3 THE DEVELOPMENT

3.1 INTRODUCTION

1. This Chapter of the Environmental Impact Assessment Report (EIA Report) provides a description of the proposed Heathland Wind Farm (the Development) which forms the basis of the assessments presented within Chapters 6 to 18. It provides details of the construction phase, the 30-year operational phase and decommissioning phase of the Development.
2. This Chapter includes an overview of the Development followed by a detailed description of the main components and their method of construction. Measures that have been built into the design of the Development to reduce effects, also known as 'embedded' mitigation measures, are set out in the previous chapter (Chapter 2 - Site Selection and Design), and in this chapter. In addition to these embedded mitigation measures, Chapters 6 to 18 present mitigation and enhancement measures where specifically relevant to their assessment topic.
3. This Chapter of the EIA Report is supported by the following figures provided in Volume 2a EIA Report Figures:
    - Figure 3.1: Site Layout Plan;
    - Figure 3.2a: Indicative Turbine Elevations;
    - Figure 3.2b: Indicative Turbine Elevations;
    - Figure 3.3a: Indicative Foundation Design;
    - Figure 3.3b: Indicative Foundation Design
    - Figure 3.4a: Indicative Crane Hardstanding;
    - Figure 3.4b: Indicative Crane Hardstanding;
    - Figure 3.5: Indicative Cable Trench Detail;
    - Figure 3.6: Substation Compound;
    - Figure 3.7: Control Building Elevation;
    - Figure 3.8: Indicative Construction Compound;
    - Figure 3.9: Indicative Access Track;
    - Figure 3.10: Indicative Culvert Details;
    - Figure 3.11: Proposed Site Entrance;
    - Figure 3.12: Indicative Anemometry Mast;
    - Figure 3.13: Borrow Pit 1 Plan and Profile; and
    - Figure 3.14: Borrow Pit 2. Plan and Profile
4. This Chapter of the EIA Report is supported by the following Technical Appendix document provided in Volume 3 Technical Appendices:
    - Technical Appendix A3.1: Borrow Pit Assessment.

3.2 DESCRIPTION OF THE DEVELOPMENT

3.2.1 Development Overview

5. The Development comprises a wind powered electricity generating station known as Heathland Wind Farm with a generation capacity exceeding 50 MW. It will involve the erection and operation of a wind farm and associated infrastructure. The Development will comprise:
    - Up to fourteen wind turbines (including external transformers) and associated infrastructure including:
        - A substation compound;
        - A battery storage facility; and

- Forestry felling and compensatory planting.

6. As the Site is currently used as a commercial forestry plantation with existing good quality tracks, efforts have been made to utilise these tracks where possible. The components of the Development are summarised in Table 3.1 and shown on Figure 3.1.

Table 3.1 Key Parameters of the Development

Element	Details
Turbines	Up to 14 turbines comprising up to three turbines with a maximum tip height of 150 m, and up to 11 turbines with a maximum tip height of 180 m. Each turbine will require a small transformer located externally at its base. Each foundation would be designed separately according to the chosen turbine type, manufacturer and geotechnical site investigations undertaken during the enabling works to establish the nature of the subsoil condition at each turbine location. .
Access Track	Access track to serve the construction and operation of the wind farm with width approximately 5 m, this will consist of approximately 4.1 km of upgraded forestry tracks and 6.3 km of newly constructed track.
Site Access	It is proposed that Site access will be afforded via a new access point off the A706, at approximately NGR 294922, 656994.
Electrical Infrastructure	Onsite underground cabling will be lain alongside the access tracks where possible, linking the turbine transformers to the windfarm control building and substation. The EIA will assume and assess transformers located outside of the turbines. A substation compound will be located at approximately NGR 296305, 657465. The compound measuring approximately 60 m x 40 m will include a single storey control building, external electrical infrastructure, battery storage components and vehicle parking.
Crane Hardstanding	Crane hardstandings will be required adjacent to each turbine, this will consist of an area of between approximately 1,250 and 1,575 m^2 at each turbine. In addition to the main hardstanding area, there will be additional flattened areas for crane assembly and turbine blade storage; however, these will be temporary and not constitute hardstanding.
Temporary Construction Compound	A temporary construction compound will be required during the construction of the Development, forming an area of hardstanding providing space for temporary construction cabins, parking and lay down areas; this will measure approximately 100 m x 50 m and be located in the western area of the Site, at approximately NGR 295640, 657008.
Borrow Pits	Up to two onsite borrow pits are proposed. One is located between T8 and T9 to the north of the Site, and the second is located south of T12, and will extend an existing quarry. Given that the track layout reuses 4.1 km of existing track, relatively little aggregate will be required when compared to a typical wind farm of this size, and the use of both borrow pits may not be required.
Anemometry Mast	A temporary anemometry mast will be erected for 5 to 7 years, of up to 90 m height, at location NGR: 296022 656469.

17. It is estimated that the permanent footprint of the Development, including infrastructure and following restoration will be approximately 19.1 hectares. This includes upgrades to existing forestry track. During the construction period it is estimated that a further 7.6

ha will be temporarily required, which includes the borrow pits, laydown areas and the construction compound which will be reinstated following the construction works.

18. As Development is largely located within commercial forestry plantation felling is required to accommodate infrastructure, including tracks, turbine infrastructure, borrow pits, substation and construction compound. Further details are outlined in Section 3.2.12.

