4 DEVELOPMENT DESCRIPTION

4.1 INTRODUCTION

This Chapter provides a description of the proposed Ackron Wind Farm (the Development). The application for Planning Permission is for a wind energy development comprising of the construction, 30-year operation and subsequent decommissioning of up to 12 turbines; together with on-site access tracks, hardstanding areas, met-mast, a substation and control building compound, and on-site underground cabling. During construction, a temporary construction compound will be required which will house a site office and welfare facilities.

This Chapter includes an overview of the Development followed by a detailed description of the main components and their method of construction. Measures that have been built into the design of the Development to reduce effects, also known as 'embedded' mitigation measures, are set out in the previous chapter (**Chapter 3: Site Selection and Design**) and in this chapter. In addition to these embedded mitigation measures, **Chapters 6** to **16** present mitigation and enhancement measures where specifically relevant to their assessment topic.

This Chapter of the Environmental Impact Assessment (EIA) Report is supported by the following figures provided in Volume 2a Figures excluding Landscape and Visual:

- Figure 4.1: Site Layout Plan;
- Figure 4.2: Indicative Turbine Elevations;
- Figure 4.3: Indicative Foundation Design;
- Figure 4.4: Indicative Crane Hardstanding;
- Figure 4.5: Indicative Access Track;
- Figure 4.6: Typical Culvert Details;
- Figure 4.7: Indicative Control Building Compound;
- Figure 4.8: Indicative Control Building Elevation;
- Figure 4.9: Indicative Cable Trench;
- Figure 4.10: Access Junction Arrangement;
- Figure 4.11: Indicative Meteorological Mast Details;
- Figure 4.12: Indicative Construction Compound;
- Figure 4.13: Borrow Pit 1; and
- Figure 4.14: Borrow Pit 2.

This Chapter of the EIA Report is supported by the following Technical Appendix documents provided in Volume 3 Technical Appendices:

- A4.1: Construction Environmental Management Plan (CEMP); and
- A4.2: Borrow Pit Assessment.

4.2 OVERVIEW OF THE DEVELOPMENT

The Development is described in the Application Form as *"a proposed wind farm with up to 12 turbines on land 1575 m NE of Ackron Farm, Golval, Forsinard"*. For the purposes of conditions to be imposed on any permission granted, the Development will comprise up to 12 three-bladed horizontal axis turbines with a maximum tip height of 149.9 metres (m). The total installed capacity would be up to 49.9 megawatts (MW). The main components of the Development are as follows:

- Up to 12 three-bladed turbines with a maximum tip height of 149.9 m including external transformers (if required);
- Associated foundations, blade laydown areas and crane hardstandings at each wind turbine location;

- Access tracks linking the turbine locations;
- Substation compound incorporating electrical switchgear and wind farm control elements;
- Temporary construction compound;
- Network of underground cabling running adjacent to the access tracks where possible;
- A permanent anemometry mast (up to 92 m);
- Up to two borrow pits; and
- New site access off the A897.

The components of the Development are shown in Figure 4.1.

During the construction period, it is estimated that approximate land take of 16 ha will be required, which includes all temporary and permanent infrastructure. This area includes additional areas beyond the components and infrastructure that would be disturbed by associated earthworks. These areas would be reinstated throughout construction and post-construction. It is estimated that the permanent footprint of the Development following completion of construction will be approximately 7.5 ha.

The Development will require the felling of approximately 1.1 ha of woodland land grant to accommodate the laydown area for T2. This would be replanted onsite or compensated via habitat restoration.

4.3 DEVELOPMENT LAYOUT

The layout of the Development is shown in Figure 4.1. Table 4.1 specifies the indicative national grid references of the proposed turbines; the turbines will be subject to a micro-siting allowance to allow flexibility for encountering unknown ground constraints during pre-construction and construction.

Table 4.1: Wind Turbine Approximate Grid References

Turbine No.	Easting	Northing
1	291530	962830
2	290904	962411
3	291631	962462
4	291239	962200
5	291727	962074
6	291610	961671
7	291253	961752
8	291080	963294
9	291027	962857
10	291993	962898
11	291411	963226
12	292238	962643

Figure 4.1 also shows the location of the ancillary infrastructure necessary for the Development. In summary, the associated elements of the Development, separate to the turbines, hardstanding and access tracks, are to be located at the following approximate locations:

- Temporary construction compound at approximate National Grid Reference (NGR) 289879, 962841;
- Substation and control building at approximate NGR 290428, 962958; and
- Permanent meteorological mast at approximate NGR 291000, 962139.

4.4 MICRO-SITING

Current knowledge of the ground conditions at the Site is based on desk top studies and preliminary site investigations. These would be verified post-consent by intrusive pre-construction ground investigations which may result in minor adjustments to turbine and ancillary infrastructure locations due to environmental or technical constraints.

