



APPENDIX 6

CONSTRUCTION AND ENVIRONMENTAL MANAGEMENT PLAN

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1.

INTRODUCTION

This Construction and Environmental Management Plan (CEMP) has been developed by MKO on behalf of Carrow Renewable Energy Ltd. who intend to apply to An Coimisiún Pleanála for planning permission to construct a renewable energy development which will comprise of 14 no. wind turbines and associated infrastructure in the townlands of Carrow and adjacent townlands, in Co. Tipperary, including an 110 kV on-site substation, underground 110kV cabling to connect to the national grid at Killonan 110kV substation, in the townland of Milltown, Co. Limerick, and all associated works.

The CEMP has been prepared in conjunction with the Environmental Impact Assessment Report (EIAR) and the Natura Impact Statement ('NIS') which will accompany the planning application for the Proposed Project to be submitted to the competent authority. Should the Proposed Project secure planning permission, the CEMP will be updated, in line with all conditions and obligations which apply to any grant of permission. The CEMP should be read in conjunction with the EIAR, NIS and planning drawings. The CEMP will also require updating by the selected contractor in order to identify, assess and satisfy the contract performance criteria as set out by the various stakeholders. The CEMP due to its structure and nature will also require constant updating and revision throughout the construction period as set out below. Therefore, this is a working document and will be developed further prior to and during the construction phase of the Proposed Project.

Triggers for amendments to the CEMP will include:

- Response to any specific requirements arising from conditions attached to a grant of planning permission.
- When there is a perceived need to improve performance in an area of environmental impact;
- As a result of changes in environmental legislation applicable and relevant to the Proposed Project;
- Where the outcomes from auditing establish a need for change;
- Where Work Method Statements identify changes to a construction methodology to address high environmental risk; and
- As a result of an incident or complaint occurring that necessitates an amendment.

This CEMP identifies the key planning and environmental considerations that must be adhered to and delivered during site construction and operation. The Contractor, as appointed by the Project Developer, will be required to implement all of the requirements set out in this CEMP. The CEMP may be updated and revised throughout the construction phase of the Proposed Project, but all future iterations must meet or exceed the standards and requirements set out in this document and the Project Developer must be satisfied that all requirements set out in this document can and will be implemented in full by the appointed contractor.

The CEMP to be prepared by the appointed contractor will be a single, amalgamated document that can be used during the construction phase of the Proposed Project, as a single consolidated point of reference relating to all construction, environmental and drainage requirements for the Planning Authority, developer and contractors alike. The CEMP may evolve over further iterations as the construction works progress, but at all times must meet or exceed the standards and requirements set out in this document. It will be the contractor's current version of the CEMP, which at any point in time, will guide the construction activities on site and the implementation of which will be audited by an Environmental Clerk of Works (ECoW).

1.1

Scope of the Construction and Environmental Management Plan

This CEMP is presented as a guidance document for the construction of the proposed Carrow Wind Farm, which will comprise 14 no. wind turbines, and associated infrastructure in the townland of Carrow, and adjacent townlands, in Co. Tipperary, including a 110kV on-site substation, underground 110kV electrical cabling to connect to the national grid at Killonan 110kV substation, in the townland of Milltown, Co. Limerick, and all associated works.

For the purposes of this CEMP, the various project components are described and assessed using the following references: 'Proposed Project', 'the Site', 'Proposed Wind Farm' and 'Proposed Grid Connection'.

- Where the 'Proposed Project' is referred to this encompasses the entirety of the project for the purposes of this EIA in accordance with the EIA Directive. The Proposed Project is described in detail in Chapter 4 of this EIAR.
- Where the 'Proposed Wind Farm' is referred to, this refers to turbines and associated foundations and hardstanding areas, including access roads, underground cabling, permanent meteorological mast, temporary construction compounds, junction accommodation works, spoil management areas, borrow pits, tree felling, site drainage, operational stage signage, battery energy storage system, and all ancillary works and apparatus. The Proposed Wind Farm is described in detail in Chapter 4 of this EIAR.
- Where the 'Proposed Grid Connection Route' is referred to, this refers to 110kV onsite substation, Battery Energy Storage System and underground 110kV cabling connecting to the existing Killonan 110kV substation Co. Limerick, and all ancillary works and apparatus. The Grid Connection Route is described in detail in Chapter 4 of this EIAR.
- Where 'the Site' is referred to, this relates to the primary study area for the EIAR, as delineated by the EIAR Site Boundary in green as shown on Figure 1-1 and encompasses an area of approximately 1,564 hectares.

A detailed description of the Proposed Project is provided in Chapter 4 of the EIAR.

The CEMP is divided into ten sections, as outlined below.

- **Section 1** provides a brief introduction as to the scope of the report.
- **Section 2** outlines the Site and Proposed Project details, detailing the targets and objectives of this plan along with providing an overview of construction methodologies that will be adopted throughout the Proposed Project.
- **Section 3** sets out details of the environmental controls to be implemented on site. Site drainage principles, traffic management, dust control, invasive species management and a waste management plan are also included in this section.
- **Section 4** sets out a fully detailed implementation plan for the environmental management of the Proposed Project outlining the roles and responsibilities of the project team.
- **Section 5** outlines the general Health and Safety measures that will be implemented on site during the construction phase of the Proposed Project.
- **Section 6** outlines the Emergency Response Procedure to be adopted in the event of an emergency in terms of site health and safety and environmental protection.
- **Section 7** consists of a summary table of all mitigation proposals to be adhered to during the Proposed Project, categorised into three separate headings, 1) pre-commencement measures; 2) construction-phase measures and 3) operational-phase measures.

- **Section 8** consists of a summary table of all monitoring requirements and proposals to be adhered to during the Proposed Project, categorised into three separate headings, 1) pre-commencement measures; 2) construction-phase measures and 3) operational-phase measures.
- **Section 9** sets out a programme for the timing of the works.
- **Section 10** outlines the proposals for reviewing compliance with the provisions of this report.

1.2 Targets and Objectives

The following key targets and objectives will inform the final detailed design should the Proposed Project secure planning permission and proceed to the construction phase. This includes consideration of the buildability of the designs that emerge:

- Ensure construction works and activities are completed in accordance with mitigation and best practice approach presented in the EIAR, NIS and associated planning documentation;
- Ensure construction works and activities have minimal impact/disturbance to local landowners and the local community;
- Ensure construction works and activities have minimal impact on the natural environment;
- Adopt a sustainable approach to construction and, ensure sustainable sources for materials supply where possible; and,
- Provide adequate environmental training and awareness for all project personnel.

The key site objectives are as follows:

- Using recycled materials if possible, e.g. excavated stone and overburden;
- Ensure sustainable sources for materials supply where possible;
- Avoidance of any pollution incident or near miss as a result of working around or close to existing watercourses and having emergency measures in place;
- Avoidance of vandalism;
- Keeping all watercourses free from obstruction and debris;
- Correct implementation of the sustainable drainage system (SuDS) drainage design principles;
- Keep impact of construction to a minimum on the local environment, watercourses, and wildlife;
- Correct fuel storage and refuelling procedures to be followed;
- Good waste management and house-keeping to be implemented;
- Air and noise pollution prevention to be implemented;
- Monitoring of the works and any adverse effects that it may have on the environment. Construction Methods and designs will be altered where it is found there is an adverse effect on the environment;
- Comply with all relevant water quality legislation listed throughout this document; and,
- Ensure a properly designed, constructed and maintained drainage system appropriate to the requirements of the site is kept in place at all times.

2. SITE AND PROPOSED PROJECT DETAILS

2.1 Site Location

The Proposed Wind Farm is located approximately 2 km south of the village of Hollyford and 4.3km north of the village of Dundrum, both in Co. Tipperary. It is proposed to access the Proposed Wind Farm site during both the construction and operational phase via a new site entrance off the L-1154 Local Road along the southwestern boundary of the Proposed Wind Farm in the townland of Moheragh, Co. Tipperary. The proposed entrance will include temporary accommodation works in order to facilitate the delivery of turbine components and other abnormal loads. The Proposed Wind Farm is served by a number of existing public, forestry and agricultural roads and tracks. A site location context map and the EIAR Site Boundary is shown as Figure 2-1. The Proposed Wind Farm site is shown overlain on aerial imagery in Figure 2-2. For clarity, the red line planning application boundary is shown on Figure 2-3.

The Proposed Grid Connection Route includes for underground 110kV grid connection cabling from the proposed onsite 110kV substation, in the townland of Moheragh, Co. Tipperary to the existing Killonan 110kV substation in the townland of Milltown, Co. Limerick. The Proposed Grid Connection Route to Milltown, Co. Limerick measuring approximately 37.6km in length, is primarily located within the public road corridor. Approximately 6.9km is proposed within National Roads, 15.45km proposed within Regional Roads, 14.4km proposed within Local Roads, 788 meters proposed within the Proposed Wind Farm internal road network, approximately 150 meters proposed within agricultural land in Brittas, Co. Limerick and approximately 1km within agricultural land in Kishyquirk, Co. Limerick.

Accommodation works will be required at various locations on the national and regional road network between the port of entry and the Proposed Wind Farm site. These will be limited to temporary measures including temporary local road widening, temporary access road through agricultural land, overruns of roundabout islands and temporary relocation of some signs and street furniture. The proposed accommodation works area locations are shown in Figure 2-3.

Current land-use on the Proposed Wind Farm comprises commercial forestry, agricultural pastoral land, mixed forest and transitional woodland-shrub. Current land-use along the Proposed Grid Connection Route comprises of public road corridor, public open space, agriculture, commercial forestry, land principally used by agriculture with significant areas of natural vegetation, mineral extraction sites, mixed forest and discontinuous urban fabric. Land-use in the wider landscape of the site comprises a mix of agriculture, quarrying, renewable energy, low density residential and commercial forestry. Land-use in the areas proposed for turbine delivery route accommodation comprises a mix of agriculture, transitional woodland-shrub, and coniferous forest.

A full and detailed description of the Proposed Project (i.e. the Proposed Wind Farm and the Proposed Grid Connection) for the purposes of the planning application and the additional elements that form part of the overall project, assessed in the EIAR, is contained in Chapter 4 of the EIAR. The townlands in which the Proposed Project is located are listed in Table 2-1.

Table 2-1 Townlands within which the Proposed Project is located.

Development Works	Townlands in Co. Tipperary	Townlands in Co. Limerick
Proposed Wind Farm		
Wind Turbines, Access Roads, Temporary Construction Compounds, Permanent Meteorological Mast,	Carrow, Moheragh, Carrowkeale, Glenpaudeen, Camus, Ballynahinch, Kilshenane, Ballygarrane,	N/A

Development Works	Townlands in Co. Tipperary	Townlands in Co. Limerick
Underground Cabling, Battery Energy Storage System, Spoil Management, Tree Felling, Site Drainage, Operational Stage Site Signage and accommodation works to facilitate the delivery of large turbine components and other abnormally sized loads.	Dundrum, Gortarush Lower, Scarrough and Ballybrack.	
Proposed Grid Connection		
Onsite 110kV Substation and Battery Energy Storage System	Moheragh	N/A
Underground 110kV Cabling Route connecting to the existing Killonan 110kV substation	Moheragh, Ballybrack, Ballysheeda, Shanaknock, Rahyvira, Newtown North, Glassdrum, Greenfield, Cappagh, Philipston, Knockane, Kilbeg, Moher East, Shanacloon, Toem, Moher West, Cahernahallia, Gortaderry	Toomaline Lower, Toomaline Upper, Doon South, Lisgaugh, Cooga Upper, Kilmoyla Lower, Cooga Lower, Darkisland, Ballycoshown, Gortavalla North, Knocknacarriga, Gortnascarry, Cappamore, Portnard, Turagh, Dromsallagh, Dromcluher, Eyon, Brittas, Gorteennaskagh, Killinure, Bohergar, Sandylane, Boher, Cloghnadromin, Lismullane, Kishyquirk, Clooncunna South, Clooncunna North, Ahabeg, Cunnihee, Whitehall, Coolyhenan, Milltown, Killonan

*Townland located within EIAR boundary, but not within planning application boundary.

