3. The Proposed Development

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3. The Proposed Development

3.1 Introduction

3.1.1 This chapter provides a description of the site and its geographical context and presents a description of the Proposed Development.

3.2 Site Status and Context

Site Description

3.2.1 The closest turbine is located approximately 2.7 km and 2.6 km south-west of Kirkconnel and Kelloholm respectively in Dumfries and Galloway. It comprises of the upland areas of White Hill and White Knowe, Sandy Knowe and Libry Moor. The elevation of the site ranges from 240 m to 440 m above ordnance datum (AOD). The site occupies an area of 389 ha. The site location is shown in Figure 1.1.

3.2.2 The site of the Proposed Development comprises largely open moorland habitat with an area of 80 ha of plantation forestry present in the eastern region of the site. There are no residential properties located within the site boundary.

3.2.3 The wider area is interspersed with surviving areas of ancient, semi-natural ancient and commercial woodland, with areas of upland habitat to the south and west and agricultural land to the north and east. New Cumnock and Sanquhar are located approximately 6.5 km west and 5.9 km east of the site boundary respectively. The Glenmuckloch open surface coal mine is located approximately 1.7 km north from the northern site boundary. Kello Water flows in a north-easterly direction below the southern site boundary to join the River Nith at Kelloholm. The Kirkconnel to New Cumnock railway line is approximately 1.5 km north of the site boundary. Hare Hill Wind Farm is situated approximately 1.7 km west of the site. Several residential properties are located along the A76, with numerous dwellings clustered in the villages of Kirkconnel and Kelloholm.

3.2.4 A minor unclassified road known as the Heads of the Valley Road runs along the eastern edge of the site boundary. Access to the site can be obtained from the A76 by using this minor road or directly from the A76 to western side of the site.

3.2.5 The western extent of the site is drained by Polneul Burn and tributaries, including the Red Sike and Macan's Burn, which flow north to meet the River Nith approximately 1.5 km from the northern site boundary. The east of the site is drained by Polmeur Burn and its tributaries.

Current Status

3.2.6 As described in Chapters 1 and 2 the Proposed Development site currently has planning permission for the Consented Development. The Consented Development is the exact same physical development as the Proposed Development but with a lower power rating for each turbine. Each turbine of the Consented Development would be around 2 MW while each turbine of the Proposed Development would be around 3.4 MW. The location of the access tracks, substation and temporary construction compound, and the location, number, and

dimensions of the turbines for the Proposed Development and Consented Development are identical.

Environmental Designations

3.2.7 Figure 3.1 shows sites with environmental designations within 20 km of the Proposed Development. A brief summary of these is provided below with full descriptions provided in the relevant chapters of the EIA Report.

3.2.8 Within the site boundary there is the following:

- one Site of Special Scientific Interest (SSSI) (namely Polhote and Polneul Burns) designated for geology; and
- one Geological Conservation Review (GCR) site (namely Polhote and Polneul Burns).

3.2.9 Between the site boundary and up to 5 km from the site boundary the additional relevant designations are as follows:

- eight B-Listed Buildings and three C-Listed Buildings;
- three GCR sites;
- two SSSI designated for geology;
- two Special Areas of Protection (SPA);
- two SSSI designated for geology, ecology and ornithology; and
- Ayrshire Council Sensitive Landscape Area.

3.2.10 Between 5 and 10 km from the site boundary the additional relevant designations are as follows:

- one SSSI designated for geology
- two SSSI designated for ecology and ornithology;
- five Scheduled Monuments;
- one A-Listed Building, 29 B-Listed Building and 30 C-Listed Building; and
- Dumfries and Galloway Regional Scenic Area.

3.2.11 Between 10 and 15 km from the site boundary the additional relevant designations are as follows:

- two A-Listed Buildings, 46 B-Listed Buildings and 31 C-Listed Buildings;
- eight Scheduled Monuments;
- one Garden and Designed Landscape;
- South Lanarkshire Special Landscape Area;
- one Special Area of Conservation (SAC);
- one SPA;
- one SSSI designated for geology, ecology and ornithology;
- three SSSI designated for geology; and
- one SSSI designated for ecology and ornithology.

Other Relevant Developments within 5 km

3.2.12 Figure 3.2 shows the locations of other proposed developments, either consented or in planning, and relevant operational developments within 5 km of the Proposed Development (refer to Chapter 4, paragraphs 4.7.6-4.7.9).

