1 Introduction & Proposed Development

Background

1.1 This Environmental Statement (ES) has been prepared by Renewable Energy Systems Limited (RES) to accompany a planning application that has been made to the Department for Infrastructure (DFI) for permission to construct, operate and decommission a wind farm known as Carnbuck Wind Farm, hereinafter referred to as 'the Proposed Development'. The purpose of the ES is to inform DFI in the assessment of the likely significant environmental effects resulting from the Proposed Development and to establish the need for mitigation measures to reduce such effects.

1.2 The application site is located in the townlands of Carnbuck, Magheraboy and Moneyneagh, near Corkey, County Antrim. The site is adjacent to the existing Gruig Wind Farm. The application site is shown in **Figure 1.1: Site Location** and **Figure 1.2: Planning Application Boundary.**

1.3 This chapter is supported by:

- Figures 1.1 to 1.19
- Technical Appendices 1.1 to 1.6

The Applicant

1.4 The application for planning permission is made by RES ('the Applicant').

1.5 RES is the world's largest independent renewable energy company. At the forefront of the industry for 40 years, RES has delivered more than 22GW of renewable energy projects across the globe and supports an operational asset portfolio exceeding 7.5GW worldwide for a large client base. RES is active in 10 countries working across onshore and offshore wind, solar, energy storage and transmission and distribution. RES has developed 22 onshore wind farms in Northern Ireland totalling 380 MW, which equates to nearly 20% of Northern Ireland's operational onshore wind capacity. RES currently operates 7 projects totalling 159 MW of wind capacity across Northern Ireland, has secured planning permission for a further 108 MW awaiting construction and has 81 MW in the planning system.

EIA Process

Scope of the ES

1.6 The Environmental Impact Assessment (EIA) has assessed the environmental impacts associated with the construction, operation and decommissioning the Proposed Development, comprising 12 three bladed wind turbines, each up to 180m maximum height above ground level; associated external electricity transformers; underground cabling; access tracks; turning heads; crane hardstandings; control building and substation compound, energy storage containers, mast, off-site areas

of widening to the public road and all ancillary works. The Proposed Development also comprises upgrades to the existing site entrance and access tracks of Gruig Wind Farm. During construction and commissioning there would be a number of temporary works including a construction compound with car parking; temporary parts of crane hardstandings; welfare facilities. The purpose of the development is for the generation of electricity.

1.7 RES has undertaken informal scoping with DFI regarding the Proposed Development and a letter of Intention to Submit an ES was lodged, which is included in **Technical Appendix 1.1**. An Intention to Submit response from DFI is included in **Technical Appendix 1.2**. along with the responses received from consultees. Informal consultation was also undertaken by individual chapter authors. Responses from consultees have been considered in the individual chapters of this ES.

1.8 An EIA has been undertaken in accordance with the Planning (Environmental Impact Assessment) Regulations (Northern Ireland) 2017, (the "EIA Regulations"), to identify and assess the likely environmental effects of the Proposed Development and establish an appropriate range of mitigation measures in order to reduce adverse impacts where possible. This ES contains the findings of the EIA.

1.9 The Proposed Development will represent a 'Schedule 2' development, as defined under the "EIA Regulations". Development that is listed in Schedule 2 requires an EIA if it is likely to have an impact on the environment by virtue of factors such as its size, nature or location. Therefore, any potential effects of the construction, operation and decommissioning of the Proposed Development deemed to have significant environmental effects are subject to an EIA.

1.10 The scale of the Proposed Development means that there is the potential for significant environmental effects to arise. Consequently, it was deemed appropriate to undertake an EIA.

1.11 EIA is a process by which information about the environmental impacts of a project is collected, evaluated and taken into account in its design and the decision as to whether it should be granted planning permission. The applicant presents the information on the project and its likely environmental impacts in an ES. This enables decision-makers to consider these impacts when determining the related planning application. The EIA process has a number of key characteristics:

- It is systematic, comprising a sequence of tasks defined both by regulation and by practice;
- It is analytical, requiring the application of specialist skills from the environmental sciences;
- It is impartial, its objective being to inform the decision-maker rather than to promote the project;
- It is consultative, with provision being made for obtaining information and feedback from statutory agencies and key stakeholders; and
- It is iterative, allowing opportunities for environmental concerns to be addressed during the planning and design of a project.

1.12 This final point is particularly important with respect to the design of the Proposed Development where a number of design iterations have taken place in response to environmental factors identified during the EIA process. This is described in **Chapter 3: Design Evolution & Alternatives**.

1.13 The EIA for the Proposed Development has been carried out in accordance with the latest regulations, guidance and advice on good practice, comprising:

- Planning (Environmental Impact Assessment) Regulations (Northern Ireland) 2017;
- Environmental Impact Assessment: A guide to procedures (Department for Communities and Local Government, amended reprint 2001); and
- Guidelines for Environmental Impact Assessment (Institute of Environmental Management and Assessment, 2004).

1.14 Individual technical assessments have been undertaken in accordance with a variety of legislation, guidance and best practice. Relevant details are contained within the Legislation and Policy Framework section where applicable to each technical chapter.

The Assessment Method

1.15 Appropriate methodologies have been used to assess the effects relating to each of the environmental topics that have been investigated as part of the EIA. These methodologies are based on recognised good practice and guidelines specific to each subject area, details of which are provided within each individual technical section.

1.16 The design team employed an iterative approach to the design of the Proposed Development where the design evolved throughout the EIA process as different constraints and potentially adverse impacts were identified and evaluated. This method is considered best practice as mitigation measures can concurrently be integrated into the design throughout the EIA process. This approach allowed the design team to alleviate or remove potentially adverse impacts and incorporate measures into the design to enhance positive impacts. The final evaluation of significance assesses the residual impacts assuming all mitigation measures are applied.

1.17 Each technical chapter assesses the impacts that could arise as a result of the Proposed Development. Impacts are assessed as being either adverse, beneficial, permanent, temporary or reversible. Significance is determined by assessing the magnitude and sensitivity of each likely impact.

1.18 The ES complies with current planning policy and will be submitted in conjunction with a planning application. This report is a formal ES as required by DFI under the Planning (EIA) Regulations (Northern Ireland) 2017. The ES is designed to provide information for the purpose of assessing the likely impact upon the environment.

Structure of the Environmental Statement

1.19 Schedule 4 of the "EIA Regulations" states that the following must be included within the ES:

- A description of the development (description of the physical characteristics (site, design and size of the development), land-use requirements, production processes) and an estimate of expected residues and emissions resulting from the operation of the proposed development.
- An outline of the alternatives studied by the applicant and explanation of why the particular option was chosen.
- A description of the aspects of the environment likely to be significantly affected by the development (including population, fauna, flora, soil, water, air, climatic factors, material assets, including the architectural and archaeological heritage and landscape) and the inter-relationship between the above aspects.
- A description of the likely significant effects of the development on the environment (to include direct, indirect, secondary, cumulative, short, medium and long-term, permanent and temporary, beneficial and adverse effects of the development).
- A description of the measures envisaged to prevent, reduce and where possible offset any significant adverse effects on the environment.
- The data required to identify and assess the main effects that the development is likely to have on the environment.
- An indication of any difficulties (technical deficiencies or lack of know-how) encountered.
- A non-technical summary of the information contained within the ES.