2.2 Description of the Proposed Project

This section of the CEMP describes the Proposed Project and all its component parts. The planning application for the Proposed Project will be made to Tipperary County Council, and the development description which appears in the public notices as follows:

The development will consist of the provision of the following:

Planning Notice Proposed Project Description

- The construction of 14 no. wind turbines with an overall turbine tip height of 185 metres; a rotor blade diameter of 163 metres; and hub height of 103.5 metres, and associated foundations and hard standing areas;
- A permanent 110kV substation compound (2 no. control buildings with welfare facilities, all associated electrical plant and equipment, security fencing, entrance on to existing track, all associated underground cabling, wastewater holding tank, site drainage and all ancillary works;
- Underground internal wind farm electrical cabling and communications cabling connecting the wind turbines to the proposed on-site 110kV electrical substation and associated ancillary works;

- iv. *A meteorological mast of 103.5m in height, and associated foundation and hard-standing area;*
- v. *All works associated with the upgrade of the existing agricultural access off the L1154 local road (including the installation of fencing and steel gates) to serve as the main site entrance for the wind farm;*
- vi. *The provision of 4 no. new access points along the L1154;*
- vii. *The provision of 4 no. new access points along the L-5117;*
- viii. *The provision of 5 no. new access/egress point L-5206;*
- ix. *The provision of 2 no. new access points along the L-52061;*
- x. *Upgrade of existing tracks/ roads and junctions and provision of new site access roads and junctions;*
- xi. *3 no. temporary construction compounds with temporary offices and staff welfare facilities;*
- xii. *Accommodation works along the public road network in the townlands of Camus, Ballynahinch, Kilshenane, Dundrum, Gortarush Lower, Carrow, Scarrough, and Moheragh, Co. Tipperary to facilitate the delivery of turbine components and other abnormal loads;*
- xiii. *2 no. Borrow Pits;*
- xiv. *Spoil Management;*
- xv. *Site Drainage;*
- xvi. *Tree Felling and hedgerow removal;*
- xvii. *Biodiversity Management and Enhancement Measures;*
- xviii. *Operational stage site signage;*
- xix. *Battery Energy Storage System and all associated electrical plant and equipment, security fencing, 2 no. static water storage tanks and a firewater retention tank, and all associated infrastructure and apparatus;*
- xx. *The provision of underground electrical (110kV) and communications cabling from the proposed on-site 110kV electrical substation to the existing Killonan 110kV electrical substation to facilitate the connection to the national grid (RPS S018);*
- xxi. *Provision of 58 no. joint bays, communication chambers and earth sheath links along the proposed underground electrical cabling route;*
- xxii. *Reinstatement of land, road and track surface above the proposed cabling trench; and*
- xxiii. *All related site works and ancillary development considered necessary to facilitate the proposed development, including landscaping and the reinstatement of land.*

The applicant is seeking a ten-year planning permission for development and 35-year operational life from the date of commissioning of the wind farm development.

Current and future wind turbine generator technology will ensure that the wind turbine model, chosen for the Proposed Wind Farm, will have an operational lifespan greater than the 35-year operational life that is being sought as part of the planning application.

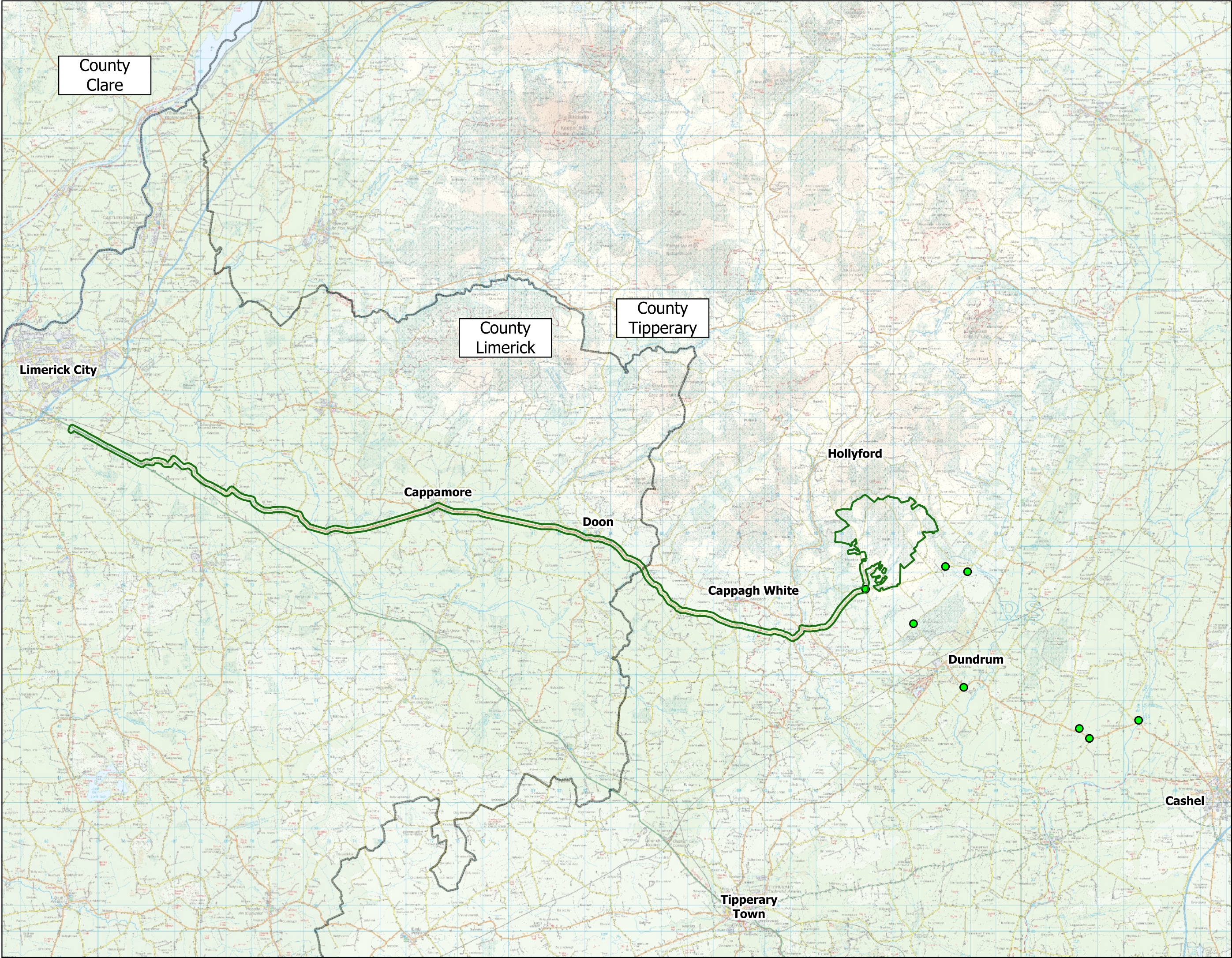
Modern onshore wind turbine generators currently have a typical generating capacity in the 4 to 7 MW range, with the generating capacity continuing to evolve upwards as technology improvements are achieved by the turbine manufacturers. For the purposes of this EIAR it is assumed that the wind turbine model installed as part of the Proposed Wind Farm will have an output of 6.2MW. Therefore, on this basis, the proposed 14 no. wind turbines would have a combined generating capacity of 86.8MW. The actual turbine procured as part of a competitive tender process may have a power output that is marginally lower or greater than the 6.2MW turbine described in the EIAR. Irrespective of the power output of the actual turbine procured, the conclusions of the EIAR will not be materially affected.

As detailed in Section 3.2.3 in Chapter 3: Consideration of Reasonable Alternatives, the layout of the Proposed Project has been led by consideration of constraints and facilitators, thereby avoiding the environmentally sensitive parts of the Proposed Wind Farm site. The roads layout for the Proposed Project makes the use of the existing onsite access roads and tracks where possible, with approximately 2.6km of existing roadway/ tracks requiring upgrading, 1.6km of existing public roads to be maintained and approximately 12.9km of new access road to be constructed. The Proposed Grid Connection underground cabling route is located predominately within the public road corridor.

There are no inhabitable, residential dwellings located closer than four times the maximum turbine tip height (i.e. within 740 metres) from any proposed turbine locations.

As part of the Proposed Project, tree felling will be required within and around the development footprint to allow for the construction of the turbine bases, access roads underground cabling, and the other ancillary infrastructure. Further details on tree felling required within and around development footprint on the Proposed Project site is detailed in Chapter 6 of this EIAR. A majority (66%) of the Proposed Wind Farm site comprises commercial forestry. A total of 51.64 hectares of commercial forestry will be permanently felled as part of the Proposed Project along with existing treeline boundaries as detailed in Chapter 6, Section 6.5.2.2.1. Figure 4-13 of Chapter 4 shows the extent of the commercial forestry to be permanently felled as part of the Proposed Project. The commercial forestry felling activities required as part of the Proposed Project will be the subject of a Limited Felling Licence (LFL) application to the Forest Service in accordance with the Forestry Act 2014 and the Forestry Regulations 2017 (SI 191/2017) and as per the Forest Service's policy on granting felling licenses for wind farm developments. The policy requires that a copy of the planning permission for the Proposed Project be submitted with the felling licence application; therefore, the felling licence cannot be applied for until such time as planning permission is obtained for the Proposed Project.

Detailed site layout drawings of the Proposed Project are included in Appendix 4-1 to the EIAR.



County
Clare

County
Limerick

County
Tipperary

Limerick City

Cappamore

Doon

Cappagh White

Hollyford

Dundrum

Cashel

Tipperary
Town

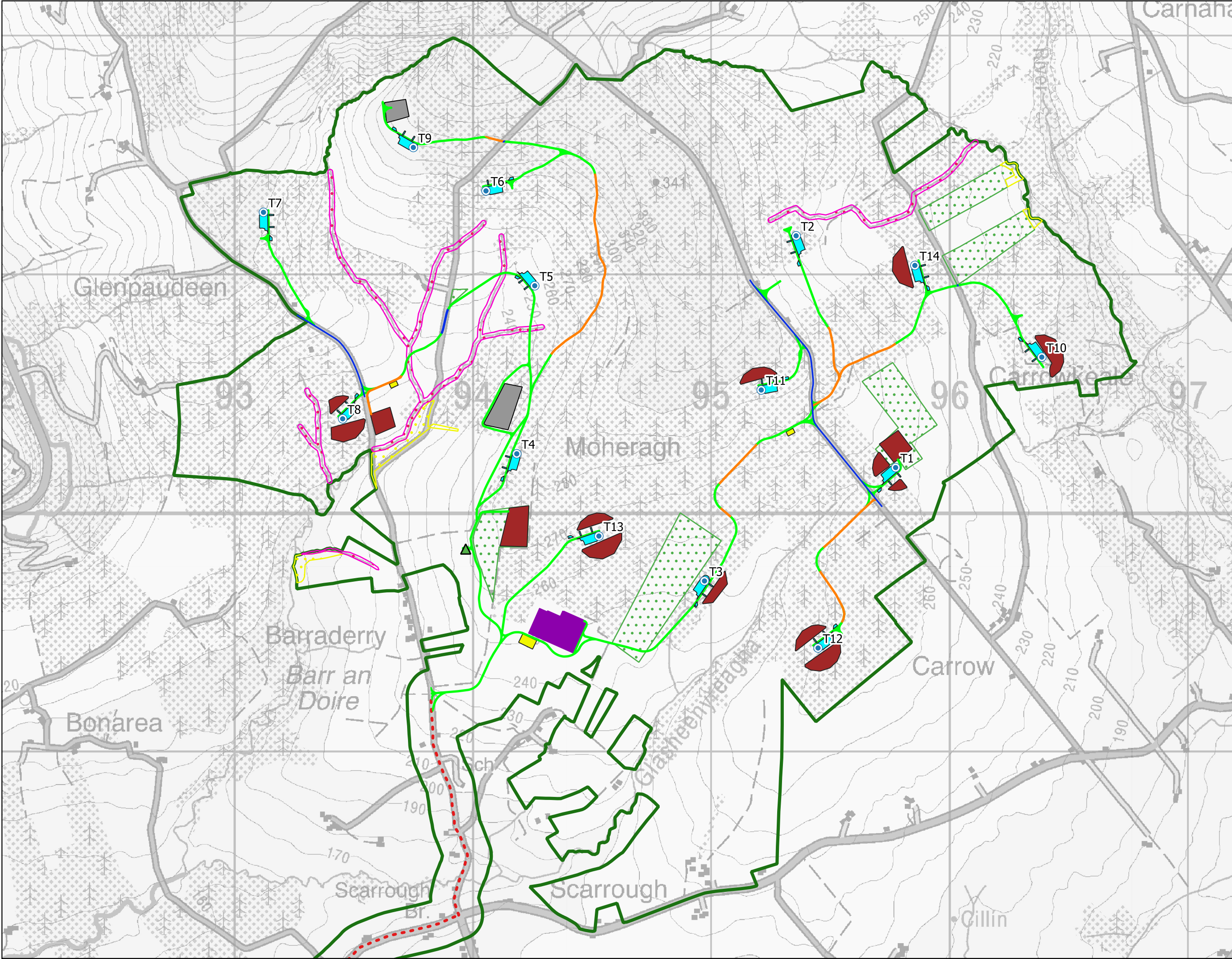
Map Legend

- EIAR Site Boundary
- Location of Temporary Accommodation Works
- County Boundary



Site Location	
Project Title	
Carrow Wind Farm	
Drawn By	Checked By
ER	EM
Project No.	Drawing No.
231102	Figure 2-1
Scale	Date
1:130,000	2026-03-24

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Map Legend

- Proposed Turbine Locations
- Proposed Met Mast
- Proposed Hardstands
- Existing Roads to be Maintained
- Existing Roads to be Upgraded
- Proposed New Roads
- Proposed Borrow Pits
- Proposed Spoil Repository Areas
- Temporary Construction Compound
- Proposed Riparian Buffer
- Proposed Wet Grassland Management
- Proposed Woodland Management
- Proposed 110kV Substation
- Proposed 110kV Underground Grid Connection Route
- EIAR Site Boundary
- County Boundary