3.2.13 These developments are:

- a number of opencast coal mines currently in extraction or restoration;
- Hare Hill Wind Farm – a operational wind farm of 20 turbines, located approximately 1.6 km from the Proposed Development;
- Hare Hill Wind Farm Extension – a wind farm under construction of up to 39 turbines, located approximately 1.8 km from the Proposed Development;
- High Park Wind Turbine Development – a consented single turbine development, located approximately 6.0 km from the Proposed Development;
- High Park Farm Extension – a proposed wind farm of two turbines, located 5.2 km from the Proposed Development.
- Lethans Wind Farm – a proposed wind farm of up to 26 turbines, located 3.5 km from the Proposed Development.
- Glenmuckloch Wind Farm – a consented wind farm of up to eight turbines, located 4.0 km from the Proposed Development.
- Sunnyside Wind Farm - an operational wind farm of 2 turbines, located approximately 6.3 km from the Proposed Development.
- Sanquhar Community Wind Farm – a consented wind farm of up to 12 turbines, located approximately 1.8 km from the Proposed Development.
- Sanquhar 6 Community Wind Farm - a consented wind farm of up to 6 turbines, located approximately 2.7 km from the Proposed Development.
- Ulzieside Wind Farm – a proposed wind farm currently in planning of up to 12 turbines, located approximately 4.3 km from the Proposed Development.
- Whiteside Hill Wind Farm – an operational wind farm of 10 turbines, located approximately 4.4 km from the Proposed Development.

3.3 Description of the Development

3.3.1 The final Proposed Development layout is illustrated in Figures 1.2 and 1.3. The key components of the Proposed Development are described below. It should be noted that all infrastructure descriptions and locations, such as, turbine locations, access track locations, water crossings etc. remain as per the Consented Development.

Turbines and Turbine Foundation

3.3.2 The Proposed Development will comprise 24 wind turbines up to 76 m hub height, 101 m rotor diameter (resulting in a maximum height from ground to blade tip, when vertical, of 125 m) with a power rating of around 3.4 MW.

3.3.3 The candidate turbine for the Proposed Development will be based on the following dimensions, refer to Table 3.1 below.

Table 3.1 – Turbine Dimensions

	Candidate Turbine Dimensions (m)
Tip Height	125
Hub Height	76
Rotor Diameter	101

3.3.4 The proposed locations of the turbines have been defined in order to enable the EIA to describe fully the Proposed Development for which permission is being sought. The British National Grid coordinates denoting where each of the turbines are proposed to be located are listed in Table 3.2 below.

Table 3.2 – Wind Turbine coordinates (British National Grid)

Turbine	Easting	Northing
T01	269572	611396
T02	269201	611337
T03	269055	611108
T04	268892	610887
T05	269030	610590
T06	268807	610399
T07	268720	610143
T08	268627	609893
T09	269488	611065
T10	269408	610668
T11	269198	610102
T12	269050	609876

Turbine	Easting	Northing
T13	269913	610787
T14	269962	610498
T15	269724	610136
T16	269685	609866
T17	270428	610753
T18	270382	610471
T19	270402	610182
T20	270151	610007
T21	270187	609664
T22	270579	609876
T23	270830	610051
T24	270764	610503

3.3.5 Whilst these locations have been determined through an iterative environmental based design process, there is the potential for these exact locations to be altered through micro-siting allowances prior to construction. A micro-siting allowance of up to 100 m in all directions is being sought in respect of each turbine and its associated infrastructure in order to address any potential difficulties which may arise in the event that preconstruction surveys identify unsuitable ground conditions or environmental constraints that could be avoided. Any variation of between 50 m and 100 m shall only be permitted following prior written approval of the Planning Authority in consultation with the MOD, NATS, Glasgow Prestwick Airport and where relevant SEPA and/or SNH. It is proposed that the final positioning will be addressed through an appropriately worded condition.

3.3.6 Each of the turbines comprise the following components:

- blades;
- tower;
- nacelle;

- hub; and
- transformer.

3.3.7 Each turbine will be mounted on a tapered tubular steel tower and consist of a nacelle containing the gearbox, generator and associated equipment, to which are attached a hub and rotor assembly including three blades. At the base, the turbine will be approximately 4 m in diameter.

3.3.8 An elevation drawing of a typical turbine is illustrated in Figure 3.3. The turbines will be of a typical modern, three-blade, horizontal axis design in semi-matt white or light grey with no external advertising or lettering except for statutory notices. The specific turbine manufacturer and model has not yet been selected as this is subject to an on-going tendering exercise and will be confirmed post consent. Therefore, for the purposes of the EIA potential turbine dimensions and operational attributes have been established as a maximum development scenario. The hub height, rotor diameter and tip height as described above and illustrated in Figure 3.3 should be considered as maximum values.

3.3.9 The turbines are likely to be required to carry infrared aviation lighting (invisible to the naked eye) – it is proposed that the requirements for any such lighting would be addressed through an appropriately worded condition.

3.3.10 A transformer will be sited either within the base of each tower or externally sited a few metres from the turbine tower. For the purpose of the EIA it has been assumed that the transformers would be external and have the approximate dimensions of 4.5 m long by 3 m wide by 2.5 m high.

