2 Proposed Development Description

2.1 Introduction

2.1.1 This chapter of the Environmental Impact Assessment (EIA) Report describes the components of the proposed development for which consent is being sought, for the purposes of informing the identification and assessment of likely significant effects. It includes details about the construction, operation and decommissioning of the proposed development.

2.1.2 This chapter is supported by the following appendices:

- Technical Appendix 2.1: Outline Construction and Environmental Management Plan (CEMP);
- Technical Appendix 2.2: Outline Borrow Pit Management Plan (BPMP); and
- Technical Appendix 2.3: Outline Pollution Prevention Plan (PPP).

2.1.3 A number of figures have also been prepared to support the chapter, which provide an overview of the key components of the proposed development.

2.2 Site Location and Description

2.2.1 The proposed development is located south of the B7068, approximately 5.5km[1] south-west of Langholm in Dumfries and Galloway.

2.2.2 The extents of the site of the proposed development are indicated on indicated on Figure 1.2.

2.2.3 The site is centred on Ordnance Survey grid reference E 333000, N 580000, covers an area of approximately 1,020ha with wind turbines occupying hills locally known as Collin Haggs, Healy Hill and Bloch Hill. The site is currently used predominately for sheep and cattle grazing with small areas of commercial forestry.

2.2.4 The Wauchope Water passes to the north of the site, which flows into the River Esk at Langholm, ultimately flowing south to the Solway Firth. The A7 between Edinburgh and Carlisle passes to the east. To the south along the B6357 are the settlements of Chapelknowe, Milltown, Evertown and Canonbie. The operational wind farm Solwaybank Wind Farm sits adjacent to the west of the site, with the settlements of Kirtleton and Waterbeck west of Solwaybank Wind Farm.

2.2.5 The proposed development is for:

- up to 21 three-bladed horizontal axis wind turbines of up to 230m tip height. The wind turbines would be nominally rated at 6MW;
- at each wind turbine, associated low to medium voltage transformers and related switchgear;
- wind turbine foundations;
- hardstand areas for erection cranes at each wind turbine location;
- a network of access tracks including watercourse crossings, passing places, turning heads and site entrances from the public road network;
- borrow pits (dependent on availability of stone within the site);
- a substation compound containing electrical infrastructure, control building, welfare facilities and a communications mast;
- a battery energy storage system (BESS), rated at 45MW and associated compound;
- a network of buried electrical and communication cables; and
- temporary construction compounds.

2.2.6 The proposed development is expected to operate for up to 50 years following which decommissioning of the wind turbines and other infrastructure would be undertaken as required.

Proposed Development Layout

2.2.7 Figure 1.3 presents the infrastructure layout of the proposed development.

2.2.8 Table 2.1 gives the centre point location and proposed hub height for each of the proposed wind turbines.

Table 2.1: Wind Turbine Locations

Wind Turbine	Easting	Northing	Tip Height (m)	Hub Height (m)
T1	330671	579641	180	105
T2	331117	579442	180	105
T3	331233	579934	200	125
T4	330682	580233	230	155
T5	330260	580468	200	125
T6	331349	580426	230	155
T7	331843	580853	200	125
T8	332252	580610	230	155
T9	332213	580118	230	155
T10	332257	579636	230	155

[1] This distance is given to the approximate centre point of the site boundary.

Wind Turbine	Easting	Northing	Tip Height (m)	Hub Height (m)
T11	332750	580029	230	155
T12	332803	579565	230	155
T13	333272	579391	200	125
T14	333266	580464	200	125
T15	333809	580437	200	125
T16	333611	580986	230	155
T17	334128	580901	230	155
T18	333709	581477	230	155
T19	334307	581395	180	105
T20	334105	581903	180	105
T21	334665	581842	180	105

2.2.10 For the purpose of assessment, a maximum wind turbine tip height of up to 230m to tip has been used. Where necessary for assessment purposes a rotor blade diameter of 150m has been used although the blade length may vary (within the maximum wind turbine tip height) depending on wind turbine availability at the time of construction.

2.3 Construction Phase

Proposed Infrastructure

2.3.1 Prior to the commencement of construction, a Construction Environmental Management Plan (CEMP) will be produced setting out in detail the individual items of works associated with the construction of the proposed development (see Technical Appendix 2.1: Outline CEMP).

2.3.2 Below is a high-level overview of the infrastructure that forms the proposed development including reference to relevant figures submitted with the application. Where applicable, it includes construction and reinstatement methodologies. For the purposes of carrying out the assessments on construction activities in the EIA Report, the reasonable worst-case scenario has been adopted.

Wind Turbines

2.3.3 Consent is being sought for the installation and operation of up to 21 three-bladed horizontal axis wind turbines.

2.3.4 The specific wind turbine model has not yet been selected but to inform modelling and assessment a wind turbine up to a maximum blade tip height of 230m above ground level has been assumed. Each with a rotor diameter of approximately 150m with, nominally, 6MW generating capacity. Indicative drawings of the proposed wind turbines are presented in Figures 2.1a, 2.1b & 2.1c.

2.3.5 Each of the wind turbines consists of the following components:

- blades;
- hub
- nacelle;
- tower; and
- external transformer.