3.2.2 Wind Turbines and Associated Infrastructure

3.2.2.1 Wind Turbines

19. Consent is being sought for the erection of up to 14 three-bladed horizontal axis wind turbines: up to three turbines, T1, T2 and T3, will have a maximum height from base to tip of 150 m (with the blade in the vertical position), and up to 11 turbines, T4 to T14, will have a maximum height from base to tip of 180 m (with the blade in the vertical position).

20. The candidate turbines used for the purposes of this EIA are the Nordex N133 and the GE 158. Figure 3.2a and Figure 3.2b show typical horizontal axis wind turbines for the two candidate models, comprising four main components: a rotor (consisting of a hub and three blades), a nacelle (containing the generator and gearbox) to which the rotor is mounted, a tower, and a foundation.

21. The blades will be made of fiberglass reinforced epoxy and mounted on a tapered tubular steel tower. The turbines will be light grey in colour and the finish of the tower and blades will be gloss-matte.

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

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

24. The turbines are computer controlled to ensure that at all times, the turbine faces directly into the wind to ensure optimum efficiency. The rotors of all 14 turbines will rotate in the same direction.

25. When operating, the rotational movement of the blades is transferred through the gearbox, to drive the generator. This produces a three-phase power output typically at 690 Volts (V), which is transferred from the generator to the turbine transformer. The turbines will be controlled and monitored from within the proposed control building and will also be remotely monitored where performance details and statistical information for each turbine will be recorded. Table 3.2 details the proposed locations of each turbine.

26. During the construction phase, two cranes are typically required to install the turbines, consisting of a larger 800 – 1000 tonne main crane and a secondary 400 – 500 tonne crane. The cranes would use the crane hardstandings as described in Section 3.2.3. The construction contractors would determine the actual cranes used following the turbine procurement process, together with the exact programme and number of teams on site.

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

28. The layout of the Development is shown in Figure 3.1 and national grid references of the proposed turbine locations are provided in Table 3.2. The turbines will be subject to a micro-siting allowance (detailed in Section 3.2.12) to allow flexibility for encountering unknown ground constraints during pre-construction and construction.

Table 3.2: Wind Turbine Approximate Grid References

Turbine No.	Candidate Turbine	Easting	Northing
1	Nordex 133	295292	657001
2		295710	656644
3		296033	657230
4	GE 158	296425	656680
5		296725	657260
6		296554	657665
7		296500	658108
8		296453	658537
9		297116	658744
10		297194	658322
11		297211	657846
12		297500	657506
13		298204	657675
14		298084	657153

3.2.2.2 Turbine Foundations

33. It is proposed that the foundations for the turbines would comprise a standard concrete gravity foundation constructed on poured concrete with steel reinforcement. The foundation would require up to 612 m^3 of concrete per turbine base and up to 90 tonnes of steel reinforcement.

34. Each turbine foundation will consist of an octagonal or circular base on a foundation slab, which sits on the underlying rock or suitable substratum with a founding depth of between 1.8 m and 3 m, in an 'inverted T' design. Figure 3.3a and Figure 3.3b show indicative turbine foundations for the two candidate models. The area of excavation is likely to be a maximum of 35 m x 35 m to allow for an excavated working area around the concrete turbine foundation.

35. The detailed design specification for the foundation would depend on the geotechnical site investigations undertaken during the enabling works to establish the nature of the subsoil condition at each turbine location. Each foundation would be designed separately according to the chosen turbine type and manufacturer specification.

36. The Site is underlain by historical mineworkings, both from opencast extraction and from underground extraction. Where possible, risk has been reduced by locating turbines in

areas less affected by historic mining activities, however seven proposed turbines remain in areas at high risk of ground instability.

37. A thorough ground investigation will be undertaken post consent to inform necessary mitigation. Should it not be possible to microsite (see Section 3.2.11) turbines into less risk in relation to the underlying mining conditions, then this may involve ground treatment of identified mineworkings (i.e. grouting up of voids) or piled foundations to extend to a suitable depth beyond known workings. It also possible that a combination of grouting and piling may be required. Further information is detailed in Chapter 11 – Geology, Soils and Peat and associated Technical Appendix 11.3: Coal Mining Risk Assessment.

38. The ground excavation methods would vary depending on the local ground conditions and the nature of the surface vegetation. The general processes would be as follows:

    - Topsoil/turf will be stripped and stored in order to be reused in restoration of the turbine construction area;
    - Subsoil (if present) will be stripped and stored, keeping this material separate from the topsoil/turf;
    - Excavation of turbine foundations will then take place followed by the installation of the steel reinforcement bars and casting of concrete; and
    - After the foundation has been poured the area would be backfilled as soon as practicable with spoil, pending turbine installation.

39. Once the turbines have been installed, the immediate construction area around the turbine bases would be restored using the retained topsoil or turf to within approximately 1 m of the tower bases. A 1 m wide gravel path would then be laid around the tower base. Material won from foundation excavations would, if suitable, be reused locally as part of the reinstatement works around turbines or borrow pits, or in the landscaping of access tracks and other site infrastructure. Disposal off-site to a suitably licensed facility, will only be considered if the material is contaminated. More details on contaminated material is provided in Chapter 11 – Geology, Soils and Peat.

3.2.2.3 Transformers and Cabling

40. Depending on the final choice of turbine, transformers will either be located within the turbine tower (with internal switchgear) or externally, close to the base of the tower. For the purposes of this assessment it has been assumed that the transformers will be located externally, adjacent to each turbine. An external transformer will normally be placed within a glass reinforced plastic (GRP) housing, the size of housing will depend on the type of transformer selected but in general it will be approximately 3 m x 2.5 m in plan and 2.5 m in height above surrounding ground level, located adjacent to the turbine within the hardstanding area.