For this reason, a 50 m micro-siting allowance has been included around the proposed turbines and ancillary infrastructure. Turbines and associated infrastructure would not be micro-sited into deeper peat or closer to watercourses except with prior agreement from the Scottish Environment Protection Agency (SEPA).

The micro-siting allowances are considered and assessed throughout the technical and environmental chapters (**Chapters 6 - 16**) completed as part of the EIA for the Development.

4.5 DESCRIPTION OF THE WIND FARM ELEMENTS

4.5.1 Wind Turbines

Consent is being sought for the erection of up to 12 three-bladed horizontal axis wind turbines with a maximum height from base to tip that will not exceed 149.9 m. A diagram of a typical wind turbine with a tip height of up to 149.9 m is shown in Figure 4.2. Figure 4.2 shows a typical horizontal axis wind turbine comprising four main components: a rotor (consisting of a hub and three blades), a nacelle (containing the generator and gearbox) to which the rotor is mounted, a tower, and a foundation. The blades will be made of fiberglass reinforced epoxy and mounted on a tapered tubular steel tower. The turbines will be light grey in colour and the finish of the tower and blades will be semi-gloss and semi-matt respectively.

The specific turbine is dependent on the final choice of turbine models available at the time of procurement and will be chosen with the aim of optimising renewable energy generation at the Site. However, the chosen turbines will have a maximum blade tip height of no more than 149.9 m as this is the upper limit of the environmental and planning parameters considered in the EIA.

The wind turbines would convert the kinetic energy of the wind into electrical energy, the air passing over the blades causing them to rotate. This low speed rotational motion of the blades is converted into electrical energy using a generator located inside the nacelle.

A transformer then steps up the voltage to 33 kilovolts (kV) which is then fed into the control building via underground electrical cabling linking all of the turbine unit transformers. The turbine transformers are expected to be located within the nacelle or tower of the turbine; however, if required due to the turbine model selected for installation on-site, the transformers may be located immediately adjacent to each turbine in a small kiosk, typically 1.5 m x 1.5 m x 3.0 m.

Turbines are typically of a variable speed type, so that turbine rotor speed will vary according to the energy available in the wind. Turbines of the dimensions proposed typically have rotational speeds of between 6 and 14 revolutions per minute (rpm), depending on variations in wind speed, generating power for all wind speeds between 3 and 25 metres per second (m/s). At speeds greater than 25 m/s, the turbine reduces power output by pitching the blades out of the wind to protect the turbine from damage caused by high wind speeds. These very high wind conditions usually prevail for less than 1% of the year.

All turbines are controlled by a sophisticated Supervisory Control and Data Acquisition (SCADA) system, which would gather data from all the turbines in order to control them from a central remote location. Communications cables connecting to each turbine would be buried in the electrical cable trenches to facilitate this.

In the case of any fault, such as over-speed of the blades, overpower production, or loss of grid connection, the turbines shut down automatically through braking mechanisms. They are also fitted with vibration sensors so that, if, in the unlikely event a blade is damaged, the turbines would automatically shut down.

Turbines, as with any tall structure, can be susceptible to lightning strike and appropriate measures are included in the turbine design to conduct lightning strike down to earth and minimise the risk of damage to it. In the case of a lightning strike on a turbine or blade the turbine would automatically shut down.

In cold weather, ice can build up on blade surfaces when operating. The turbines can continue to operate with a thin accumulation of snow or ice, but would shut down automatically when there is a sufficient build up to cause aerodynamic or physical imbalance of the rotor assembly.

During the construction phase, heavy lifting cranes will be used to install the wind turbines. The crane type would be confirmed when the specific turbine type has been selected. The construction contractors would determine the actual cranes used, together with the exact programme and number of teams on-site.

The method for erecting each turbine would depend on the turbine supplier and site conditions. Turbine components would either be lifted directly off transportation units for erection or more typically stored adjacent to the crane hardstanding area. The tower sections are initially erected, followed by the nacelle and then the hub depending on the blade installation. The turbine blades would then be lifted individually and attached to the hub or if sufficient space is available would be attached to the hub at ground level then raised together and attached to the nacelle. The overall assembly process for each turbine takes approximately two to four days, depending on weather conditions.

4.5.2 Wind Turbine Foundations

The wind turbines would be installed on foundations of stone and concrete. A diagram of a typical wind turbine foundation is shown in Figure 4.3.

Construction of turbine foundations would involve the excavation to expose the underlying load bearing strata or bedrock. Topsoil and other vegetation removed will be laid on the surrounding undisturbed ground until required for reinstatement.

The load bearing strata or bedrock would be levelled off and blinded prior to the in-situ casting of the steel-reinforced concrete slab that would be approximately 20 m in diameter. The depth of the excavation would be approximately 3 - 4 m, and depending on the depth of the load bearing strata or bedrock, the sides would be battered back to ensure that they remain stable during construction. Each foundation is expected to be made up from approximately 500 m^3 of concrete, equating to 8,000 m^3 for all turbine foundations.