3.3.11 The turbine foundations are proposed to be an inverted "T" in section consisting of a reinforced central concrete pedestal approximately with a reinforced concrete slab. The tower is proposed to be attached to the foundations via an anchor cage which is then screwed to the tower. Until detailed ground investigations have been undertaken the exact size and depth of foundations required cannot be determined. Therefore, for the purposes of this EIA Report, the following approximate dimensions have been used:

- central concrete pedestal 4.75 m in diameter;
- reinforced concrete slab approximately 14 m in diameter; and
- maximum depth of the foundations approximately 3 m.

3.3.12 An illustration of a typical turbine foundation is provided in Figure 3.4. The actual foundation design will be specific to the site conditions as verified during detailed site investigations undertaken before construction commences. In the unlikely event that ground conditions are unsuitable for the standard foundation design described above, a piled foundation design may be required, involving the installation of a series of concrete piles per turbine, with each pile being bored or driven until the underlying bedrock is reached.

Crane Hardstandings

3.3.13 To enable the construction of the turbines, a crane hardstanding area and turning circle at each turbine location will be required to accommodate assembly cranes and construction vehicles. This will comprise a crushed stone hardstanding area measuring, at the widest point, approximately 102 m long by 30 m wide with a typical thickness of approximately 700 mm (refer to Table 3.3), but subject to the specifications required by the selected crane

operator and following detailed ground investigations prior to construction. The crane hardstandings will remain in place during the lifetime of the Proposed Development to facilitate maintenance works.

3.3.14 The crane hardstandings are illustrated as part of the site layout on Figures 1.2 and 1.3.

Access

3.3.15 Abnormal loads will access the site via the western access direct from the A76, while all other construction traffic will access the site from the eastern access via Heads of the Valley Road. Preferred access routes to the site are shown in Figure 1.2 and 1.3.

3.3.16 The recommended route for abnormal load vehicles (i.e. wind turbine component deliveries) is south along the A74(M) and M6 to junction 44, then turning back north along the M6 to exit at junction 22 of the A74(M). The vehicles will then travel along the A75 and A76 to the site.

3.3.17 Two route options have been identified for general construction traffic: Route 1 is northwards along the A76 from the A702 junction; Route 2 is southwards along the A76 from the A70 junction.

3.3.18 A Transport Assessment (refer to Chapter 12) has been prepared in support of the planning application for the Proposed Development and this provides greater detail on access routes to the site for construction vehicles. Chapter 12 includes a review of the proposed route, construction traffic impacts, and an abnormal load route review.

3.3.19 Prior to construction, appropriate highway safety measures will be agreed with Dumfries and Galloway Council (DGC), with necessary signage or traffic control measures implemented throughout the construction phase on the agreed basis.

3.3.20 Heads of the Valley Road, the existing track which runs into the main part of the site from site entrance at the north-east, is a hard-surfaced track of between 4 m and 6 m width for the 1.3 km distance from the site entrance to the primary site compound. This track will be improved to a suitable load-bearing surface of minimum 5 m width along its length.

3.3.21 On leaving Heads of the Valley Road at the primary site compound, approximately 9.9 km of new permanent access tracks will be created within the site in order to allow construction of, and maintenance access to, the wind turbines. The access tracks within the site boundary will be approximately 5 m wide, with some extra width provided on bends, gradients, junctions, passing and turning places.

3.3.22 Construction of the access tracks will require the initial stripping of topsoil (including peat, where present) and subsoil (if required), and laying a compacted stone base. Areas of deep peat (greater than 1.5 m depth) have been avoided through the design iteration process (refer to Chapter 2 above), so topsoil removal may require excavation of peat up to 1.5 m deep. Topsoil and peat will be stockpiled according to principles set out in Chapter 9.

3.3.23 A geotextile membrane will then be laid in order to reduce the settlement of underlying soils resulting from the access track. Following this the track will then be built up on the geotextile by laying and compacting crushed stone to give a total thickness of up to approximately 700 mm (refer to Table 3.3). Figure 3.5 shows an indicative cross section of an onsite access track. The proposed drainage for the access tracks is described in paragraphs 3.3.34-39 below.

3.3.24 The proposed layout of access tracks within the site is shown on Figures 1.2 and 1.3. A micro-siting allowance of up to 100 m in all directions is being sought in respect of the access track and its associated infrastructure in order to address any potential difficulties which may arise in the event that preconstruction surveys identify unsuitable ground conditions or environmental constraints that could be avoided. Any variation of between 50 m and 100 m shall only be permitted following prior written approval of the Planning Authority in consultation with the MOD, NATS, Glasgow Prestwick Airport and where relevant SEPA and/or SNH.