41. The transformers will be either oil-filled with a bunded footing to remove any risk of spillage or a solid cast resin type which is effectively non-polluting. The transformers will increase the electrical voltage from 690V to 33 kilovolts (kV).

42. Turbines will typically be connected by 33kV single phase power cables which will be laid in trenches alongside the access tracks, with a depth of 1 m. The excavated trenches will also include SCADA cables or fibre optic cables. This will allow interrogation and control of individual turbines as well as remote monitoring. A copper cable will also be located in the trench and will be connected to the substation and each turbine to provide an earthing system to provide protection from lightning strikes and electrical faults. The cables will be laid on a sand bed, then surrounded by further sand and backfilled using suitably graded material. Clay, or equivalent low permeability barriers, will be inserted into the cable trenches at regular intervals to avoid the trenches becoming preferential drainage pathways. Details of typical trenches are shown in Figure 3.5.

3.2.3 Crane Hardstandings

43. Each turbine requires an area of hardstanding adjacent to the turbine foundation to provide a stable base on which to site the turbine components and cranes for the erection of the turbine.

44. The main working area at each hardstanding area composed of crushed stone will measure approximately 45 m x 35 m for T1-T3 and approximately 50 m x 25 m for T4-T14, and the footprint of the main hardstandings will measure approximately 1,250 m^2 or 1,575 m^2 respectively. There will be smaller temporary hardstanding areas which are required for the assembly of the main crane jib and 'blade fingers' which are required for the storage of the turbine blades.

45. A typical arrangement is shown in Figure 3.4a and Figure 3.4b; however, the final arrangement of the hardstanding will depend on the method of erection and exact specification of the cranes chosen by the turbine erection contractor. The hardstandings will be sufficiently level and with a suitable load-bearing capacity to ensure the safe storage of turbine components and operation of the cranes.

46. Surface water and groundwater levels will be managed to ensure that natural drainage patterns are maintained and that water levels within excavations do not rise beyond appropriate and safe limits. Various cable ducts and other ancillaries will be installed within the foundations and under the access track crossing points.

47. Construction of the temporary crane hardstanding would be similar to the construction of the site tracks as described in Section 3.2.4. Surplus excavated material would be reused elsewhere within the Site such as for track maintenance during construction or during borrow pit reinstatement. Similarly, any surplus topsoil would be used to restore track edges or the borrow pits after construction.

48. The crane hardstanding would be left in place following construction in order to allow for the use of similar plant should major components need replacing during the operation of the Development. These would also be utilised during decommissioning at the end of the Development's life for removal of large components via crane and thereafter would be excavated and removed from site.

3.2.4 Access

3.2.4.1 Site Access and Main Site Entrance

49. The main site entrance will be taken off the A706 which runs between Forth and Breich. The new entrance will include a bellmouth junction for traffic to enter and egress the Site from the west. The site entrance point has been designed to maximise sight lines for vehicular movements entering and leaving the Site, final design will be agreed with the Councils to ensure visibility splays are achieved. During construction a security hut will be located here to log visitors on and off site. Figure 3.11 shows the proposed arrangement at the site entrance.

50. A transport access study is provided Chapter 12 – Traffic and Transport, which has identified the following abnormal loads delivery route from the anticipated Port of Delivery, King George V Dock in Glasgow:

- Loads will exit the port via the AIL access gate onto Kings Inch Drive and proceed towards Kings Inch Drive / Mayo Avenue junction;
- At the junction, turn left onto the M8 spur road and merge onto the M8 via the M8 Junction 25a Slip Road;
- Exit the M8 at Junction 3 and take the A899 exit into Livingstone and take the first exit onto the A899 at Livingstone East Roundabout;
- Continue along the A899 southbound and take the third exist at Lizzie Brice's Roundabout onto the A71 southwest bound;

- Continue on the A71 through the settlements of Polbeth and West Calder and turn left onto the A704;
- Continue on the A704 and turn left onto the A706;
- Continue on the A706 southbound; and
- Turn left into site entrance junction.

3.2.4.2 On-Site Access Tracks

51. The length of onsite access track will total approximately 10.4 km which consists of localised upgrades to 4.1 km of existing forestry track and 6.3 km of new track. Effort has been made to re-use existing forestry tracks on Site where possible.

52. New tracks will be required from the existing forestry tracks to the turbine locations to enable the turbine components, construction materials and construction staff to be transported to their locations, and to enable access for subsequent maintenance visits. The proposed track layout is illustrated in Figure 3.1.

53. The access tracks have been designed to minimise environmental disturbance and land take wherever possible by avoiding areas of deep peat, environmental constraints identified during the EIA and limiting the number of watercourse crossings.

54. Access tracks will be approximately 5 m in width, with an additional 1 m verge on either side subject to local ground conditions. The tracks will be designed to have sufficient radii for turning of the construction vehicles, abnormal loads and plant. Turning heads have been included within the design as necessary to allow abnormal load vehicles and cranes to undertake turns during the turbine delivery and assembly process. These are incorporated into the crane hardstanding areas in order to minimise land take.

55. Figure 3.9 illustrates a typical track design options. It is anticipated that access tracks would be constructed using a 'cut track' design. Topsoil is stripped to expose a suitable rock or sub-soil horizon on which to build the track. The track is built up on a geotextile layer by laying and compacting crushed rock to a depth dependent on ground conditions and topography. Generally, the surface of the track will be flush with or raised slightly above the surrounding ground level.