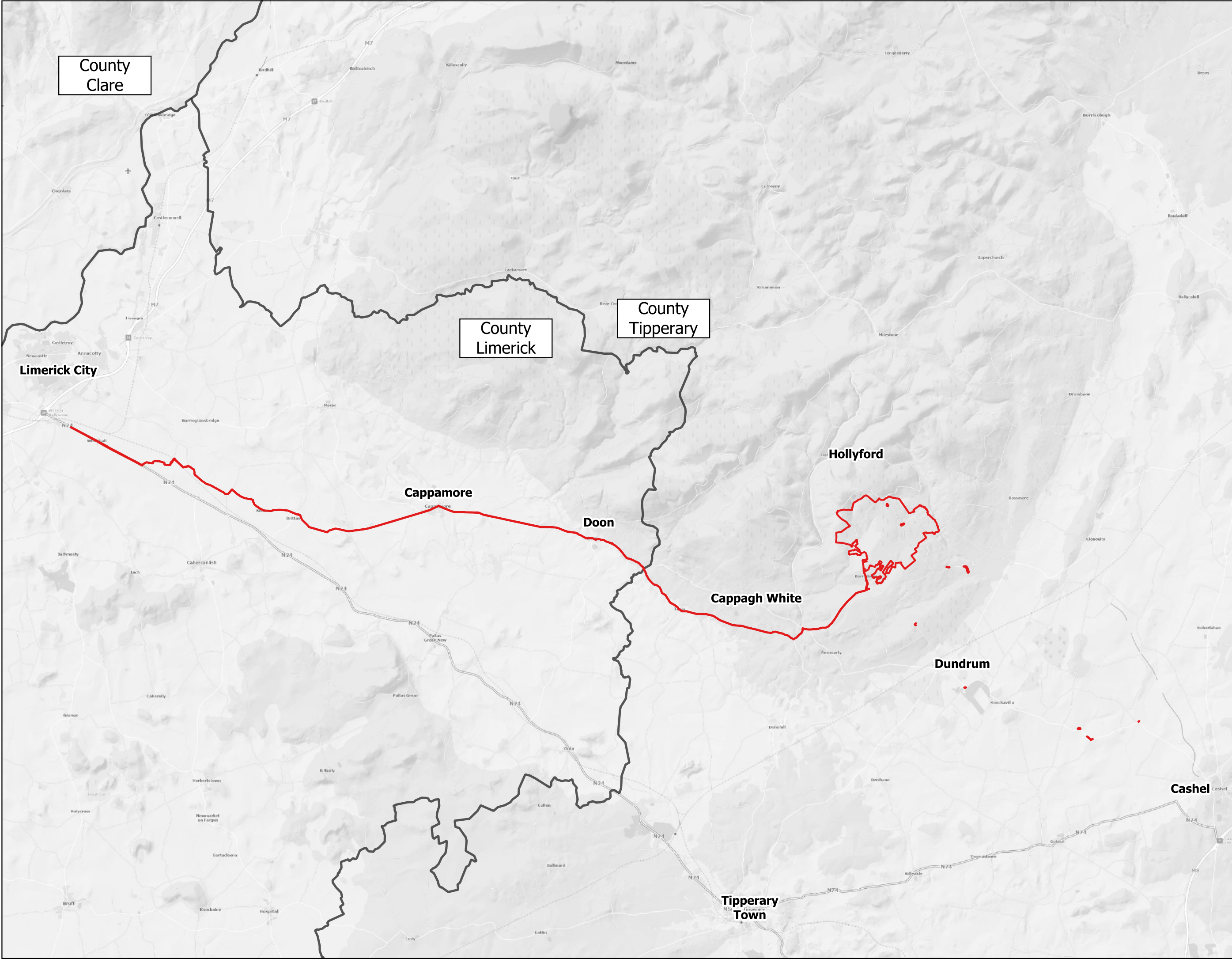
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Drawing Title
Proposed Wind Farm Layout

Project Title
Carrow Wind Farm

Drawn By ER	Checked By EM
Project No. 231102	Drawing No. Figure 2-2
Scale 1:14,000	Date 2026-03-09

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County
Clare

County
Limerick

County
Tipperary

Limerick City

Cappamore

Doon

Cappagh White

Hollyford

Dundrum

Cashel

Tipperary
Town

Map Legend

-  Planning Application Boundary
-  County Boundary



Drawing Title
Planning Application Boundary

Project Title
Carrow Wind Farm

Drawn By	Checked By
ER	EM

Project No.	Drawing No.
231102	Figure 2-3

Scale	Date
1:130,000	2026-03-24



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2.3 Construction Methodologies Overview

2.3.1 Introduction

An experienced main contractor will be appointed for the civil works for the construction phase of the Proposed Project. The appointed contractor for the works will be required to comply with this CEMP and any revisions made to this document in the preparation of method statements for the various elements of the construction phase of the Proposed Project. An overview of the proposed Construction Methodologies is provided below.

2.3.2 Overview of Proposed Construction Methodology

The EIAR includes construction methodologies for various elements of work to be undertaken as part of the Proposed Project. These construction methodologies are reproduced in the following sub-sections but will be superseded by an appointed contractor's construction method statements, which will form part of the CEMP. The contractor's construction method statements will be prepared to take account of the detailed engineering, geotechnical and detailed drainage design which will be prepared prior to commencement of construction and all requirements of this CEMP.

Proposed Wind Farm:

- > Site Drainage System;
- > Site Entrance Management;
- > Access Roads (New and Upgrade to existing tracks);
- > Proposed Wind Farm Underground Electrical (33kV) and Communication Cabling;
- > Watercourse/Culvert Crossings;
- > Borrow Pits;
- > Spoil Management Areas;
- > Temporary Construction Compounds;
- > Tree Felling and Replanting;
- > Biodiversity Management and Enhancement Measures
- > Meteorological Mast Foundations;
- > Turbine Hardstanding Areas;
- > Turbine Foundations
- > Decommissioning

Proposed Grid Connection

- > Onsite 110 kV Electricity Substation and Control Buildings;
- > Battery Energy Storage System (BESS)
- > Temporary Construction Compound;
- > Underground Electrical (110kV) and Communication Cabling;
- > Existing Underground Services;
- > Joint Bays;
- > Watercourse/Service Crossings on the Proposed Grid Connection Underground Cabling Route;

2.3.3 Proposed Wind Farm

2.3.3.1 Site Drainage System

The early establishment of the drainage system will manage the risk of impacts on watercourses on and adjacent to the Site during construction. In addition, construction operations will adopt best working practices and the development of the Site will be phased accordingly.

The EIAR (and appended drawings) includes a drainage design required for the purposes of assessing the potential effects of the Proposed Project. The drainage design will be developed further with a level of construction detail necessary to implement the measures onsite. The detailed (construction phase) drainage design will form part of the updated Main Contractor's CEMP, and the effective implementation of the detailed drainage design will be audited by the ECoW. Surface water management and drainage design principles are outlined in Section 3.2 below and Section 4.6 of the EIAR.

2.3.3.2 Site Entrance Management

Main Construction and Operational Site Entrance

During the construction phase, the Proposed Wind Farm site will be accessed via a proposed new site road originating from an existing agricultural access off the L-1154 local road. The L-1154 runs along the southwestern boundary of the Proposed Wind Farm site in the townland of Moheragh, Co. Tipperary. This entrance will be used as the site entrance for HGVs and other abnormal loads during the construction phase of the Proposed Wind Farm. Once the Proposed Wind Farm site is operational, a smaller entrance to the north of the HGV entrance will be used for the operation and maintenance of the Proposed Wind Farm during the operational phase in the unlikely event of the delivery of a replacement turbine component or other abnormal load required for the operational maintenance of the wind farm the southern HGV entrance will be reopened.

It is proposed to access the proposed onsite 110kV substation, during both the construction and operational phases of the Proposed Wind Farm, via this proposed site entrance off the L-1154 local road in the townland of Moheragh, Co Tipperary.

For the purposes of delivering large turbine components and other abnormal loads to the Proposed Wind Farm site, a temporary turbine component site entrance is proposed approximately 90m south of the main site entrance. During the construction phase, this entrance will closed off outside of the turbine component delivery period. The existing boundary along the L-1154 will be reinstated upon commissioning of the Proposed Wind Farm.

The locations of Proposed Wind Farm main site entrance and temporary site entrance is shown in Figure 4-30 of Chapter 4 and Appendix 4-1 of this EIAR.

2.3.3.3 Access Roads

The Proposed Wind Farm site is currently served by a number of existing tracks and access roads. As part of the Proposed Wind Farm site, it is proposed to utilise 5 no. existing access/egress locations and construct 11 no. new access/egress locations. These access and egress entrances will be used throughout the construction, operation, and decommissioning phases of the Proposed Wind Farm site to enable delivery of materials and turbine components (construction phase), maintenance and monitoring use (operational phase), and removal of Proposed Wind Farm infrastructure (decommissioning phase).

All proposed site entrances were subject to a swept path analysis assessment to identify the turning areas required, as described in Section 15.1 of the Traffic and Transport Assessment. Appropriate

sightlines will be established for the safe access and egress of traffic during the operational phase, please see Section 15.1.2 of Chapter 15 for further information

Please see Table 4-3 of Chapter 4 for details on the locations of these entrances and their proposed use.

Upgrade of Existing Access Roads or Tracks

Approximately 2.6km of the existing roads will require upgrading which will comprise widening of the roadway to a total running width of approximately six metres, with wider sections at corners and the laying of a new surface dressing on the existing section of roadway where necessary. The road widening will be undertaken as follows. Cross section details of widening of existing roads is shown in Figure 4-6 of the EIAR.

The general construction methodology for upgrading of existing roads or tracks is summarised below.

- *If it is considered that the current road formation level is adequate to support required bearing, then no upgrade or widening works will be completed.*
- *Otherwise, where required, the subsoil in the existing road verge will be excavated down to a suitable formation layer.*
- *All spoil excavated will be managed on-site. It will be placed within the identified spoil management areas within the Site (which will be located outside identified watercourse 50m buffers). Some topsoil may be temporarily stockpiled locally for reuse for landscaping purposes.*
- *All drainage measures prescribed in the detailed drainage design for the Proposed Project will be implemented around the works area.*
- *Well-graded granular fill (imported or site-won) will be spread and compacted in layers up to 200mm to provide a homogeneous running surface. The thickness of layers and amount of compaction required will be decided by the Construction Manager based on the characteristics of the material and the compaction plant to be used.*
- *These layers of granular fill will be brought to the same level as the top of the existing road surface.*
- *Where required, a layer of geogrid will be installed directly onto the top of the granular fill layer and the existing road surface.*
- *A layer of finer well graded stone for the running surface will be laid on the geogrid and compacted.*
- *Upon completion the upgraded roads will be a single-track design with a width of 6m with localised widening at bends and changes in direction (depending on the location within the Site).*

Prior to any works commencing on the upgrade of existing roads, the requirement for additional roadside drainage will be considered by the Project Hydrologist in line with the proposals outlined in Section 2.3 of the CEMP.

Construction of New Roads

The construction methodology for the proposed new access roads and turbine hardstands is outlined as follows:

- *Establish alignment of the new road from the construction drawings and mark out the centrelines with ranging rods or timber posts;*
- *All drainage measures prescribed in the detailed drainage design for the Proposed Project will be implemented around the works area;*
- *The road layout has been designed to avoid crossings of natural watercourses where possible;*

- *Where existing culverts are to be upgraded or extended, the works will be carried out to follow a method statement to be prepared in consultation with Inland Fisheries Ireland;*
- *The access tracks will be of single-track design with a width of 5m with localised widening at bends and changes in direction. (depending on the location within the Site)*
- *All spoil excavated will be managed on-site. It will be placed within the identified spoil management areas within the Site. Some topsoil may be temporarily stockpiled locally for reuse for landscaping purposes.*
- *The subsoil will be excavated down to a suitable formation layer of competent stratum;*
- *The road will be constructed using well-graded granular fill (imported or site-won), spread and compacted in layers typically of 200mm and a suitable capping layer to provide a homogeneous running surface. The thickness of layers and amount of compaction required will be subject to detailed design by Project Engineer in consultation with the Construction Manager based on the characteristics of the material and the compaction plant to be used;*
- *The new access roads will be constructed with a camber to aid drainage of surface water;*
- *Excavations side slopes shall not generally be greater than 1(V): 2 (H). Design slopes will be informed by the Geotechnical Engineer;*
- *At bends or steep inclines from the road, reflective snow poles will be erected to warn traffic on dark mornings and evenings that there is a turn in the road or a sharp incline beyond the road.*
- *Where underground services are to be traversed during the construction of new roads throughout the Proposed Wind Farm site, they will be traversed as per the methodology as outlined above.*

2.3.3.4 Proposed Wind Farm Underground Electrical (33kV) and Communication Cabling

The transformers in each turbine and the met mast are connected to the on-site substation through a network of underground electrical and communication cabling. The ground is trenched using a mechanical excavator. The top layer of soil (or road surface) is removed and saved so that it is replaced on completion. The cables will be bedded with suitable material. The cables will be laid at a depth of approximately 1.2m below ground level; a suitable marking tape is installed between the cabling and the surface (see Plate 2-1 below illustrating an example of a single cable trench). On completion, the ground will be reinstated. The route of the underground electrical and communication cabling will follow the access tracks as illustrated on the Proposed Wind Farm layout drawings included as Appendix 4-1 of the EIAR. The cabling may be placed on either side of the road footprint, on both sides of the road and/or within the road. The exact configuration of the underground cabling will be set by the requirements of the electrical designers at detailed design stage.



Plate 2-1 Typical Cable Trench View

2.3.3.5 Watercourse/ Culvert Crossings

The Proposed Wind Farm site is extensively drained by a network of natural watercourses and manmade land drains. Construction of 9 no. new watercourse crossing (clear span bridge/culvert design) and upgrade of 2 no. existing crossings on forestry tracks will be required to facilitate the Proposed Wind Farm site infrastructure.