2.3.6 Three blades will attach to the hub forming the rotor assembly which is mounted to the nacelle. The nacelle contains the gearbox, generator and associated control and monitoring equipment. The nacelle and rotor assembly are mounted atop a tapered tubular tower mounted onto a reinforced concrete foundation.

2.3.7 All wind turbine components are pre-fabricated off-site. Towers would likely be three to four sections and made from steel and the blades from fibreglass. It is proposed that the wind turbine tower, nacelle and blades be finished in a semi-matt, off-white/pale grey colour.

2.3.8 Wind turbines shall not carry any symbols, logos or other lettering except where required under other legislation. However, it is proposed to add wind turbine numbers to the base of each tower to aid service engineers during the operational phase of the wind farm.

2.3.9 Numbers would be up to 1,000mm tall by 900mm wide and would be positioned between up to 3m from finished ground level in order to be visible from the approaching access track.

2.3.10 A transformer will be required for each wind turbine which is assumed to be located external to the wind turbine.

2.3.11 External transformer housing would be situated adjacent to each of the wind turbine towers. The requirement for such structures, along with their dimensions, would vary based on the final wind turbine choice. It is possible that the transformer will be internal to the wind turbine structure however an indicative design for a typical external transformer housing is included in Figures 2.2a & 2.2b.

2.3.12 Since all wind turbines in the proposed development exceed 150m above ground level to blade tip height, they are within scope of Article 222 of the Air Navigation Order, which requires all obstructions of 150m or more above ground level to be fitted with medium intensity steady red lights on the highest practicable point.

2.3.13 Chapter 13: Aviation, Radar and Other Issues provides details of a lighting scheme proposed for the wind turbines, which has been agreed with the CAA, and Chapter 5: Landscape and Visual Impact Assessment assesses the associated impacts of this lighting scheme.

Wind Turbine Foundations

2.3.14 Foundations will be required to support the wind turbines. These are typically steel reinforced concrete structures constructed in the ground to which the wind turbines are bolted to. Until a detailed ground investigation can be carried out it is not clear what form the foundation will take. Typically wind turbine foundations are either gravity type foundations or piled type foundations.

2.3.15 Regardless of the sub-structure, the above ground finish will see a 4.5m – 5.5m diameter foundation plinth protrude from the ground to support the wind turbine. It is proposed that a 5m wide maintenance path surrounds the plinth connecting to either the adjacent access track or crane hardstand.

2.3.16 Figures 2.2a & 2.2b present the typical design for a both gravity type and piled type foundations.

Crane Hardstands

2.3.17 Adjacent to each wind turbine, an area of permanent hardstand approximately 35m x 55m will be constructed of compacted stone bearing directly on a suitable formation strata for use by the erection cranes. The exact geometry and position of the crane hardstands will depend on the wind turbine supplier's specifications, the cranes selected for erection and the findings of detailed ground investigations prior to construction. An indicative crane hardstand arrangement is presented in Figure 2.3.

2.3.18 The crane hardstands would be constructed using the same method as the excavated access tracks.

2.3.19 After wind turbine erection is complete, the temporary hardstand areas (as shown on Figure 2.3) would be reinstated. There would be a need to use cranes from time to time during the operational phase of the proposed development. The 'Good Practice during Wind Farm Construction'[2] guide recommends that crane hardstand areas are not covered with peat or topsoil. Therefore, the crane hardstands would be left uncovered, which would ease maintenance activities and comply with best practice guidance.

Access Tracks

2.3.20 Approximately 11.68km of access track will be constructed for the proposed development as shown in Figure 1.3. This comprises 11.68km of new track construction and 3.65km of upgrade to an existing access track construction. The access track layout has been designed in order to maximise the use and upgrade of existing tracks as far as reasonably practicable.

2.3.21 For construction of access track, alternative methods would be utilised for different areas of the site, depending on site specific conditions. For each method, the access track running width shall be approximately 4.5m and will be constructed of compacted crushed stone. Access track widths may also be wider for short sections such as at passing places, at sharp bends or turning heads and junctions. Two passing places and 12 full AIL turning heads have been proposed as presented on Figure 1.3. Full AIL turning heads are required to facilitate both forward and reverse delivery of wind turbine blades to each wind turbine location. This is required when constructing a rotor at ground level to perform a full rotor lift. Alternatively, wind turbine blades can be lifted individually to the hub, a single blade lift. Should the latter blade lift be adopted then the full AIL turning heads can be reduced or removed.

2.3.22 It is expected that all access tracks would be excavated whereby overlying soil or peat material would be removed to a suitable formation strata from which the access track would be built in compacted stone.

2.3.23 Where peat depths are greater than 1m deep, it is generally more efficient to "float" the access track over peat using geogrid. Typical access track construction details are presented in Figure 2.4.

2.3.24 4 new watercourse crossings are required as part of the proposed development These watercourse crossings shall be designed to ensure that fish and mammal movement is not restricted. It is understood that applications will need to be made to SEPA under The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (CAR) for authorisation of the various watercourse crossings. An example design of a typical watercourse crossing is presented in Figure 2.8. Further information on watercourse crossings is provided in Chapter 9: Hydrology, Hydrogeology, Geology & Soils.

2.3.25 For safety reasons, marker posts may be placed in the ground by the edge of the access track in order to guide on-site vehicles during times of poor visibility.