1.20 This ES has been prepared in accordance with the "EIA Regulations" described above. The ES comprises the following volumes:

- **Volume 1**: Non-technical Summary (NTS) of the ES
- **Volume 2**: Main Text
- **Volume 3**: Figures (the illustrations that accompany the ES)
- **Volume 4**: Technical Appendices (technical information relating to the environmental topics such as detailed methodologies, baseline data information and data analysis).

1.21 Volume 2 is organised as follows:

- **Chapter 1**: Introduction & Proposed Development
- **Chapter 2**: Planning Policy
- **Chapter 3**: Design Evolution & Alternatives
- **Chapter 4:** Landscape & Visual
- **Chapter 5:** Archaeology & Cultural Heritage
- **Chapter 6**: Vegetation & Peatland

- **Chapter 7**: Terrestrial Fauna
- **Chapter 8:** Ornithology
- **Chapter 9:** Fisheries
- **Chapter 10:** Geology & Water Environment
- **Chapter 11**: Acoustic Assessment
- **Chapter 12:** Traffic & Transport
- **Chapter 13:** Shadow Flicker
- **Chapter 14:** Socioeconomics
- **Chapter 15:** Schedule of Mitigation

1.22 Biodiversity is covered under Chapters 6, 7, 8, 9 and 10; Human Health is covered under Chapters 11 & 13 and Climate Change is covered within Chapter 14. A schedule of mitigation is described in Chapter 15.

1.23 Chapters 1, 3, 11, 12, 13 and 15 have been authored by RES using their in-house professionally qualified expertise in respect of these topics. The Environmental Statement has been compiled by RES, primarily by Fiona Stevens (Senior Development Project Manager - Lead) who is a Practitioner Member of the Institute of Environmental Management & Assessment (PIEMA) with over 15 years' experience of planning and developing renewable energy projects.

1.24 In general, for each environmental topic, the following format has been adopted with regard to the presentation of information:

- Introduction
- Scope of Assessment
- Legislation and Policy Framework
- Consultation
- Assessment Methodology
- Baseline Assessment
- Assessment of residual impacts
- Design Evolution and Mitigation Measures
- Residual Impacts
- Cumulative Impacts
- Summary and Conclusions
- References.

1.25 A number of individual disciplines have adopted variations from this format as a result of specific assessment methodologies and appropriate reporting structure.

Planning Application

1.26 In February 2022, DFI confirmed that the planning application should be submitted to the DFI, in accordance with Section 26 of the Planning Act (Northern Ireland) 2011, regarding the Department's jurisdiction in relation to developments of regional significance.

The Proposed Development

1.27 The Proposed Development comprises up to 12 three-bladed horizontal axis wind turbines, each up to 180 m maximum height above ground level; associated external electricity transformers; underground cabling; access tracks; turning heads; crane hardstandings; control building and substation compound, energy storage containers, off-site areas of widening to the public road and all ancillary works. The development also comprises upgrades to the existing site entrance and access tracks of Gruig Wind Farm. During construction and commissioning there would be a number of temporary works including a construction compound with car parking; temporary parts of crane hardstandings; welfare facilities. The purpose of the development is for the generation of electricity.

1.28 The Planning Application Boundary (red line boundary) is shown on **Figure 1.2**. This boundary contains the main wind farm site, including positions of the turbines and associated infrastructure, with 50 m micrositing. The Planning Application Boundary lies fully within Land under the Applicant's Control (blue line boundary), as shown in **Figure 1.2.** The measures contained in the Outline Habitat Management Plan (**Technical Appendix 6.2)** are contained within the blue line boundary.

1.29 A detailed plan of the Proposed Development showing the position of the turbines and other infrastructure is shown on **Figure 1.3: Infrastructure Layout**.

1.30 This chapter provides a description of the physical characteristics of the Proposed Development for the purpose of identifying and assessing the main environmental impacts of the proposal.

1.31 In this chapter in order to differentiate between land take and infrastructure that will be present for the wind farm lifetime, and land take and infrastructure which is only required for short term works during the construction period, the term 'permanent' is used to describe the former and 'temporary' used to describe the latter. However, it should be noted that the Proposed Development would have a temporary operational lifetime of approximately 35 years from the date of commissioning, after which the above ground infrastructure would be removed and the land remediated. Therefore, the effects are largely long-term temporary as opposed to permanent.

1.32 Planning permission is being sought for the Proposed Development comprising the following:

- Up to 12 three-bladed horizontal axis wind turbines of up to 180 m tip-height
- Associated external electricity transformers
- Upgrades to an existing site entrance
- New access tracks and upgrades to existing tracks at Gruig Wind Farm
- Turning heads
- Control buildings and substation compound
- Battery energy storage containers and associated infrastructure
- Off-site areas of widening to the public road and all ancillary works
- Turbine foundations
- Hardstanding areas at each turbine location for use by cranes erecting and maintaining the turbines
- Electricity transformers
- Approximately 7.4 km of new access track and 2.6 km of upgraded, existing access track
- On-site electrical, control and communications network of underground (buried) cables
- Temporary construction compound
- Permanent and temporary drainage works
- Associated ancillary works

Flexibility

1.33 Although the design process and evolution seeks to combine environmental and economic requirements, the Applicant would nevertheless wish some flexibility, where necessary, in micrositing the exact positions of the turbines and routes of on-site access tracks and associated infrastructure (50 m deviation in plan from the indicative design). Any repositioning would not encroach into environmentally constrained areas. Therefore, 50 m flexibility in turbine positioning would help mitigate any potential environmental effects: e.g. avoidance of unfavourable ground conditions or archaeological features not apparent from current records. See **Figure 1.3: Infrastructure Layout** for details.

Land Take

1.34 The turbines need to be spaced a suitable distance apart (taking into account the prevailing wind direction), so as not to interfere aerodynamically with one another (creating array losses). The actual land developed is limited to the substation, wind turbine towers, transformers, permanent crane hardstandings, battery energy storage hardstanding and the access tracks, which account collectively for

approximately 6.24% of the total area within the Planning Application Boundary, as detailed in Table 1.1.

Table 1.1 - Summary of Temporary and Permanent Hardstanding in the Proposed Development

Wind Farm Element	Temporary hardstanding[1] in m^2	Permanent Hardstanding[2] in m^2
Turbines and transformer pads	-	2712
Crane pads and laydown areas	7560	23,100
New on-site access tracks (including junctions and turning heads)	-	40,100
Control building & substation compound (including hardstand)	-	3,214
Energy storage hardstanding (replacing temporary construction compound)	-	4,500
Total hardstanding in m^2	7560	73,626
Total hardstanding in ha	0.76	7.36
Total hardstanding as % of total area within the Planning Application Boundary (Main site) (117.95 ha).	0.64%	6.24%
Total hardstanding as % of total area within the Land Under Applicant Control (Main site) (740 ha).	0.10%	0.99%

1.35 Thus, in summary, the Proposed Development would require approximately 7.36 ha of hardstanding lasting throughout the life of the project. An estimated further 0.76 ha would be occupied by hardstanding on a temporary basis.

Habitat Management

1.36 An Outline Habitat Management & Enhancement Plan (HMEP) has been developed to enhance peatland habitats on site. Please see **Chapter 6: Vegetation & Peatland**, for further details.