Clear-Span Watercourse Crossing

It is proposed to construct a clear-span watercourse crossing at 9 no. of the 11 no. locations where new watercourse crossings are required within the Proposed Wind Farm site. The locations of these crossings are shown on the layout drawings included in Appendix 4-1. The clear-span watercourse crossing methodology presented below will ensure that no instream works are necessary. The standard construction methodology for the installation of a clear-span watercourse crossing is as follows:

- The access road on the approach either side of the watercourse will be completed to a formation level which is suitable for the passing of plant and equipment required for the installation of each watercourse crossing.
- All drainage measures along the proposed road will be installed in advance of the works.
- A foundation base will be excavated to rock or competent ground with a mechanical excavator with the foundation formed in-situ using a semi-dry concrete lean mix. The base will be excavated along the stream bank with no instream works required.
- Access to the opposite side of the watercourse for excavation and foundation installation will require the installation of a temporary pre-cast concrete or metal bridge across the watercourse to provide temporary access for the excavator. Plant and equipment will not be permitted to track across the watercourse.
- Once the foundation base has been completed, the pre-cast concrete clear-span structure will be installed using a crane which will be set up on the bank of the watercourse and will be lifted into place from the bank with no contact with the watercourse.
- Once the crossing is in position stone backfill will be placed and compacted against the structure up to the required level above the foundations.

- Underground cabling ducting will be contained within the road make-up of the proposed crossing.

A standard design drawing of a pre-cast concrete, clear span crossing is shown in Figure 4-36.

The watercourse crossing will be constructed to the specifications of the OPW bridge design guidelines 'Construction, Replacement or Alteration of Bridges and Culverts - A Guide to Applying for Consent under Section 50 of the Arterial Drainage Act, 1945', and in consultation with Inland Fisheries Ireland. Abutments will be constructed from precast units combined with in-situ foundations, placed within an acceptable backfill material.

Confirmatory inspections of the proposed new watercourse crossing locations will be carried out by the Project Civil/Structural Engineer and the Project Hydrologist prior to the construction of the crossing.

Culvert Crossing

All new proposed culverts and proposed culvert upgrades will be suitably sized for the expected peak flows in the watercourse.

Some culverts may be installed to manage drainage waters from works areas of the Proposed Project, particularly where the waters have to be taken from one side of an existing roadway to the other for discharge. The size of culverts will be influenced by the depth of the track or road sub-base. In all cases, culverts will be oversized to allow mammals to pass through the culvert.

Culverts will be installed with a minimum internal gradient of 1% (1 in 100). Smaller culverts will have a smooth internal surface. Larger culverts may have corrugated surfaces which will trap silt and contribute to the stream ecosystem. Depending on the management of water on the downstream side of the culvert, large stone may be used to interrupt the flow of water. This will help dissipate its energy and help prevent problems of erosion. Smaller water crossings will simply consist of an appropriately sized pipe buried in the sub-base of the road at the necessary invert level to ensure ponding or pooling does not occur above or below the culvert and water can continue to flow as necessary.

All culverts will be inspected regularly to ensure they are not blocked by debris, vegetation or any other material that may impede conveyance.

2.3.3.6 Borrow Pit

The estimated volume to be extracted from the borrow pits for the construction of the Proposed Wind Farm is up to 272,490m³. This figure presented is the anticipated maximum volumes; however, the actual volumes to be removed from the borrow pits will be confirmed at the time of construction and following detailed pre-construction site investigation works.

The borrow pits will be excavated and backfilled as follows:

- The area to be used for the borrow pits will be marked out at the corners using ranging rods or timber posts. Drainage runs, and associated settlement ponds will be installed around the perimeter;
- The initial borrow pit excavation will involve removal of soil to the top of bedrock. These materials will be stored temporarily in the borrow pits or placed alongside access roads;
- All drainage measures prescribed in the detailed drainage design for the Proposed Project will be implemented around the works area;
- The bedrock material will be extracted by breaking and blasting (section 4.8.1.7.1 and 4.8.1.7.2 in Chapter 4) from the borrow pits and stockpiled or used as required;

- The use of material won from the borrow pits will be sequential with new road construction or turbine foundation formations;
- Temporary stockpiling of aggregates will be required to accommodate the cut and fill operations within the borrow pits, and the progression of access roads and turbine excavations;
- As the borrow pit excavation progresses and becomes deeper, surface water and groundwater ingress will be removed via pumping to settlement ponds, and re-distribution locally across natural vegetated areas. Where required, additional specialist water treatment measures will be employed to ensure no deterioration in downstream water quality occurs;
- When extraction ceases within the borrow pits, the borrow pits will be backfilled with excavated spoil and its associated drainage measures will be removed.
- The extraction area of the borrow pits will have to be permanently secured and a stock-proof fence will be erected around the borrow pits to prevent access to these areas as well as the installation of appropriate health and safety signage.

Two extraction methods have been assessed for breaking out the useful rock below: rock breaking and blasting

2.3.3.6.1 **Rock Breaking**

Weathered or brittle rock can be extracted by means of a hydraulic excavator and a ripper attachment. This is a common extraction methodology where fragmented rock is encountered as it can be carefully excavated in layers. In areas where stronger rock is encountered and cannot be removed by means of excavating then a rock breaking methodology may be used. Rock breaking equipment comprises a large hydraulic 360-degree excavator with a rock breaker attachment. Given the power required to break out tight and compact stone at depth, the machines are generally large and in the 40-60 tonne size range. Even where rock might appear weathered or brittle at the surface, the extent of weathering can quickly diminish with depth resulting in strong rock requiring significant force to extract it at depths of only a few metres.

A large rock breaking excavator progressively breaks out the solid rock from the ground in the borrow pit area. A smaller rock breaker, in the 30-40 tonne size range, then breaks the rocks down to a size that can then be fed into a crusher.

The extracted, broken rock is loaded into a mobile crusher using a wheeled loading shovel and crushed down to the necessary size of graded stone required for the on-site civil works. The same wheeled loader takes the stone from the crusher conveyor stockpile and stockpiles it elsewhere within the borrow pit, away from the immediate area of the crusher, until it is required elsewhere within the Site.

2.3.3.6.2 **Rock Blasting**

Where blasting is used as an extraction method, a mobile drilling rig is used to drill vertical boreholes into the area of rock that is to be blasted. A drilling rig will drill the necessary number of boreholes required for a single blast in approximately 3 to 4 days. The locations, depth and number of boreholes are determined by the blast engineer. This is a specialist role fulfilled by the blasting contractor.

The blast engineer will arrange for the necessary quantity of explosive to be brought to site to undertake a single blast. The management of explosives on-site and the actual blasting operation will be agreed in advance with and supervised by An Gardaí Síochána. The blast engineer sets the explosives in place in the boreholes, sets the charges, and fires the blast.

A properly designed blast should generate rock of a size that can be loaded directly into a mobile crusher, using the same wheeled loader outlined above. The same method is used for processing the rock generated from a blast, as would be used to process rock generated by rock breaking. Generally,

the drilling rig will recommence drilling blast holes for the next blast as soon as one blast is finished. The potential impacts and control measures associated with noise and vibration from this extraction method are assessed in Chapter 12: Noise and Vibration. Any blasting will be carried out in accordance with the *Guidance on the Safe Use of Explosives in Quarries* (Safety and Health Commission for the Mining and Other Extractive Industries, 2002)¹ and the British Standard BS 5228-1:2009+A1:2014 *Code of practice for noise and vibration control on construction and open sites – Noise*².

2.3.3.7 Spoil Management Areas

It is proposed to manage overburden generated through construction activities for the Proposed Project locally within the Site, through backfilling of the proposed borrow pits void in the first instance and following that within linear berms that will be placed along access roads and turbine hardstand areas, where appropriate (avoiding environmentally constrained areas). Excess overburden will also be placed around selected turbines bases and hardstands. The areas around 8 no. turbine bases and hardstands (12 no. individual areas proposed) have been assessed as suitable locations for spoil placement due to suitable ground conditions and slope angles. Excess overburden will be placed in three spoil management areas located within the Proposed Wind Farm site. The first spoil management area will be located adjacent to Turbine 1, measuring approximately 9,525 square meters (m²) in area. The second spoil management area will be located approximately 120m east of Turbine 8, measuring approximately 7,720 m². The third spoil management area will be located approximately 225m south of Turbine 4, measuring approximately 16,075 m².

The total estimated volume of spoil to be managed following excavations during the construction phase of the Proposed Project is approximately 399,565 m³. Some material arising from the construction of the Proposed Grid Connection underground cabling route will be sent to an appropriate licenced facility. There is more than enough capacity to manage the total volume of spoil requiring management for both the Proposed Wind Farm and the Proposed Grid Connection as detailed in Table 4-2 of Chapter 4.

2.3.3.8 Temporary Construction Compounds

Three temporary construction compounds will be located within the Proposed Wind Farm site. The primary construction compound will be located adjacent to the Proposed Substation, measuring approximately 2,610 square meters (m²) in area. The second construction compound will be located approximately 240m northeast of Turbine 8, measuring approximately 650 m²; and third construction compound will be located approximately 200m southeast of Turbine No. 11, measuring approximately 650 m².

The locations of the proposed temporary construction compounds are shown on the Proposed Project site layout drawing in Figure 4-1b of Chapter 4. The layouts of the temporary construction compounds are shown on Figure 4-10, Figure 4-11 and Figure 4-12 of Chapter 4.

- The area to be used as the compound will be marked out at the corners using ranging rods or timber posts. Drainage runs and associated settlement ponds will be installed around the perimeter;
- The compound platform will be established using a similar technique as the construction of the substation platform as discussed below in Section 4.8.2.1;
- A layer of geo-grid will be installed where deemed necessary by the designer and compacted layers of well graded granular material will be spread and lightly compacted to provide a hard area for Site offices and storage containers;
- A limited amount of fuel will have to be stored in appropriately bunded containers and a designated area for oil storage will be constructed within the compound.

¹https://www.hsa.ie/eng/Publications_and_Forms/Publications/Mines_and_Quarries/Guidance%20on%20the%20Safe%20Use%20of%20Explosives%20in%20Quarries.pdf

²<https://www.thenbs.com/PublicationIndex/documents/details?Pub=BSI&DocID=305965>

- Areas within the compound will be constructed as site roads and used as vehicle hardstandings during deliveries and for parking;
- A bunded containment area will be provided within the compound for the storage of lubricants, oils and site generators etc;
- A waste storage area will be provided within the compound;
- The compound will be fenced and secured with locked gates if necessary; and,
- Upon completion of the Proposed Project, the temporary construction compounds will be decommissioned and allowed to vegetate naturally.

2.3.3.9 Tree Felling and Replanting

As part of the Proposed Project, tree felling will be required within and around the development footprint to allow for the construction of the turbine bases, access roads underground cabling, and the other ancillary infrastructure.

Further details on tree felling required within and around development footprint on the Proposed Project site is detailed in Chapter 6 of this EIAR.

A majority (66%) of the Proposed Wind Farm site comprises commercial forestry. A total of 51.64 hectares of commercial forestry will be permanently felled as part of the Proposed Project along with existing treeline boundaries as detailed in Chapter 6, Section 6.5.2.2. Figure 4-13 of Chapter 4 shows the extent of the commercial forestry to be permanently felled as part of the Proposed Project.

The commercial forestry felling activities required as part of the Proposed Project will be the subject of a Limited Felling Licence (LFL) application to the Forest Service in accordance with the Forestry Act 2014 and the Forestry Regulations 2017 (SI 191/2017) and as per the Forest Service's policy on granting felling licenses for wind farm developments. The policy requires that a copy of the planning permission for the Proposed Project be submitted with the felling licence application; therefore, the felling licence cannot be applied for until such time as planning permission is obtained for the Proposed Project.

2.3.3.9.1 Forestry Replanting

In line with the Forest Service's published policy on granting felling licences for wind farm developments, areas cleared of forestry for access roads, and any other wind farm-related uses will have to be replaced by replanting at an alternative site or sites. The Forest Service policy requires replacement or replanting on a hectare for hectare basis for the footprint of the infrastructure developments.

The estimated 51.64 hectares that will be permanently felled for the footprint of the Proposed Project infrastructure will be replaced or replanted on a hectare for hectare basis as a condition of any felling licence that will be issued in respect of the Proposed Project. Replanting is a requirement of the Forestry Act and is primarily a matter for the statutory licensing processes that are under the control of the Forest service.

The replacement of the 51.64 hectares of forestry can occur anywhere in the State subject to licence. The replacement of forestry, felled as part of the Proposed Project, may occur on any lands, within the state, benefitting from Forest Service Technical Approval³ for afforestation, should the Proposed Project receive planning permission. Under the Forestry Regulations 2017, all applications for licences for afforestation require the prior written approval (technical approval) of the Minister for Agriculture, Food and the Marine. Before the Minister can grant approval, he/she must first determine if the project is likely to have significant effects on the environment (for EIA purposes) and assess if the development, individually or in combination with other plans or projects is likely to have a significant

³ All proposed forestry developments where the area involved is greater than 0.1 hectare must receive the prior written approval of the Forest Service. The application for approval is known as Pre-Planting Approval – Form 1.

effect on a European site (for Habitats purposes). Further details in relation to forestry replanting are included in Appendix 2-4 of the EIAR.