[2] http://www.snh.gov.uk/planning-and-development/renewable-energy/onshore-wind/good-practice-during-windfarm-const/

Public Road Access

2.3.26 The proposed development will be accessed directly from the C70A via two new site entrance south of Bloch Farm. The new site entrances will be designed to accommodate deliveries for wind turbine components. Figure 2.5 presents indicative layouts of the new site entrances.

2.3.27 Wheel cleaning facilities will be set up at both the above-mentioned site entrances to site from the C70A to remove mud from the wheels of vehicles leaving the proposed development. Public roads will be inspected daily, and a lorry-mounted road brush will be employed to remove any mud or debris transferred onto the roads from on-site activities.

Description of Abnormal Access

2.3.28 The delivery of the Abnormal Indivisible Loads (AILs) will likely be from the King George V Dock in Glasgow. The AILs will leave the dock along Kings Inch Drive joining the M8 at Junction 26. They will continue east joining the M73 at Junction 8 and then the M74 at Junction 1. They will then continue southwards crossing over the border into England and continue on the M6 until Junction 42. At Junction 42 the AILs will leave the M6 and make a turn northwards around the roundabout. Continuing northwards along the M6 the AILs will leave the M6 at Junction 45 turning right onto the A6071. They will then continue east along the A6071 and turn left onto the A7 northwards towards Langholm.

2.3.29 Continuing along the A7 the AILs will turn right onto the Auchenrivock Road continuing northwards along the Auchenrivock road to turn left onto the U251A. AILs would continue along the U251A crossing underneath the A7 Dockenbeck Bridge until the U251A meets an existing track between Old Irvine and Kerr connecting the U251A and the C70A (hereinafter referred to as the "Old Irvine – Kerr track").

2.3.30 The Old Irvine – Kerr track will require to be upgraded and widened to facilitate AIL delivery. AILs will continue across the upgraded Old Irvine – Kerr track to meet the C70A.

2.3.31 AILs will then turn right northwards along the C70A to the site entrances as mentioned above.

2.3.32 Public roads would be utilised and repaired where necessary. An assessment of the public road access is provided in Chapter 10: Traffic & Transport.

Onsite Cabling

2.3.33 The wind turbines envisaged for use on the proposed development would initially generate electricity at 690 – 1000V. This typically needs to be stepped up to the on-site distribution voltage of 33kV via the ancillary transformer, as mentioned above in the Wind Turbines section. Each wind turbine will be connected to the substation compound via underground electrical cables.

2.3.34 Cable trenches will accommodate these electrical cables, including also communication cables and the earthing cable network. Figure 2.12 presents the typical cable trench cross section that shall be adopted across the site. Where cables need to cross access tracks or hardstands they will be routed through ducts.

2.3.35 The layout of the cable trenches within the site would generally run adjacent to the access tracks where possible. The route would be marked above ground with clearly identified posts, spaced at suitable intervals along the length.

Substation and Battery Energy Storage System Compounds

2.3.36 A substation compound is required to collect the electricity generated and distribute it off-site to the electricity grid system. A substation compound of approximately 77.5m x 82.5m is proposed near the western site entrance approximate Ordnance Survey grid reference E333200, N579900. It will be constructed of compacted stone bearing directly on a suitable formation strata, including reinforced concrete foundations for the buildings and ancillary equipment. The substation compound would contain 33kV/132kV step-up transformers, associated switchgear, telecommunications mast and ancillary equipment suitable for a transmission connection to the electricity grid system. The wind farm control building required at the substation compound would accommodate metering equipment, switchgear, the central computer system and electrical control panels. It is anticipated that the Transmission Operator will also require their own control building. In addition to the control buildings a welfare building will be installed for all personnel.

2.3.37 Figures 2.9a & 2.9b present an indicative substation compound layout and elevations. This is indicative and the design and layout are subject to change once the expected point of connection is known, see Grid Connection section below.

2.3.38 The telecommunications mast is expected to be up to 10m tall. A typical elevation of the telecommunications mast is presented in Figure 2.10.

2.3.39 In order to match on-site energy generation to energy demand, as well as facilitate options such as a reduction in any possible grid constraint requirements, the proposed development also includes a battery energy storage system (BESS).

2.3.40 The BESS compound is proposed to be 160m x 45m, located opposite the access track to the substation compound at approximate Ordnance Survey grid reference E333250, N579980. It will be constructed of compacted stone bearing directly on a suitable formation strata, including reinforced concrete foundations for the building and ancillary equipment. Within the BESS compound permanent containers, mounted on small concrete foundations, would house an energy storage device, inverters and other ancillary equipment. For each container there would be a transformer located on the hardstand.

2.3.41 Should the BESS compound be realised it will be formed by expanding the temporary construction compound as indicated on Figure 1.3. Figures 2.11a & 2.11b present indicative BESS compound layout and elevations.

2.3.42 For both the substation and BESS compounds foul drainage will be provided in accordance with Building Control requirements and in agreement with SEPA.

Grid Connection

2.3.43 The proposed point of connection for the proposed development into the electricity grid system is at the substation compound. The proposed development would most likely be connected at Gretna Substation, a substation located approximately 11km south of the proposed development.

2.3.44 The connection would be comprised of buried 132kV cables and/or OHL. The exact arrangement of this grid connection is subject to detailed design by Scottish Power Transmission, the Transmission Operator (TO). To confirm the applicant has made an application to the TO for an offer of grid connection.