On top of the slab, a concrete up-stand would then be cast, to which the turbine tower would later be bolted. The excavated area would be backfilled with compacted layers of graded material from the original excavation and capped with topsoil. The exact details of each foundation would vary across the Site in response to the actual ground conditions encountered. A detailed ground investigation would be undertaken prior to construction to establish the requirement at each foundation.

Whilst the foundation excavation is open (typically for 1 to 2 months) it would need to be kept free of water to allow construction of the reinforced concrete base. Water ingress would potentially be from ground (from exposed faces), surface, and rain water. The foundation excavation would be designed to be gravity draining where local topographical conditions allow. If this is not possible, the excavation would be dewatered by pumping. The discharges from dewatering operations would be subject to a method statement agreed with an on-site Environmental Clerk of Works (ECoW) and SEPA. Where necessary, settling ponds, filter treatment facilities, and buffer strips would be installed to remove sediment from pumped water. No water from foundation dewatering operations would be discharged directly into a watercourse.

4.5.3 Crane Hardstanding

Each wind turbine requires an area of hardstanding to be built adjacent to the turbine foundation. Each crane hardstanding will be approximately 45 m x 35 m, as shown in Figure 4.4. A soft, levelled area is also required adjacent to the hardstanding for the assembly of turbine components. The hardstanding will provide a stable base on which to lay down turbine components for assembly, erection, and to lift the tower sections, nacelle and rotor into place.

Topsoil and peat would be removed from the area of the crane pad and either laid at the margin but within the disturbed area or preferably, transferred directly to the areas to be restored. The area would then be covered by geo-grid overlain with compacted stone up to approximately 1,000 millimetres (mm) depth, dependent on ground conditions and load capacity.

The crane hardstanding would be left in place following construction in order to allow for the use of similar plant should major components need replacing during the operation of the wind farm. These could also be utilised during decommissioning at the end of the wind farm's life.

4.5.4 On-Site Access Tracks

A total of approximately 7,260 m of on-site access tracks would be required for the Development. It is anticipated that approximately 6,550 m of new access track including turning heads, and approximately 500 m of existing upgraded track is required. Floating tracks will be utilised on-site; however, where peat is shallow and design levels permit, the tracks will be rock fill. Table 4.2 summarises track requirements on-site and dimensions.

Table 4.2: On-Site Track Composition

Design	Approximate Length	Approximate Dimensions - Width x Depth
Rock Filled Track (or upgrade to existing tracks)	7,050 m	6.0 m x 1.0 m
Floating Tack	210 m	6.0 m x 1.5 m

The proposed alignment of access tracks, developed through an iterative process based on the digital terrain model and site surveys, has sought to:

- Minimise the overall track length;
- Minimise the variation of the vertical alignment of the tracks;
- Minimise the number of dead ends/spurs within the layout; and
- Avoid or minimise incursion into identified constraints, such as watercourses, areas of deeper and potentially unstable peat, priority habitats, and steep slopes.

The location of the on-site access tracks is shown in Figure 4.1 with indicative access track shown in Figure 4.5.

Owing to the size of some of the turbine components, all floating access tracks would be a minimum of 6.0 m wide include verges and earthworks. Floating tracks will be approximately 1 m deep, as shown in Figure 4 of Technical Appendix A13.2: outline Peat Management Plan (oPMP). Temporary passing places would also be provided as required along with turning heads to facilitate traffic movements. The new and upgraded tracks will be unpaved and formed of crushed rock sourced onsite, where possible. The design of a particular length of site track would depend on local geological, topographical and drainage conditions.

4.5.5 Track Drainage

The need for drainage on the access track network would be considered for all parts of the track network separately, since slope and wetness vary considerably across the Site. In flat areas, drainage of floating tracks is not required (majority of tracks on-site), as it can be assumed that rainfall on to the road would infiltrate to the ground beneath the tracks or along the verges. Track-side drainage would be avoided, where possible, in order to prevent any local reductions in the water table or influences on the tracks structure and compression (the latter can occur where a lower water table reduces the ability of the peat to bear weight, increasing compression).

Where tracks are to be placed on slopes (very gradual slope over the Site), lateral drainage would be installed on the upslope side of the track. The length of drains would be minimised, to prevent either pooling on the upslope side or, at the other extreme, creating long flow paths along which rapid and concentrated runoff could occur. Regular cross-drains would be required to allow flow to pass across the track (as recommended in SEPA's guidance[1]), with a preference for subsequent re-infiltration on the downslope side, rather than direct discharge to the drainage network.