3.3.25 It is proposed that the final positioning will be addressed through an appropriately worded condition.

3.3.26 Further details on proposed public highway improvements are provided in Chapter 12 of this EIA Report.

Watercourse Crossings

3.3.27 A number of watercourses, both natural and artificial, will be crossed by the proposed access tracks within the site. A micro-siting allowance of up to 100 m in all directions is being sought in respect of each turbine and its associated infrastructure in order to address any potential difficulties which may arise in the event that preconstruction surveys identify unsuitable ground conditions or environmental constraints that could be avoided. Any variation of between 50 m and 100 m shall only be permitted following prior written approval of the Planning Authority in consultation with the MOD, NATS, Glasgow Prestwick Airport and where relevant SEPA and/or SNH. It is proposed that the final positioning will be addressed through an appropriately worded condition.

3.3.28 Where the access tracks cross artificial drainage channels, it is proposed to create simple concrete pipe culvert crossings to maintain the drainage flows.

3.3.29 The access tracks within the site will cross the following natural watercourses (refer to Figures 1.2 and 1.3):

- WC01 – crossing of unnamed tributary of the Polmeur Burn between turbines 24 and 18 (it should be noted that this watercourse is currently blocked and will be reopened as part of the Proposed Development – refer to Chapter 9);
- WC02 – main crossing of the Polneul Burn between turbines 13 and 10, within thePolneul and Polhote Burns SSSI;
- WC03 – crossing of an unnamed tributary of the Polneul Burn between turbines 10 and 9; and
- WC04 – crossing of Macan's Burn between turbines 3 and 9; and
- WC05 – crossing of Macan's Burn to access turbine 4.

3.3.30 At the location of the proposed new crossing of the Polneul Burn (WC02), there is currently an existing track crossing the stream over a concrete pipe culvert (refer to Appendix 8.3, Photograph 8). It is proposed to construct a new bridge at this location, after which the existing culvert and crossing will be removed.

3.3.31 The proposed new bridge across the Polneul Burn at WC02 will be a single span structure, approximately 20 m long, with concrete abutments located outwith the watercourse. There will be no structures or construction activities within the watercourse. An illustrative

photograph of the type of structure proposed for this location is shown in Figure 3.6. It is proposed that agreement of the detailed design of the bridge, including its foundation and appearance, should be addressed through an appropriately worded condition.

3.3.32 Following construction of the Polneul Burn crossing, the existing concrete pipe culvert will be removed and this section of the watercourse will be restored to its natural profile.

3.3.33 The remaining three watercourse crossings will be constructed by installing an arch/ bottomless culvert at each crossing location. Figure 3.7 shows an indicative plan of this type of structure.

3.3.34 A micro-siting allowance of up to 100 m in all directions is being sought in respect of each watercourse crossing and its associated infrastructure in order to address any potential difficulties which may arise in the event that preconstruction surveys identify unsuitable ground conditions or environmental constraints that could be avoided. Any variation of between 50 m and 100 m shall only be permitted following prior written approval of the Planning Authority in consultation with the MOD, NATS, Glasgow Prestwick Airport and where relevant SEPA and/or SNH.

3.3.35 It is proposed that the final solution and detailed design for all water crossings will be addressed through an appropriately worded condition in accordance with the Water Environment (Controlled Activities) (Scotland) Regulations 2011.

Drainage

3.3.36 Surface or sub-surface water flow within the vicinity of the access tracks and hardstanding areas will be routed into drainage channels or will flow across the hardstanding areas. The drainage channels will be situated on the upstream side of the infrastructure and run in parallel with them. These channels will pass under the hard areas, via small diameter carrier drains, to the downstream side where the run-off will percolate to the riparian zone.

3.3.37 Where ground conditions permit, channels may connect with infiltration trenches on the downhill side of the hard areas, with a small sump at the inlet to collect silt and treat run-off prior to infiltration to the surrounding soils. Silt traps will also be located along trenches to further facilitate the collection of silts.

3.3.38 The edges of the access tracks will be flush to allow the surface water from the road to route directly into the collection channels or infiltration trenches. On steeper sections of track, regular cross drains, connected to infiltration trenches, will be installed to collect surface run-off and ensure longitudinal flow is intercepted, thus avoiding rutting and subsequent breakup of the track surface. Trenches will maintain linear flows to downstream areas avoiding point discharge of large flows.

3.3.39 Where the access tracks follow contours, earthworks may be required to accommodate these. Where earthworks are required a collection ditch will be installed at the head of the cutting, with small stone check dams, incorporating sumps, to collect silt and prevent sediment transfer to watercourses.

3.3.40 Where turbines are located on steep ground, collection drains will be located on the upstream side and will drain into either infiltration or filter trenches on the downstream side.

3.3.41 A detailed drainage design will be undertaken and provided to the Scottish Environment Protection Agency (SEPA) and the Local Authority prior to construction. An outline drainage strategy for the Proposed Development is provided in Appendix 3.1.