56. Peat has been avoided where possible and existing forestry tracks have been utilised to a large extent. Floating tracks are therefore not required.

57. Excavated soils would be stored at no greater than 3 m in height, directly adjacent to, or near the tracks on ground appropriate for storage of materials i.e. relatively dry and flat ground, a minimum of 50 m away from any watercourses. Wherever possible, reinstatement will be carried out as track construction progresses.

58. The access track will be left in place after construction of the Development and can be utilised for forestry or recreational access as well as access to the turbines for maintenance and repair works.

59. Prior to the commencement of site construction, a detailed engineering specification for the access track design will be submitted to the planning authority as part of a Planning Conditions Compliance Statement which will include Construction Method Statements (CMS) for all aspects of construction.

60. A Drainage Management Plan (DMP), which will detail proposed surface drainage measures to treat and deal with all the surface runoff from the site, will be designed in accordance with Sustainable Drainage Systems (SuDS) principles. This plan will form part of a Construction Environmental Management Plan (CEMP).

61. All access tracks will incorporate robust drainage, including drainage channels running adjacent to the tracks, on one or both sides. The track would be designed with a crossfall towards the drainage channels to prevent a build-up of surface water and allowing the

track to act as a watercourse. The make-up of the tracks will also be as permeable as possible to prevent any instances of surface water build up.

62. Cross drainage pipes will be installed at regular intervals to prevent flooding or surcharging of the drainage channels and to maintain natural drainage catchments.

63. The implementation of the drainage design will be developed in response to a risk appraisal undertaken by the contractor and will be proactive, rather than being reactive to any events arising once works commence. The design will reduce the risk of sedimentation (from loose material) and pollution (from accidental spillage) of all downstream watercourses.

3.2.5 Watercourse Crossings

64. As noted above, the track layout design has sought to limit the number of watercourse crossings; however, given the nature of the Site and the principles of wind farm design a number of crossing points are required. There is a requirement for seven crossings for watercourses. Of these, two are existing crossing points as part of the existing forestry track network which will require upgrading, while five would be subject to a new crossing. The locations of watercourse crossings are detailed in full in Chapter 10 – Hydrology and Hydrogeology.

65. The type and design of each watercourse crossing will be dependent on the stream morphology, peak flows, local topography and ecological requirements, and will be chosen so as to avoid or minimise potential environmental effects. A typical watercourse crossing design is shown in Figure 3.10.

66. Any crossing would be designed in accordance with Construction Industry Research and Information Association (CIRIA) Culvert design and operation guide (C689)[1] and incorporating the most recent climate change allowances, to ensure sufficient capacities.

67. Any watercourse crossings would be subject to registration under The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended)[2] (CAR) and Water Environment (Miscellaneous) (Scotland) Regulations 2017[3].

3.2.6 Substation Compound including Energy Storage

68. The substation compound would be located on an area of crushed stone hardstanding measuring approximately 60 m x 40 m. The compound is located relatively centrally with respect to the turbines in order to minimise electrical losses and cabling requirements, and on a flat area of land, centred at approximately NGR 296305, 657465, as shown on Figure 3.1.

69. The substation compound will be partitioned into two broad sections, accommodating the control building and associated external electrical switchgear, and the battery storage facility. It will also include an area for vehicle parking and storage during the construction period. A typical arrangement is shown in Figure 3.6.

70. The principal element of the substation compound is the control building which contains the electrical infrastructure and control elements of the Development. This will likely comprise a single storey unit measuring approximately 10 m x 25 m with a pitched roof as shown in Figure 3.7. The control building will include control components, including

[1] Benn, J, Kitchen, A, Kirby, A, Fosbeary, C, Faulkner D, Latham, D, Hemsworth, M (Dec 2019) Culvert, screen and outfall manual (C786F) https://www.ciria.org/ItemDetail?iProductCode=C786F&Category=FREEPUBS (access 08/09/2020)

[2] The Water Environment (Controlled Activities) (Scotland) Regulations 2011 http://www.legislation.gov.uk/ssi/2011/209/contents/made (accessed 08/09/2020)

[3] Water Environment (Miscellaneous) (Scotland) Regulations 2017. http://www.legislation.gov.uk/ssi/2017/389/contents/made (accessed 08/09/2020)

metering equipment, switchgear, the central computer system and electrical control panels as well as welfare facilities, associated air conditioning systems, and a maintenance room.

71. In addition to the electrical infrastructure housed within the control building, there will likely be a degree of external electrical switchgear located within the substation compound. Any external switchgear would be located within a security fence of up to 3 m height and served via a locked access gate.

72. The battery storage facility will be able to import power from the national grid or wind turbines and export to the national grid as required providing a 'security buffer' to cope with supply and demand events. Battery storage components would be contained in sealed units.

73. The substation building will have its own foul drainage system. Surface water will drain via soakaway or other preferred SuDS method to be agreed with West Lothian Council and South Lanarkshire Council (the Councils).

74. The substation building will be constructed in-keeping with the local built environment. The final designs for the buildings and compound will incorporate sustainable design features and will be agreed with the Councils.

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

76. Lighting will be kept to a minimum and will be limited to working areas only and will comply with health and safety requirements. Lighting will be down lit and linked to timers and movement sensors so that light pollution is kept to a minimum.

3.2.7 Grid Connection

77. The grid connection does not form part of the Section 36 consent application for the Development. The consent for the grid connection will be sought by the relevant owner/operator of the local distribution network, Scottish Power Energy Networks (SPEN). The Network Operator will be responsible for the consenting, construction and operation and maintenance of the grid connection.

