Chapter 4: Project Description

Chapter 4
Project Description

Introduction

4.1 This chapter of the Environmental Impact Assessment (EIA) Report describes the components of Loch Liath Wind Farm (hereafter referred to as 'the Proposed Development') for which permission is being sought and which have been assessed through the EIA process. It includes details about the construction and operation of the Proposed Development, and outlines measures proposed to mitigate effects on the environment during these stages.

4.2 This chapter is supported by the following appendices:

- **Appendix 4.1: Outline Construction and Environmental Management Plan (CEMP)**; and
- **Appendix 4.2: Schedule of Good Practice and Mitigation Measures**.

Project Components

4.3 As outlined in **Chapter 1: Introduction**, the main components of the operational Proposed Development will comprise:

- Up to 13 wind turbines (three [T1, T6 and T7] will have a maximum blade tip height of up to 180 metres (m) and ten [T2, T3, T4, T5, T8, T9, T10, T11, T12 and T13] will have a maximum blade tip height of up to 200m);
- It is anticipated that six of the turbines (T1, T4, T7, T10, T12 and T13) will be fitted with visible aviation warning lights;
- Foundations supporting each wind turbine;
- Associated crane hardstandings and adjacent laydown areas at each turbine location;
- Approximately 9.3 kilometres (km) of new access tracks which includes 8.2km standard/cut track and 1.1km of floating track;
- A total of nine new watercourse crossings and a further seven drain crossings (16 crossings in total) and associated infrastructure i.e. box or bottomless culverts;
- A network of onsite underground electrical cables and cable trenches to connect the turbines to the onsite substation;
- One permanent steel lattice anemometer mast of up to 122.5m in height;
- Vehicle turning heads;
- Onsite substation and control building;
- Onsite passing places (location and size to be determined by the turbine supplier);
- Site signage; and
- A habitat management and enhancement area (further details are provided in **Appendix 8.5: Outline Restoration and Enhancement Plan** (OREP) for peat, biodiversity, forestry and landscape).

4.4 In addition to the above elements of the Proposed Development, construction will also require the following components:

- One temporary construction compound;
- Creation of one temporary borrow pit for the extraction of stone;
- Concrete batching is proposed with the exact location of the batching plant to be confirmed (this is likely to be either in the borrow pit or construction compound, with detail to be confirmed in the CEMP, and subject to obtaining an abstraction licence from the Scottish Environment Protection Agency (SEPA) should water abstraction be required); and
- Whilst no widening of the existing Bhlaraidh Wind Farm access from the A887 is required, it may be necessary to scrape of the top layer of material to ensure the turbine blade tips do not strike the earthworks embankment and it may be necessary to improve the running surface prior to use.

4.5 The detailed layout of the Proposed Development is shown in **Figures 4.1a-c**. Each component of the Proposed Development is described in further detail later in this chapter with supporting figures.

4.6 **Table 4.1** details the proposed locations and maximum blade tip height of the turbines.

Table 4.1: Proposed Turbine Locations

Turbine Number	Easting	Northing	Maximum Blade Tip Height (m)
1	237585	822647	180
2	237961	823103	200
3	238186	822681	200
4	238670	823253	200
5	238568	823643	200
6	237542	823071	180
7	237468	823541	180
8	237935	823610	200
9	237981	824085	200
10	237965	824546	200
11	238479	824108	200
12	238558	824577	200
13	238320	825060	200

The Proposed Development Components

Wind Turbines

4.7 Consent is being sought for the installation and operation of up to 13, three-bladed horizontal axis wind turbines (including internal transformers) ranging from up to 180m to 200m to maximum blade tip height (as detailed in **Table 4.1**). The candidate turbine for all turbines is the Siemens Gamesa 155, each with a maximum capacity of 6.6 megawatts (MW), and a blade length of 76.6m. Hub heights would range from 102.5m-122.5m and the candidate turbine has a rotor diameter of 155m. It should be noted that the final chosen turbine may have larger or smaller blade lengths and hub heights depending on the technology available at the time of construction, however the maximum tip height proposed for each turbine would be fixed by a planning condition on the Section 36 consent. Similarly, the overall capacity rating of turbines could change, however any more advanced and powerful turbine chosen would again need to comply with the maximum blade tip height parameters consented. A typical wind turbine is illustrated in **Figure 4.2a** (maximum blade tip height of 200m) and **Figure 4.2b** (maximum blade tip height of 180m).

Aviation Warning Lighting

4.8 As the turbines of the Proposed Development will exceed 150m maximum blade height tip height, they will need to be lit in accordance with the requirements of the Civil Aviation Authority (CAA) Air Navigation Order (ANO), in addition to meeting the lighting

requirements of the Ministry of Defence (MOD). It is proposed that T1, T4, T7, T10, T12 and T13 are provided with 2000/200 candela (cd) lights at hub height to satisfy the CAA-ANO requirement, with additional infra-red (IR) lighting being provided to satisfy the MOD requirements. Aviation is assessed in **Chapter 14: Other issues** and is detailed further in **Appendix 14.2: Aviation Lighting and Mitigation Report**.