Electrical Connection

3.3.42 The electrical power produced by the individual turbines will be fed to an onsite substation via underground cables. The proposed location for the substation is shown in Figures 1.2 and 1.3, which is located in the south-west corner of the site. The Applicant has a grid connection agreement with the transmission licence holder for connection into Glenglass substation.

3.3.43 Onsite cables will be laid in trenches, typically up to a maximum of 0.5 m deep and 1 m wide. The trenches will also carry earthing and communication cables for the operation of the Proposed Development. Cabling will be located mainly adjacent to the access tracks. The cables will be laid on a sand bed and backfilled using suitably graded material.

3.3.44 The substation compound will measure approximately 45 m by 35 m. The substation building will accommodate all the equipment necessary for automatic remote control and monitoring of the Proposed Development, in addition to the electrical switchgear, fault protection and metering equipment required to connect the wind farm to the electricity transmission network, and a hardstanding area for vehicle parking constructed from crushed stone to a depth of approximately 300 mm (refer to Table 3.3). Indicative elevation drawings of the substation are provided in Figure 3.8. It will be constructed and finished in accordance with details to be approved through an appropriately worded condition.

3.3.45 A micro-siting allowance of up to 100 m in all directions is being sought in respect of the substation and its associated infrastructure in order to address any potential difficulties which may arise in the event that preconstruction surveys identify unsuitable ground conditions or environmental constraints that could be avoided. Any variation of between 50 m and 100 m shall only be permitted following prior written approval of the Planning Authority in consultation with the MOD, NATS, Glasgow Prestwick Airport and where relevant SEPA and/or SNH.

3.3.46 It is proposed that the final positioning will be addressed through an appropriately worded condition.

Meteorological Monitoring Mast

3.3.47 Up to two permanent onsite meteorological monitoring masts will be required to monitor wind speeds for the operational life of the Proposed Development. It is expected that the masts will be of a height no greater than 80 m (around the hub height of the proposed turbines).

3.3.48 The final locations and heights of the meteorological masts will be determined in consultation with the confirmed wind turbine manufacturer prior to construction of the Proposed Development. It is proposed that these details and any requirements for aviation lighting will be addressed through an appropriately worded condition.

Temporary Construction Compounds

3.3.49 Two secure, temporary construction and material storage compounds will be required during the construction period. The locations of these compounds are shown in Figures 1.2 and 1.3.

3.3.50 The primary compound is proposed to be located at the eastern site entrance to reduce traffic volumes within the site to necessary construction vehicle movements. Access to the site (with the exception of the abnormal loads) will be controlled from this point with mandatory signing in and out procedures. The compound will be a triangular area of approximately 150 m by 190 m and constructed from crushed stone to a depth of approximately 300 mm (refer to Table 3.3).

3.3.51 A secondary compound will be located in the south-western corner of the site to allow control of construction operations west of the Polneul Burn and at the adjacent substation. This compound will be approximately 50 m by 150 m, also constructed from crushed stone to a depth of approximately 300 mm (refer to Table 3.3).

3.3.52 The compounds will house temporary portable cabin structures to be used as the main site office and welfare facilities, including toilets, clothes drying and kitchen, with the provision for sealed waste storage and removal. This area will also be used for the storage and assembly of turbine components, parking for vehicles, containerised storage for tools and small parts, and oil and fuel storage. Further details of proposed oil and fuel storage procedures are provided in Chapter 9.

3.3.53 The compounds and site office areas will be constructed and restored using the same methodologies as for the site access tracks. The temporary construction compounds will be removed and restored back to their original appearance following completion of the construction phase.

3.3.54 The detailed location, size and engineering properties of the construction compounds will be confirmed prior to the start of construction, after the turbine supplier and model have been confirmed. A micro-siting allowance of up to 100 m in all directions is being sought in respect of each construction compound and its associated infrastructure in order to address any potential difficulties which may arise in the event that preconstruction surveys identify unsuitable ground conditions or environmental constraints that could be avoided. Any variation of between 50 m and 100 m shall only be permitted following prior written approval of the Planning Authority in consultation with the MOD, NATS, Glasgow Prestwick Airport and where relevant SEPA and/or SNH. It is proposed that the final positioning will be addressed through an appropriately worded condition.

New Libry Moor Forestry Plantation Felling and Compensatory Planting

3.3.55 As part of the Proposed Development, areas of the plantation woodland within the site will be felled through key-holing in order to allow construction of the Proposed Development infrastructure. A total of 3.73 ha will be felled and not re-planted to allow the construction and operation of the Proposed Development. Timber generated from felling the plantation woodland will be removed from the site and disposed appropriately, by means potentially including sale as timber or recycling.