78. It is proposed that the Development will connect into the grid at Wishaw station, located approximately 16 km to the west of the Site. The precise grid route has not yet been confirmed, but the route will be designed to minimise effects on environmental receptors.

79. Each technical chapter, Chapters 6 – 17, will include a high level assessment of this grid connection.

3.2.8 Temporary Infrastructure

3.2.8.1 Temporary Construction Compound

80. A temporary construction compound will be created for the duration of the build centred at approximately NGR 295640, 657008 as shown on Figure 3.1. This area has been chosen within a relatively level area of the Site, close to the Site entrance and with suitable separation distance from any environmental constraints identified during the EIA process. The area of the compound will measure approximately 100 m x 50 m and will include space for:

- Portakabins for site office and staff welfare facilities with provision for sealed waste storage and removal;
- Areas for storing materials;
- Parking for project related vehicles; and
- Containerised storage for tools and spares.

81. A typical construction compound arrangement is shown on Figure 3.8. Welfare facilities for site personnel will be required during construction which would be located within the construction compound. Foul water and effluent would be treated either via septic tank with soakaway designed to SEPA guidelines (including GPP4) or by the use of chemical facilities with periodic material for off-site disposal. Any facilities would be subject to agreement with SEPA.

82. The area to be used for the construction compound would be stripped of topsoil to expose a suitable formation which will be stored for future re-instatement. A geosynthetic material base or similar will then be laid followed by a layer of suitable material then a further geosynthetic material laid prior to the top surface of blended fines.

83. Appropriate bunding arrangements will be employed in all areas where fuel and oil storage tanks will be situated, in order to prevent contamination of the surrounding soils, vegetation, surface water and ground water. The fuel storage area will be above ground with secondary containment in accordance with SEPA's GPP2 (Above Ground Oil Storage Tanks), PPG7 (Refuelling facilities) and GPP8 (Safe storage and disposal of fuel oils), and will be situated a minimum of 50 m from watercourses to reduce the risk of pollution of watercourses. Any contaminated run-off within the sealed bund will be removed to a licensed waste management facility.

84. Following completion of the construction phase the components of the compounds will be removed and the area fully restored.

3.2.8.2 Borrow Pits

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

86. It is estimated that approximately 168,000 m^3 of stone (excluding aggregate for concrete) will be required as part of the construction of the Development. It is considered that a conservative estimation of 74,000 m^3 may be required to construct the hardstandings and tracks to a suitable standard.

87. Two potential borrow pits have been identified with an estimated 550,299 m^3 of available aggregate. This is additional capacity to that required for construction materials which allows some flexibility in the use of borrow pits, and it is therefore likely that the final borrow pit dimensions will be smaller than those presented; however, for the purpose of the EIA Report it is assumed that both borrow pits are used to their full extents as a worst case.

88. The locations of the borrow pits are shown on Figure 3.1; one is located between T8 and T9 to the north of the Site, and the second is located south of T12. The plans and profiles of the borrow pits are shown in Figures 3.13 and 3.14. A Borrow Pit Assessment is also presented in Appendix A3.1.

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

3.2.9 Anemometry Mast

90. A temporary anemometry mast will be installed at NGR 295640, 657008 for 5-7 years from the operation of the Development. The anemometry mast will be used to provide measurement of wind speed to provide information for the control and monitoring of the operation of the Development. The location of the mast has been selected to provide the best representation of wind speeds across the Site.

91. The anemometry mast will be a maximum height of 90 m and will be of galvanised steel lattice construction. It will have a concrete foundation with approximate dimensions of 6 m x 6 m x 0.5 m and erected using an appropriately sized crane. A typical anemometer mast is shown in Figure 3.12. An access track is not required to serve the mast, as construction and operation can be undertaken by all-terrain vehicles.

3.2.10 Site Signage

92. During construction, the Site will have suitable signage to protect the health and safety of workers, contractors and the general public. There will be a sign giving the operator's name, the name of the Development and an emergency contact telephone number. On the turbines and substation building, there will be further signs giving information about the component, potential hazards, the operator's name, the location grid reference and the emergency telephone number. The final location and design of the signage will be defined prior to the Development becoming operational.

3.2.11 Micro-Siting

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

94. For this reason, and the fact of previous mine workings in this area, a 100 m micro-siting allowance has been included around the proposed turbines and ancillary infrastructure. Turbines and associated infrastructure would not be micro-sited into deeper peat or closer to watercourses except with prior agreement from the Scottish Environment Protection Agency (SEPA).

95. The micro-siting allowances are considered and assessed throughout the technical and environmental chapters (Chapters 6 - 18) completed as part of the EIA for the Development.

3.2.12 Forestry Removal

96. As Development is largely located within commercial forestry plantation felling is required to accommodate infrastructure, including tracks, turbine infrastructure, borrow pits, substation and construction compound. This includes a 100 m lay-down radius of tree clearance around each turbine and 15 m wide corridor buffers along the access tracks.

97. In total 58.45 ha of forestry would be removed for infrastructure construction within which 57.64 ha would relate to established tree crops, 0.81 ha would be land recently felled and awaiting replanting. A further 15.93 ha of land used would relate to existing open ground within the forests.

98. Post-construction, the areas required for borrow pits lying between turbines T7 and T8 and to the south of T12, from which 8.55 ha of crops would have been removed, will be replanted on the Site and consequently the total productive area removed for infrastructure construction will be 49.90 ha which represents 7.09% of the stocked forest area within the Site. This will be compensated for by an appropriately designed new

compensatory forestry planting scheme on a substitute site in order to satisfy the requirements of the Control of Woodland Removal Policy[4].