Drainage Ditches along Excavated Tracks

Excavated tracks cut off the natural drainage across the Site; therefore, drainage ditches would be required. It is anticipated that at times the water in the ditches may contain high concentrations of sediment from excavations and track construction as well as possible accidental pollutants from construction activities; therefore, no water from a drainage ditch would be discharged directly to a watercourse. Instead it would pass through a sand filter, filter strip, silt trap or other best practice pollution control feature. Drains would not be ended directly into natural channels, ephemeral streams or old ditches.

The ditch design would be considered in line with the recommendations of the Forestry Civil Engineering (FCE) and NatureScot[2] guidance[3], including the use of flat-bottomed ditches to reduce the depth of disturbance.

In instances of drainage close to surface watercourses, discharge from the drainage may be to surface water rather than re-infiltration. In these situations, best practice control measures including sediment settlement would be undertaken before the water is discharged into surface water systems. The discharges would be small and collected from only a limited area, rather than draining a large area to the same location.

Although drainage would be provided in areas of disturbance as required, areas of hardstanding would be minimised so that this need is reduced. This includes careful

[1] Scottish Renewables, SNH, SEPA, FCS, HES (2015) Version 3 of the Good Practice During Wind Farm Construction [Online] Available at: https://www.nature.scot/sites/default/files/2018-08/Guidance%20-%20Good%20Practice%20during%20wind%20farm%20construction.pdf (Accessed 7/8/2020)
[2] Scottish Natural Heritage (SNH) rebranded in August 2020 as NatureScot. Where relevant reference is still made to SNH within this chapter in respect of guidance which remains valid and is yet to be republished etc.
[3] SNH (2010) Floating Roads on Peat [Online] Available at: http://www.roadex.org/wp-content/uploads/2014/01/FCE-SNH-Floating-Roads-on-Peat-report.pdf (Accessed 7/8/2020)

design of construction compounds and minimising the size of crane pads at each turbine location.

Check Dams

Check dams (small dams built across channels or ditches) may be required at regular intervals in the drainage ditches alongside an excavated track. They are required for two principal reasons: firstly, they act as a silt/pollution trap slowing the flow of water so allowing sediment to settle out, and secondly, they help to direct water into the cross drains and allow natural drainage paths to be maintained as much as possible. The spacing of the check dams would depend on the following factors:

- Gradient of the track;
- Spacing of cross-drains; and
- Depth of excavation.

Interface between Different Types of Drainage

Where the track construction method changes, the drainage methods would also change. If this results in an end point for a drainage ditch, the ditch would be piped across the road and allowed to discharge to land on the down side of the slope taking into account the precautions against peat instability, pollution and erosion discussed later in this chapter.

As discussed above, the alignment of the on-site tracks has already been subject to initial review and rerouting to respond to identifiable constraints. The final decision on alignment and on the appropriate type of access track design to adopt for a particular length of track would be made by a team of engineers, geologists, and the ECoW, in advance of construction and giving enough time to produce method statements and define working areas for discussion with SEPA prior to construction.

Construction timing and design of access tracks can strongly influence the potential for effects on the freshwater environment. Construction during wetter periods of the year poses a significantly greater risk of causing erosion and siltation, which can be particularly severe following major rainfall or snowmelt events. Whilst there is no proposal to restrict construction during such periods, the awareness of the increased potential for effects to arise following precipitation would be captured within the Construction Environmental Management Plan (CEMP). A CEMP is provided in Appendix A4.1.

4.5.6 Watercourse Crossing

Whilst every attempt has been made to avoid watercourse crossings, due to the characteristics of the Site, it has been necessary for the on-site access tracks to cross a local watercourse to reach the proposed wind turbine locations. One new watercourse crossing is included in the project design; as shown in Figure 12.4. The indicative culvert design is outlined on Figure 4.6 with detailed design carried out prior to the construction phase in line with good practice and in agreement with SEPA.

4.5.7 Substation Compound including Control Building

The electricity substation compound would comprise a fenced hardstanding with maximum dimensions of approximately 100 m x 50 m, which would contain electrical equipment and a single storey control building measuring approximately 16.5 m x 11.5 m. The control buildings would house switchgear, metering, protection and control equipment as well as welfare facilities. Figures 4.7 and 4.8 show the substation compound and control buildings. The proposed location of the compound control building and main site compound is shown in Figure 4.1.

The area for the substation compound would be prepared by removing the topsoil and subsoil down to competent bearing strata, and concrete foundations would be required to take the weight of the components. An electrical earth network would be buried around the building.

The underground cables from the wind turbines would be brought into the substation compound in ducts. The ducts would guide the cables to the appropriate switchgear inside the building. Communications cables would enter in a similar manner.

No welfare facilities (toilets and drying rooms) are proposed to be included in the substation compound; however, if required, provisions for sealed waste and storage will be required. Welfare facilities would be installed as required by the Construction (Design and Management) Regulations 2015[4].