Turbine Foundations and Crane Hardstandings

4.9 The turbines will be installed on foundations comprising both stone and steel-reinforced concrete. These typically measure approximately 22m diameter in plan (an area of 408 metres squared (m^2) with a concrete depth of between approximately 4m and 2.5m and overlay of depth approximately 100mm dressed back with topsoil to allow re-vegetation (see **Figure 4.3**). Each turbine foundation will require approximately 1,632 cubic metres (m^3) of concrete and 200 tonnes of reinforcement. The detailed design, sizing and specification for each foundation will depend on the final turbine type and the specific ground conditions encountered at each turbine location.

4.10 Adjacent to each turbine, an area of hardstanding approximately 50m x 20m will be constructed for use as a crane hardstanding and laydown area, remaining in place during operation of the Proposed Development. The exact geometry and position of the crane pads will depend on the turbine supplier's specifications, the crane selected for erection, and detailed ground investigations prior to construction. Temporary hardstandings will be located opposite the permanent crane hardstandings which will be used as laydown areas for the turbine blades prior to lifting into place. These temporary areas will be reinstated following erection of the turbine. The hardstanding areas will be levelled using cut and fill operations and surfaced in crushed stone to provide a durable surface. These hardstandings are used during the erection process as a platform for the cranes to lift the turbine components into position. During operation, the main crane hardstanding provides safe access for maintenance and repairs which may also require the use of a crane. The main crane hardstanding will therefore be permanent infrastructure. An indicative crane hardstanding arrangement, showing both permanent and temporary areas, is shown in **Figure 4.4**.

Anemometer Mast

4.11 One permanent steel lattice anemometer mast will be installed to ensure the accurate ongoing measuring and monitoring of wind speed data on the Site. The height of the mast will be up to 122.5m and an indicative drawing is provided in **Figure 4.5**. The mast will be installed at the location show on **Figure 4.1**.

Turbine Transformers and Cables

4.12 An electrical transformer will be required for each turbine and will be located within the turbine tower. The transformers will be either oil-filled with a bunded footing to remove any risks of spillage or a solid cast resin type which is effectively non-polluting. The transformers will increase the electrical voltage to 33 kilovolts (kV) and will be connected to the control buildings within the onsite substations via underground high voltage cables.

4.13 The underground cables running from the turbines to the substation will be laid in trenches alongside access tracks, typically 1.5m wide and 1.4m deep. Indicative details are provided in **Figure 4.6.**

4.14 A Supervisory Control and Data Acquisition (SCADA) system will be installed to gather information from the individual wind turbines and provide the facility to control them from a central location. A fibre optic communications cable will run alongside the power cables to link the turbines to the SCADA system. The wind turbines can be monitored remotely via a telephone or data connection to the SCADA system.

4.15 An underground power supply and SCADA cable will connect the meteorological masts to the nearest turbine, allowing data to be transmitted onwards to the control building. It is anticipated that this will run alongside the 33kV cable route.

Grid Connection, Security Building and Substation

4.16 The Proposed Development will be connected to the national electricity network (the 'grid'). The grid connection will be subject to a separate application for consent by Scottish and Southern Energy Networks (SSEN). As a result, potential environmental effects as a result of offsite grid connection are not considered within this EIA Report.

4.17 A typical onsite substation compound layout is shown in **Figure 4.7** and proposed substation elevations on **Figure 4.12**. The substation compound will measure approximately 120m x 70m and will be surrounded by a 2.1m high fence. It will contain a control building and electrical equipment, including switchgear, communications equipment, and protection equipment. The control building will also contain toilets and a storeroom. An indicative plan and elevation of a typical control building proposed, is shown in **Figure**

4.8. Waste will be held in a closed system and removed by a licensed contractor at regular intervals. The buildings will be constructed in keeping with the local built environment. Indicative drainage design is shown on **Figure 4.10**.

Temporary Construction Compound

4.18 One temporary construction compound measuring approximately 50m x 50m will be located south of the substation, as shown in **Figure 4.1**. The temporary construction compound will consist of a hardstanding area upon which will be accommodated temporary site offices, car parking, storage, and welfare facilities for site staff. An indicative construction compound is shown in **Figure 4.7**.

4.19 The temporary construction compound will contain provision for fuel storage, an electrical generator, and a temporary septic tank. The fuel storage area will be above ground with necessary secondary containment in accordance with the SEPA standards (PPG7 and GPP8) and will be situated a minimum of 50m from watercourses to reduce the risk of pollution.

4.20 The temporary construction compound site will be restored to its current condition once construction is complete, and turbines are operational.

Borrow Pits

4.21 To minimise the volume of stone brought onto the Site for construction of the Proposed Development, and any associated environmental effects, it is proposed that stone will be sourced from one onsite borrow pit to provide the material necessary for new or upgraded tracks and hardstanding construction. Borrow pit details are shown in **Table 4.2**.