Wind Turbines & Foundations

1.37 The wind turbine industry is evolving at a remarkable rate. Designs continue to improve technically and economically. The most suitable turbine model for a particular location can change with time and therefore a final choice of machine for the Proposed Development has not yet been made. The most suitable machine will be selected before construction, with a maximum tip height of 180 m.

[1] Temporary hardstanding: this refers to ground which will be occupied by hardstanding / built structures during the construction of the Development. However, once the Development has been constructed this land will be reinstated and available for grazing.

[2] Permanent hardstanding: this refers to ground which will be occupied by hardstanding / built structures throughout the lifetime of the Development.

1.38 Most of the dominant wind turbine manufacturers are now producing turbines that are classed as suitable for the wind regimes typical of Northern Ireland and many are also producing turbines that meet the up to 180 m tip height specification being suggested for the Proposed Development. Exact tower and blade dimensions vary marginally between manufacturers. A diagram of a typical 180 m tip height turbine is given in **Figure 1.4.**

1.39 Exact megawatt capacities also vary between manufacturers. For economic assessment purposes, a suitable candidate turbine currently available in the market place of 4.2 MW (with an overall tip height of 180) has been assumed.

1.40 Turbines begin generating automatically at a wind speed of around 3 to 4 metres per second (m/s) and have a shut-down wind speed of about 25 m/s. If requested, it is proposed to install lighting on turbine(s) in a pattern that is acceptable to the Civil Aviation Authority (CAA) and Ministry of Defence (MoD) for aviation visibility purposes. Infrared lighting allows military aircraft with night vision capability to detect and avoid wind farms. Proposals for turbine lighting are included in **Technical Appendix 1.6**.

1.41 Each turbine would have a transformer and switchgear. The transformer's function is to raise the generation voltage from approximately 690 volts to the higher distribution level that is required to transport the electricity from the turbines to the grid connection point substation on the site. Depending on the turbine supplier, the transformer and switchgear may be located inside or outside each turbine.

1.42 The wind turbines would be erected on reinforced concrete foundations. It is anticipated that the foundations would be of gravity base design, but there may be the requirement to use piled foundations where ground conditions dictate. Final base designs will be determined after a full geotechnical evaluation of each turbine location. **Figure 1.14** provides an illustration of a typical gravity base wind turbine foundation design.

1.43 The turbine foundation formation level is approximately 16-25 m diameter in area and 2.5-4 m below ground level. The walls of the excavation will be battered to approximately 1:2, yielding a maximum ground level excavation area of approximately 40 m diameter.

1.44 The excavation area around each turbine is significant in terms of both its scale and duration of the works and as such requires consideration. Ancillary excavation works and material storage around other parts of development, such as those for cable trenching, would have a negligible impact on environmental receptors due to the very minor scale of the excavation, or duration of the works, and are not considered further in the ES.

1.45 Following completion of the turbine installation, the permanent hardstanding would be approximately 226m^2 at each turbine site, which includes the concrete plinth to which the steel tower is attached and a maintenance track/path around the base of the turbine. The external transformer (if required) would take an additional 28 m^2 of land at each turbine. The completed foundation is covered

with soil approximately 1.5m deep, leaving only the concrete plinth exposed at ground level, to which the steel tower is attached. Movement of livestock around the tower would be unrestricted.

1.46 Proposals for turbine lighting are detailed in **Technical Appendix 1.6**.

Battery Energy Storage System (BESS)

What is Energy Storage?

1.47 Energy Storage is a means of storing electrical energy just like a rechargeable battery, mobile phone or electric car. These are means by which power can be stored and released. The Proposed Development includes 22 no. energy storage containers which is of a larger scale, but the basic principle is the same.

1.48 According to SONI statistics, the electricity demand in Northern Ireland, day to day, for instance during 2018 the lowest demand ranged from as low as 437MW to as high as 1648 MW. Therefore, power generation and grid must deal with large transitions between lows and highs, not only over the course of a day or week but second by second. One of the basic roles of energy storage is to act as a power reserve, when electricity generation drops below demand. Its importance then is linked to its ability to ensure a constant supply of electrical energy to our homes and business. That improves efficiency and reduces prices for consumers.

1.49 Energy storage can absorb energy at times of high generation and low demand, and release energy at times of peak demand. Customers offering Energy Storage Services (ESS) therefore have the potential of deferring network reinforcement and accommodating the connection of further demand or generation which would otherwise be constrained by thermal capacity. ESS can also play in the System Services market helping to balance demand and generation.

The Need for Energy Storage – Why is it Important?

1.50 The Proposed Development is intended to be used to provide cost effective flexible services to the electricity network, such as adding electricity to, or removing electricity from the system, when this is useful to the operation of the system. SONI, the System Operator in charge of ensuring stable secure power for the Ireland's homes and businesses, procures such services from grid connected energy systems and the flexibility they provide is critical to achieving national decarbonisation targets and a stable supply of electricity at least cost to consumers.

1.51 Energy provision in Northern Ireland is undergoing a transition from one designed primarily around a number of large thermal power stations such as Kilroot, Ballylumford and Coolkeeragh to one which now includes a number of renewable generators such as wind farms. Renewable generation is now supplying over 40% of the total annual electrical requirement in Northern Ireland. With the Minister of the Economy announcing in 2021 that the Renewable Energy target for Northern

Ireland will be 70% by 2030, increasing to 80% by 2030 if the Climate Bill amendment receives royal assent, this transition will be even more important.

1.52 There are, however, technical constraints on the transmission network which are limiting the amount of renewable energy which can be delivered from these renewable generators to the main demand centres in the east of the province.

1.53 Energy Storage is an innovative solution, which is being deployed across the world, to facilitate the shift from traditional thermal generation to low/zero carbon generation. The energy storage containers will help match generation produced from intermittent renewable generation with the peaks and troughs in electricity demand.

1.54 The need for battery energy storage systems (BESS) has been identified by SONI under their DS3 programme. The delivery of the DS3 programme is required to allow Northern Ireland to meet its renewable energy targets.

1.55 The BESS in the Proposed Development provides an opportunity to support innovative technology, contribute towards renewable energy targets, ensure a secure electricity supply to its population and play its part in reducing electricity costs for consumers.

1.56 In particular, the Proposed Development will deliver frequency response service to enable the necessary balancing of the emerging low carbon electricity system. The frequency at which the electricity system operates is an indication of the balance between supply and demand and a failure to maintain this frequency within strict boundaries would lead to catastrophic system failure and blackouts. Normally, the system runs at a frequency of 50Hz. If there is not enough supply to meet demand the frequency drops below 50Hz. If there is too much supply for the current demand, the frequency rises above 50Hz. The Proposed Development will be able to respond within a fraction of a second to frequency deviations away from 50Hz (by increasing supply or demand as appropriate) to help keep the system in balance.

1.57 The BESS element of the Proposed Development could also provide distribution, reinforcement and deferral services. These enable existing electrical network assets such as substations and overhead lines to have their capacity increased without the need for building new infrastructure. All of these uses of the Proposed Development involve charging the battery system with electricity, storing electricity for a period, or discharging electricity. The Proposed Development will make a valuable contribution to Ireland's secure, low carbon and affordable electricity system.