4.5.8 Electrical Connections On-Site

Underground cables would link the turbines to the on-site control building and substation. Detailed construction and trenching specifications would depend on the ground conditions encountered at the time, but typically cables would be laid in a trench approximately 1.5 m deep and 1.5 m wide. To minimise ground disturbance, cables would be routed alongside the access tracks wherever practicable and, if not, the total footprint of construction activity would be stated within the Construction Methods Statement. Figure 4.9 shows a typical cable trench detail. The method of installation would be selected to have minimum disturbance to the peat at the time of installation and afterwards.

The following methods would be used where appropriate:

- Burial in ducts across the tracks;
- Burial in trenches; and
- Ploughing.

Any excavations for trenches would be cordoned off and marked clearly. Cable hauling operations would be coordinated with traffic movements, especially when hauling is being carried out from the roadway. Cable off-cuts and waste from terminations would be systematically collected, stored, and recycled or disposed of properly.

4.5.9 Concrete

The majority of the concrete used on-site is required for turbine foundations with additional material for the substation, met mast foundation, and control building foundations, as detailed in Table 4.3.

Table 4.3: Approximate Volume of Concrete

Infrastructure	Approximate Volume of Concrete
12 Wind Turbine Foundations	8,000 m^3
Substation/Control Building Foundation	1,250 m^3
Total Approximate Concrete Volume	9,250 m^3

Concrete may be sourced from local concrete suppliers or processed at an on-site concrete batching plant.

4.5.9.1 Site Access and Entrance

Due to the abnormal size and loading of wind turbine delivery vehicles, it is necessary to review the public highways that would provide access to the Site to ensure they are suitable and to identify any modifications required to facilitate access.

[4] UK Government (2015) the Construction (Design and Management) Regulation 2015 [Online] Available at: http://www.legislation.gov.uk/uksi/2015/51/contents/made (Accessed 7/8/2020)

A preliminary transport access study is included in Appendix A12.1 utilising the port of entry at Scrabster Harbour. The Site will be accessed via the A836 and A897 with a new junction from the A897, as shown in Figure 4.10.

The following potential abnormal loads delivery route has been identified:

- Port of entry to be Scrabster Harbour (port is a proven turbine component delivery point);
- Proceed southbound on A9 towards Burnside;
- Turn right onto A836;
- Proceed westward on the A836 for approximately 14.9 miles;
- Turn left onto A897;
- Proceed south on the A897 for approximately 200 m (0.12 miles);
- Leave A897 turning left into Site access junction.

Ackron Wind Farm Ltd (the Applicant)'s preferred port of entry would be Scrabster Harbour which is considered suitable of accommodating turbine component delivery. As the turbine delivery vehicles are abnormal indivisible loads, a Special Order is required under the Road Vehicles (Authorisation of Special Types) (General) Order 2003[5].

The detailed off-site access requirements would be confirmed with Transport Scotland and the Council's Highway Department once the exact requirements are established. A Traffic Management Plan would also be put in place to ensure safe operation, and this would also be established in conjunction with the aforementioned authorities.

A detailed drawing of the access junction into the Site is shown in Figure 4.10. An upgraded site entrance is required consisting of a bellmouth junction for traffic to entre and egress the Site to the west. The entrance point has been designed to maximise the sight lines for vehicular movements entering and leaving the Site. The final design will be agreed with the Council to ensure visibility splays are achieved. During construction a security hut will be located at the site entrance to log visitors on and off site.

4.5.9.2 Permanent Anemometer Mast

An operational phase anemometer mast is required to optimise turbine performance and calibrate turbine wind readings. This mast would likely be of a lattice design without guy wires and would have a height of up to 92 m as shown on Figure 4.11. The met mast will be used to provide on-going measurement of wind speed to provide information for the control and monitoring of the operation of the Development. The met mast model (i.e. lattice or guyed) may change based on the requirements of the Development.

It would require a concrete foundation with approximate dimensions of approximately 6 m x 6 m. The mast would be located within the south-western part of the Site, west of Turbine 4 and south-east of Turbine 2 due to prevailing wind direction (approximately 250 degrees).

4.5.9.3 Site Signage

During construction, the Site will have suitable signage to protect the health and safety of workers, contractors and the general public.

During construction and operation, the Site will have signage to provide directions and health and safety information for workers. There will be a sign giving the operator's name, the name of the Development and an emergency contact telephone number. On the turbines and substation building, there will be further signs giving information about the component, potential hazards, the operator's name, the location gird reference and the

[5] UK Government (2003) the Road Vehicles (Authorisation of Special Types) (General) Order 2003 [Online] Available at: http://www.legislation.gov.uk/uksi/2003/1998/contents/made (Accessed 7/8/2020)

emergency telephone number. The final location and design of the signage will be defined prior to the Development becoming operational in agreement with the Council.