4.22 It is estimated that approximately 97,000m^3 of stone aggregate will be required for construction of the Proposed Development (including permanent access tracks, structural fill beneath turbine foundations and crane hardstandings), with the borrow pit search area having the estimated capacity to provide 70% of this requirement. However, for the purposes of a robust assessment for effects on traffic and transport, it has been assumed that 50% of the stone will be obtained from the borrow pit, with 50% being required to be imported. Further details are provided in **Chapter 12: Traffic and Transport**. The imported stone will be required to construct the short section of access between the Blharaidh Wind Farm Access track and the borrow pit.

Table 4.2: Proposed Turbine Locations

Borrow Pit Search Area	Approx Size (m)	Location
Borrow Pit 1	200 x 40	237453 822571

Access from the Public Road Network

4.23 The Proposed Development will be accessed via the A887. The access will then follow the existing Bhlaraidh Wind Farm track, before accessing the turbine area. Details of the proposed vehicle movements during construction and operation of the Proposed Development are provided in **Chapter 12** which also provides detail on the proposed abnormal loads' route to the Site and which is supported by **Appendix 12.1: Transport Assessment**.

4.24 A Construction Traffic Management Plan (CTMP) will be implemented to minimise disturbance on the local road network. The CTMP will also contain details of the temporary measures (such as signage) to be put in place on the approach to the Site to ensure the safe access and egress of construction vehicles from and onto the major road network. Further details are provided in **Appendix 12.1**.

Onsite Access Tracks

4.25 In total approximately 26.6km of track will be utilised for the Proposed Development. Approximately 17.3km of existing track will be used with minor upgrades if required (i.e. the existing Bhlaraidh Wind Farm access track, which is likely to require only scraping of the top layer of material to ensure the turbine blade tips do not strike the earthworks embankment and possible improvements to the running surface prior to use as noted above). In addition, 9.3km of new access track will be constructed for the Proposed Development, 1.1km of which is proposed to be of a 'floating' design to reduce the need for peat excavation. The remaining tracks will be of a traditional 'cut' design. Further details on the floating and cut tracks are provided below.

4.26 The nominal track running width will be approximately 6m. Adjacent to this track will be an assumed 1m width verge at either for cabling and appropriate drainage subject to local ground conditions. Track widths may be slightly wider in some sections to

accommodate bends in the track alignment. Turning heads will be installed at appropriate locations to accommodate abnormal load turning. Typical track arrangements are show in **Figure 4.9**.

4.27 The design of the access track layout was based on the following objectives, which fundamentally seek 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 facilitate safe access to each turbine, avoiding steep slopes, ground with potential instability, deeper areas of peat and maintaining a 50m buffer from watercourses where possible;
- To minimise watercourse crossings except where crossings are necessary (where required, water crossings will be 'mammal friendly', with banksides retained or mammal ledges installed to minimise potential effects on water vole and otter);
- To minimise requirements for passing places and turning areas;
- To minimise environmental effects, including effects on deep peat and associated habitats, and areas of Ground Water Dependant Terrestrial Ecosystems (GWDTEs);
- To minimise effects to ecological and ornithological features;
- To keep overall new track length to a minimum, reducing stone requirements and associated potential environmental effects;
- 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 and creating clear definitions between turbine working areas and access tracks; and
- To follow the existing ground topography as much as possible, minimising the necessity for cut and fill engineering works and associated visual effects.

Watercourse Crossings

4.28 To access the turbines and associated infrastructure, nine new watercourse crossings will be required. In addition, there are a further seven drain crossings. Watercourse crossings will be subject to appropriate SEPA CAR[1] licencing and mitigation will be put in place to control and attenuate runoff, and crossings will be regularly checked and maintained during construction and operation. All watercourse crossings are detailed in **Appendix 7.5: Watercourse Crossing Inventory** and shown in **Figure 7.6a-d**. Typical new water crossing structures will be bottomless arch or bottomless box culverts as shown on **Figure 4.11**. Whilst not anticipated to be required at the Site, this is shown for information and could potentially be used in the event that micrositing during construction requires a crossing to be moved to a wider point in a channel than currently proposed.

4.29 Monitoring of water quality and water flow will be undertaken during construction of the Proposed Development and a water quality monitoring plan will be devised prior to construction through consultation with SEPA. Further information in relation to watercourse crossings and water quality monitoring is provided in **Chapter 7: Geology, Hydrology, Hydrogeology and Peat** and associated appendices.