3.3.56 In recognition of this loss of woodland and in order to ensure compliance with The Scottish Government's Policy on Control of Woodland Removal (FCS, 2009), 10.77 ha of compensatory planting will be provided across the site. Further details of species composition are provided in Chapter 17.

3.3.57 It is proposed that the detailed design of proposed areas for replacement mixed woodland/scrub planting will be confirmed prior to construction through an appropriately worded condition.

Summary of Developed Areas

3.3.58 Table 3.3 below summarises the approximate areas and volume of aggregate material required for each of the infrastructure elements described above.

Table 3.3 - Proposed Development areas

Infrastructure	Area (m^2)	Depth of Aggregate (m)	Volume of Aggregate (m^3)
Primary Construction Compound	11,749	0.3	3,525
Secondary Construction Compound	7,500	0.3	2,250
Substation	1,575	0.3	473
Turbine foundations	5,400	3 (average concrete depth)	11,088 (concrete)
Crane hardstandings and access track	105,725	0.7	74,007

3.4 Construction

3.4.1 The estimated onsite construction period for the Proposed Development, not including felling prior to construction commencing, is expected to take approximately 12-18 months and includes a programme to reinstate all temporary working areas. Normal construction hours will be between 07:00 and 19:00 Monday to Friday and 08:00 to 18:00 at weekends. These times have been chosen to minimise disturbance to local residents. Details of the construction programme will be provided to DGC in a Construction and Decommissioning Environmental Management Plan (CDEMP) prior to the commencement of construction – this will be addressed through an appropriately worded condition. Refer to paragraphs 3.4.19-24 below.

3.4.2 The construction programme will consist of the following principal operations, listed sequentially wherever possible. The Proposed Development will be phased so that certain activities will take place concurrently:

- felling and disposal of areas of woodland at New Libry Moor;
- compensatory woodland/scrub planting.
- construction of the primary temporary site compound and establishment of a storage area for wind farm components and temporary site facilities;
- construction of access tracks, including construction of watercourse crossings, and excavation of cable trenches;
- construction of wind turbine foundations and crane pad hardstanding areas;
- cable laying;
- construction of substation;
- erection of wind turbines;

- connection of on-site electrical power and signal cables;
- commissioning of the site equipment;
- site reinstatement and restoration of temporary works areas; and

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

- crushed stone;
- geotextile;
- cement;
- sand;
- concrete quality aggregate;
- steel reinforcement; and
- electrical cable.

3.4.4 Necessary excavations will be made, initially by stripping back the topsoil from the area to be excavated. This soil will typically be stored separately either as a mound adjacent to the excavation area for backfill, if required, or stored at a designated area on site for further use or reinstatement of temporary works areas. Principles for storage of excavated peat are defined in Chapter 9.

3.4.5 It is proposed that the concrete required for the foundations will be batched off-site.

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

3.4.7 The proposed method for constructing the wind turbines is as follows. The turbines will be erected using a large mobile crane or crawler crane, positioned on the hard standing adjacent to the turbine base. A smaller tail crane will be positioned adjacent to the delivery position of the turbine components. The two cranes will lift the tower sections and blades into their assembly positions, and the main crane will lift the tower sections, nacelle and blades into their operational positions.

3.4.8 As soon as practical, once installation is complete, the immediate construction area will be restored to its original profile, although the crane hardstandings will be retained for future maintenance. The topsoil will be replaced and reseeded where appropriate and as advised by an onsite Environmental Clerk of Works. Surplus topsoil and peat will be used to restore track edges after construction. This progressive reinstatement has been found to assist with re-establishment of the local ecology as it minimises the time soil and turf are in storage.

Traffic and Transportation

3.4.9 A detailed Transport Assessment is provided within Chapter 12 of this EIA Report.

3.4.10 Construction traffic associated with the construction and maintenance of the proposed wind farm falls into two categories, namely Abnormal Indivisible Loads (AIL) and Construction/Maintenance Loads. Details of both types of vehicles are as follows:

- AILs:
  - wind turbine blade transporter;
  - nacelle/tower section transporter;
  - assembly crane; and
  - transformer transporter.
- Construction/Maintenance Loads:
  - 4-axle large tipper Heavy Goods Vehicle (HGV);
  - cement mixer;
  - standard low loader; and
  - land rover/transit vans, general personnel transport.

3.4.11 Preferred access routes are detailed in Chapter 12.

3.4.12 The abnormal loads are those that will require an escort, either by private contractor or by police escort. Construction/maintenance loads are those that do not require any special escort or permissions and are only influenced by normal traffic regulations.

3.4.13 The Applicant will ensure that the vehicles will be routed as agreed with DGC and Transport Scotland, to minimise disruption and disturbance to local residents. Further details regarding transport and access can be found in Chapter 12 of this EIA Report.