2.3.3.10 Biodiversity Management and Enhancement Measures

A Biodiversity Management and Enhancement Plan (BMEP) has been prepared for the Proposed Project and is included as Appendix 6-1 of this EIAR. This plan has been developed to offset the loss of habitats identified within the Proposed Wind Farm site and further enhance the biodiversity of the site and its environs. These enhancement measures have also been considered in the landscape & visual assessment which is included at Chapter 14: Landscape & Visual, of this EIAR, with particular reference to Section 14.7.3.1.3. Similarly, the drainage design for the Proposed Project has been prepared by Hydro Environmental Services Ltd. (HES) and is included in Appendix 9-1 of this EIAR.

2.3.3.11 Meteorological Mast Foundation

One meteorological (met) mast is proposed as part of the Proposed Wind Farm site. The met mast will be equipped with wind monitoring equipment at various heights. The proposed met mast will be located at N593923, E649893 (ITM) as shown on the Proposed Wind Farm layout drawing in Figure 2-1. The mast will be a free-standing slender lattice structure 103.5 metres in height. The mast will be constructed on a hard-standing area sufficiently large to accommodate the equipment that will be used to erect the mast. The proposed meteorological mast is shown in Figure 4-9 of Chapter 4.

The met mast foundation will be formed at a suitable level directed by the Geotechnical Engineer/Designer. The foundation area will be prepared as follows:

- *The extent of the excavation will be marked out and will include an allowance for trimming the sides of the excavation to provide a safe working area and slope batter;*
 - *Where practical, the soil will be stripped over the area of the excavation and stored locally for reuse, the subsoil will be excavated and stored to one side for reuse during the landscaping around the finished met mast;*
 - *No material will be removed from site with excavated spoil being transported and stored in the identified spoil management areas within the Site.*
 - *All groundwater and surface water arising from met mast base excavation will be pumped to the dirty water system prior to discharge from the works area;*
 - *Soil excavation shall be observed by a qualified archaeologist in accordance with a scheme of archaeological monitoring to identify any significant remains as they come to light;*
- The foundations excavation will be raised to formation level by compacted layers of well graded granular material will be spread and compacted to provide a hard area for the met mast foundation.*

2.3.3.12 Turbine Hardstanding Areas

Hard standing areas consisting of levelled and compacted hardcore are required around each turbine base to facilitate access, turbine assembly and turbine erection. The hard-standing areas are used to accommodate cranes used in the assembly and erection of the turbine, offloading and storage of turbine components, and provide a safe, level working area around each turbine position. The hard-standing areas are extended to cover the turbine foundations once the turbine foundation is in place. All crane hardstand areas will be designed taking account of the loadings provided by the turbine manufacturer and will consist of a compacted stone structure. The crane hardstands will be constructed in a similar manner to the excavated site roads detailed in Section 2.3.3.3 above.

The sizes, arrangement and positioning of hard standing areas are dictated by turbine suppliers. The proposed hard standing areas are illustrated in the detailed drawings included in Appendix 4-1 of the EIAR. The extent of the required areas at each turbine location may be optimised on-site depending

on topography, position of the Site access road, the proposed turbine position and the turbine supplier's exact requirements.

2.3.3.13 Turbine Foundations

Each wind turbine is secured to a reinforced concrete foundation that is installed below the finished ground level. The size of the foundation will be dictated by the turbine manufacturer, and the final turbine selection will be the subject of a competitive tender process. Different turbine manufacturers use different shaped turbine foundations, ranging from circular to hexagonal and square, depending on the requirements of the final turbine supplier. The turbine foundation transmits any load on the wind turbine into the ground. The proposed horizontal and vertical extent of the turbine foundation will be 25m and 4m respectively, which has been assessed in the EIAR.

After the foundation level of each turbine has been formed using piling methods or on competent strata (i.e. bedrock or subsoil of sufficient load bearing capacity), the "Anchor Cage" is levelled, and reinforcing steel is then built up around and through the anchor cage. The outside of the foundation is shuttered with demountable formwork to allow the pouring of concrete and is backfilled accordingly with appropriate granular fill to finished surface level following completion of the foundation.

It is anticipated that the formation level of the turbine foundations will be on the lower mineral subsoil or bedrock. They will be formed at a suitable level directed by the Geotechnical Engineer/Designer. The foundations will be constructed as follows:

1. *The extent of the excavation will be marked out and will include an allowance for trimming the sides of the excavation to provide a safe working area and slope batter;*
1. *Where practical, the soil will be stripped over the area of the excavation and stored locally for reuse, the subsoil will be excavated and stored to one side for reuse during the landscaping around the finished turbine;*
2. *No material will be removed from site with excavated spoil being transported to the identified spoil management areas within the Site.*
3. *All groundwater and surface water arising from turbine base excavation will be pumped to the dirty water system prior to discharge from the works area;*
4. *Soil excavation shall be observed by a qualified archaeologist in accordance with a scheme of archaeological monitoring to identify any significant remains as they come to light;*
5. *The foundations excavation will be raised to formation level by compacted layers of well graded granular material will be spread and compacted to provide a hard area for the turbine foundation.*

Standard excavated reinforced concrete bases will be completed as follows:

1. *A layer of lean-mix blinding will be laid approximately 75mm thick directly on top of the newly exposed formation, tamped and finished with a screed board to leave a flat level surface. The concrete should be protected from rainfall during curing and all surface water runoff from the curing concrete should be prevented from entering surface water drainage directly;*
2. *High tensile steel reinforcement will be fixed around the anchor cage in accordance with the designer's drawings & schedules. The foundation anchorage system will be installed, levelled and secured to the blinding using steel box section stools;*
3. *Ductwork will be installed as required, and formwork erected around the steel cage and propped from the backside as required;*
4. *The foundation anchorage system will be checked both for level and line prior to the concrete being installed in the base. These checks will be passed to turbine manufacturer for their approval;*

5. Concrete will be placed using a concrete pump and compacted when in the forms using vibrating pokers to the levels and profile indicated on the drawings. Upon completion of the concreting works the foundation base will be covered and allowed to cure;
6. Steel shutters will be used to pour the circular chimney section;
7. Earth wires will be placed around the base;
8. The foundation will be backfilled with a cohesive material, where possible using the material arising during the excavation or imported material and landscaped using the soil set aside during the excavation; and.
9. Any excess overburden excavated during construction shall be managed in line with the recommendations/ best practice guidelines outlined in Section 2.3.12 above.

Reinforced concrete piled foundations will be completed as follows:

1. The extent of the excavation will be marked out and will include an allowance for trimming the sides of the excavation to provide a safe working area and slope batter;
2. No excavated material will be removed from site with excavated spoil being transported and stored in the identified spoil management areas within the Site.
3. No material will be removed from site and placement areas will be stripped of vegetation prior to stockpiling in line with best working practices;
4. A piling platform for the piling rig will be constructed by excavating to a suitable intermediate mineral subsoil and backfilling to formation level by compacted layers of well graded granular material spread and compacted to provide a hard area for the piling rig;
5. The piling rig, fitted with an auger, will then bore through the soft material with a sleeve fitted around the auger to prevent the sidewalls of the soil and overburden from collapsing. The borehole is then extended to a suitable depth into the subsoil/bedrock.
6. When the auger and the sleeve are removed high tensile steel cages will be lowered into the boreholes. These steel cages will extrude above the level of the top of the concrete pile.
7. As the auger is removed concrete is pumped into the borehole.
8. Reinforcing steel on the top of the pile will tie to the foundation base steel.
9. The procedure for standard excavated reinforced concrete bases as outlined above can be applied from here.

2.3.4 Proposed Grid Connection

2.3.4.1 Onsite Electricity Substation and Control Buildings

A detailed drawing of the proposed onsite 110kV substation is shown in Figure 4-16. The proposed onsite 110kV substation will be constructed by constructed by the following methodology:

- The area of the on-site substation will be marked out using ranging rods or wooden posts and the soil and overburden stripped and temporarily stockpiled for later use in landscaping. Any excess material will be sent to one of the designated spoil management areas.
- 2 no. control buildings will be built within the on-site substation compound.
- The foundations will be excavated down to the level indicated by the designer and appropriately shuttered reinforced concrete will be laid over it. An anti-bleeding admixture will be included in the concrete mix.
- The block work walls will be built up from the footings to DPC level and the floor slab constructed, having first located any ducts or trenches required by the follow on mechanical and electrical contractors.
- The block work will then be raised to wall plate level and the gables & internal partition walls formed. Scaffold will be erected around the outside of the building for this operation.
- The roof slabs will be lifted into position using an adequately sized mobile crane.

- The timber roof trusses will then be lifted into position using a telescopic load all or mobile crane depending on-site conditions. The roof trusses will then be felted, battened, tiled and sealed against the weather.
- The transformer, electrical equipment and storage container plinths will be excavated down to the level indicated by the designer and appropriately shuttered reinforced concrete will be laid over it. An anti-bleeding admixture will be included in the concrete mix.
- Lightning poles will be erected at appropriate locations adjacent to the substation. All lightning poles will be appropriately earthed.
- The electrical equipment will be installed and commissioned.
- Perimeter fencing will be erected.
- The construction and components of the substation will be built to EirGrid specifications.

2.3.4.2 Battery Storage

A battery-based energy storage system (BESS) will adjoin the 110kV onsite substation and is located adjacent to the substation compound. The battery storage compound will have a footprint of approximately 4,800m². The battery storage compound will include 10 no. Battery Storage modules and 10 no. transformers and 5 no. auxiliary transformers. Each battery storage module will measure 12.2m X 2.89m with a height of 2.58m.

Prior to installing the steel containers, clearance of the site area, levelling off the ground surface and creation of a hard stand will be undertaken. These containers and the adjacent infrastructure house the batteries, inverters, transformers, fire suppression equipment and associated electrical components. The containers will be mounted onto concrete plinth foundations. The containers shall be spaced to allow airflow around the containers, feeding their climate control systems. Further detail regarding BESS safety can be found in Appendix 4-4 Fire Risk Management and Emergency Response Plan of this EIAR.

In addition to the modular steel containers, other components of the development include:

- A grid transformer within the electrical compound;
- Above ground cable junction boxes/ cabling cabinets and cable racks/steel trunking facilitating the necessary electrical connections between containers;
- Underground ducting and cabling;
- A security fence around the perimeter of the compound;
- Communications equipment; and,
- Lightning protection poles.

The battery storage compound will operate continuously, linked to the on-site substation. It will be monitored in tandem with the overall development and there will be sporadic maintenance visits as required. The battery energy storage system will remain in place as it will form a permanent part of the national electricity grid.

The BESS containers are shown in Figure 4-19 of Chapter 4 of this EIAR.

2.3.4.3 Substation Temporary Construction Compound

The temporary construction compound adjacent to the proposed on-site 110kV substation will be constructed as outlined above in Section 2.3.3.8.

2.3.4.4 **Underground Electrical (38kV) and Communication Cabling for Proposed Grid Connection**

The underground cabling works will consist of the installation of ducts in an excavated trench to accommodate electrical and fibre communications cables to facilitate a connection between the proposed 110kV on-site substation and the existing 110kV Killonan Substation.

The underground electrical cabling will be laid beneath the surface of private roads (existing and proposed) and the public road using the following methodology:

- Before works commence, updated surveying will take place along the proposed cable route, with all existing culverts and services identified. All relevant bodies i.e., ESBN, Tipperary and Limerick County Councils etc. will be contacted and all up to date information for all existing services sought.
- When the cable is located on public roads, a traffic management plan will be prepared prior to any works commencing. A road opening licence will be obtained where required and all plant operators and general operatives will be inducted and informed as to the location of any services.
- A tracked 360-degree excavator will then proceed to dig out the proposed trench, typically to a depth of 1.2m, within which the ducts will be laid.
- The cable ducts will be concrete surrounded where they pass under the public road and under drains or culverts.
- Trench supports will be installed, or the trench sides will be benched or battered back where appropriate and any ingress of ground water will be removed from the trench using submersible pumps, fitted with appropriate silt filtration systems, to prevent contamination of any watercourse.
- Once the trench has been excavated, a base-layer will be laid and compacted, comprising Clause 804, or 15 Newton CBM4 concrete as required.
- The ducting will be installed as per specification, with couplers fitted and capped to prevent any dirt etc. entering the duct. In poor ground conditions, the ends of the ducts will be shimmed up from the bed of the trench, to prevent any possible ingress of water dirt. The shims will be removed again once the next length has been connected. Extreme care will be taken to ensure that all duct collars (both ends) are clean and in good condition prior to ducts being joined.
- As the works progress, the as-built location of the ducting will be recorded using a total station or GPS.
- As per the associated base-layer (Clause 804 material or 15 Newton CBM4 concrete) will be installed and compacted as per approved detail, with care not to displace the ducting.
- Spacers will be used to ensure that the correct cover is achieved at both sides of the ducting.
- The remainder of the trench will be backfilled in two compacted layers with approved engineer's specified material.
- Yellow marker warning tape will be installed across the width of the trench, at 300mm depth,
- The finished surface is to be reinstated, as per original specification. Off-road cabling may be finished with granular fill to facilitate access to the trench for any potential maintenance that is required during the operational phase of the Proposed Project.
- Marker posts will then be placed at regular intervals (generally at joint bays and any change in direction) to denote the location of the underground cabling.

2.3.4.5 **Existing Underground Services**

Any underground services encountered along the underground cabling route will be surveyed for level and the ducting will pass over the service provided adequate cover is available. A minimum clearance of 300 mm will be required between the bottom of the ducts and the service in question. If the

clearance cannot be achieved the ducting will pass under the service and again 300 mm clearance between the top of the communications duct and bottom of the service will be achieved. In deeper excavations an additional layer of marker tape will be installed between the communications duct and top-level yellow marker tape. If the required separation distances cannot be achieved then a number of alternative options are available such as using steel plates laid across the width of the trench and using 35N concrete surrounding the proposed ducting, with marker tape on the side of the trench. Back fill around any utility services will be with dead sand/pea shingle where appropriate.