1.58 One or more of the battery storage containers are connected to a power conversion system (PCS) and transformer unit, these may be separate pieces of equipment or one combined PCS and transformer. The PCSs are inverters which convert the direct current (DC) from the batteries to alternating current (AC) when the batteries are exporting electricity into the grid. The system works in reverse when the batteries are being charged or importing electricity from the grid. Power transformers will

step up the PCS AC voltage from a low voltage to a higher voltage as required by the electricity grid connection.

1.59 The batteries will operate on average for up to 24 hours per day to support the grid network, times of operation will depend on the grid parameters and requirements. There shall be no emissions from the site with the exception of noise from cooling fans. All noise associated with the energy storage has been assessed in **Chapter 11: Noise** of the ES with the full technical details supplied in **Technical Appendix 11.1.**

1.60 More information about the proposed BESS at Carnbuck Wind Farm is included in **Technical Appendix 1.3**.

1.61 The BESS will comprise 22 permanent containers housing energy storage devices, associated inverters and ancillary equipment. Permanent fencing will enclose the containers. The BESS compound is illustrated in **Figure 1.8: Energy Storage Compound Plan & Elevation** and **Figure 1.9: Energy Storage Container Elevation.**

1.62 The BESS compound, measuring 4,500m^2 in area, will be constructed on the area used for the temporary construction compound area.

Crane Hard Standings

1.63 During the erection of the turbines, crane hardstanding areas would be required adjacent to each turbine base. **Figure 1.15** shows the general hardstanding arrangement at each turbine. Typically, these consist of one main permanent area of 1925m^2 adjacent to the turbine position, where the main turbine erection crane will be located. The other areas, totalling 630m^2, will be temporary and used during the assembly of the main crane jib. The hardstanding will be constructed using the same method as the excavated access tracks. This involves the topsoil being replaced with suitable structural fill to finished level.

1.64 After construction operations are complete, the temporary crane pad areas, shown on **Figure 1.15**, will be reinstated. There will be a requirement to use cranes on occasion during the operational phase of the Proposed Development, so the main crane hardstanding (1925m^2) will be retained to ease maintenance activities. This approach complies with current best practice guidance[3] which recommends crane hardstandings are left uncovered for the lifetime of the Proposed Development.

Site Tracks

1.65 The Proposed Development would result in the construction of approximately 7.4 km of new track. The running width of the track would be 4.5m on straight sections, with 0.25m wide shoulders on each side, totalling 5m. The permanent land take area for the new track would be approximately 40,100 m^2. Upgrades to the existing site track at Gruig Wind Farm to facilitate Carnbuck are also included as part of the Proposed Development. However this upgrading entails maintenance and no widening is proposed, therefore no additional land take will result. This

[3] SNH, Scottish Renewables, SEPA and the Forestry Commission Scotland (2010) "*Good Practice during Wind Farm Construction*"

sharing of infrastructure will help to minimise the impact of the Proposed Development.

1.66 The on-site access track layout has been designed to minimise environmental disturbance by maximising the use of the existing site entrance and existing site track at the operational Gruig Wind Farm; avoiding sensitive habitats where possible; and keeping the length of track commensurate with the minimum required for operational safety. The track route also takes cognisance of the various identified environmental constraints. Typical access track designs are shown in **Figure 1.11**.

1.67 13 new watercourse crossings will be required as part of the track layout. These crossings would be designed to ensure that fish movements are not restricted (where recommended in Chapter 9: Fisheries) in addition to ensuring the crossing size is adequate for potential flood flows. An example of the watercourse crossing design is shown in **Figure 1.18**.

Electrical Connection

1.68 Assuming the use of the currently available models, each wind turbine would generate electricity at low voltage and would have an ancillary transformer located either within or outside the base of the tower to step up the voltage to the required on-site distribution voltage. Each turbine would be connected to any adjacent turbines by underground cables.

1.69 The wind farm substation is proposed to be located on the central part of the site as shown in **Figure 1.3: Infrastructure Layout**. All power and control cabling on the wind farm will be buried underground in trenches located, where possible, along the route of site access tracks. These trenches will be partially backfilled with topsoil. The vegetation soil tuft will be stripped and laid beside the trench and used to reinstate the trench to the original ground level immediately after the cables have been installed.

1.70 The connection of wind farms to the electrical grid typically follows a separate consenting process and it is normally the responsibility of the network operator to progress the relevant consent, where required. The Best Practice Guidance to PPS 18 states that whilst the routing of such lines by Northern Ireland Electricity (NIE) is usually dealt with separately to the application for the wind farm, developers will generally be expected to provide details of indicative routes and method of connection.

1.71 RES considers connection to the grid system via a combination of overhead line and underground cables following the public road to either the existing Kells or Ballymena Substations as the most likely options available. Although not a part of the planning application for the Proposed Development, proposed grid connection route is illustrated and the environmental effects have been assessed and these are presented in **Technical Appendix 1.4**.

Control Building & Substation Compound

1.72 The Control Buildings & Substation Compound will comprise of a High Voltage Air Insulated Substation (AIS) compound with various electrical plant and up to two control buildings as per Vol 2 Fig 1.7. The electrical plant within the substation compound will include:

- NIE 110kV grid connection plant comprising of structures supporting circuit breakers, disconnectors, post insulators, current transformers, voltage transformers, surge arrestors and cable sealing ends. The equipment, to be installed in the NIE section of the compound, will be used by SONI and NIE for the electrical control and protection of the site and for measuring relevant electrical quantities associated with the wind farm site.
- Grid Transformer which will transform the medium distribution voltage (33kV) used within the wind farm to a higher transmission voltage (110kV) used for the grid connection circuit to export the electrical power from the site.
- Neutral Earthing Resistor which will control electricity current arising from earth faults to safe levels.
- Lightning Protection Columns required to protect the equipment in the substation compound from lightning strikes.
- Pre-Insertion Resistor, which may be installed to meet grid compliance requirements for power quality (studies during detailed design phase will identify if it is required)
- Harmonic Filter and Resistor, which may be installed to meet grid compliance requirements for power quality (studies during detailed design phase will identify if they are required).
- Capacitor Banks and associated Capacitor Circuit Breakers and Capacitor Switches, which may be installed to meet grid compliance requirements for power quality (studies during detailed design phase will identify if they are required).
- Reactor and associated Reactor CB which may be installed to meet grid compliance requirements for power quality (studies during detailed design phase will identify if it is required)

1.73 The total area taken up by the control building and associated infrastructure is expected to be 3,214m^2. This is to include the building, rear compound, all associated welfare, access and parking (**Figure 1.5**).

1.74 The wind farm control building (shown in **Figures 1.5 and 1.6)** will be designed and constructed to the standard required by NIE for the accommodation of NIE substation equipment and wind farm equipment. Where possible, local building

materials and finishes will be used to ensure that the appearance is in keeping with other buildings in the area.

1.75 The control building will accommodate metering equipment, switchgear, the central computer system and electrical control panels. A spare parts store room, and welfare facilities will also be located in the control building. The building will be attended by maintenance personnel on a regular basis.