2.3.45 Should further detailed studies determine that a grid connection to another transmission entry point prove more suitable, the TO will advise the applicant in due course. Any final grid connection route and associated consents would be the responsibility of the TO and this route would require further studies and would be subject to a separate consenting process and EIA if required.

Borrow Pits

2.3.46 Borrow pits may be used to provide the stone for the construction of access tracks, compounds and hardstands, subject to sufficient quality and quantity of stone being available at the identified borrow pit search areas, as indicated on Figure 1.3. These borrow pit search areas are shown as the maximum potential area of borrow pit extraction, but it is not anticipated that these areas would be fully exploited. An indicative borrow pit arrangement is shown in greater detail in Figure 2.14.

2.3.47 Final borrow pit locations within the borrow pit search areas would be subject to detailed ground investigations to confirm suitability of material.

2.3.48 If an on-site batching plant is required, it would be situated within a borrow pit or at another secure location which would be agreed in advance with SEPA and Scottish Water prior to construction. Figure 2.15 presents a typical batching plant layout).

2.3.49 The batching plant equipment will include:

- concrete and aggregate storage bins;
- concrete batching equipment;
- wash out facilities;
- testing facilities;
- water supply; and
- waste storage area.

2.3.50 It is anticipated that a borehole would be sunk to provide a reliable water supply for the batching plant. Any borehole would be subject to suitable yields being available, which will be determined through future detailed ground investigation. Any borehole would require suitable authorisation from SEPA under CAR.

Temporary Compounds

2.3.51 A temporary construction compound will be constructed to provide a secure area for office facilities and storage of materials and components. The temporary construction compound of 70m x 45m will be required at the western site entrance at approximate Ordnance Survey grid reference E333170, N580010. The temporary construction compound will be constructed of compacted stone bearing directly on a suitable formation strata.

2.3.52 The temporary compound will be used to accommodate a number of construction facilities including site offices and meeting rooms, staff welfare facilities, storage and laydown areas for construction vehicles, plant, equipment, turbine components, other materials and aggregate recycling. The compound will also provide sufficient parking for the on-site personnel, deliveries and visitors.

2.3.53 There will be a sealed bunded area where fuel and oil storage tanks will be situated, to prevent potential contamination in accordance with SEPA guidance the bunded area will be situated a minimum of 50m from any watercourse to reduce the risk of pollution entering watercourses.

2.3.54 Depending on the time of year and the stage of the construction programme, temporary lighting may be required at the temporary compounds and at work areas during working hours. It is not proposed that the lighting will be on outside of working hours.

2.3.55 A typical layout of the temporary construction compound is presented in Figure 2.13.

Signage

2.3.56 There would be a requirement for signage at the proposed development to provide safe day-to-day navigation, for emergency vehicles to navigate to emergencies, should they arise, as well as aid the development of comprehensive risk assessment for those visiting and using the site.

Construction & Reinstatement

2.3.57 Construction of the proposed development will consist of the following key construction activities:

- ground investigation;
- construction of the site entrances from the C70A;
- construction of the temporary compounds;
- construction of the access tracks, including passing places, turning heads, junctions, utilities crossings, drainage and water crossings;
- extracting stone from borrow pit;
- construction of the substation compound;
- construction of the BESS compound;
- construction of the wind turbine foundations;
- construction of crane hardstands;
- excavation of trenches and laying of cabling adjacent to the tracks connecting the wind turbines to the substation compound;
- delivery and erection of wind turbines;
- testing and commissioning of site equipment including wind turbines; and
- site restoration.

Site Entrances

2.3.58 The construction method for site entrances would generally be as follows:

- Traffic management to be installed;
- Topsoil shall be removed and carefully stockpiled;
- New drainage shall be installed taking care to ensure that existing drainage will not be compromised;
- Road pavement works to be completed to the design requirements;
- Line marking, signage, fencing, visibility splay clearance and vehicle restraint systems required as part of the design will be installed;

Working of Borrow Pits

2.3.59 Excavation of material from the borrow pits will be carried out using standard quarrying techniques, which may include blasting and mechanical excavation.

2.3.60 The general methodology set out below for careful management of the borrow pit will be adhered to in order to minimise potential environmental impact.

2.3.61 A Borrow Pit Management Plan will be agreed with SEPA and the planning authorities prior to the commencement of construction. Provisions for the control of surface run-off during and post construction and the re-vegetating of working faces post construction will be included.

2.3.62 As a worst case, it is anticipated that blasting may occur up to 2-5 times a week for the first six months, before tapering off and becoming less frequent.

2.3.63 Appropriate dust suppression at the borrow pits and any materials storage areas will be provided as required.

2.3.64 Once operations are sufficiently underway, restoration will take place progressively behind the working area to encourage re-vegetation. This will minimise any impact to the surrounding environment by minimising the working area at any point.