Micrositing

4.30 It is proposed that the turbines and other infrastructure will be subject to a 50m micrositing allowance which will be applied should adverse ground conditions be encountered during pre-construction ground investigations, or when more optimal ground conditions are available. Movement of infrastructure will, however, be dependent on other onsite constraints and subject to advice from an Ecological Clerk of Works (ECoW). This allowance will ensure that the final position of the turbines and associated infrastructure are not varied to such a degree as to cause a notable change in the predicted environmental effects outlined in the EIA Report. Beyond this distance, any relocation of components will require either written approval from The Highland Council (THC) in consultation with statutory consultees or will be treated as a formal variation to the permission. Where relevant, the specialist chapters detail individual proposed directional restrictions on the overall micrositing allowance to ensure that environmental effects no greater than those identified within this EIA Report occur.

Construction Details

4.31 The construction phase for the Proposed Development will consist of the following principal activities:

- Construction of temporary security compound and car parking within the construction compound;
- The working of the borrow pit;
- Concrete batching;
- Construction of the control building and substation;
- The upgrading/creation of site access tracks, including passing places, turning heads, junctions and drainage;
- Construction of turbine foundations and crane hardstandings at each turbine location;
- Excavation of trenches and laying of electrical and control cables adjacent to the Proposed Development tracks connecting the turbines to the control building;
- Delivery to Site and erection of wind turbines and anemometer mast (including the installation of aviation warning lighting);
- Testing and commissioning of Site equipment including wind turbines; and
- Site restoration and implementation of habitat enhancement and management measures.

4.32 These construction activities are discussed further below.

Construction of Temporary Construction Compound

4.33 The construction of the temporary construction compound will be formed by stripping organic and soft surface material and laying geotextile and crushed rock to create a firm regular surface of approximately 50 x 50m x 500 millimetres (mm) deep. Perimeter drainage will intercept rainfall and then channel water to temporary filtration and dispersion structures, utilising where possible the natural contours of the landscape. The stripped surface material will be stockpiled nearby for reinstatement.

4.34 Depending on the time of year and the stage of the construction programme, temporary lighting may be required at the temporary construction compound during working hours. This will be designed to minimise light-spill on sensitive habitat features such as watercourses and waterbodies.

Working of Borrow Pit

4.35 Excavation of material from the borrow pits will be carried out using standard quarrying techniques, which may include blasting and mechanical excavation. However, all blasting work will be undertaken by a specialist contractor who will assume responsibility for blast design and implementation. The extent of any blasting requirement cannot be determined until intrusive site investigation tests are completed which will be undertaken following the issue of a consent for this application.

Concrete Batching

4.36 Concrete batching is expected to be undertaken onsite, which would include all turbine and substation foundation concrete. The concrete will be mixed onsite, with deliveries of cement powder and water (bowsers) being delivered by HGV tankers. Alternatively, water may be abstracted onsite which would be subject to an abstraction licence to be agreed with SEPA. The batching facility will be located either within the borrow pit or the construction compound with suitable pollution prevention measures in place, which would be developed in conjunction with the ECoW and incorporated into the CEMP. To ensure a robust assessment has been undertaken, the EAI Report assesses a worst-case scenario, such that the assessment of effects presented in **Chapter 7** assumes that water will be abstracted from the Site, whereas **Chapter 12** assumes that water will be delivered to the Site.

Construction of Control Building, Substation and Grid Connection

4.37 The substation would be constructed as per SSEN requirements and would house all the equipment required for connecting the Proposed Development to the electricity network. A new control building would also be constructed and this would accommodate welfare, metering equipment, switchgear, central computer systems and electrical control panels. External to the control building there will also be an auxiliary transformer and standby generator with close coupled fuel storage tank.

[1] The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended) (CAR)

Construction of Tracks and Track Drainage

4.38 Where possible, the track and infrastructure design has avoided the encroachment onto deep peat, as noted above. As such, a non-floating track design is proposed for 8.2km of the new tracks and will be achieved by excavating through to a suitable formation. During construction, vegetation, topsoil and subsoil will be placed to the sides of the tracks. A layer of stone will be compacted on top of the base formation to a thickness of around 400mm dependent upon ground conditions and will be supplied from the onsite borrow pit. The total track depth will depend on the strength of the base formation and upon the gradient of the slope being traversed, which will be conformed through detailed engineering design. Drainage ditches will be constructed alongside the access tracks. Surplus soil will be placed and dressed alongside the track to blend in with the surrounding landscape and finally topsoil will be placed on the track shoulders and seeded with appropriate seed mix to promote vegetation growth, if necessary.

4.39 It is anticipated that up to 1.1km of new track will be floated to reduce the need for peat excavation. Instead of a traditional cut and fill design, these tracks will make use of a 'floating technique' and will incorporate geosynthetic material laid on the surface of the peat turf at a width to suit the road dimension. This approach will significantly increase the load carrying capability of the access tracks and reduce variable settling of the access track into the peat. A layer of approximately 400mm of crushed stone will then be laid on the geosynthetic material to form the access track, incorporating a further geosynthetic layer within the stone aggregate.