1.76 Following an assessment of foul treatment options through a review of Pollution Prevention Guidelines 4, it was determined that both the toilet, wash hand basin and sink should drain to a small package treatment plant located adjacent to the control building, which would follow the Controlled Activities Regulations (CAR) guidelines and be constructed and located in accordance with the relevant Building Standards and agreed with the Council.

1.77 A permanent external environmental waste storage area will be provided with a minimum of 6 m clearance from the buildings. The area will consist of a concrete plinth surrounded with a security fence and double gate.

Description of Access

1.78 The site entrance for the Proposed Development is the existing site entrance for Gruig Wind Farm, which is located on the Altnahinch Road. The site entrance is shown in **Figure 1.10: Site Entrance.**

1.79 The proposed access route for the delivery of large turbine components, known as abnormal indivisible loads (AILs), is shown in **Figure 12.1: Turbine Delivery Route**.

1.80 **Technical Appendix 12.1** shows a swept path analysis of all points along the turbine delivery route that require either overrun or oversail beyond the road edge.

1.81 At the end of the construction period and in consultation with DFI Roads, any reinstatement required to any street furniture which may be removed on a temporary basis will be undertaken. In the unlikely event that a replacement blade is required during the operational phase of the wind farm, any works will be undertaken following consultation with DFI Roads.

1.82 The proposed routes for construction traffic are shown on **Figure 12.2: HGV Routes**.

1.83 A full assessment is included in **Chapter 12: Traffic and Transport**.

Typical Construction Activities

1.84 Prior to commencement of construction, detailed method statements will be prepared to address best practice working methods. This is known as the Construction Method Statement (CMS). As a minimum, the following best practice construction methods will be adhered to:

- Where possible and in order to minimise impacts of earthworks, excavations will be kept to a minimum with granular material being reused where appropriate
- Consideration will be given to weather conditions when stripping soil. For example, during periods of heavy rain (>25 mm in 24 hours), significant snow event (>75 mm lying) or an extended period of freezing conditions (ground penetration >100 mm), soil stripping works will be reviewed to take in account any adverse weather conditions and where deemed applicable, works will cease until site conditions prevail that are compatible with this activity
- Vegetated turves shall be stripped and stockpiled separately prior to excavation of topsoil/peat in all work areas
- Vegetated turves will be reused as quickly as possible
- Excavations will be monitored for changing soils types to prevent cross mixing of soils in stockpiles
- Topsoil shall be stripped and stored carefully for use in reinstatement works, which shall be carried out as soon as possible after sections of work are complete. Topsoil will be stripped prior to excavation of subsoil in all work areas
- Any remaining subsoil will be excavated down to a suitable bearing stratum and set-aside for later use in landscaping, backfilling around structures and verge reinstatement
- Reinstatement will be ongoing as the works are constructed to minimise the amount of time in which any material will be stockpiled
- Where required, all stockpiled material will be sited in areas with shallow peat depths, negligible peatslide risk and avoiding all 50 m watercourse buffer zones, ecological and cultural heritage constraints
- All stockpiles shall be shaped to promote run-off. Detailed SUDS drainage and silt control methods shall be designed for each stockpile
- Additionally, a “toolbox talk” will be provided by the site management team to highlight possible events causing slope instability and provide guidance on best practice when operating in areas of peat and/or increased slopes. In addition, a workforce engagement event shall be performed at least once for the project and shall be organised by the project team and be attended by RES and project contractor’s workforce. The event will set and communicate the required safety culture and working practices for the project.

Access Tracks

1.85 In areas of peat with a depth greater than 1.0 m consideration has been given to the use of floating tracks. The feasibility of a floating road construction is

dependent upon a number of factors, namely: the geomorphology of the peat; topography; length of road section; wind farm layout; number of vehicle movements for each option; restoration requirements; peat re-use considerations. All parameters noted above will be assessed at detailed design stage post consent and the best practice road construction type will be inferred from the various design constraints.

1.86 The access track itself will be constructed of inert material of suitable grade to withstand the expected traffic loading. Road construction techniques and roadside ditches will be designed to minimise the effect on natural hydrology as much as possible.

1.87 The depths of the ditches will be kept to the minimum required for free drainage of the road. Individual drain lengths will be minimised to avoid significant disruption of natural drainage patterns and avoid accumulation of large volumes of water within an individual drain.

1.88 Drains will not directly flow into watercourses, but into a buffer zone. Buffer zones are used to allow filtration of suspended solids in the water and reduction of runoff velocities. This reduces the flashiness of response, encourages deposition of sediments and allows pollutants to be filtered out.

Construction of Temporary Compound and Battery Energy Storage System

1.89 A temporary construction compound will be located on the site, as illustrated in **Figure 1.3: Infrastructure Layout.** Details of the temporary compound layout are included in **Figure 1.12: Temporary Construction Compound Layout Plan.** The compound will include the following:

- Temporary portable cabins for office accommodation, monitoring of incoming vehicles and welfare facilities
- Self-contained toilets with provision for waste storage and removal
- Containerised storage areas for tools, small plant and parts
- An area for site vehicle parking and storage of larger material items
- A standing and turning area for vehicles making deliveries to the site
- A bunded area for storing fuels, oils and greases.

1.90 The temporary construction compound measures 4,500m^2. On completion of the construction work these facilities will be removed and the area will be used for an energy storage compound.

1.91 The location of the temporary compound has been selected to avoid environmental constraints and for reasons of security, practicality and to obtain suitable ground conditions. The proposed compound area will be constructed by top soil excavation in a similar manner to the access tracks, laying stone over a geotextile membrane.

1.92 During construction, temporary fencing will be erected as required, around the construction compound. This is illustrated in **Figure 1.12 and Figure 1.13.**

BESS

1.93 The construction phase of the BESS will be aligned and incorporated into the general construction of the wind farm. The BESS area will be constructed at the later part of the overall construction programme as the containers and their compound will be located within an area which will be used as the temporary construction compound for the wind farm.

1.94 The lithium ion batteries will be manufactured off site and will be delivered to site as fully sealed modules. The batteries will be tested to all the required standards including the UL9540A standard (**see Technical Appendix 1.3**).

1.95 The lithium ion batteries will be enclosed in steel ISO shipping containers, designed and manufactured to a bespoke design for lithium-ion batteries. The enclosures will be mounted on concrete foundations with dc cables connecting the batteries to the power conversion systems (changes the electricity from dc to ac) then ac cables connecting the power conversion systems to the substation.

1.96 The BESS compound area would be constructed by laying stone over a geotextile membrane. During the construction phase temporary drainage measures will be installed to control sediment run-off in line with the SUDS measures outlined in **Technical Appendix 10** of the ES.

1.97 The BESS will comprise 22 permanent containers housing energy storage devices, associated inverters and ancillary equipment. Permanent fencing will enclose the containers. These are illustrated in **Figure 1.8: Energy Storage Compound Plan & Elevation** and **Figure 1.9: Energy Storage Container Elevation.**

Sustainable Drainage System

1.98 The drainage measures and Sustainable Drainage System (SuDS) designs have been directed by recommendations in **Chapter 10: Geology & Water Environment**

1.99 The runoff drainage system will be designed to mimic natural conditions to mitigate against increased flashiness in water courses and reduced groundwater recharge. The SuDS will protect the status of water courses and ground waters. A proposed SuDS Design Statement is included within the Water Framework Directive Assessment in **Technical Appendix 10.1.**

1.100 Construction will be carried out according to Department of Agriculture, Environment & Rural Affairs (DAERA) and Construction Industry Research and Information Association (CIRIA) guidance for site works. Pollution control measures during the construction phase will be included in the CMS & Construction Environmental Management Plan (CEMP), which will be agreed with the Planning Authority before starting construction work on site.