2.3.65 An Outline Borrow Pit Management Plan is provided as Technical Appendix 2.2.

Construction of Excavated Tracks, Hardstands and Compounds

2.3.66 The construction method for excavated tracks, hardstands and compounds would generally be as follows:

- The topsoil will be excavated and stored to one side for reuse during the reinstatement of the structure;
- Excavation will be undertaken to competent material. Excavated subsoil material may be stockpiled temporarily adjacent to the excavation for later use as backfill or stored elsewhere on the proposed development. Temporary and permanent drainage shall be installed at the same time as the excavation works for the structure;
- In the case where competent material is lower than the required formation level the foundation will likely be over-excavated to competent material and compacted engineering fill placed to the required formation level;

- Where excavation is required to extend below the water table or in material which does not drain freely, appropriate pumping will be employed to keep the excavation dry. Water pumped from an excavation shall not be discharged directly to any watercourse;
- If ground conditions dictate a geotextile membrane will be applied;
- Crushed stone will be placed and compacted in layers to achieve the required structural dimensions;
- For the compounds, ducting and reinforced concrete foundations will be constructed at the required design level;
- Pre-fabricated buildings and electrical equipment will be delivered to site and lifted into place;
- Drainage will be excavated adjacent to the structures where required. Surface water runoff will not be allowed to discharge directly into existing watercourses but will be routed through a sustainable drainage system (SuDS) in accordance with the Pollution Prevention Plan. An Outline Pollution Prevention Plan is provided as Technical Appendix 2.3;
- A surface water cut off ditch may be installed on the slope above the earthworks footprint where achievable given the topography; and
- Depending on depth and type of material, cut slopes are anticipated to be between 1:1 to 1:3.

Construction of Floating Access Tracks

2.3.67 Floating access track construction may be adopted where the ground conditions dictate. This system involves installing a geosynthetic reinforcement directly onto the organic vegetated layer and placing layers of crushed stone and additional geosynthetic reinforcement (if required by the design) above. If ground conditions require a geotextile membrane may be applied also.

Installation of Cabling

2.3.68 The cable trench construction and installation method would generally be as follows:

- Trenches will be excavated and a suitable bedding material placed for which to lay the cables upon;
- The cables shall be laid directly onto the bedding material and spaced according to the design;
- The trench will then be backfilled and compacted with suitable material up to the required level and finished with a layer of topsoil to aid in the trench reinstatement;
- A suitable marking tape will be installed between the cables and the surface; and
- The cables will terminate at each wind turbine and at the substation compound.

Construction of Wind Turbine Foundations

2.3.69 The gravity type foundation construction method would generally be as follows:

- The topsoil will be excavated and stored to one side for reuse during the reinstatement round the finished foundation;
- Excavation will be undertaken to competent material. Excavated subsoil material may be stockpiled temporarily adjacent to the excavation for later use as backfill or stored elsewhere on in the proposed development. Temporary and permanent drainage shall be installed at the same time as the excavation works for the foundation;
- In the case where competent material is lower than the required formation level the foundation will likely be over-excavated to competent material and compacted engineering fill placed to the required formation level;
- Where excavation is required to extend below the water table or in material which does not drain freely, appropriate pumping will be employed to keep the excavation dry. Water pumped from an excavation shall not be discharged directly to any watercourse;
- A layer of concrete blinding will be laid directly on top of the newly exposed formation, finished to ensure a flat and level working surface;
- Steel reinforcement, the wind turbine anchorage system and cable ducts will be fixed in place and formwork erected around the steel cage;
- Concrete will be placed using a crane, pump or other suitable lifting device and compacted using vibrating pokers;
- The foundation will be backfilled with suitable material, and landscaped using the topsoil set aside during the initial excavation; and
- A maintenance path will be built leading from the access track or crane hardstand to the wind turbine door or access steps and around the wind turbine for maintenance.

2.3.70 The piled type foundation construction method would generally be as follows:

- The topsoil will be excavated and stored to one side for reuse during the reinstatement round the finished foundation;
- A suitable level piling platform will be constructed which will likely consist of compacted stone designed to comply with the requirements of the piling rig being used;

- Formation of the pile shaft will be achieved by rotary methods to the required depth and embedment in the competent soils or bedrock. Any spoil produced shall be removed and stored at the selected location within the site. Depending on the selected piling technique, it may be necessary to insert temporary casing into the ground to support the pile bore;
- Delivery and placement of the concrete into the pile bore will be undertaken using a concrete pump;
- The pile reinforcement cage may be installed before or after the concrete placement depending on the selected technique;
- On completion of all the piles within a wind turbine foundation, the piling rig and ancillary equipment shall be moved to the next wind turbine location as required; and
- A reinforced concrete pile cap, connected to the piles below, would then be constructed in much the same manner as the gravity type foundation.

Erection of Wind Turbines

2.3.71 The following general steps will be undertaken in order to erect the wind turbines:

- Some components will be pre-delivered in sections and offloaded at the crane hardstands;
- The remaining components will be delivered on a just-in-time basis and be lifted directly from vehicle trailers;
- Components will be lifted by adequately sized cranes (one main crane and one smaller assist crane) and positioned on the foundations / other sections until the entire wind turbine is erected;
- Upon completion of the erection all fasteners will be tightened and the internal fit out of the wind turbine undertaken;
- The wind turbines will then be connected to the substation compound; and
- Wind turbine testing and commissioning will be undertaken before the wind turbines will be handed over as complete.

Reinstatement

2.3.72 Following construction, the proposed development will be reinstated. The anticipated type and extent of reinstatement is outlined below.

2.3.73 Where a re-turfing method is appropriate, such as along access 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.

2.3.74 Local restoration 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.

2.3.75 Bare soil areas will be allowed to re-vegetate naturally in combination with reseeding using a low density (~20kg per hectare) seed mix which mirrors local vegetation to help bind the soil more quickly.