4.40 The tracks will have adequate crown or cross-slope to allow rainwater to be shed and, where gradients are present, lateral drainage will intercept flow. A drainage ditch will be formed on the upslope side of the track, dependent on a detailed drainage design. Cross pipes will be laid as required in areas where the position of the access track could lead to ponding on one side. As far as possible these will coincide with naturally occurring drainage channels. Experience at other sites has shown that cross pipes simply placed at regular intervals are often ineffective and unnecessary. When the track slopes downhill, 'waterbars' will be placed to divert the flow into naturally occurring channels. The advice of the ECoW will be sought to ensure that the location and outfall of cross pipes and waterbars minimises vegetation damage or change. Final track drainage design will be determined prior to the commencement of construction of the relevant track section. The design of track and ancillary drainage will comply with Sustainable Drainage Systems (SuDS) standards and be agreed with SEPA. Typical cut and floating track designs are illustrated on **Figure 4.9**.

Construction of Turbine Foundations and Hardstandings

4.41 Construction of turbine bases, hardstandings and laydown/storage areas will require the excavation of surface organic and soft surface material through to underlying rock. This excavated material may be used to partially backfill the excavation and provide material for landscaping and surfacing reinstatement. As such, this material will be stored near to the excavation until required. The underlying rock will be levelled to provide a workable platform for the assembly of reinforcing bars and formwork used to contain the poured concrete.

Installation of Cabling

4.42 The cabling connecting each turbine to the control building will be laid in a trefoil arrangement as shown in **Figure 4.6**. Detailed construction and trenching specifications will depend on ground conditions encountered. Typically, cables will be laid in a trench with dimensions 1.4m deep and 1.5m wide. To minimise ground disturbance, cables will be routed along the side of the access tracks where practicable. Cables will be laid within a sand or granular bedding to prevent damage from sharp stones. Trenches will be backfilled with excavated material and the surface redressed.

Erection of Turbines

4.43 The erection process for each turbine will take approximately 2 to 5 days, although this will depend on weather conditions, as generally, turbines are erected in wind speeds not exceeding 8 to 10 metres per second (m/s) for health and safety reasons. Turbine erection will be undertaken by a specialist contractor and cranes will be used for the off-loading of turbine components from the abnormal load vehicles and to assist in turbine assembly. A 'crawler' or mobile wheeled crane of larger capacity, working in tandem with the main crane, will be used to erect the turbines. The turbine erection contractor will specify the type of cranes used during the erection process. The cranes will be positioned on the hardstanding area adjacent to each turbine and will include outriggers for support.

Working Hours

4.44 In general, working hours for construction will be from 07:00 to 19:00 Monday to Friday and 07:00 to 13:00 on Saturday. No working is proposed on Sundays and public holidays unless otherwise agreed with THC.

4.45 Exceptions to the proposed working hours will be made for concrete foundation pours, turbine erection, turbine component delivery and emergency works. Concrete pouring for an individual turbine foundation must take place continuously and so activity will only cease when the pour has been completed. As indicated above, turbine erection can only occur during periods of low wind speeds and so to minimise the construction programme, lifting operations may need to be scheduled out with the above hours. In addition, it may be necessary to complete a particular lifting operation to ensure the structure is left safe.

Construction Employment

4.46 The construction period for the Proposed Development will last up to approximately 18 months and an average workforce of 30 people is estimated during the construction period. The number of construction staff present onsite will vary according to the construction phase and activities being undertaken. Staffing levels will generally decrease as construction is progressed through the commissioning phase.

4.47 In addition to the direct employment opportunities, the construction of the Site will bring benefits to local business such as in the supply of materials or services for construction and in accommodation for workers and catering. Further details on construction employment are provided in **Chapter 13: Socio-Economics, Tourism and Recreation**.

Construction Programme

4.48 Construction of the Proposed Development is estimated to last up to approximately 18 months and a detailed construction programme will be prepared by the Principal Contractor at the outset of construction. An indicative programme for the construction activities of the Proposed Development is shown in **Table 4.3** below.

4.49 Many of the Proposed Development's construction operations will be carried out concurrently, although predominantly in the order identified, reducing the overall length of the construction programme. Site restoration will be programmed and carried out to allow the restoration of disturbed areas as early as possible and in a progressive manner. An ECoW will be onsite during construction in certain areas/months as agreed with THC.

4.50 Anticipated construction traffic deliveries at the Site per month during the construction period, assuming the principal activities listed above, is set out in **Appendix 12.1.** This shows that the peak of construction occurs in Month 8. As mentioned above, a CTMP will be implemented to minimise disturbance on the local road network during construction. Further specific measures proposed to avoid or minimise effects during construction are discussed on a topic-by-topic by topic basis in **Chapters 6 to 14**.