2.3.4.6 Joint Bays

Joint bays are typically pre-cast concrete chambers where lengths of cable will be joined to form one continuous cable. They will be located at various points along the ducting route generally between 500 to 800 metres intervals or as otherwise required by ESB/EirGrid and electrical requirements. The Installed Joint Bays will be 2.5m x 6m x 1.75m pre-cast concrete structures installed below the finished ground level.

Where possible, joint bays will be located in areas where there is a natural widening/wide grass margin on the road in order to accommodate easier construction, cable installation and create less traffic congestion. Joint Bays will be located in the non-wheel bearing strip of roadways, however given the narrow profile of local roads this may not always be possible. During construction the joint bay locations will be completely fenced off once they have been constructed they will be backfilled until cables are being installed. Once the cabling is installed the joint bays will be permanently backfilled with the existing surface re-instated and there will be no discernible evidence of the joint bay on the ground.

In association with joint bays, Communication Chambers are required at every joint bay location to facilitate jointing of the communication cabling. Earth Sheath Link Chambers are also required approximately every second joint bay along the cable route. Earth Sheath Links are used for earthing and bonding cable sheaths of underground electrical cabling, installed in a flat formation, so that the circulating currents and induced voltages are eliminated or reduced. Earth Sheath Link Chambers and Communication Chambers are located in proximity to Joint Bays. Earth Sheath Link Chambers and Communication Chambers will be pre-cast concrete structures with a steel access cover at finished surface level. The locations of the joint bays and chambers are shown in Appendix 4-1 of the EIAR. Please see Figure 4-21 of the EIAR for a standard joint bay.

The precise siting of all Joint Bays, Earth Sheath Link Chambers and Communication Chambers within the underground cabling route corridor assessed is subject to approval by ESB and EirGrid

2.3.4.7 Watercourse Crossings on the Proposed Grid Connection Underground Cable Route

There are 35 no. identified watercourse crossings and an Irish Rail crossing along the Proposed Grid Connection underground cabling route. Of these, 23 no. watercourse crossings are referenced on EPA/OSI mapping. An additional 12 no. watercourse crossings were identified during surveys of the underground cable route. The construction methodology for the 35 no. EPA/OSI mapped and the unmapped watercourse crossings has been designed to eliminate the requirement for in-stream works at these locations. The various crossing methodologies to be employed along the Proposed Grid Connection underground cabling route include the following:

- Type A: Crossing using standard trefoil formation (Figure 4-23)
- Type B Flatbed formation under (Figure 4-24)
- Type C: Flatbed Formation over (Figure 4-25)
- Type D: Horizontal Directional Drilling (Figure 4-26)

A general description of the construction methods employed at watercourse crossings and at the Irish Rail crossing are described in Section 4.8.2.6 and 4.8.2.7 of Chapter 4 of this EIAR. An illustration of

the proposed crossing methodology at the 23 no. EPA/OSI mapped crossing locations is included within the detailed site layout drawings in Appendix 4-1. A description of proposed methodologies for the crossing of services along the proposed underground cable route is included below.

2.3.4.7.1 **Crossing Using Standard Trefoil Formation Over – Option A**

Watercourses will not be directly impacted upon since no instream works or bridge/culvert alterations are proposed. Where adequate cover exists above a bridge/culvert or where a new bottomless box culvert or clear-span structure has been installed at a sufficient depth, the standard ESB approved trefoil arrangement will be used where the cable ducts pass over a culvert without any contact with the existing culvert or water course. The cable trench will pass over the culvert in a standard trench.

2.3.4.7.2 **Flatbed Formation Under– Option B**

Where cable ducts are to be installed under a watercourse or service where sufficient cover cannot be achieved by installing the ducts in a trefoil arrangement, the ducts will be laid in a much shallower trench the depth of which will be determined by the location of the top of the obstacle or the depth of excavatable material under a bridge. The ducts will be laid in this trench in a flatbed formation under the watercourse or service and will be encased in 6mm thick steel galvanized plate with a 35N concrete surround as per ESB Networks specification.

2.3.4.7.3 **Flatbed Formation over – Option C**

Where cable ducts are to be installed over a watercourse or service where sufficient cover cannot be achieved by installing the ducts in a trefoil arrangement, the ducts will be laid in a much shallower trench the depth of which will be determined by the location of the top of the obstacle or the depth of excavatable material over it. The ducts will be laid in this trench in a flatbed formation over the watercourse or service and will be encased in 6mm thick steel galvanized plate with a 35N concrete surround as per ESB Networks specification.

Where a bridge/culvert or service has insufficient cover depth to fully accommodate the required trench, the ducts can be laid in a flatbed formation partially within the existing road surface. Where this option is to be employed, the ducts will also be encased in steel with a concrete surround as per ESB Networks specifications. In order to achieve cover over these ducts and restore the carriageway of the road, it may be necessary to raise the pavement level locally to fully cover the ducts. The increased road level will be achieved by overlaying the existing pavement with a new wearing course as required. Any addition of a new pavement will be tied back into the existing road pavement at grade. After the crossing over the culvert has been achieved, the ducts will resume to the trefoil arrangement within a standard trench.

2.3.4.7.4 **Horizontal Directional Drilling – Option D**

The horizontal directional drilling method of duct installation is carried out using Vermeer D36 x 50 Directional Drill (approximately 22 tonnes), or similar plant. The launch and reception pits will be approximately 2.5m wide, 2.5m long and 2.0m deep. The pits will be excavated with a suitably sized excavator. The drilling rig will be securely anchored to the ground by means of anchor pins which will be attached to the front of the machine. The drill head will then be secured to the first drill rod and the operator will commence to drill into the launch pit to a suitable angle which will enable him to obtain the depths and pitch required to the line and level of the required profile. Drilling of the pilot bore will continue with the addition of 3.0m long drill rods, mechanically loaded and connected into position.

During the drilling process, a mixture of a natural, inert and fully biodegradable drilling fluid such as Clear Bore™ and water is pumped through the centre of the drill rods to the reamer head and is forced in to void and enables the annulus which has been created to support the surrounding subsoil and thus prevent collapse of the reamed length. Depending on the prevalent ground conditions, it

may be necessary to repeat the drilling process by incrementally increasing the size of the reamers. When the reamer enters the launch pit, it is removed from the drill rods which are then passed back up the bore to the reception pit and the next size reamer is attached to the drill rods and the process is repeated until the required bore with the allowable tolerance is achieved.

The use of a natural, inert and biodegradable drilling fluid such as Clear Bore™ is intended to negate any adverse impacts arising from the use of other, traditional polymer-based drilling fluids and will be used sparingly as part of the drilling operations. It will be appropriately stored prior to use and deployed in the required amounts to avoid surplus. Should any excess drilling fluid accumulate in the reception or drilling pits, it will be contained and removed from the site in the same manner as other subsoil materials associated with the drilling process to a licensed recovery facility.

Backfilling of launch & reception pits will be conducted in accordance with the normal specification for backfilling excavated trenches. Sufficient controls and monitoring, as listed below, will be put in place during drilling to prevent frack-out, such as the installation of casing at entry points where reduced cover and bearing pressure exists.

- The area around the Clear Bore™ batching, pumping and recycling plants shall be bunded using terram and sandbags in order to contain any spillages;
- One or more lines of silt fences shall be placed between the works area and adjacent rivers and streams on both banks;
- Accidental spillage of fluids shall be cleaned up immediately and transported off site for disposal at a licensed facility; and,
- Adequately sized skips will be used for temporary storage of drilling arisings during directional drilling works. This will ensure containment of drilling arisings and drilling flush.

3. ENVIRONMENTAL MANAGEMENT

3.1 Introduction

This CEMP includes all best practice measures required to construct the Proposed Project. The drainage proposals will be developed further prior to the commencement of construction however, any such improvements will be in line with the principles set out here and will also be in full compliance with the planning consent and mitigation measures as presented in the EIAR, Natura Impact Statement (NIS) and all other relevant planning documents. The following sections give an overview of the drainage design principles, dust and noise control measures and a waste management plan for the Site.

3.2 Protecting Water Quality

3.2.1 Good Environmental Management During Construction

Timing of works can strongly influence the potential for damaging the freshwater environment. Operations during wetter periods of the year pose a significantly greater risk of causing erosion and siltation, which can be particularly severe following major rainfall or snowmelt events. Traditionally, wind farm construction undertaken during the drier summer months would result in significantly less erosion and siltation. Construction activities in the hydrological buffer zones shall be avoided during or after prolonged rainfall or an intense rainfall event and work will cease entirely near watercourses when it is evident that water quality is being impacted.

3.2.2 Site Drainage Principles

The site drainage features have been outlined in Section 4.6 of the EIAR for the Proposed Project in addition to the drainage design and management for the Proposed Project. The protection of the watercourses within and surrounding the site, and downstream catchments that they feed is of utmost importance in considering the most appropriate drainage proposals for the site of the Proposed Project. No routes of any natural drainage features will be altered as part of the Proposed Project. Turbine locations and associated new roadways were originally selected to avoid natural watercourses, and existing roads are to be used wherever possible. The Proposed Project has where possible, been kept a minimum of 50 metres from natural watercourses. There will be no direct discharges to natural watercourses. All discharges from the proposed works areas or from interceptor drains will be made over vegetated ground at an appropriate distance from natural watercourse and lakes. Buffer zones around the existing natural drainage features have informed the layout of the Proposed Project and are indicated on the drainage design drawings.

A detailed drainage design for the Proposed Project will be prepared prior to the commencement of construction to by the Project Hydrologist to incorporate these site drainage principles and carry forward into the construction phase of the Proposed Project.

Existing artificial drains in the vicinity of existing site roads will be maintained in their present location where possible. If it is expected that these artificial drains will receive drainage water from works areas, check dams will be added (as specified below) to control flows and sediment loads in these existing artificial drains. If road widening or improvement works are necessary along the existing roads, where possible, the works will take place on the opposite side of the road to the drain.

3.2.3 Legislation and Best Practice Guidance

The drainage design presented in the EIAR and planning application documents has been prepared based on experience of the project team of other renewable energy sites in similar environments, and the number of best practice guidance documents.

There is no one guidance document that deals with drainage management and water quality controls for wind farm and other renewable energy developments. However, a selection of good practice approaches have been adopted in preparation of this CEMP, and these are taken from the various best practice guidance documents listed below. These relate to infrastructure and operational works on sites, road design, water quality controls for linear projects, road drainage and management of geotechnical risks. To achieve best practice in terms of water protection through construction management, the detailed drainage design and all drainage management proposals shall be prepared in accordance with guidance contained in the following:

- Institute of Geologists Ireland (2013): Guidelines for Preparation of Soils, Geology & Hydrogeology Chapters in Environmental Impact Statements;
- National Roads Authority (2008): Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes;
- Department of Environment, Heritage and Local Government (2006): Wind Energy Development Guidelines for Planning Authorities;
- Institute of Geologists Ireland (2013): Guidelines for Preparation of Soils, Geology & Hydrogeology Chapters in Environmental Impact Statements;
- Forestry Commission (2011): Forests and Water UK Forestry Standard Guidelines, Fifth Edition. Publ. Forestry Commission, Edinburgh;
- Coillte (2009): Forest Operations & Water Protection Guidelines;
- Forest Service (Draft): Forestry and Freshwater Pearl Mussel Requirements – Site Assessment and Mitigation Measures;
- Forest Service (2000): Forestry and Water Quality Guidelines. Forest Service, DAF, Johnstown Castle Estate, Co. Wexford;
- Forest Service, (2000): Code of Best Forest Practice – Ireland. Forest Service, DAF, Johnstown Castle Estate, Co. Wexford;
- COFORD (2004): Forest Road Manual – Guidelines for the design, construction and management of forest roads;
- National Roads Authority (2005): Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes;
- Eastern Regional Fisheries Board: Requirements for the Protection of Fisheries Habitat during Construction and Development Works at River Sites;
- Inland Fisheries Ireland (2016): Guidelines on Protection of Fisheries During Construction Works Adjacent to Waters;
- Scottish Natural Heritage, 2010: Good Practice During Wind Farm Construction;
- PPG1 - General Guide to Prevention of Pollution (UK Guidance Note);
- PPG5 – Works or Maintenance in or Near Water Courses (UK Guidance Note);
- CIRIA Report No. C648 (2006): CIRIA (Construction Industry Research and Information Association) guidance on 'Control of Water Pollution from Linear Construction Projects';
- CIRIA Report Number C532 (2001): Control of water pollution from construction sites - Guidance for consultants and contractors.; and,

3.2.4 Site Drainage Design and Management

The proposed site drainage features for this Site are outlined in Section 4.6 of the EIAR. As this CEMP is a working document and is presented as an Appendix to the EIAR, the drainage measures are not included in this document. When the final CEMP report is prepared, and presented as a standalone document, all drainage measures will be included in that document. These drainage proposals will be developed further prior to the commencement of construction as part of the detailed drainage design.

The following sections give an outline of drainage management arrangements in terms of pre-construction, construction, operational and decommissioning phases of the Proposed Project.