2.3.76 Access tracks, hardstands and compounds are required throughout the operation of the wind farm to permit access for maintenance and repair operations. They will also be necessary to allow access during the decommissioning stage. Generally, the sloping verges of access tracks, hardstands and compounds will be dressed with site sourced turf or seed bank material. If suitable material is generated during the construction of the structure, this material can be used to form a low-lying screening verge along the downhill side of the structure. This will assist in reducing the visibility of the structure. Further detail is provided in Technical Appendix 9.2: Peat Management Plan.

2.3.77 The temporary compounds will be reinstated into the surrounding landscape and restored to its original condition.

2.3.78 It is essential that the access track width is retained during the operation of the proposed wind farm to allow occasional crane access if required, hence no works to reduce the access track width, post wind turbine erection, are proposed.

2.3.79 Cable trenches would be similarly reinstated. Where practicable, vegetation over the width of the cable trenches would be lifted as turves and replaced after trenching operations to reduce disturbance.

Micrositing

2.3.80 Micrositing allows the locations of the wind turbines and infrastructure to be modified post-consent within specified parameters, following detailed ground investigation and ground clearance. Through industry experience, a micrositing allowance of up to 100m is considered appropriate for wind turbines and associated infrastructure, subject to certain conditions, such as ensuring buffers from watercourses are maintained. The assessments within this EIA Report account for the potential micrositing of the wind turbines and associated infrastructure.

Construction Programme

2.3.81 Construction of the proposed development is estimated to last 15 months. An indicative programme for the construction activities of the proposed development is shown in Table 2.2.

Table 2.2: Outline Programme

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Mobilisation	■	■													
Site entrance and access tracks	■	■	■	■	■	■	■								
Crane hardstands		■	■	■	■	■	■	■							
Wind turbine foundations					■	■	■	■	■	■	■				
Substation & BESS							■	■	■	■	■	■			
Cable installation								■	■	■	■	■			
Turbine deliveries											■	■			
Turbine erection											■	■	■	■	
Operational take over														■	■

Construction Hours

2.3.82 In general, working hours for construction will be from 07:00 to 19:00 Monday to Saturday. No working is proposed on Sundays or public holidays.

2.3.83 Exceptions to the proposed working hours will be made for foundation pours and wind turbine erection. Concrete pouring for an individual wind turbine foundation must take place continuously and so activity will only cease when the pour has been completed. Wind 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.

Environmental Management

Construction Environmental Management Plan

2.3.84 A Construction Environmental Management Plan (CEMP) will be prepared prior to the start of construction, detailing measures to avoid or mitigate potential effects associated with key construction activities. These will reflect and expand upon measures identified in the EIA Report, and will be agreed with the planning authorities, SEPA, NatureScot and other stakeholders where appropriate. An Outline CEMP is provided as Technical Appendix 2.1.

2.3.85 The CEMP will, as a minimum, include details of:

- design philosophy and construction methodologies;
- surface and ground water management;
- water quality monitoring;
- flood risk management;
- private water supply management;
- waste and resource management;
- wastewater and water supply monitoring and control;
- noise and vibration control;
- dust and other emissions to air control.
- spoil management;
- peat slide monitoring and control;
- oil and chemical delivery and storage;
- temporary lighting management
- existing on-site utilities management
- post construction reinstatement
- construction traffic management;
- health and safety management;
- public liaison provision; and
- decommissioning and restoration methodologies.

2.3.86 The CEMP will typically contain the following supporting documents:

- A Pollution Prevention Plan;
- A Peat Management Plan;
- A Construction Traffic Management Plan;
- A Site Waste Management Plan;
- A Borrow Pit Management Plan;
- A Path Management Plan; and
- A Water Quality Monitoring Plan.

Pollution Prevention Plan

2.3.87 CAR dictates that a Construction Site License will be required from SEPA for the proposed development prior to commencement of construction. To make this application it is proposed that a Pollution Prevention Plan (PPP) would be prepared. Once approved by SEPA it would act as a supporting document to the CEMP. An Outline Pollution Prevention Plan is provided as Technical Appendix 2.3.

Peat Management Plan

2.3.88 Prior to construction of the proposed development a detailed ground investigation will be carried out. This will allow for a post consent update of the Peat Management Plan (PMP), following the principles set out in the draft Peat Management Plan provided as Technical Appendix 9.2.

Construction Traffic Management Plan

2.3.89 As detailed in Chapter 10: Traffic & Transport, a Construction Traffic Management Plan (CTMP) would be developed to ensure road safety for all users during transit of loads to the proposed development. The CTMP would outline measures for managing the convoy and would set out procedures for liaising with the emergency services to ensure that police, fire and ambulance vehicles are not impeded by the loads. The CTMP would be developed in consultation with the planning authorities, the police, Transport Scotland and the local community and agreed before deliveries to the proposed development commence.

Site Waste Management Plan

2.3.90 The proposed development would produce small amounts of general, municipal and hazardous waste during its construction, operation and decommissioning. The Site Waste Management Plan (SWMP) would be put in place to ensure waste generated from the proposed development is kept to a minimum and does not have a significant cumulative effect on local waste management infrastructure.