99. Some crops adjoining the areas to be felled for infrastructure construction will require further tree clearance due to the predicted instability of these adjoining stands of trees. The area of proposed management felling for windblow mitigation is 29.30 ha representing 4.16% of the stocked forest area within the Site. Areas felled for windblow mitigation within the forests would be replanted with a replacement crop in the same location with species determined by the approved restocking plans within the existing LMPs

100. The forest removal will be undertaken largely using conventional harvesting and/or mulching for crops which are commercially unsuitable. Activities will be carried out using standard forest harvesting equipment with commercial timber removed from the Site.

101. Further details on the Forest Design for the Site are explored in Chapter 15 - Forestry.

3.2.13 Restoration

102. Site restoration will involve the restoration of track and hardstanding verges, borrow pits and the temporary construction compound to provide a natural ground profile with non-geometric surfaces and tie-ins with existing undisturbed ground levels. Restoration will be undertaken at the earliest opportunity to minimise storage of turf and other materials and to allow restoration of disturbed areas as early as possible and in a progressive manner.

103. A restoration plan for the site will be secured by condition and agreed with the Councils and relevant statutory consultees.

3.3 CONSTRUCTION AND DEVLEOPMENT PHASING

104. The on-site construction period is estimated at approximately 18 months in duration and would comprise the following principal operations:

- Phased forestry felling to facilitate construction;
- Construction of access junction off the A706 (note forestry operations will use the existing FLS access), and initial section of track;
- Construction of the temporary construction compound and laydown areas near the Site entrance;
- Extraction of stone from the onsite borrow pits;
- Upgrade of existing access tracks and construction of new access tracks, including watercourse crossing points;
- Construction of the substation compound area;
- Installation of temporary and permanent drainage;
- Construction of turbine foundations;
- Construction of crane hardstanding areas;
- Delivery, erection and commissioning of wind turbines;
- Construction of the substation building, including control building and battery storage facility;
- Excavation of shallow cable trenches approximately 1 m off the edge of the track and cable laying adjacent to the access tracks and crane hardstandings for drainage;
- Connection of onsite electrical distribution cables;

[4] Forestry Commission Scotland (2009). The Scottish Government's Policy on the Control of Woodland Removal. Edinburgh. Available at: https://forestry.gov.scot/publications/349-scottish-government-s-policy-on-control-of-woodland-removal-implementation-guidance
Note that in April 2019 Forestry Commission Scotland became "Scottish Forestry".

- Commissioning of the site equipment; and
- Reinstatement of the borrow pits and the temporary construction compounds.

3.3.1 Construction Period

105. It is expected that many of the above operations will be carried out concurrently, although predominantly in the order identified, which will minimise the overall length of the construction programme. An indicative Construction Programme is illustrated in Chart 3.1 below.

106. It is proposed that construction activities be limited to the working hours of 07:00 to 19:00 Monday to Friday and 07:00 to 13:00 on Saturdays, with the exception of any emergency working or turbine deliveries. During the installation phase, there may be the requirement for extended working as some critical elements of installation cannot be stopped once started, such as concrete pouring. This would be agreed in advance with the Councils.