4.5.10 Temporary Infrastructure

4.5.10.1 Temporary Construction Compound

The temporary construction compound would be approximately 100 m x 50 m and its location is shown in Figure 4.1, while the typical construction compound layout is shown in Figure 4.12.

The construction compound will be located within an existing hardstanding area associated with the adjacent quarry and will require minimal stripping of surface materials. The area may require a thin layer of compacted stone for levelling purposes of approximately 300 mm depth; however, this will be dependent on the existing ground conditions.

Temporary cabins, to be used for site offices and welfare facilities (including toilets and drying rooms) with provision for sealed waste and storage) are proposed. Welfare facilities would be installed as required by the Construction (Design and Management) Regulations 2015. If connection to local power is not possible, a diesel generator (bunded to 110% diesel capacity) would be used to service the site facilities.

Where possible, water for welfare facilities would be provided via mains water supply. Where a mains supply is not available, water would be provided by ground water extraction or delivery.

The temporary site construction compound area would be fully reinstated following the construction period.

4.5.10.2 Borrow Pits

It is the intention to source aggregate for the construction of access tracks, structural fill beneath turbine foundations, construction compounds and turbine hardstandings from on-site borrow pits, as far as possible. By sourcing aggregate from within the Site, rather than an off-site quarry, this has the advantage of reducing the number of heavy goods vehicles (HGV) on public roads.

It is estimated that approximately 93,500 m^3 of stone (excluding aggregate for concrete) will be required as part of the construction of the Development.

Two potential borrow pits have been identified, it is estimated that these will have additional capacity to that required for construction materials which allows some flexibility in the use of borrow pits and it is therefore likely that the final borrow pit dimensions will be smaller than those presented; however, for the purpose of the EIA Report it is assumed that both borrow pits are used to their full extents as worst case. The two borrow pits would be located on a small ridge with exposed rock which initial surveys have indicated as being of suitable material for aggregate extraction. The locations of the borrow pits are shown in Figure 4.1 and detailed further in Figures 4.13 and 4.14. A Borrow Pit Assessment is also presented in Technical Appendix A4.1.

The locations of the two borrow pits have been influenced by environmental considerations to minimise the impacts on ecology, peatlands, cultural heritage, hydrology and landscape as described within the relevant technical chapters of this EIA Report. The final location, number and estimate of material from each potential site would be determined once full ground investigation works and testing have been completed. The borrow pits will require the use of plant to both extract and crush the resulting rock to the required grading. It is anticipated that most rock will be extracted by breakers; however, some blasting may be required.

Following construction, the borrow pits will be restored. The restoration will include replacing any surplus or unused material, soil or turf materials to restore the slopes to a stable profile and allow regeneration. A restoration plan for the site, post construction, will be prepared by the Applicant and agreed with the Council and relevant statutory consultees.

4.5.10.3 Blade Laydown Areas

Blade laydown areas are located adjacent to the crane hardstandings, as shown on Figure 4.1. The blade laydown areas will be approximately 40 m x 15 m excluding 'blade fingers' and constructed of hardstanding. The 'blade fingers' will be constructed of compacted stone and measure approximately 15 m x 3 m each.

Topsoil and peat would be removed from the blade laydown areas and either laid at the margin but within the disturbed area or preferably, transferred directly to the areas to be restored. The area would then be covered by geo-grid overlain with compacted stone to approximately 1,500 mm depth, dependent on ground conditions and load capacity.

The blade laydown areas and blade fingers will be fully reinstated following construction of the Development with the trees removed for the Turbine 2 laydown area replanted elsewhere within the Site.

4.6 CONSTRUCTION OF THE DEVELOPMENT

4.6.1 Timetable/Indicative Programme

The construction period for the Development would be approximately 15 months in duration and would comprise the following activities:

- Construction of access junction;
- Formation of site compound(s) upon existing hardstanding and temporary site office facilities;
- Construction of new access tracks and passing places (as required), inter-linking the turbine locations and substation compound;
- Construction of permanent meteorological mast;
- Construction and upgrade of culverts under roads to facilitate drainage and maintain existing hydrology;
- Construction of crane hardstanding and blade laydown areas;
- Construction of turbine foundations;
- Construction of site substation;
- Excavation of trenches and cable laying;
- Connection of on-site distribution and signal cables;
- Remedial works to the public highway to accommodate turbine deliveries (if required);
- Delivery and erection of wind turbines; and
- Commissioning of site equipment.

Site restoration and Habitat Management provisions will be implemented post-construction and through operation.

Where possible, construction activities would be carried out concurrently (thus minimising the overall length of the construction programme), although they would occur predominantly in the order listed. In addition, development would be phased such that, at different parts of the Site, the civil engineering works would be continuing whilst wind turbines are being erected. Site restoration would be programmed and carried out concurrently with the construction to allow restoration of disturbed areas as early as possible and in a progressive manner.