1.101 Mitigation measures to minimise the hydrological effect of constructing the access tracks have been proposed in **Chapter 10: Geology & Water Environment** of this ES.

Crane Hardstanding Construction

1.102 **Figure 1.15** shows the crane hardstanding layout configuration in plan. The hardstanding would be constructed using the same method as the excavated access tracks. This involves the topsoil and subsoil being replaced with suitable stone, ensuring an adequate bearing capacity has been achieved to carry the anticipated loads. The final position of the hardstanding would be decided at detailed design stage and prior to construction and shall be based on a number of considerations, including; size of crane required, depth of excavation required, hydrological/ecological features in the vicinity, local topography (it is preferable to position the crane hardstanding on the same level, or higher level to the turbine foundation level since this eases lifting operations).

Turbine Foundation Construction

1.103 The turbine towers are fixed to a concrete foundation. The foundation proposed in **Figure 1.14** comprises a gravity base design. Each foundation typically consists of a tapered octagonal block of concrete, and formation will be approximately 3.5 m below ground level. The volume of concrete used to make each foundation is approximately 500 m^3, which is reinforced by approximately 60 tonnes of steel bar. The sub formation depth of the foundation varies for each turbine location according to the depth to suitable sub formation level.

1.104 The foundation is typically poured in two parts, with a suitable construction joint between them. This will be detailed in the CMS. Following the pouring and curing of the concrete, the foundation is backfilled with material which is initially excavated and meeting the density requirements, leaving only the tower plinth, typically 4.5 m – 5.5 m diameter, sitting at or close to ground level. Surplus excavated material will be stored in appropriate areas identified in the Peat Management Plan (PMP), produced as part of CEMP/CMS prior to construction. The proposed plan will calculate generated excavated material and identify space for the excess volume of material. An Outline Peat Management Plan is provided in **Technical Appendix 10.4**.

1.105 The exact quantities of concrete, reinforcement, depth and dimensions will vary on the final choice of turbine model. In the detailed pre-construction design of each foundation, geotechnical tests are carried out to determine the strength of the subsoil layers beneath the turbines and the soil behaviour under loading over time. This information is used to confirm a final design and incorporates factors for safety.

1.106 An earthing mat or electrode consisting of up to three interconnected concentric rings of bare stranded copper conductor is laid around the foundation of each tower and transformer, approximately 0.5 m below the finished ground level. In addition,

earthing rods padded by bentonite (a water retaining clay mineral) are required at set locations around the foundation, and are positioned vertically below the earth mat. The number of rods and length is dependent upon the electrical resistivity of the soil which is confirmed during the site investigation, prior to construction.

1.107 Sulphate resistant cement, or higher cement content, within the concrete will be used if the site is identified to have waters with potentially low pH. This is so that they do not have a corrosive effect on turbine bases.

Wind Turbine Erection

1.108 Wind turbine towers, nacelles and turbine blades will be transported to the site as abnormal loads as described in Section 1.78. The tower sections and other turbine components will be stored at each turbine hardstanding until lifted into position.

1.109 The components would be lifted by adequately sized cranes and constructed in a modular fashion. Assembly, in general requires only fixing of bolts, torquing of nuts and electrical and hydraulic connections.

Cabling, Substation and Control Building

1.110 The location of the substation and control building is shown in **Figure 1.3: Infrastructure Layout**. Layout and elevation drawings for these buildings are presented in **Figures 1.5 -1.7**. All cabling between the turbines and the substation on the site will be connected using underground trenched cables. Where excavated, the top layer of soil will be removed and used to reinstate the excavation following the installation of the cables. Where cables are being laid in areas of peat, the various different layers will be separated and replaced appropriately. Cabling would generally run parallel to the adjacent site tracks. **Figure 1.16** presents a typical underground cable cross-section. In addition and in an effort to ensure that the cable trench does not act as a preferential drain, impermeable bunds will be installed perpendicular to the cable direction at suitable intervals (taking into account local ground conditions and topography).

Re-instatement

1.111 A programme of site reinstatement and enhancement would be put in place to minimise the visual and ecological impacts on the land, in accordance with the Outline Habitat Management Plan (Technical Appendix 6.2).

1.112 Reinstatement would be implemented upon completion of construction. This would relate to the construction compound, temporary areas of the crane hardstandings, cable trenches and track shoulders where appropriate. There remains a potential to use cranes during the operational phase of the Proposed Development, therefore the main crane hardstanding will remain uncovered.

1.113 It is essential that the access track width is retained during the operation of the Proposed Development to allow occasional access if required. Therefore no works to reduce the track width, post turbine erection, are proposed.

Construction Programme

1.114 It is anticipated that the construction would take approximately 18 months. The indicative construction programme shown in **Diagram 1.1** shows the anticipated scheduling of construction activities. Construction of tracks and foundations would be progressive, minimising the number of simultaneously active locations and ensuring that traffic density is kept low. Turbine erection would span approximately nine weeks toward the end of the work programme.

Diagram 1.1 – Indicative Construction Programme

TASK	CONSTRUCTION MONTH																	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Mobilisation & setup construction compound																		
Site entrance and tracks																		
Crane hardstandings																		
Turbine foundations																		
Control building & substation																		
Cable installation																		
Turbine deliveries																		
Battery, storage containers, PCSs and transformer delivery																		
Turbine erection & commissioning																		
Operational take over																		

Hours of Work

1.115 Construction work will take place between the hours of 0700-1900 Monday to Friday and 0700 – 1300 on Saturdays. Outside these hours, work at the Site shall be limited to turbine erection, testing/commissioning works and emergency works. Deliveries may occur outside these times to minimise disruption to local residents.

Construction Traffic and Plant

1.116 In addition to staff transport movements, construction traffic will consist of heavy goods vehicles (HGVs) and abnormal load deliveries.

1.117 As outlined in **Chapter 12: Traffic and Transport**, taking into account forecast vehicle numbers from construction activities (4,957 trips) and forecast staff vehicle numbers (13,300 private car, minibus or land rover trips), the total number of two-way vehicle movements generated during the construction period would therefore be 18,257 journeys. Approximately 166 abnormal load deliveries would be generated for the turbine erection stage which would typically result in three deliveries per day. The final number will be determined in the development of the Traffic Management Plan (TMP) which will be written in consultation with Department for Infrastructure (DfI), post-consent.

1.118 Turbine components will be supervised during their transportation using appropriate steerable hydraulic and modular trailer equipment where required. Axle loads would be appropriate to the roads and access tracks to be used. The transportation of turbine components would be conducted in agreement with the relevant roads authorities and local police. RES will notify the police of the movement of abnormal length (e.g. turbine blade delivery) and any abnormal weight (e.g. crane) vehicles and obtain authorisation from DfI prior to any abnormal vehicle movements.