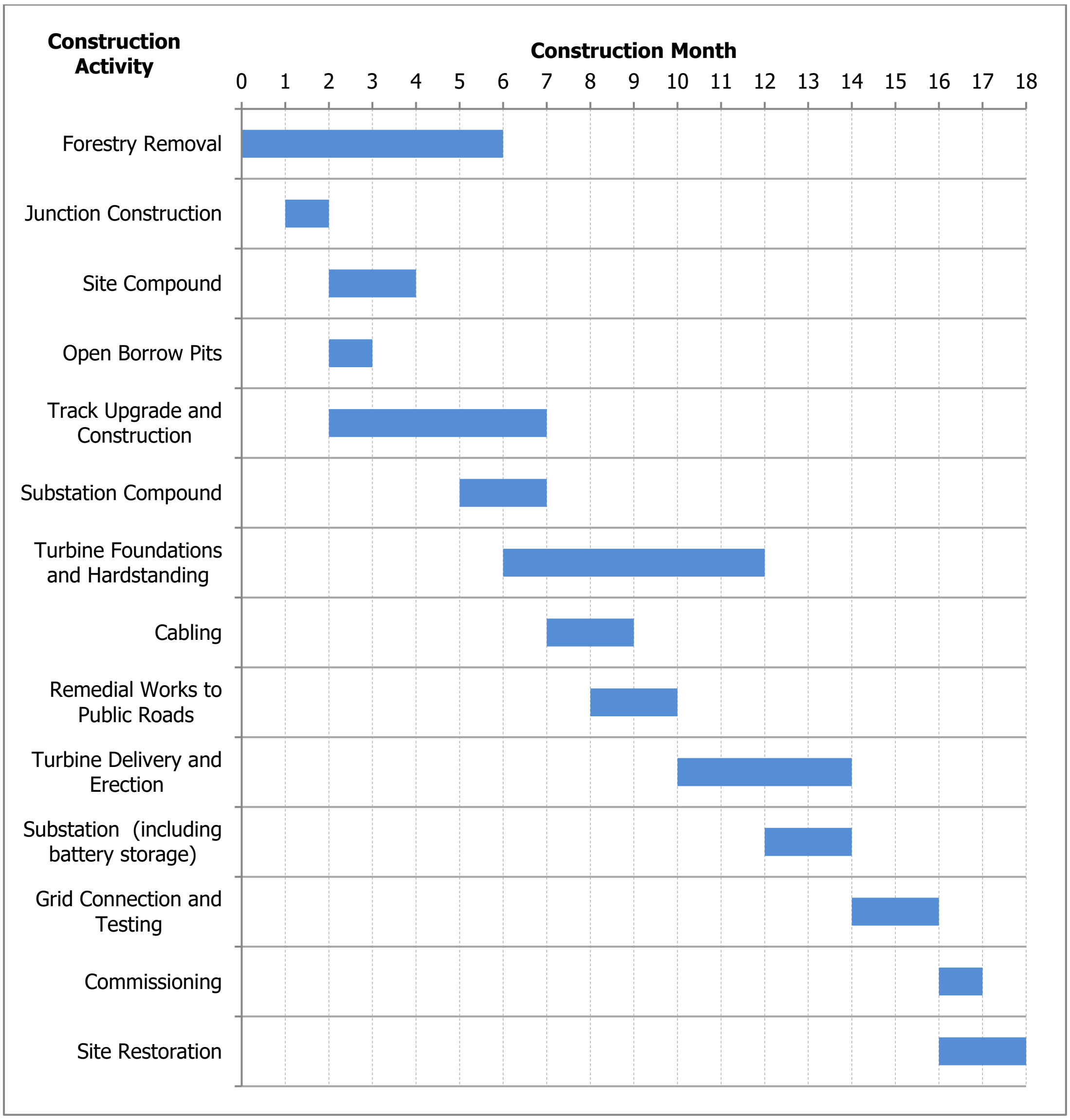

Chart 3.1 Indicative 18 Month Construction Programme

3.3.2 Construction Methods and Environmental Management

107. The construction phase will be controlled via a series of detailed method statements, which will be prepared by an Infrastructure Contractor appointed by the Applicant, who

will have overall responsibility for environmental management on the construction site. While these method statements can only be formulated following detailed site investigation and detailed engineering design it is possible to indicate the outline of the methods that will be used, particularly in relation to environmental management.

108. The services of specialist advisors will be retained as appropriate, such as an archaeologist and ecologist, to be called on as required to advise on specific environmental issues. The appointed Infrastructure Contractor working with specialist advisors will ensure construction activities are carried out in accordance with the mitigation measures outlined in this EIA Report.

109. Prior to construction, a detailed CEMP would be prepared that collates all measures required during construction to avoid and minimise environmental harm including guidance and best practice. The CEMP would include:

- Site induction and training;
- Working hours;
- Enabling works;
- Surface water and drainage management;
- Waste management;
- Wastewater and water supply monitoring and control;
- Oil and chemical delivery and storage;
- Water quality monitoring;
- Ecological protection measures;
- Construction noise management;
- Cultural heritage protection measures;
- Handling of excavated materials;
- Forest and woodland management;
- Reinstatement and restoration;
- Traffic management;
- Environment incident response and reporting;
- Use and extent of borrow pits;
- Method statements and risk assessments;
- Final drawings and details of access tracks; and
- Final drawings and details of turbine foundations.

110. To ensure that the mitigation and management measures detailed within this EIA Report are carried out, construction personnel and contractors will be required to adhere to the CEMP which will form an overarching document for all construction site management requirements.

111. Contractors will also be required to adhere to the following to minimise environmental effects of the construction process:

- Conditions required under the Consent and deemed planning permission;
- Requirements of statutory consultees including SEPA and NatureScot (formerly SNH); and
- All relevant statutory requirements and published guidelines that reflect 'good practice'.

112. The Applicant will require that all contractors follow the requirements of ISO14001 - 'Environmental Management Systems - Specification and Guidance for Use'[5], and will provide the following:

- Details of main contractor's corporate environmental policy;
- Assessment of environmental impacts during construction;

[5] ISO (2015) ISO 14001:2015 Environmental management systems – Requirements with guidance for use [online]. Available at: https://www.iso.org/standard/60857.html (Accessed 04/08/2020).

- Procedures and controls for environmental management;
- Environmental monitoring details and reporting systems;
- Schedule of contractual and legislative requirements; and
- Schedule of relevant consents, licences and authorisations.

113. The CEMP will be agreed with the relevant statutory bodies including SEPA, NatureScot and the Councils prior to commencement of construction, and performance against the CEMP will be monitored by the Applicant's Construction Project Manager throughout the construction period.

114. Particular environmental impacts and associated mitigation measures required to be addressed within the CEMP are discussed in relevant sections of this EIA Report.

115. In addition, the CEMP will typically be supported by the following documents which apply to the construction process:

- Water Construction Environment Management Plan;
- Peat Management Plan;
- Pollution Prevention Plan;
- Traffic Management Plan;
- Site Waste Management Plan; and
- Restoration Plan.

3.3.3 Construction Materials

116. The key materials which would be required for the construction of the track, turbine foundations, hardstanding areas and cable trenches are:

- Crushed stone;
- Geotextile;
- Cement;
- Sand;
- Concrete quality aggregate: high strength structural grade, which is not prone to substantial leaching of alkalis;
- Steel reinforcement; and
- Electrical cable.

117. All materials will be sourced and transported to the site from local suppliers, where possible, with the exception of materials sourced from onsite borrow pits.

3.3.4 Construction Movements

118. Various vehicle types are required during the construction stage of the Development; of these, the majority would be standard road vehicles of similar type to those using local roads on a daily basis. However, the delivery of some of the wind turbine components would require vehicles and transport configurations that are longer and/or wider and/or heavier than standard road vehicles, this is discussed in Chapter 12 – Traffic and Transport.