Floating roads scheduling and construction would take account of predicted settlement rates, with monitoring undertaken to ensure their stability.

The starting date for construction activities will largely be dependent upon the date that consent might be granted and grid availability; subsequently, the programme would be influenced by constraints on the timing and duration of any mitigation measures confirmed in the individual technical chapters or by the consent decision.

The final length of the programme would be dependent on seasonal working and weather conditions. Summer months are favoured for construction due to longer periods of sunlight allowing longer working days. Summer months are generally also drier which aids the construction progress and reduces the impact of site debris reaching the public highway (e.g. mud, etc.), though wheel wash facilities would be installed at the main site entrance / exit point, if appropriate. Wet weather has the potential to complicate construction activities in peat, although these complications can be minimised through the use of 'stop rules' if appropriate.

Weather, in particular wind, has a strong influence on the timing of construction activities. Crane activities are generally limited during strong winds (>9 m/s) and turbine erection during these weather conditions would be avoided for safety reasons; the actual conditions would be reviewed as part of the crane lifting plan. During periods of cold weather (<4 °C), concrete pouring of the turbine bases must consider cold weather effects.

4.6.2 General Construction Methodology

The following sections describe the construction methodologies proposed and serve as a basis for completion of the technical assessments.

The Development would be constructed in accordance with documented ISO 14001 (2015)[6] environmental management procedures which ensure compliance with applicable environmental legislation and best practice. Effective communication underpins the whole system of environmental management, ensuring appropriate information passes between the Applicant and the consultants / contractors engaged. This ensures that environmental considerations are fully integrated into the management of the Development throughout construction, the operation, and maintenance of the completed project and ultimately to decommissioning.

4.6.3 Construction Method Statement and Construction Environment Management Plan

Selection of the construction contractor would be based partly upon the contractor's record in dealing with environmental issues and on its provision of evidence that it has incorporated all environmental requirements into its method statements as well as its staffing and budgetary provisions. The Applicant would retain the services of specialist advisers, for example on archaeology, ecology, and peat restoration, to be called on, as required, to advise on specific issues, including micro-siting. More detailed information on the role of such specialist advisors during construction is provided in the relevant technical sections, where appropriate.

The contract between the applicant and the contractor would specify the measures to be taken to reduce or mitigate the environmental impact of the construction process (as detailed in the technical chapters of this EIA report). A copy of any conditions associated with the deemed planning permission would be incorporated into the contract with the

[6] ISO (2015) ISO 14001:2015 [Online] Available at: https://www.iso.org/standard/60857.html (Accessed 7/8/2020)

contractor and any subcontractors responsible for constructing the Development. All contractors will be contractually obliged to adhere to the planning conditions.

All of the general mitigation measures would be set out within a Construction Method Statement (CMS), which would be produced prior to the commencement of construction of the development. This CMS would set out how the development would be constructed and additional mitigation commitments. These additional commitments would include both specific mitigation measures as well as proposals for monitoring and emergency procedures. Such emergency procedures would include a site-specific Pollution Incident Response Plan in order to prevent and mitigate damage to the environment caused by accidents such as spillages and fires.

The CMS would be fully developed following consent and be subject to approval by the Council, in conjunction with relevant consultees for the attendant elements, including the Construction Environmental Management Plan (CEMP, refer to Appendix A4.1). The CEMP provides a draft framework, which would be amended as a live document, prior to and throughout construction.

The CEMP will be maintained and updated throughout the construction process as a live document. It will be augmented by design specifications and construction documentation and will provide comprehensive information on environmental management appropriate to the stage of development. This document represents the initial application measures only at this point of the process, as construction methods, further site investigations, etc. would be required as part of the discharge of conditions, and these elements of work would further inform the CEMP. The final CEMP would be subject to approval the Highland Council with further consultation undertaken with Scottish Environment Protection Agency (SEPA) and NatureScot.

The CEMP would incorporate the following:

- Pollution Prevention Plan (PPP) with indicative measures presented within Appendix A4.1: CEMP;
- Drainage Management Plan (DMP) with indicative measures presented within Appendix A4.1: CEMP;
- Traffic Management Plan (Appendix A11.3: TMP);
- Site Waste Management Plan (SWMP);
- Stakeholder Management Plan (SMP);
- Ecological Management Plan (incorporating Species Protection Plan, Breeding Bird Protection Plan and any habitat protection measured required during construction); and
- Peat Management Plan (PMP in Appendix A13.2).

The CEMP (Appendix A4.1) is proposed as the means to capture a diverse range of environmental management controls. Examples of the measures proposed and expected to be incorporated into the CEMP include the adoption of best practice guidance; the appointment of an ECoW to oversee correct implementation of agreed commitments; completion of a Traffic Management Plan presenting detailed access routes and delivery timings, car parking arrangements, temporary signage etc; demarcation of working area following the micrositing exercise with temporary fencing as required along with location specific method statements if habitat sensitivity is high; development of an infrastructure monitoring programme to identify any requirement for remedial work; and an exclusion of equipment from watercourses and, as far as possible from immediate riparian zones during watercourse crossing construction along with measures to minimise change in in stream substrates.