Table 4.3: Indicative Construction Programme

Activity	Month																	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Site Mobilisation/Demobilisation																		
Construction of Temporary Construction Compound and Car Parking																		
Working of Borrow Pits																		
Construction and Upgrading of Access Tracks																		
Construction of Turbine Foundations and Hardstandings																		
Construction of Control Building, Substation and Grid Connection																		
Installation of Cabling																		
Crane Delivery																		
Erection of Turbines																		
Reinstatement																		
Commissioning																		
Demobilisation																		
Staff																		

Reinstatement

General Approach

4.51 Following completion of construction of the Proposed Development, the Site will be reinstated by the contractor. Where a re-turfing method is appropriate, such as along track verges, the surface layer of soil and vegetation will be stripped and stored separately from the lower soil layers, and replaced as intact as possible once construction is complete. Local reinstatement will be carried out to retain the structure and composition of the original plant communities, as well as forming a stable area over reformed ground, thus reducing erosion by rain, run-off and wind. Bare soil areas will be allowed to re-vegetate naturally in combination with reseeding using a low density (~20 kg per hectare) seed mix which mirrors local vegetation to help bind the soil more quickly.

Site Tracks

4.52 Site tracks are required throughout the operational phase to permit access for maintenance and repair operations. They will also be necessary to allow access during the decommissioning stage.

4.53 Generally, the sloping verges of access tracks will be dressed with turf or seed bank material sourced from spoil from the Site, where possible. If suitable material is generated during the construction of the track, this material can be used to form a low-lying bund along the downhill side of the track, to be dressed as per the track verges. This will assist in reducing the visibility of the track.

Turbine Bases and Crane Hardstandings

4.54 Turbine foundations will be capped with soil material, which may form a raised mound above the existing ground level. These will be re-turfed with the removed material, but where vegetation is sparse or unlikely to regenerate, reseeding with an appropriate local seed mix may be undertaken as outlined above.

4.55 The condition of turfs will be monitored regularly during the first few months following reinstatement. If necessary, water will be imported to the Site to ensure the re-establishment of this vegetation. A programme of reinstatement monitoring will be implemented in the first few years of operation to document the success of revegetation of these areas, if necessary.

4.56 Hard-standing areas at each turbine location will be retained for use during operation and decommissioning, however the edges will as far as possible be blended to the adjacent contours and natural vegetation allowed to re-establish.

Temporary Working Areas

4.57 The temporary areas will be restored to their original condition.

Peat Management

4.58 Whilst the Proposed Development has been designed to minimise disturbance to peatland, it has not been possible to avoid areas of peatland entirely. Consequently, a Peat Management Plan (Outline PMP) is presented at **Appendix 7.3: Outline Peat Management Plan** and includes the following information:

- Estimation of the volume of soil and peat likely to be excavated during construction;
- Identification of opportunities to minimise excavation volumes;
- Options for onsite reuse of excavated material; and
- Good practice methods to be employed in relation to handling and storage of excavated soil and peat.

4.59 The Outline PMP will ensure that excavated soil and peat is appropriately managed and re-used onsite. It is anticipated that all excavated peat can be reused within the Site for reinstatement of ground, at both the point of excavation as well as in the landscaping of track shoulders and hardstandings. Prior to construction and on completion of ground investigations and micrositing, the Outline PMP will be refined and agreed with SEPA and NatureScot. Excavated peat is also proposed to be used in peatland restoration in discrete areas across the Site. This is considered in detail in the OREP set out in **Appendix 8.5**.

4.60 In accordance with Scottish Government Guidance[2], the Proposed Development has been designed to avoid peat landslide hazard. A Peat Stability Assessment has been carried out and the report on this assessment is included at **Appendix 7.4: Peat Landslide Hazard and Risk Assessment**.

Environmental Management

4.61 Prior to the construction of the Proposed Development, the Applicant will develop a detailed CEMP with the appointed Principal Contractor, an outline of the content of which is provided in **Appendix 4.1**. The CEMP will establish the project management structure and clearly identify the roles and responsibilities in the management and reporting on the construction phase environmental aspects. The CEMP will be used to ensure that all relevant planning conditions and mitigation identified within the EIA Report to protect the environment are implemented through agreed procedures and working methods. Adherence to the CEMP, as well as referenced legislation and guidance documents, will be a contractual requirement for the appointed Principal Contractor and their sub-contractors, and is likely to form a condition to the planning permission.

4.62 The purpose of the CEMP will be to:

- Provide a mechanism for ensuring that construction methods avoid, minimise and control potentially adverse significant environmental effects, as identified in the EIA Report;
- Ensure that good construction practices are adopted and maintained throughout the construction of the Proposed Development;
- Provide a framework for mitigating unexpected effects during construction;
- Provide assurance to third parties that agreed environmental performance criteria are met;
- Establish procedures for ensuring compliance with environmental legislation and statutory consents; and
- Detail the process for monitoring and auditing environmental performance.

4.63 The CEMP will be updated when necessary to account for changes or updates to legislation and good practice methods throughout the construction phase. The CEMP will also be amended to incorporate information obtained during detailed ground investigations which will be undertaken post planning consent and prior to construction activities. Compliance with the CEMP (including procedures, record keeping, monitoring and auditing) will be overseen by a suitably qualified and experienced ECoW.