3.3.5 Waste Management

119. All waste will be removed off-site for safe disposal at a suitably licensed waste management facility in accordance with current waste management regulations. Wherever possible, excavated stone or soils will be re-used on site, primarily for the restoration of disturbed ground. All details of this will be included within the CEMP, as agreed with the Councils and SEPA.

120. The main items of construction waste and their sources are:

- Hardcore, stone, gravel from temporary surfaces to facilitate construction waste, and concrete;
- Subsoil from excavations for foundations and roads;
- Timber from temporary supports, shuttering and product deliveries;
- Miscellaneous building materials left over from construction of the control building;
- Sanitary waste from chemical toilets (if used);
- Plastics packaging of material; and
- Lubricating oils, diesel - unused quantities at end of construction period.

121. Subsoil not required for reinstatement purposes will be collected at the end of the construction phase and disposed of according to best practice and existing waste legislation. Waste oils and diesel will be removed from the Site and disposed of by an approved waste contractor in accordance with provisions of the Special Waste Regulations 1996.

122. In the event of the complete decommissioning of the wind turbines, all mechanical/electrical equipment will be removed from the Site, the control building will be removed, the concrete bases will be covered over with soil and any disturbed ground will be reinstated and reseeded. All cables would be cut off below ground level, de-energised, and left in-situ.

123. The decommissioned turbine components will have sufficient salvage value to ensure their proper recycling. An important environmental issue in the decommissioning of the wind turbines will be the proper handling and disposal of any contaminating material (e.g. lubricating/cooling oils etc.). The Applicant undertakes to ensure that all such contaminating material will be removed from the Site in accordance with best practice.

124. The Infrastructure Contractor will be required to prepare a Site Waste Management Plan (SWMP) to ensure that best practice principles are applied with regard to reducing, re-using and recycling of all materials.

3.3.6 Health and Safety Related Issues

125. Health and safety issues during construction and decommissioning fall under the Construction (Design and Management) (CDM) Regulations 2015[6]. Health and safety will be initially addressed as part of the Pre-Construction Information Pack prepared by the Applicant. The Construction Project Manager will be required to prepare a Construction Phase Plan (Health and Safety Plan) and to forward information to the Applicant during the works to enable the Health and Safety File to be completed.

126. Turbines are designed to be safe and are built to withstand extreme wind conditions. The turbines selected for the Development will have a proven record in terms of safety and reliability.

127. Day-to-day operational and maintenance activities will be co-ordinated with the private landowner's operational requirements.

128. Public access to the Site will be restricted throughout the construction working area during construction for health and safety reasons and will be reinstated following cessation of construction activities.

129. An Operations and Maintenance Manual for the design life of the Development will be prepared by the Contractor and will cover all operational and decommissioning procedures.

[6] Health and Safety Executive (2015) Construction Design and Management Regulations 2015 [online]. Available at: http://www.hse.gov.uk/construction/cdm/2015/index.htm (Accessed 04/08/2020).

3.4 OPERATIONAL PHASE

130. The Development will have an operational lifespan of up to 30 years from full commissioning of the proposed turbines.

3.4.1 Turbine and Infrastructure Maintenance

131. Turbine maintenance will be carried out in accordance with the manufacturer's specification. The following routine turbine maintenance will be undertaken:

- Initial service;
- Routine maintenance and servicing;
- Gearbox oil changes;
- Blade, gearbox and generator inspections; and
- Replacement of blades and components as required.

132. Operational site inspections will be undertaken on a weekly basis and the servicing of turbines will be undertaken as per the turbine manufacturer requirements, usually once per year, but with monthly visits by the manufacturer's servicing team.

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

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

3.4.2 Snow Clearance

135. Safe access to the Development is required year round. There is potential for the Development to experience snowfall and therefore clearance of snowdrifts may be necessary via grading of the track using suitable ploughing plant.

3.5 DECOMMISSIONING

136. As noted previously, the operational lifespan of the Development and associated infrastructure will be up to 30 years. Following this, an application may be submitted to retain or replace the turbines, or alternatively they will be decommissioned.

137. Decommissioning would involve the following:

- Dismantling and removal of the wind turbines and electrical equipment;
- Reinstatement of the turbine areas and associated hardstanding; and
- Demolition and removal of control building and compound.

138. Turbine components and electrical equipment would be dismantled and removed in a similar manner to their delivery and erection. Turbine towers, nacelles and blades would be transported from the Site as abnormal loads. A route assessment will be undertaken prior to decommissioning to identify the best route to remove the components offsite. Turbine components would be broken up offsite in controlled environments ready for reuse, recycling or appropriate disposal.

139. The removal of the top 1 m of the turbine base and plinth would be undertaken, requiring an excavated trench around the upstand to provide a working area. Breakout of the top part of the plinth would be undertaken using an excavator-mounted jack hammer. The cables would be cut level with the remaining concrete. Once the broken out concrete has been removed, the area would be reinstated by backfilling with soil/peat to an agreed method statement.

140. A similar process would be undertaken for the substation building, with the equipment removed offsite for breaking up and appropriate disposal and the building demolished.

The top one metre of the concrete foundation slab would be broken up and removed, and the ground reinstated with topsoil. However cut faces are likely to be retained, as there would be insufficient material to fully backfill the substation area.

141. The access tracks will be retained in situ at decommissioning for use by FLS. The cables will also be left in situ.

142. Overall, it is estimated that the decommissioning period for the Development would be approximately eight months.