Borrow Pit Management Plan

2.3.91 Prior to construction of the proposed development a detailed ground investigation will be carried out. This will allow the applicant to confirm suitability of the proposed borrow pits and update the Borrow Pit Management Plan (BPMP). An Outline Borrow Pit Management Plan is provided as Technical Appendix 2.2.

Path Management Plan

2.3.92 Prior to construction of the proposed development a Path Management Plan will be prepared in liaison with DGC. It will detail the maintenance of safe public access routes during construction and long term public access during the operation of the proposed development.

Water Quality Monitoring Plan

2.3.93 A Water Quality Management Plan (WQMP) will be prepared following receipt of planning consent. The plan will detail proposed monitoring locations, monitoring frequency and analytical parameters based on the findings of the EIA Report and any subsequently submitted documents / information. The plan will also include trigger / action levels and outline protocols and procedures required in the event of an incident.

Environmental Clerk of Works (ECoW)

2.3.94 An ECoW would be appointed to undertake site surveys, monitor the construction activities and report to both the applicant and planning authorities of any incidences. The ECoW will ensure compliance with the CEMP and any other environmental documentation required by planning condition. The ECoW would liaise closely with the applicant, providing expert advice to help rectify any potential environmental matters that arise during the construction phase.

Planning Monitoring Officer (PMO)

2.3.95 A PMO would be appointed to monitor compliance of the proposed development with the planning requirements of its consent during construction and report to both the applicant and the planning authorities. The PMO would liaise closely with the applicant, providing expertise to help rectify any potential planning issues that might arise.

2.4 Operational Phase

2.4.1 Once operational, the proposed development will not be permanently staffed, and it is envisaged that the amount of traffic associated with the proposed development will be minimal. Traffic generated will comprise routine maintenance and service team visits, together with the occasional need for more extensive maintenance or repair. Wind turbine operations will be overseen by suitably qualified contractors.

2.4.2 Routine maintenance and servicing will take place two to four times per year. Servicing will include the performance of tasks such adjustment of blades, inspection of blade tip brakes and inspection of welds in the tower. Other visits to the proposed development will take place more frequently to ensure that the wind turbines are operating at their maximum efficiency. In the event of any unexpected events on-site appropriate repair works will be carried out.

2.4.3 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.

2.4.4 Ongoing access track maintenance will generally be undertaken in the summer months when access tracks are dry. Safe access will be maintained all year round.

2.4.5 The proposed development would have a sophisticated overall Supervisory Control and Data Acquisition system (SCADA) that would continually interrogate each of the wind turbines and the high voltage (HV) connection. If a fault were to develop which required, an operator to intervene then the SCADA system would make contact with duty staff via a mobile messaging system. The supervisory control system can be interrogated remotely. The SCADA system would have a feature to allow a remote operator to shut down one or all of the wind turbines.

2.4.6 An operator will be employed to monitor the wind turbines, largely through remote routine interrogation of the SCADA system. The operator will also look after the day-to-day logistical supervision of the proposed development and would be on-site intermittently.

2.4.7 If a fault should occur, the operator would diagnose the cause. If the repair warranted the proposed development being disconnected from the grid then the operator would make contact with the TO. However, this is a highly unlikely occurrence as most fault repairs can be rectified without reference to the network utility. If the fault was in the electrical system then the faulty part or the entirety of the proposed development would be automatically disconnected.

2.4.8 Signage will be placed on the proposed development giving details of emergency contacts. This information would also be made available to the local police station and the TO.

2.5 Decommissioning Phase

2.5.1 In the event of decommissioning, or replacement of the wind turbines, it is anticipated that the likelihood of effects is similar to, or less than, that expected during construction. Decommissioning would be undertaken in line with best practice processes and methods at that time and will be managed through an agreed CEMP.

2.5.2 Decommissioning will involve the following:

- dismantling and removal of wind turbines and electrical equipment;
- restoration of the wind turbine areas, hardstands and access tracks; and
- dismantling and removal of the substation and BESS compounds.

2.5.3 Wind turbine components and electrical equipment will be dismantled and removed in a similar manner to their delivery and erection. The wind turbines will be split into sections which will then be transported from the proposed development by HGVs unless the components are sold on, in which case, they will be removed as AILs. Wind turbine components will be cut up off-site in controlled environments ready for reuse, recycling or appropriate disposal.

2.5.4 The removal of the top of the wind turbine base will be undertaken requiring an excavated trench around the upstand to provide a working area. Breakout of the top part of the upstand will be undertaken using an excavator mounted jack hammer. The cables will be cut level with the remaining concrete. Once the broken-out concrete has been removed, the area will be reinstated by backfilling with topsoil / peat.

2.5.5 The cables will be left in place to avoid unnecessary ground disturbance.

2.5.6 The CEMP will be updated as required to ensure best practice is adopted during decommissioning of the proposed development.

2.5.7 An assessment of the decommissioning of the proposed development has not been undertaken as part of the EIA as:

- the future baseline conditions (environmental and other developments) cannot be predicted accurately at this stage; and
- the proposals for refurbishment / decommissioning are not known at this stage.

2.6 Health and Safety

Construction Phase

2.6.1 The construction site would be managed and operated in accordance with Health and Safety at Work etc. Act 1974 and comply with relevant Health and Safety Regulations, including:

- The Management of Health and Safety at Work Regulations 1999;
- Electricity Safety, Quality and Continuity Regulations 2002; and
- Construction (Design and Management) Regulations 2015.