3.2.4.1 Pre-Construction Drainage

Prior to commencement of works in sub-catchments across the site, main drain inspections will be completed to ensure ditches and streams are free from debris and blockages that may impede drainage. It is proposed to complete these inspections on a catchment-by-catchment basis as the construction works develop across the site, as works in all areas will not commence simultaneously.

Drainage and associated pollution control measures will be implemented onsite before the main construction works commence. Where possible drainage controls will be installed during seasonally dry ground conditions. This will reduce the possibility of impact on surface waters by suspended sediment released during construction and entrained in surface run-off.

The routes of any natural drainage features will not be altered as part of the Proposed Project. Turbine locations have been selected to avoid natural watercourses. It is proposed that 9 no. new clear span watercourse crossings are required, while 2 no. crossings will be required or upgraded within the Proposed Wind Farm site.

There will be no direct discharges to natural watercourses. All discharges from the proposed works areas or from interceptor drains will be made over vegetated ground at an appropriate distance from natural watercourse and lakes. Buffer zones around the existing natural drainage features have informed the layout of the Proposed Project and are indicated on the drainage design drawings.

Where artificial drains are currently in place in the vicinity of proposed works areas, these drains may have to be diverted around the proposed works areas to minimise the amount of water in the vicinity of works areas. Where it may not be possible to divert artificial drains around proposed work areas, the drains will be blocked to ensure sediment laden water from the works areas has no direct route to other watercourses. Where drains have to be blocked, the blocking will only take place after an alternative drainage system to handle the same water has been put in place.

Existing artificial drains in the vicinity of existing site roads will be maintained in their present location where possible. If it is expected that these artificial drains will receive drainage water from works areas, check dams will be added (as specified below) to control flows and sediment loads in these existing artificial drains. If road widening or improvement works are necessary along the existing roads, where possible, the works will take place on the opposite side of the road to the drain.

3.2.4.2 Construction Phase Drainage

The key principles of drainage design that will be implemented and adhered to as part of the Proposed Project are as follows:

- Keep clean water clean by intercepting it where possible, upgradient of works areas, and divert it around the works areas for discharge as diffuse overland flow or for rewetting of land.
- Collect potentially silt-laden runoff from works areas via downgradient collector drains and manage via series of avoidance, source, in-line, treatment and outfall controls prior to controlled diffuse release as overland flow or for rewetting of land.
- No direct hydraulic connectivity from construction areas to watercourses or drains connecting to watercourses.
- Where possible, maintain 50-metre watercourse buffer zones for the wind turbines.
- No alteration of natural watercourses.
- Maintain the existing hydrology of the Site.
- Blocking of existing manmade drainage as appropriate.

- Daily inspection and recording of surface water management system by on-site Environmental Clerk of Works and immediate remedial measures to be carried out as required and works temporarily ceased if a retained stormwater/sediment load is identified to have the potential to migrate from the Site.
- Use of siltbuster or equivalent system if required.

Runoff control and drainage management are key elements in terms of mitigation against effects on surface water bodies. Two distinct methods will be employed to manage drainage water within Site. The first method involves 'keeping clean water clean' by avoiding disturbance to natural drainage features, minimising any works in or around artificial drainage features, and diverting clean surface water flow around excavations, construction areas and temporary storage areas. The second method involves collecting any drainage waters from works areas within the Site that might carry silt or sediment, and nutrients, to route them towards settlement ponds (or stilling ponds) prior to controlled diffuse release over vegetated surfaces. There will be no direct discharges to surface waters. During the construction phase all runoff from works areas (i.e. dirty water) will be attenuated and treated to a high quality prior to being released. The Proposed Drainage Design is included as Appendix 4-2 of the EIAR.

The Project Hydrologist will complete a detailed drainage design and maintenance plan before construction commences and will attend the Site to set out and assist with micro-siting of proposed drainage controls as outlined in Section 4.6 of the EIAR. The drainage system will be excavated and constructed in conjunction with the road and hard standing construction. Drains will be excavated, and settlement ponds constructed to eliminate any suspended solids within surface water running off the site.

Drainage infrastructure within the Proposed Wind Farm site will include:

- Source controls:
 - Interceptor drains, vee-drains, diversion drains, flume pipes, erosion and velocity control measures such as use of sand bags, oyster bags filled with gravel, filter fabrics, and other similar/equivalent or appropriate systems.
 - Small working areas, covering or sealing stockpiles, weathering off stockpiles, cessation of works in certain areas.
- In-Line controls:
 - Interceptor drains, vee-drains, oversized swales, erosion and velocity control measures such as check dams, sand bags, oyster bags, flow limiters, weirs, baffles, silt bags, silt fences, sedimats, filter fabrics, and collection sumps, temporary sumps, sediment traps, pumping systems, settlement ponds, temporary pumping chambers, or other similar/equivalent or appropriate systems.
- Treatment systems:
 - Temporary sumps and ponds, temporary storage lagoons, sediment traps, and settlement ponds, and proprietary settlement systems such as Siltbuster, and/or other similar/equivalent or appropriate systems.

It should be noted that for the Proposed Wind Farm site, an extensive network of forestry and agricultural drains already exist, and these will be integrated and enhanced as required and used within the Proposed Wind Farm drainage system. The integration of the existing forestry drainage network and the Proposed Wind Farm network is relatively simple. The key elements being the upgrading and improvements to existing water treatment elements, such as in line controls and treatment systems, including silt traps, settlement ponds and buffered outfalls.

The main elements of interaction with existing drains will be as follows:

- Apart from interceptor drains, which will convey clean runoff water to the downstream drainage system, there will be no direct discharge (without treatment for sediment reduction, and attenuation for flow management) of runoff from the

Proposed Wind Farm site drainage into the existing site drainage network. This will reduce the potential for any increased risk of downstream flooding or sediment transport/erosion;

- Silt traps will be placed in the existing drains upstream of any streams where construction works / tree felling is taking place, and these will be diverted into proposed interceptor drains, or culverted under/across the works area;
- Runoff from individual turbine hardstanding areas will be not discharged into the existing drain network but discharged locally at each turbine location through settlement ponds and buffered outfalls onto vegetated surfaces;
- Buffered outfalls which will be numerous over the Site will promote percolation of drainage waters across vegetation and close to the point at which the additional runoff is generated, rather than direct discharge to the existing drains of the Proposed Wind Farm site; and,
- Drains running parallel to the existing roads requiring widening will be upgraded, widening will be targeted to the opposite side of the road. Velocity and silt control measures such as check dams, sand bags, oyster bags, flow limiters, weirs, baffles, silt fences will be used during the upgrade construction works. Regular buffered outfalls will also be added to these drains to protect downstream surface waters.

Setbacks from sensitive hydrological features means that adequate room is maintained for the proposed drainage mitigation measures to be properly installed and operate effectively. The proposed buffer zone will:

- Avoid physical damage to watercourses, and associated release of sediment;
- Avoid excavations within close proximity to surface watercourses;
- Avoid the entry of suspended sediment from earthworks into watercourses; and,
- Avoid the entry of suspended sediment from the construction phase drainage system into watercourses, achieved in part by ending drain discharge outside the buffer zone and allowing percolation across the vegetation of the buffer zone;

All of the Proposed Project works will be supervised by the Environmental Clerk of Works (ECow) supported by the Project Hydrologist.

Best practice and practical experience on other similar projects suggest that in addition to the drainage plans that are included in the EIAR, there are additional site-based decisions and plans that can only be made in the field through interaction between the Site Construction Manager, the Project Hydrologist and the Project Geotechnical Engineers. The mechanisms for interaction between these roles are outlined within Section 4.1 of this CEMP.

In relation to decisions that are made on site it is important to stress that these will be implemented in line with the associated drainage controls and mitigation measures outlined in Section 7 of this CEMP, and to ensure protection of all watercourses.

The Project Hydrologist/Design Engineer will complete a site drainage and maintenance plan before construction commences and will attend the Site to set out and assist with micro-siting of proposed drainage controls as outlined in Chapter 4, Section 4.6 of the EIAR. The drainage system will be excavated and constructed in conjunction with the road and hard standing construction. Drains will be excavated, and stilling ponds constructed to eliminate any suspended solids within surface water running off the site.

3.2.4.3 Operational Phase Drainage

The Project Hydrologist will inspect and review the drainage system after construction has been completed to provide guidance on the requirements of an operational phase drainage system. This operational phase drainage system will have been installed during the construction phase in

conjunction with the road and hardstanding construction work as described above and in Section 4.6 of the EIAR.

The drainage system will be monitored in the operational phase until such a time that all areas that have been reinstated become re-vegetated and the natural drainage regime has been restored.

The drainage system will not be altered upon decommissioning. Measures which will be implemented to ensure no impacts upon the drainage system during decommissioning will be outlined within the Decommissioning Plan (Appendix 4-6) and fully agreed with the local authority prior to any decommissioning works.

3.2.4.4 Preparative Site Drainage Management

The detailed drainage design will specify all materials and equipment necessary to implement the drainage measures effectively, which will be brought on site in advance of any works commencing.

An adequate quantity of straw bales, clean stone, terram, stakes, etc. will be kept on site at all times to implement the detailed drainage design measures as necessary. The detailed drainage measures will be installed prior to, or at the same time as the works they are intended to drain.

3.2.4.5 Pre-emptive Site Drainage Management

The works programme for the groundworks part of the construction phase of the Proposed Project will also take account of weather forecasts and predicted rainfall in particular. The site Construction Manager is responsible for making the decision to postpone or abandon works. Large excavations and movements of overburden or large-scale overburden or soil stripping will be suspended or scaled back if heavy rain is forecast. The extent to which works will be scaled back or suspended will relate directly to the amount of rainfall forecast.

3.2.4.6 Reactive Site Drainage Management

In line with the requirements of the EIAR, the final drainage design prepared for the Proposed Project prior to commencement of construction will provide for reactive management of drainage measures. The effectiveness of drainage measures designed to minimise runoff entering works areas and capture and treat silt-laden water from the works areas, will be monitored continuously by the ECoW or supervising hydrologist on-site. The contractor is solely responsible for the implementation of the detailed drainage design on site. The ECoW is responsible for monitoring the effectiveness of the drainage design as it is implemented on-site. The ECoW or supervising hydrologist will respond to changing weather, ground or drainage conditions on the ground as the Proposed Project proceeds, to ensure the effectiveness of the drainage design is maintained in so far as is possible. This may require the installation of additional check dams, interceptor drains or swales as deemed necessary on-site. The drainage design may have to be modified on the ground as necessary, and the modifications will draw on the various features outlined above in whatever combinations are deemed to be most appropriate to situation on the ground as a particular time.

In the event that works are giving rise to siltation of watercourses, the ECoW or supervising hydrologist will stop all works in the immediate area around where the siltation is evident. The source of the siltation will be identified and additional drainage measures such as those outlined above will be installed in advance of works recommencing.

3.2.4.7 Cable Trench Drainage

Cable trenches are typically constructed in short, controlled sections, thereby minimising the amount of ground disturbed at any one time and minimising the potential for drainage runoff to pick up silt or

suspended solids. Each short section of trench is excavated, ducting installed and bedded, and backfilled with the appropriate materials, before work on the next section commences.

To efficiently control drainage runoff from cable trench works areas, excavated material is stored on the up-gradient side of the trench. Should any rainfall cause runoff from the excavated material, the material is therefore collected and contained in the downgradient cable trench. Excess subsoil is removed from the cable trench works area immediately upon excavation, and in the case of the Proposed Project, would be transported to one of the on-site designated spoil management areas or used for landscaping and reinstatement of other areas elsewhere on-site. Along sections of the Proposed Grid Connection underground cabling route that are further removed from the Proposed Wind Farm site it may be more practical to transport excess excavated material to a nearby licenced facility.

On steeper slopes, silt fences will be installed temporarily downgradient of the cable trench works area, or on the downhill slope below where excavated material is being temporarily stored to control run-off.

3.2.4.8 Rainfall Forecasting and Monitoring

Accurate forecasting and monitoring of rainfall is critical to the successful pre-emptive and reactive site drainage management as outlined in the subsections above.

Rainfall forecasts will be obtained for the nearest forecast reference point available via the www.yr.no weather forecasting website. The reference location will be that of Carrow, Co. Tipperary.

<https://www.yr.no/en/forecast/daily-table/2-3306429/Ireland/Munster/County%20Tipperary/Carrow>

Construction personnel will be required to check the forecasted rainfall for the days ahead and plan for or suspend planned works accordingly. The forecasted rainfall should be recorded for reference and comparison with the rainfall levels to be recorded on-site.

Actual rainfall will be monitored on site, ideally via an automated rain gauge with regular recording intervals recommended by the Project Hydrologist and a means of alerting the construction personnel of rainfall trigger levels. Any recorded rainfall data should be available on site at all times for review by the ECoW, Project Hydrologist or any regulatory authorities. The appointed contractor will be required to outline their proposed means of recording rainfall on site to the satisfaction of the ECoW and the Project Hydrologist prior to commencement of works.

3.2.5 Battery Storage - Fire Water Contamination and Toxicity

Firewater from a lithium-ion BESS fire will pick up toxic and corrosive by-products such as hydrofluoric acid, heavy metals, electrolytes, plastics, etc. This contamination occurs quickly, even in early runoff. Contaminated water cannot be reused in firefighting streams for health and safety reasons with increased firefighter exposure risks and possible damage to pumps, hoses and nozzles. In addition, reapplying contaminated water to hot batteries containers may aerosolize toxic compounds, worsening inhalation hazards. The practice on this site will be to comply with industry best practice and to treat all firewater as hazardous waste requiring capture and disposal after a fire incident.