Pollution Prevention and Health & Safety

3.4.14 Prior to commencement of construction activities, a pollution prevention strategy, contained within a CDEMP, will be agreed with SEPA to ensure that appropriate measures are put in place to protect watercourses and the surrounding environment. Further details regarding the contents of the CDEMP are provided later in this chapter.

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

3.4.16 Any fuel or oil held on site will only be of an amount sufficient for the plant required. This will be stored in a bunded area and an oil interceptor will be installed to prevent pollution in the event of a spillage. There will be no long term storage of lubricants or petrochemical products on-site.

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

3.4.18 Further details of site specific storage and management of fuel and oil and protection of watercourses during construction is presented in Chapter 9.

Construction and Decommissioning Environmental Management Plan (CDEMP)

3.4.19 As part of the construction contract, the Applicant shall sign up to produce, and adhere to, a CDEMP. The CDEMP shall be developed in accordance with the joint Scottish Renewables, Scottish Natural Heritage, SEPA, Forestry Commission Scotland and Historic Environment Scotland guidance on Good Practice During Windfarm Construction (2015).

3.4.20 The CDEMP shall describe how the Applicant will ensure suitable management of, but not limited to, the following environmental issues during construction of the Proposed Development:

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

3.4.21 The Applicant shall provide the following for integration within the CDEMP:

- details of the all the environmental mitigation which is described within this EIA Report (refer to Chapter 18) that is required during construction of the Proposed Development, and of how the Applicant will implement this mitigation and monitor its implementation and effectiveness;
- details of how the Applicant will abide by the local and national legislative requirements e.g. The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (amended 2013);
- details of how the Applicant will implement and monitor construction best practice techniques e.g. the control of noise and dust;
- details of a Peat Management Plan, following the principles set out in the joint Scottish Renewables and SEPA guidance on the assessment of peat volumes, reuse of excavated peat and the minimisation of waste' (Scottish Renewables and SEPA, 2012);
- details of a Waste Management Plan which will include opportunities to reduce and re-use waste on site, recycling of waste which cannot be reused and disposal of waste to landfill; and
- details on how the Applicant will liaise with the public and local landowners and how they will respond to any queries and/or complaints.

3.4.22 The Applicant shall consult with SNH, SEPA, Historic Environment Scotland and DGC on the production of the CDEMP. The Applicant shall amend and improve the CDEMP as required throughout the construction and decommissioning period.

3.4.23 The CDEMP shall, where applicable, cross-reference and correspond with the Construction Traffic Management Plan (CTMP). The CTMP will detail the management of traffic to and from site, including abnormal loads and daily workers commute. It shall also include mitigation for impacts to public transport, local private access and public foot paths, cycle ways and bridleways. The Applicant shall amend and improve the CTMP as required throughout the construction and decommissioning period.

3.4.24 Specific requirements of the CDEMP for each of the environmental topics assessed in the EIA are provided in the relevant EIA Report chapters.

3.5 Operation and Maintenance

3.5.1 During operation, only site maintenance vehicles and local utility company vehicles will normally be required on the site. Daily visits to the control building by maintenance personnel in four wheel drive or conventional passenger vehicles will occur following the commissioning phase.

3.5.2 Any diesel or oil stored on-site will be held within an appropriately bunded location within the substation building.

3.5.3 Health and safety will also be controlled as set out in the construction phase.

3.5.4 In the unlikely event that a major turbine component requires replacement, vehicles will use the new access tracks and crane pads.

Operation Environmental Management Plan

3.5.5 The Applicant will implement an Operation Environmental Management Plan (OEMP). Similar to CDEMP the OEMP will set out how the Applicant will manage and monitor environmental effects throughout operation. The OEMP will be developed in consultation with SNH, SEPA and DGC and will include but not be limited to:

- details on the track, water crossings and turbine maintenance;
- the control and monitoring of noise;
- the control and monitoring of surface and groundwater;
- a pollution prevention plan and a pollution incidence response plan;
- details of how the Applicant will abide by the local and national legislative requirements e.g. The Water Environment (Controlled Activities) (Scotland) Regulations 2011;
- an operational Peat Management Plan; and
- a Habitat Management Plan and relevant protected species management plans.

3.6 Decommissioning

3.6.1 The operational lifespan of the Proposed Development would be approximately 28 years (period agreed for the Consented Development), after which it would be appropriately

decommissioned. It is expected that decommissioning would take approximately twelve months. The environmental effects of decommissioning are considered to be no worse than construction effects but experienced over a much shorter time period.

3.6.2 During the decommissioning phase, vehicles would access the site by the same routes used for delivery and construction.

3.6.3 Either the restored temporary construction compound would be re-established or a new construction compound would be developed as agreed with DGC at the appropriate time, to temporarily store decommissioned plant and equipment. The nacelles and blades would be removed using cranes situated on the crane pads as previously constructed. The towers would then be dismantled.