2.6.2 In awarding any civil, electrical or other contracts for the construction of the proposed development the appointed contractor is obligated by law to follow the CDM Regulations implemented by the Health and Safety Executive (HSE). These are based on standard procedures that are adapted to take account of all site specific requirements. The CDM Regulations require due consideration is given to construction workers and the public, with risk assessments and method statements created to cover all risks identified including access rights across the site.

2.6.3 The applicant will appoint a Principal Designer to ensure all the CDM Regulations are correctly implemented, and to compile a Health and Safety File, which would be used in the operational phase of the proposed development. The applicant would be required to provide a timescale and start date for the proposed development, to allow the Principal Designer to review the adequacy of the contractor involved against the description of the required works. Additionally, a representative from the applicant would be at the proposed development during the construction period. This person would be empowered to halt any or all construction works if they believe correct health and safety procedures are not being adhered to. Similar procedures for site workers, visitors and civilians must be drawn up for the operational phase. The HSE can investigate safety aspects of the proposed development and visit at any time if they have concerns.

Public Safety

2.6.4 Throughout the construction phase of the proposed development, the relevant statutory requirements would be adhered to. All potentially hazardous areas would be fenced off and all unattended machinery will be stored in the temporary construction compound or immobilised to prevent unauthorised use. In addition, signage will be placed at each possible entrance to the site and in areas where there may be further danger, for example around open borrow pits.

2.6.5 Throughout construction, measures to manage diversion routes would be secured. The diversion routes would be clearly marked and for safety reasons would direct the user away from any areas of construction. It is proposed that further details would be provided in a Path Management Plan post consent.

2.6.6 Although members of the public have the right to roam land in Scotland under the Land Reform (Scotland) Act 2003 there will be restricted access around the proposed development during the construction phase for health and safety purposes.

Operational Phase

2.6.7 Wind farms have a proven track record for safety. A very small number of wind turbines have been known to suffer mechanical damage through lightning strikes or mechanical failure. Experience on operational wind farms has shown that allowing the public to access an operating wind farm does not lead to a compromise with respect to safety issues.

2.6.8 Companies supplying products and services to the wind energy industry operate to a series of international, European and British standards. A set of product standards for wind energy equipment has been developed by the International Electrotechnical Commission - IEC 16400. There are a number of British Standards that correspond to it, for example; BS EN 61400-1 ed3.0: 2005 “Wind turbines – Part 1: Design requirements”.

2.6.9 The applicant will commit to installing wind turbines and components that meet BS EN 61400-1 ed3.0.

2.6.10 Public access to the site after construction has been completed would remain the same as the current situation, although with some specific improvements to footpath infrastructure to facilitate public access which have been proposed as part of the proposed development. Appropriate warning, directional and identification signs would be installed on the wind turbines, transformers and at the substation and BESS compounds. Access to these would be restricted to wind farm personnel. At all times these facilities will be locked. Additionally, safety and/or directional signs will be placed at strategic points across the site, particularly on the public routes to inform members of the public that they are entering a wind farm, to make them aware of potential hazards and provide direction for emergency services should the need arise. Any signage would be agreed with the relevant authorities prior to installation. It is proposed that further details would be provided in a Path Management Plan post consent.

2.6.11 No resulting safety risks are expected as a result of public access to the proposed development. Wind turbine models being considered for the site would operate automatically and have sensors to detect any instabilities or unsafe operation during high wind speeds. Should sensors placed within the nacelle and tower of the wind turbine detect any other malfunction in operation or should wind speeds increase over maximum operational thresholds, the brakes would be automatically applied in order to rapidly shut the wind turbine down.

2.6.12 Icing in Scotland is likely to be a rare occurrence, especially with this site in the south of Scotland, icing conditions are expected to be benign. The design of the proposed development has taken into account the possibility of ice throw occurring and wind turbines have been sited in locations to ensure that the rotor blades do not oversail any public roads to minimise the risk from ice fall. To further minimise the risk public notices will be displayed at new and existing access points to the site, alerting members of the public and staff accessing the site of the possible risk of ice throw under certain weather conditions.

2.6.13 If the cause of the shutdown was high wind speeds, then the wind turbine would automatically begin operation once the average wind speed reduced to within operational levels. Under other causes of shutdown, e.g., through malfunction, the wind turbine would remain shut down and in a safe condition (i.e., commonly with the blades orientated 90° to the wind direction) until restarted by a member of the operations and maintenance (O&M) team following satisfactory investigation. This procedure ensures safe operation of wind turbines to protect members of the public walking, cycling or riding past wind turbines during the operational phase. In addition, the vibrometers in the nacelles would detect rotor imbalance in blades caused by icing and the wind turbine's control and monitoring system would shut the wind turbines down under these conditions. The wind turbines are also equipped with lightning protection equipment so that strikes would be conducted from the nacelle down the tower into the earth.

2.7 Conclusion

2.7.1 This chapter has set out a description of the proposed development and provided details of the activities that would be undertaken throughout the construction, operation and decommissioning phases of the proposed development.

2.7.2 There is sufficient detail to provide consultees with a reasonable understanding of the proposed development and to assess its likely significant environmental effects. Further construction details would be provided in the CEMP, which would be submitted for approval prior to the construction of the proposed development.