The developed CMS would be submitted for agreement with the appropriate planning authorities and bodies, such as SEPA, prior to construction and development. In order to ensure that the CMS is being suitably adhered to by the appointed contractors, an independent and suitably qualified Owner's Engineer would be employed during the construction phase of the project to monitor implementation and provide specialist advice. The Owner's Engineer would liaise with the various environmental, archaeological and other advisers who would have input into the project to ensure compliance is met in relation to any imposed planning conditions as well as the approved CMS.

4.7 OPERATION OF THE DEVELOPMENT

4.7.1 General Servicing

During operation, the Site will have signage to provide directions and health and safety information for workers. There will be a sign giving the operator's name, the name of the Development and an emergency contact telephone number. On the turbines and substation building, there will be further signs giving information about the component, potential hazards, the operator's name, the location gird reference and the emergency telephone number.

Each turbine manufacturer has specific maintenance requirements, but typically, routine maintenance or servicing of turbines is carried out twice a year, with a main service at twelve monthly intervals and a minor service at six months. In the first year, there is also an initial three-month service after commissioning. The turbine being serviced is switched off for the duration of its service.

Teams of two people with a 4x4 vehicle would carry out the servicing. It takes two people (on average) one day to service each turbine.

At regular periods through the project life, oils and components would require changing, which would increase the service time on-site per machine. Gearbox oil changes are required approximately every 18 months.

Blade inspections would occur as required (somewhere between every two and five years) using a Cherry Picker or similar, but may also be performed with a 50T crane and a man-basket. It could take approximately two weeks to inspect the turbines at the Development. Repairs to blades would utilise the same equipment.

Blade inspection and repair work is especially weather-dependent. Light winds and warm, dry conditions are required for blade repairs. Hence summer (June, July and August) is the most appropriate period for this work.

The following factors could affect the duration of repair operations:

- Working with cranes is highly weather-dependent;
- The availability of spares; and
- The stage in the component's life cycle.

Ongoing track maintenance will be undertaken to ensure safe access is maintained to all parts of the Development all year round.

All wastes arising as a result of servicing and maintenance (e.g. lubricating oils, cooling oils, packaging from spare parts or equipment, unused paint etc.) will be removed from the Site and reused, recycled or disposed of in accordance with best practice.

4.7.2 Track Maintenance

The frequency of track maintenance depends largely on the volume and nature of the traffic using the track, with weathering of the track surface also having an effect. Since the volume of traffic using the access tracks during operation would be low (although heavy plant is particularly wearing), the need for track maintenance is anticipated to be low and infrequent. Any maintenance that is required would generally be undertaken in the summer months when the tracks are dry. However, maintenance will be carried out when required.

4.7.3 Habitat Management

There is the opportunity to increase the biodiversity value of degraded peatland habits within the Site though the implementation of a Habitat Management Plan HMP (HMP). Outline HMP measures are included in **Chapter 7: Ecology**, and sets out the key aims and objectives of the proposed restoration with the HMP to be developed post consent.

The HMP will aim to restore damaged and degraded blanket bog from the existing long-term management effects (such as drainage, cutting and overgrazing) but will, as a minimum, compensate for the direct loss of blanket bog habitats as a result of the Development. The HMP will also aim to improve habitats for a number of the designated features of the adjacent Caithness and Sutherland Peatland Natura 2000 Sites, including dunlin, golden plover, and otter.

In addition, as the gradual degradation of these peatlands results in the slow release of carbon into the atmosphere; restoration would contribute to reducing the impacts to global warming and positively contribute to the Scottish Government's aim.

To ensure the overall HMP aims are successfully achieved, the HMP will be implemented throughout Development operation as a 'live' document; with frequent review and amendment where deemed necessary.

Peatland restoration, facilitated through the implementation of the HMP, will provide net ecological gain as a result of the Development.

4.8 DECOMMISSIONING OF THE DEVELOPMENT

The Development has been designed with an operational life of 30 years. At the end of the operational period, it would be decommissioned and the turbines dismantled and removed in line with the Council. Any alternative to this action would require consent the Council and is not considered in this EIA Report.

During decommissioning, the bases would likely be dismantled to below ground level. All cables would be cut off below ground level, de-energised, and left in situ. Access tracks would be left for use by the landowner. No stone would be removed from the Site. The decommissioning works are estimated to take six months. This approach is considered to be less environmentally damaging than seeking to remove foundations, cables and roads entirely. The approach to decommissioning will be confirmed based on best practice at the time.