this should occur.

4.6.6 There are various ways in which the fire risk is managed such as the software and hardware fail safes and fire suppression systems. The temperature is monitored within each battery storage container through the monitoring system; if the temperature increases above the optimum conditions the cooling systems would activate in order to regulate the temperature. The specific monitoring system is dependent on the specific BESS installed.

4.6.7 An Outline Battery Safety Statement is provided as **Appendix 4.2**.

Operation Environmental Management Plan

4.6.8 The Applicant will implement an Operation Environmental Management Plan (OEMP). Similar to the CEMP, the OEMP will set out the mitigation measures proposed in the EIA Report and how the Applicant will manage and monitor environmental effects throughout the operation of the Proposed Development. The OEMP will also be developed in consultation with SIC, SEPA, NatureScot and Historic Environment Scotland (HES) where relevant.

4.7 Decommissioning

4.7.1 At the end of the Proposed Development's operational lifespan of 25 years, it will be decommissioned, unless further consents are sought. It is expected that decommissioning will take approximately 12 months. The environmental effects of decommissioning are considered to be similar to those during construction, excluding the loss of habitat which will have already occurred under construction.

4.7.2 Prior to decommissioning, a Decommissioning Environmental Management Plan (DEMP) will be produced to reflect the current legislation and policy and will be agreed with the relevant statutory authorities.

4.7.3 During decommissioning, vehicles will access the Site by the same route used for delivery and construction of the Proposed Development.

4.7.4 It is anticipated that certain components of the turbines will be dismantled and removed from Site for disposal and/or recycling as appropriate and in accordance with regulations in place at the time. It is proposed to leave the buried portion of the foundations of the turbine in situ on decommissioning. This is considered to have less impact on the hydrological system which will have established itself during the lifetime of the wind farm than complete removal of the foundations.

4.8 Climate Change & Carbon Considerations

4.8.1 Increasing atmospheric concentrations of greenhouse gases (GHGs), including carbon dioxide (CO_2) (also referred to as carbon emissions) are resulting in climate change. A major contributor to this increase in GHG emissions is the burning of fossil fuels. With concern growing over climate change, reducing its cause is of utmost importance. The replacement of traditional fossil fuel power generation with renewable energy sources provides high potential for the reduction of GHG emissions. This is reflected in UK and Scottish Government climate change and renewable energy policy and commitments.

Energy Generation

4.8.2 Whilst the Proposed Development will reduce carbon emissions by replacing the need to burn fossil fuels for power, carbon emissions will result from the component manufacturing, transportation and installation processes associated with the Proposed Development. There is also the potential for carbon fixers and sinks to be lost through the clearing of vegetation and excavation of peat during construction. There must, therefore, be a sufficient balance between the carbon reduction associated with renewable energy development and that which is produced through construction/ fabrication processes and lost through site preparation.

4.8.3 The electrical installed capacity from the wind turbine generator within the Proposed Development is currently estimated to be 5 MW, with the exact capacity depending on the model and type of turbine selected. Based on an estimated load factor which has been informed by records from the operational turbine on the Site, it is expected that the Proposed Development could generate around 22.8 GWh per year[1] (depending on the turbine selected).

4.8.4 Based on the average electricity consumption per Scottish household of 3.925 MWh/year (BEIS, 2022) and assuming generation of 22.8 GWh annually, the Proposed Development would generate enough power to supply approximately 6,900 average Scottish households.

4.8.5 Although future wind yields cannot be guaranteed, if the Proposed Development continued to generate, on average, at this load factor over its proposed 25 year lifespan, it is expected that a total of approximately 569 GWh of renewable energy could be generated.

Carbon Emissions Savings

4.8.6 A technical review of energy displacement by the UK Energy Research Centre (UKERC) considered over two hundred studies and papers from all round the world for the UK Government and concluded that "*it is unambiguously the case that wind energy can displace fossil fuel-based generation, reducing both fuel use and carbon dioxide emissions*" (UKERC, 2006).

4.8.7 Whilst the wind turbine will reduce carbon emissions by replacing the need to burn fossil fuels for power, as noted above there is the potential for carbon losses and generation through site preparation and development.

4.8.8 The Scottish Government's online Carbon Calculator Tool is regularly used for large-scale proposed developments of over 50 MW capacity. Although not required for smaller projects such as the Proposed Development, it can still be a useful tool to provide a high-level indication of the expected total carbon dioxide losses, from manufacture of the turbine, construction, decommissioning, and carbon sink losses, also taking account of gains due to habitat restoration. The Carbon Calculator Tool has been completed for the Proposed Development, with input parameters based on the proposed site design, infrastructure dimensions, results from peat depth surveys, and other information gained from site survey work, desk study and, where applicable, assumptions relating to groundwater, drainage, and habitat regeneration.

4.8.9 Scottish Government guidance on wind farm carbon savings (Scottish Government, 2018), states: "*carbon emission savings from wind farms should be calculated using the fossil fuel sourced grid mix as the counterfactual, rather than the grid mix*." The output from the Carbon Calculator indicates the expected CO_2 emission savings delivered by the Proposed Development, when compared with the fossil fuel mix, is 9,839 tonnes of carbon dioxide per year. This equates to a total of approximately 246,000 tonnes over the 25-year operational lifetime of the Proposed Development, through displacement of carbon-emitting generation.

4.8.10 The expected carbon payback time of the Proposed Development is 0.7 years. This is the period of time for which a wind farm needs to be in operation before it has, by displacing generation from fossil-fuelled power stations, avoided as much carbon dioxide as was released in its lifecycle.

[1] *Calculated from 5 MW x 8760 (number of hours per year) x 52% (Applicant own capacity factor).*

4.9 Summary

4.9.1 This chapter has provided a description of the Site and the surrounding area, alongside details of the Proposed Development and a summary of the associated infrastructure. A description of the likely activities to occur during the construction, operation and decommissioning phases is also provided, together with information on the expected renewable energy generation and carbon savings resulting from the Proposed Development

4.10 References

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