4.64 The CEMP will contain the following documents, which the Principal Contractor and their sub-contractors will be required to adhere to throughout the construction process:

- A Pollution Prevention Plan (PPP) ;
- Construction Method Statements (CMS);
- A Peat Management Plan (Outline PMP) (following the principles set out in the Outline PMP at **Appendix 7.3**);
- A Site Waste Management Plan (SWMP);
- A Construction Traffic Management Plan (CTMP) (following the principles set out in **Chapter 12**);
- An Access Management Plan (AMP) (following the principles set out in the outline AMP provided as **Appendix 13.1: Outline Access Management Plan**; and
- A Site Restoration Plan.

4.65 The CEMP will also contain the following information:

- The name, qualifications and CV of the nominated person(s) with the responsibility for all environmental matters, where possible, for approval;
- A completed register of contacts confirming the contact details for all key personnel for managing environmental issues, including the Applicant's representatives, the ECoW, Principal Contractor contacts and appropriate regulator contacts;
- The construction programme and detailed working method statements;

[2] The Scottish Government (2017) Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Developments.

- A site-specific action plan, providing a register of environmental risks and outlining the requirement for accompanying site-specific mitigation, monitoring and reporting procedures; and
- Audit and inspection procedures.

4.66 The CEMP and associated plans will be submitted to THC, and others as appropriate, prior to the commencement of construction. A copy of the CEMP will be kept in the construction site office for the duration of the construction and will be available for review at all times.

4.67 The Principal Contractor will be responsible for the continual development of the CEMP to take account of monitoring and audit results during the construction phase and changing environmental conditions and regulations.

4.68 The services of other specialist advisers will be retained as appropriate, to be called on as required to advise on specific environmental issues.

Good Practice Construction Measures

4.69 Good practice measures will be employed as standard techniques during the construction and operation of the Proposed Development. Therefore, these are not considered to be mitigation as such, but an integral part of the design, construction and operation of the Proposed Development. This is considered a realistic scenario given the current regulatory context and accepted good practice across the industry.

4.70 During construction, there will be a suitably qualified environmental manager appointed with responsibilities including training, liaison with SEPA and ensuring applicable licences are held. This role will have authority for halting works if necessary. Emergency procedures will be detailed and subsequently agreed with SEPA, including contact lists and the personnel responsible.

4.71 Good practice measures will include (but are not limited to) measures associated with:

- Pollution incidents;
- Erosion and sedimentation;
- Modification of surface water drainage patterns;
- Modification of groundwater levels and flows;
- Compaction of soils; and
- Peat stability.

4.72 Further details on these measures, which are an inherent part of the Proposed Development, can be found within the individual assessment chapters, and are summarised together with proposed mitigation in **Appendix 4.2**.

Outline Restoration and Enhancement Plan

4.73 The Outline Restoration and Enhancement Plan (OREP) can be found in **Appendix 8.5** and provides a high-level approach to implement positive land management for the benefit of nature conservation, both to mitigate and/or compensate for the effects of the Proposed Development and to delivery wider enhancement to the nature conservation value of the Site and its surroundings.

4.74 The overall objective of the OREP is to provide a holistic framework for the enhancement of the Site with respect to biodiversity, peat resource, forestry and landscape, over and above mitigation of the Proposed Development's predicted effects and taking appropriate account of the Site's environmental characteristics and potential for enhancement as identified through the EIA process. This plan also recognises the requirement of National Planning Framework 4 (NPF4) Policy 3 that "*development proposals will contribute to the enhancement of biodiversity, including where relevant, restoring degraded habitats*". Measures to protect existing habitats during construction, particularly peatland, are presented in the Outline CEMP (**Appendix 4.1**) which will be finalised prior to construction, and in the Outline PMP (**Appendix 7.3**).

4.75 The OREP sets out:

- Baseline conditions, key management considerations and opportunities in relation to habitats of conservation concern[3] and protected species within the Site;
- Proposed habitat restoration and management measures for peatland restoration and enhancement, ecological enhancement and enhancement of habitat for bird species;
- Consideration of peatland restoration best practice techniques and monitoring; and
- A summary of potential benefits.

4.76 The OREP sets out outline proposals only; in accordance with standard practice, it is intended that the outline proposals are used as a basis for a detailed management plan, to be agreed under a condition attached to any consent granted to the Proposed Development, in consultation with NatureScot, The Highland Council, SEPA, and other relevant stakeholders.

4.77 During the preparation of the detailed OREP, a detailed programme of monitoring will be developed. Monitoring is likely to be resource-intensive in initial years, while the success of implementation will require close attention. However, annual monitoring is likely to be undertaken throughout the operational lifetime of the Proposed Development.

4.78 The monitoring programme will ensure that appropriate mechanisms are in place to remediate any failed measures, or implement necessary management, throughout the operational lifetime of the Proposed Development.