1.119 Vehicle escorts will be used where necessary and the appropriate permits obtained for the transportation of abnormal loads, to ensure that other traffic is aware of the presence of large, slow moving vehicles. Where long vehicles have to use the wrong side of the carriageway, or have potential to block the movement of any vehicles travelling in the opposite direction, a lead warning vehicle will be used and escort vehicles will drive ahead to hold oncoming traffic. Vehicles will also be marked as long/abnormal loads. For return journeys, the extendible trailers used for wind turbine component delivery will be retracted to ensure they are no longer than that of a normal HGV.

Construction Method Statement

1.120 A Construction Method Statement (CMS) will be prepared once planning consent has been gained. This will describe the detailed methods of construction and working practices and work to reinstate the site following completion of construction activities.

Construction and Environmental Management Plan (CEMP)

1.121 The CEMP, which forms part of the wider CMS, details the environmental management controls that would be implemented by RES and its contractors during the construction of the Proposed Development to ensure that potential significant adverse effects on the environment are, wherever practicable, prevented, reduced and where possible offset. This will be submitted to the planning authority for agreement prior to any construction works taking place.

1.122 The purpose of the CEMP is to:

- Provide a mechanism for ensuring that measures to prevent, reduce and where possible offset potentially adverse environmental impacts identified in the ES are implemented;
- Ensure that good construction practices are adopted and maintained throughout the construction of the Proposed Development;
- Provide a framework for mitigating unexpected impacts during construction;
- Provide a mechanism for ensuring compliance with environmental legislation and statutory consents;
- Provide a framework against which to monitor and audit environmental performance.

1.123 The CEMP will, as a minimum, include details of the following:

- Pollution prevention measures
- Peat slide, erosion and compaction management
- Control of contamination/pollution prevention
- Drainage management
- Control of noise and vibration
- Control of dust and other emissions to air.

1.124 At Site Induction the principal contractor would ensure that all employees, sub-contractors, suppliers and other visitors to the site are made aware of the content of the CEMP and its applicability to them. Accordingly, environmental specific induction training would be prepared and presented to all categories of personnel working on and visiting the site.

1.125 As a minimum, the following information would be provided to all inductees:

- Identification of specific environmental risks associated with the work to be undertaken on site by the inductee
- Summary of the main environmental aspects of concern at the site as identified in the CMEP
- Environmental Incident and Emergency Response Procedures (including specific Environmental Communication Plan requirements).

1.126 A conveniently sized copy of an Environmental Risk Map or equivalent would be provided to all inductees showing all of the sensitive areas, exclusion zones and designated washout areas. The map would be updated and reissued as required. Any updates to the map would be communicated to all inductees through a tool box talk given by specialist environmental personnel. Regular tool box talks would be provided during construction to provide ongoing reinforcement and awareness of environmental issues.

1.127 An Outline CEMP has been included as **Technical Appendix 1.5**. The final CEMP will be agreed with the relevant statutory consultees prior to construction commencing.

Pollution Prevention, Water Quality Monitoring and Emergency Response Plan

1.128 The CEMP will detail a number of measures to deal with pollution prevention, including RES' policies and procedures such as 'Environmental Requirements of Contractors', 'Water Quality Monitoring Procedure' and 'Procedure in the Event of a Contaminant Spill'.

1.129 Contractors and sub-contractors would be required to follow all pertinent Pollution Prevention Guidance. The following pollution control measures will be incorporated into the CEMP:

- Equipment shall be provided to contain and clean up any spills in order to minimise the risk of pollutants entering watercourses, waterbodies or flush areas
- Trenching or excavation activities in open land shall be restricted during periods of intense rainfall and temporary landscaping shall be provided as required to reduce the risk of oil or chemical spills to the natural drainage system
- Sulphate-resistant concrete[4] shall be used for the construction of turbine bases to withstand sulphate attack and limit the resultant alkaline leaching into groundwater
- All refuelling will be undertaken at designated refuelling points. There will be no refuelling within catchments contributing to water supply points
- Equipment, materials and chemicals shall not be stored within or near a watercourse. At storage sites, fuels, lubricants and chemicals shall be contained within an area bunded to 110%. All filling points shall be within the bund or have secondary containment. Associated pipework shall be located above ground and protected from accidental damage
- Any on-site concrete wash-out shall occur in allocated bunded areas

[4] BS EN206:1 : 2000 Concrete Part 1: Specification, performance, production and conformity and BS 8500 – 1 : 2006 Concrete – Complementary British Standard to BS EN 206 – 1 Part 1

- Drip trays shall be placed under machinery left standing for prolonged periods
- All solid and liquid waste materials shall be properly disposed of at appropriate off site facilities
- Routine maintenance of vehicles shall be undertaken outwith the site
- There shall be no unapproved discharge of foul or contaminated drainage from the Proposed Development either to groundwater or any surface waters, whether direct or via soakaway
- Sanitary facilities shall be provided and methods of disposal of all waste shall be approved by regulatory bodies
- A programme of surface water quality monitoring would be undertaken during the construction phase to provide assurances as to the absence of water quality impacts
- RES has a policy that no wind turbines, auxiliary and electrical equipment would contain askarels or Polychlorinated biphenyls (PCBs).

1.130 In the unlikely event of an environmental pollution incident, there will be an emergency response procedure to address any accidental pollution incident. For example, a procedure requiring the use of spill kits to contain the material and procedures to ensure that NIEA is notified on their Pollution Hotline number (0800 807060) within 30 minutes of an incident (unless unsafe to do so), will be applied.

General Drainage Design

1.131 As set out in **Chapter 10: Geology & Water Environment**, buffers to watercourses have taken account of and infrastructure designed in accordance with best practice guidance.

1.132 The potential impact of preferential routing of drainage and associated erosion and sediment wash-off within the sub-catchments draining the site would be mitigated through the following measures which would be incorporated into the SuDS Design:

- Maintaining existing overland flow routes and channels. Existing natural flow paths lateral to access roads will be maintained through the use of piped crossings under road alignments at natural depressions and at regular intermediate intervals. The spacing of cross drains will be specified at detailed design stage;
- Avoiding transporting rainfall runoff in long linear drainage swales by providing regular channel “breakouts”, whereby water is encouraged to flow overland, thus maintaining existing natural hydrological patterns;
- Reducing surface water flow rates and volumes by attenuating runoff from tracks and hard standings “at source” by providing check-dams in swales, whereby the flow velocity and rate of discharge is artificially reduced to mimic natural properties;

- Providing settlement ponds at turbine hard standing areas and other main surface water discharge locations, where runoff from significant new impermeable areas is treated and attenuated before being released overland;
- All swales, crossings and other hydraulic features will be engineered to ensure that dimensions are suitable to convey predicted flows and so prevent build-up of surface water and / or flooding.