3.6.4 All components would be removed from the site for disposal and/or recycling as appropriate and in accordance with regulations in place at that time.

3.6.5 If required, exposed parts of the concrete foundations would be ground down to below sub-soil level, however, the remaining volume of the foundations would remain in situ.

3.6.6 The turbine base areas, onsite access tracks, temporary compounds and crane pads would be returned to their original appearances unless further consents were granted.

3.6.7 If, after the operational lifespan of the Proposed Development has expired, there is potential for repowering the Proposed Development, for example by installing new nacelles, blades or other components, this would be subject to a separate consenting process.

3.6.8 The CDEMP (refer to paragraphs 3.4.19-24) will be updated prior to decommissioning by the Principal Contractor to reflect current legislation and policy and will be agreed with DGC, SNH, SEPA and Historic Environment Scotland.

3.7 Climate Change and Carbon Considerations

3.7.1 Increasing atmospheric concentrations of greenhouse gases (GHGs), including carbon dioxide (CO2) – also referred to as carbon emissions – is resulting in climate change. A major contributor to this increase in GHG emissions is the burning of fossil fuels. With concern growing over climate change, reducing its cause is of utmost importance. The replacement of traditional fossil fuel power generation with renewable energy sources provides high potential for the reduction of GHG emissions. This is reflected in UK and Scottish Governments climate change and renewable energy policy. The relevant aspects of such policies are summarised in Chapter 5.

Energy Life Cycle Assessment

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

3.7.3 The maximum electrical power output from the Proposed Development is around 81.6 MW (compared with 48 MW for the Consented Development), comprising 24 turbines each of around 3.4 MW (compared with 2 MW for the Consented Development) rated power output.

3.7.4 Wind speed monitoring has been carried out using an onsite meteorological monitoring mast since February 2012. Based on recorded wind speeds and the selected candidate turbine at 70 m above ground level, a mean wind speed of >7.5m/s at 70 m above ground level was measured.

3.7.5 An energy yield assessment based on the recorded wind speed data concluded that the indicative annual electrical power output of the Proposed Development would be approximately 236 Giggawatt hours (GWh), or 9,833 MWh per turbine.

3.7.6 The average electricity consumption per household in the UK quoted by RenewableUK in 2017 was 3.9 MW (RenewableUK, 2017). On this basis, the Proposed Development would generate enough power to supply over 60,512 average UK households.

3.7.7 Although future wind yields cannot be guaranteed, if the Proposed Development continued to generate on average at this load factor over its proposed 28-year lifespan, it is expected that 6,608 GWh would be generated. This is around a 40% increase in the energy generated compared to the Consented Development.

Carbon Emission Savings

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

3.7.9 However, the construction, operation and decommissioning of the Proposed Development will also lead to the emission of carbon dioxide as well as the reduction in emissions.

3.7.10 The Scottish Government's Carbon Calculator Tool 2017 has been completed online and can be accessed using the following reference: SABD-8DX1-XZ07. The outputs from the tool are shown in Tables 3.4, 3.5 and 3.6 below.

Table 3.4 - Proposed Development Emission Savings

Proposed Development emission saving over	Expected	Minimum	Maximum
Coal-fired electricity generation (tCO_2 / yr)	287,624	273,078	302,171
Grid-mix electricity generation (tCO_2 / yr)	108,473	102,987	113,959
Fossil fuel-mix electricity generation (tCO_2 / yr)	148,321	140,819	155,822

Table 3.5 – Total CO_2 Losses Due to the Proposed Development

Total CO2 Losses (tCO_2 eq.)	Expected	Minimum	Maximum
Losses due to turbine life	68,522	68,173	68,872
Losses due to backup	47,735	47,735	47,735
Losses due to reduced carbon fixing potential	984	1991	6,013
Losses from soil organic matter	23,356	62	108,694
Losses due to DOC & POC leaching	946	4	16,332
Losses due to felling forestry	1,146	928	1,386
Total losses	142,689	117,100	249,033

Table 3.6 – Carbon Payback

Total CO2 Losses (tCO_2 eq.)	Expected	Minimum	Maximum
Grid-mix electricity generation (years)	1.3	1.0	2.4
Fossil fuel-mix electricity generation (years)	1.0	0.8	1.8

3.8 References

DECC – Department of Energy and Climate Change (2017a). *Sub-national electricity consumption statistics2017.* Available at: http://www.decc.gov.uk/en/content/cms/statistics/energy_stats/regional/electricity/electricity.aspx.

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Scottish Renewables, Scottish Natural Heritage, SEPA, Forestry Commission Scotland and Historic Environment Scotland (2015). *Good practice during wind farm construction, 3rd edition.* Available at: http://www.snh.gov.uk/docs/A1168678.pdf

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