Waste Management

4.79 Materials will be generated, and will require management, during construction, in particular the topsoil removed and stockpiled prior to construction area activities, and construction waste such as packaging and used formwork. Measures to reduce potential environmental effects associated with the storage and transportation of waste will include:

- The careful location of stockpiles and other storage areas;
- The use of good practice in the design of storage areas and the use of suitable containers;
- The use of sheeting, screening, and damping where appropriate and practicable;
- The control and treatment of runoff from soil and soil stockpiles;
- Minimising storage periods; and
- Minimising haulage distances.

4.80 All materials will be identified, classified, quantified and, where practicable, appropriately segregated. Any materials that cannot be reused will be disposed of according to relevant waste management legislation which will serve to address a number of possible environmental effects. This includes:

- The Duty of Care imposed by Section 34 of the Environmental Protection Act 1990; and
- The Waste Management Licensing Regulations 1994 (as amended), particularly provisions relating to registered exemptions from waste management licensing.

4.81 All materials removed from Site will be handled in accordance with relevant waste and environmental regulations. Waste will be transferred using a registered waste carrier to a licensed waste disposal site or recycling centre.

Health and Safety

4.82 All construction activities will be managed within the requirements of the Construction (Design and Management) Regulations 2015 and will not conflict with the Health and Safety at Work etc. Act 1974. The design of the Proposed Development has taken full account of these regulations. To further reduce possible health and safety risks, a Health and Safety Plan for the Proposed Development will also be drawn up. All staff and contractors working on the construction will be required to comply with the safety procedures and work instructions outlined in the Health and Safety Plan at all times.

4.83 To ensure that hazards are appropriately managed, risk assessments will be undertaken for all major construction activities, with measures put in place to manage any hazards identified.

[3] Habitats listed within the Annex 1, Scottish Biodiversity List and wetland habitats (GWDTE).

Construction (Design and Management) Regulations 2015

4.84 The Construction (Design and Management) Regulations 2015 have formed an integral part of the Proposed Development concept design and the resulting layout presented within the EIA Report. Any 'significant' (as defined by the regulations) health and safety risks have been taken account of and consideration reflected in a site wide Designers Hazard Risk Assessment (DHRA). Surveys and investigations have been undertaken throughout the pre-consent phase of the Proposed Development in order to, as far as reasonably practicable, identify, manage and if possible avoid any potential risks during construction.

4.85 These will require on-going review throughout the proposed construction period, in line with current regulation.

Operational Details

4.86 The proposed operational lifetime of the Proposed Development is 35 years.

4.87 The Site will not be manned on a full-time basis, and it is envisaged that the amount of traffic associated with the Proposed Development will be minimal. Traffic generated will comprise routine service and maintenance team visits, together with the occasional need for more extensive maintenance or repair. Wind turbine operations will be overseen by suitably qualified contractors.

4.88 Once operational, staff will be employed to operate the Proposed Development and undertake routine maintenance work during its lifetime. Routine maintenance and servicing will take place two to four times per year. Servicing will include the performance of tasks such as maintaining bolts to the required torque, adjustment of blades, inspection of blade tip brakes and inspection of welds in the tower. Other visits to the Site will take place more frequently to ensure that the turbines are operating at their maximum efficiency. In the event of any unexpected events onsite, appropriate repair works will be carried out. In addition, monitoring measures are likely to be put in place to review the effectiveness of measures set out in the OREP which will require visits to the Site once operational. Further details in relation to OREP monitoring are provided in **Appendix 8.5**.

4.89 The vehicle used for the majority of these visits is likely to be a small four-wheel drive vehicle, although there may be an occasional need for an HGV or crane to access the Site for heavier maintenance and repairs.

4.90 On-going track maintenance will generally be undertaken in the summer months when tracks are dry. Safe access will be maintained all year round.

Decommissioning

4.91 At the end of the 35-year operational period, the Proposed Development will either be decommissioned, or an application may be made for consent to extend its operational life. It is estimated that decommissioning of the Proposed Development, given its size, would take approximately 12 –18 months.

4.92 Decommissioning will involve the removal of all above ground infrastructure, the dismantling and removal of wind turbines and electrical equipment and restoration of the turbine areas, hardstandings and tracks. All demolition waste will be removed to a licensed waste disposal site. The plinth and the top surface of the wind turbine foundation bases will be broken out and removed to approximately 1m below ground level and all cabling will be cut out at the same depth. The area will then be reinstated with a final layer of topsoil over the foundations. Tracks will either be left for use by the landowner or covered in topsoil. No stone will be removed from the Site during decommissioning. This approach is considered to be less environmentally damaging than seeking to remove all foundations, underground cables and roads entirely.

4.93 All material arising from decommissioning and demolition will be disposed of responsibly and in accordance with the relevant waste management regulations at the time.

4.94 A decommissioning method statement will be prepared and agreed with the relevant statutory consultees prior to decommissioning of the Proposed Development.