Runoff and Sediment Control Measures

1.133 The following measures would be used to mitigate any potential impacts on the water quality of the sub-catchments through peat erosion, stream acidification and metals leaching during construction. These are incorporated into the CDMS:

- Appropriate sediment control measures (silt fences, attenuation ponds, etc.) would be used in the vicinity of watercourses, springs or drains where natural features (e.g. hollows) do not provide adequate protection
- Sediment control measures (e.g. check dams, silt fences etc.) would be employed within the existing artificial drainage network during construction. These would be regularly checked and maintained during construction and for an appropriate period following completion
- Watercourses would be monitored throughout the construction period by the ECoW to identify any enhanced scouring of the catchment surface. If sediment from disturbed peat is excessively mobilised through the minor channels network these would be mitigated by temporary sediment control measures (e.g. geotextiles/straw/bales/brash)
- The extent of all excavations would be kept to a minimum and during construction activities surface water flows shall be captured through a series of cut-off drains to prevent water entering excavations or eroding exposed surfaces. If dewatering of excavations is required, pumped discharges would be passed through attenuation ponds and silt fences to capture sediments before release to the surrounding land
- Where there is a permanent relocation of peat, the ground would be reinstated with vegetation as soon as practicable
- Where practicable, vegetation over the width of the cable trenches would be lifted as turfs and replaced after trenching operations to reduce disturbance
- The movement of construction traffic would be controlled to minimise soil compaction and disturbance. Vehicle movements outside the defined tracks and hardstandings would be avoided
- Trenching or excavation activities in open land would be restricted during periods of intense rainfall and temporary landscaping would be provided, as

required, to reduce the risk of sediment transport to the natural drainage system

- Construction of the track and cable crossings will cease during periods of heavy rain (>25mm in 24 hours), significant snow event (>75mm lying) or extended period of freezing conditions (ground penetration>100mm). If necessary, upstream of the crossing would be dammed and water pumped around the construction zone. The construction period would be minimised as far as practicable.

Peat Slide, Erosion and Compaction Management

1.134 Management of the risk of peat slides and storage is now recognised in literature, and a range of measures have now become standard engineering practice for construction of roads over peat.

1.135 These measures would be adopted, as appropriate, on site, ensuring that:

- Concentrated loads, such as those arising from stockpiling of material from turbine foundation excavations, would not be placed on marginally or potentially marginally stable ground
- Concentrated water flows arising from any aspect of construction or operation of the Proposed Development would not be directed onto peat slopes and unstable excavations
- Construction would be supervised on a full time basis by engineers fully qualified and experienced in geotechnical matters
- Robust drainage plans would be developed
- Work practices would be reviewed, modified as necessary and adopted to ensure that existing stability is not compromised
- Appropriate ground investigation and movement monitoring practices would be adopted.

1.136 Preliminary peat investigations on site indicated that there is minimal peat coverage on the proposed development area. Where peat exceeds 1.5m locally, infrastructure has been designed to avoid these where practicable.

1.137 In consideration of the above and the minimal peat disturbance anticipated, particularly where infrastructure is planned on steeper topography, it is considered that the risk from peat slide and instability is low. Should a detailed ground investigation provide further evidence of deep peat, consideration will be given to the production of a Peat Stability Risk Assessment.

Traffic Management Plan

1.138 As detailed in **Chapter 12: Transport & Traffic**, a Traffic Management Plan (TMP) would be developed to ensure road safety for all users during transit of development loads. The TMP would outline measures for managing the convoy and would set out procedures for liaising with the emergency services to ensure that

police, fire and ambulance vehicles are not impeded by the loads. The TMP would be developed in consultation with DfI, the police and the local community and agreed before deliveries to the Proposed Development commence.

Potential Construction and Decommissioning Phase Environmental Impacts

Operation and Management

Life of the project

1.139 The expected operational life of the wind farm is 35 years from the date of commissioning. At the end of this period, a decision is made whether to refurbish, remove or replace turbines. If refurbishment or replacement were to be chosen, relevant planning applications will be made. Alternatively, if a decision is taken to decommission the Proposed Development, this would entail the removal of all of the turbine components, transformers, the substation and associated buildings. Specific sections of the access tracks may remain on-site to ensure the continued benefit of improved access for the landowners. The concrete foundations will normally remain in place to avoid the unnecessary intrusion to the ground. The exposed concrete plinth may be removed to a specified depth, but the entire foundation will be graded over with topsoil and replanted appropriately to restore the land to its original conditions.

Maintenance Programme

1.140 Wind turbines and wind farms are designed to operate largely unattended. Each turbine at the Proposed Development would be fitted with an automatic system designed to supervise and control a number of parameters to ensure proper performance (e.g. start-up, shut-down, rotor direction, blade angles etc.) and to monitor condition (e.g. generator temperature). The control system would automatically shut the turbine down should the need arise. Sometimes the turbines would re-start automatically (if the shut-down had been for high winds, or if the grid voltage had fluctuated out of range), but other shut-downs (e.g. generator over temperature) would require investigation and manual restart.

1.141 The Proposed Development itself would have a sophisticated overall Supervisory Control and Data Acquisition system (SCADA) that would continually interrogate each of the turbines and the high voltage (HV) connection. If a fault were to develop which required an operator to intervene then the SCADA system would make contact with duty staff via a mobile messaging system. The supervisory control system can be interrogated remotely. The SCADA system would have a feature to allow a remote operator to shut down one or all of the wind turbines. This is monitored 24 hours a day, 7 days a week.

1.142 An operator would be employed to operate and maintain the turbines, largely through remote routine interrogation of the SCADA system. The operator would

also look after the day-to-day logistical supervision of the Proposed Development and would be on-site intermittently.

1.143 Routine maintenance of the turbines would be undertaken approximately twice yearly to ensure the turbines are maintained to Industry Standard. This would not involve any large vehicles or machinery.

1.144 If a fault should occur, the operator would diagnose the cause. If the repair warranted the Proposed Development being disconnected from the grid then the operator would make contact with NIE. However, this is a highly unlikely occurrence as most fault repairs can be rectified without reference to the network utility. If the fault was in the electrical system then the faulty part or the entire Proposed Development would be automatically disconnected until the fault is rectified.

1.145 Signs would be placed on the Proposed Development giving details of emergency contacts. This information would also be made available to the local emergency services and NIE.

Decommissioning

1.146 One of the main advantages of wind power generation over other forms of energy production is the ease of decommissioning and the simple removal of components from the site. The residual impact on the site is limited to the continued presence of the foundations and access tracks. All above ground structures can be removed from the site.

1.147 If the Proposed Development obtains planning approval it is expected that a planning condition would be set to provide for the decommissioning and restoration of the site in accordance with a scheme agreed in writing with Department for Infrastructure (DfI), which would consider the long term restoration of the site at the end of the lifetime of the Proposed Development.

1.148 The Proposed Development will be decommissioned in accordance with best practice at that time and/or in compliance with any planning conditions. Current best practice includes the removal of all above ground structures (e.g. turbines, substation etc); the removal of certain underground structures where required (e.g. cables); and reinstatement of disturbed areas all of which will be subject to any necessary consents. Consideration will be given to the retention of wind farm access tracks if they utilise pre-existing farm infrastructure or are not located on sensitive habitats if such continued use could lead to the long term degradation of these habitats.

Decommissioning Battery Energy Storage System

1.149 At the end of life, the battery enclosures, power conversion systems, substation, foundations and cables will be removed from site and appropriately disposed of and recycled where possible.

1.150 The battery modules will be removed from the site fully intact (they are sealed units) and sent for recycling. As part of the battery supply agreement the manufacturer shall have an obligation to take the battery enclosures back to their factory for onward recycling at an approved facility. The battery enclosures, PCS's and cables will be recycled more locally at an authorised metal recycling centre.

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