The fire-water retention design for this BESS compound will include capture, contain, and hold contaminated runoff from the worst-credible fire scenarios while keeping it away from drains, groundwater, and off-site receptors. After the fire, the retained water will be sampled, treated, or removed by licensed hazardous-waste contractors.

The objectives of the fire water containment are to:

- Contain all firewater and contaminated rainfall from a worst-case BESS fire without uncontrolled release.
- Segment the compound so a single incident doesn't flood the entire compound or escape the boundary with necessary bunding.
- Provide positive isolation of surface water drains (automatic/manual penstocks), defaulting to "closed on alarm."
- Be chemically compatible with expected contaminants (HF, metals, electrolytes, plastics byproducts) and allow safe sampling, treatment, and removal.

The sizing of the fire water retention capacity is calculated in Appendix 4-4 Fire Risk Management and Emergency Response Plan (Appendix D) of this EIAR, by the addition of the fire flow driven volume and the concurrent rainfall on the catchment. The highest 41-year period of rain fall over a 24-hour period for the area was sourced from Met Eireann's historical data. The hardstand/roof area for the BESS compound is calculated to be 4,140m² with a runoff coefficient of 1. A 15% freeboard to prevent the possibility of overtopping with the most adverse wind exposure case is not applied as the runoff water will be contained in a sealed tank(s).

For further details see Appendix 4-4 Fire Risk Management and Emergency Response Plan of this EIAR.

3.2.6 Refuelling, Fuel and Hazardous Materials Storage

Wherever possible, vehicles will be refuelled off-site, particularly for regular road-going vehicles. On-site refuelling of machinery will be carried out at designated refuelling areas at various locations throughout the site. Heavy plant and machinery will be refuelled on-site by a fuel truck that will come to the site as required on a scheduled and organised basis. All refuelling will be carried out outside designated watercourse buffer zones. Only designated trained and competent operatives will be authorised to refuel plant on-site. Mobile measures such as drip trays and fuel absorbent mats will be used during refuelling operations as required. All plant and machinery will be equipped with fuel absorbent material and pads to deal with any event of accidental spillage.

The following mitigation measures are proposed to avoid release of hydrocarbons at the site:

- All plant will be inspected and certified to ensure that they are leak free and in good working order prior to use at the site.
- Fuels stored on site will be minimised.
- Onsite refuelling will be carried out by trained personnel only;
- All refuelling will be carried out outside of the designated hydrological buffer zones;
- Mobile measures such as dip trays and fuel absorbent mats will be used during refuelling operations as required;
- All plant and machinery will be equipped with fuel absorbent material and pads to deal with any accidental spillage;
- The electrical substation compound will be bunded appropriately to 110% of the volume of oils that will be stored, and to prevent leakage of any associated chemicals to groundwater or surface water. The bunded area will be fitted with a storm drainage system and an appropriate oil interceptor;
- Spill kits will be available to deal with any accidental spillage in and outside the refuelling area.
- An emergency plan for the construction phase to deal with accidental spillages will be developed (refer to Section 6 of this CEMP);
- All hazardous wastes will be stored in bunded containers/areas before being collected by an authorised waste contractor and brought to an EPA licensed waste facility;
- Hazardous wastes will be kept separate from non-hazardous wastes so that contamination does not occur.

3.2.7 Cement Based Products Control Measures

Concrete and other cement-based products are highly alkaline and corrosive and can have significant negative impacts on water quality. They generate very fine, highly alkaline silt (pH 11.5) that can physically damage fish by burning their skin and blocking their gills.

The following mitigation measures are proposed to avoid release of cement leachate from the site:

- No batching of wet-concrete products will occur on the site. Ready-mixed supply of wet concrete products and where possible, emplacement of pre-cast elements, will take place;
- Where possible pre-cast elements for culverts and concrete works will be used;
- Where concrete is delivered on site, only the chute will be cleaned, using the smallest volume of water practicable. No discharge of cement contaminated waters to the construction phase drainage system or directly to any artificial drain or watercourse will be allowed. Chute cleaning water will be undertaken at lined concrete washout ponds;
- Weather forecasting will be used to plan dry days for pouring concrete; and,
- The pour site will be kept free of standing water and plastic covers will be ready in case of sudden rainfall event; and,
- At turbine foundations, lean-mix blinding is used to vertically contain the concrete. While the concrete is contained laterally by temporary/permanent shuttering.

The small volume of water that will be generated from washing of the concrete lorry's chute will be directed into a temporary lined impermeable containment area, or a Siltbuster-type concrete wash unit or equivalent. This type of Siltbuster unit catches the solid concrete and filters and holds wash liquid for pH adjustment and further solids separation. The residual liquids and solids will be removed off-site by an appropriately authorised waste collector for disposal at an authorised waste facility. Where temporary lined impermeable containment areas are used, such containment areas are typically built using straw bales and lined with an impermeable membrane. Two examples are shown below.



Plate 3-1 Typical concrete wash out areas

3.2.8 Tree Felling Drainage Measures

As discussed in Section 2.3.3.9 above, tree felling will be required within the site to allow for the construction of the turbine bases, access roads underground cabling, and the other ancillary infrastructure. The commercial forestry felling activities required as part of the Proposed Project will be the subject of a Limited Felling Licence (LFL) application to the Forest Service in accordance with the Forestry Act 2014 and the Forestry Regulations 2017 (SI 191/2017) and as per the Forest Service's policy on granting felling licenses for wind farm developments.

Mitigation measures will reduce the risk of entrainment of suspended solids and nutrient release in surface watercourses. These measures are derived from best practice guidance documents as outlined below and in Chapter 9 Hydrology and Hydrogeology of the EIAR.

Tree felling to facilitate the Proposed Project will not be undertaken simultaneously with construction groundworks. Keyhole felling to facilitate construction works will take place prior to groundworks commencing. During tree felling there is a potential to generate silts and sediments in surface water runoff due to tracking of machinery and disturbance of the ground surface etc, however mitigation is provided in Chapter 9 Hydrology and Hydrogeology with regard surface water quality protection for this activity which is summarised below. Also, prior to the commencement of subsequent road construction the following key temporary drainage measures will be installed:

- All existing dry forestry drains that intercept the proposed works area will be temporarily blocked down-gradient of the works using forestry check dams/silt traps;
- Clean water diversion drains will be installed upgradient of the works areas;
- Check dams/silt fence arrangements (silt traps) will be placed in all existing forestry drains that have surface water flows and also along existing forestry roadside drains; and,
- A double silt fence perimeter will be placed down-slope of works areas that are located inside the watercourse 50m buffer zone.

Before the commencement of any felling works, an Environmental Clerk of Works (ECoW) shall be appointed to oversee the keyhole and extraction works. The ECoW shall be experienced and competent, and shall have the following functions as proposed in the planning application:

- Attend the site for the setup period when drainage protection works are being installed and be present on Site during the remainder of the forestry keyhole felling works.
- Prior to the commencement of works, review and agree the positioning by the Operator of the required Aquatic Buffer Zones (ABZs), silt traps, silt fencing (see below), water crossings and onsite storage facilities for fuel, oil and chemicals (see further below).
- Be responsible for preparing and delivering the Environmental Tool Box Talk (TBT) to all relevant parties involved in Site operations, prior to the commencement of the works.
- Conduct daily and weekly inspections of all water protection measures and visually assess their integrity and effectiveness in accordance with the proposals outlined in Section 4.2 of this CEMP.
- Take representative photographs showing the progress of operation onsite, and the integrity and effectiveness of the water protection measures.
- Collect water samples for analysis by a 3rd party accredited laboratory, adhering to the following requirements:
- Surface water samples shall be collected upstream and downstream of the keyhole felling site at suitable sampling locations.
- Sampling shall be taken from the stream/river bank, with no in-stream access permitted.
- The following minimum analytical suite shall be used: pH, EC, TSS, BOD, Total P, Ortho-P, Total N, and Ammonia.
- Review of operator's records for plant inspections, evidence of contamination and leaks, and drainage checks made after extreme weather conditions.
- Prepare and maintain a contingency plan.
- Suspend work where potential risk to water from siltation and pollution is identified, or where operational methods and mitigation measures are not specified or agreed.

To protect watercourses, the following measures will be adhered to during all keyhole/tree felling activities:

- Machine combinations (i.e. handheld or mechanical) will be chosen which are most suitable for ground conditions and which will minimise soils disturbance;
- All machinery will be operated by suitably qualified personnel;
- Checking and maintenance of roads and culverts will be on-going through any felling operation. No tracking of vehicle through watercourses will occur, as vehicles will use road infrastructure and existing watercourse crossing points. Where possible, existing drains will not be disturbed during felling works;
- Machines will traverse the site along specified off-road routes (referred to as racks);
- The location of racks will be chosen to avoid wet and potentially sensitive areas;
- Brash mats will be placed on the racks to support the vehicles on soft ground, reducing mineral soil disturbance and erosion and avoiding the formation of rutted areas, in which surface water ponding can occur. Brash mat renewal should take place when they become heavily used and worn. Provision should be made for brash mats along all off-road routes, to protect the soil from compaction and rutting. Where there is risk of severe erosion occurring, extraction will be suspended during periods of high rainfall;
- Silt fences will be installed at the outfalls of existing drains downstream of felling areas. No direct discharge of such drains to watercourses will occur. Sediment traps and silt fences will be installed in advance of any felling works and will provide surface water settlement for runoff from work areas and will prevent sediment from entering downstream watercourses. Accumulated sediment will be carefully disposed of at pre-selected spoil management areas. Where possible, all new silt traps will be constructed on even ground and not on sloping ground;
- In areas particularly sensitive to erosion it will be necessary to install double or triple sediment traps and increase buffer zone width. These measures will be reviewed on site during construction;
- Double silt fencing will also be put down slope of felling areas which are located in close proximity to streams and/or relevant watercourses;
- Drains and silt traps will be maintained throughout all felling works, ensuring that they are clear of sediment build-up and are not severely eroded;
- Timber will be stacked in dry areas, and outside watercourse buffer zones. Check dams and silt traps will be emplaced on the down gradient side of timber storage/processing sites;
- Works will be carried out during periods of no, or low rainfall, in order to minimise entrainment of exposed sediment in surface water runoff;
- Refuelling or maintenance of machinery will not occur within 50m of an aquatic zone or within 20m of any other hydrological feature. Mobile bowser, drip kits, qualified personnel will be used where refuelling is required; and,
- Branches, logs or debris will not be allowed to build up in aquatic zones. All such material will be removed when harvesting operations have been completed, but care will be taken to avoid removing natural debris deflectors.

Table 3-1 Minimum Buffer Zone Widths (Forest Service, 2000)

Average slope leading to the aquatic zone		Buffer zone width on either side of the aquatic zone	Buffer zone width for highly erodible soils
Moderate	(0 – 15%)	10 m	15 m
Steep	(15 – 30%)	15 m	20 m
Very steep	(>30%)	20 m	25 m

3.3 Archaeological Management

This section of the CEMP provides an outline of the Archaeological, Architectural and Cultural Heritage mitigation measures for the construction phase of the Proposed Project.

There are no UNESCO World Heritage Sites or National Monuments located within or along the proposed footprint of the Proposed Project.

- The construction of the Proposed Windfarm will not result in any direct, negative effects on the recorded archaeological, architectural or cultural heritage resource as none of these sites are located within the footprint of the development that requires excavations and ground works.
- The construction of the Proposed Grid Connection Route will not result in any direct negative impacts on recorded archaeological sites, although the route will pass through the Zone of Notification associated with seven sites (AH55, 56, 57, 60, 61, 62, 63). It is possible that excavations works associated with the laying of the Grid Connection may result in a direct, negative (permanent) impact on remains that may be associated with the recorded monuments. The sensitivity of the sites is high and the magnitude of impact may be high, resulting (prior to the application of mitigation) in a potential significant significance of effect.
- The construction of the Grid Connection Route will not result in direct impacts on bridges BH5, BH17, BH24 and the bridge within BH25. At these locations the Grid Connection Route will be laid adjacent to the bridge structure and cross the watercourse by means of directional drilling.
- The construction of the Proposed Turbine Delivery Route will be partially located within AH64, which is a Zone of Archaeological Potential surrounding a possible Deserted Medieval Village, which also contains a number of other archaeological monuments located beyond the 50m study area. It is possible that excavations works associated with the widening of the road may result in a direct, negative (permanent) impact on remains within AH64. The sensitivity of the site is high and the magnitude of impact may be high, resulting (prior to the application of mitigation) in a potential significant significance of effect. No direct impacts are predicted on the bridge within AH64, which is a recorded monument and a protected structure (BH31/AH54).
- The construction of the Grid Connection Route will result in direct, negative (permanent) effects on two bridges location along the Proposed Grid Connection Route – CH83 and CH132. Here the cable will be laid through the bridge structures. The sensitivity off the boundaries is medium and the magnitude of impact is low, resulting in a slight significance of effect in both cases.
- The construction of the Proposed Wind Farm will result in five direct, negative (permanent) impacts on sections of townland boundaries (Carrowkeale, Carrow, Moheragh and Glenpaudeen). The sensitivity off the boundaries is medium and the magnitude of impact is low, resulting in a slight significance of effect in each case.
- During the construction of the Proposed Project, all topsoil stripping in greenfield areas will be subject to archaeological monitoring. This will also include any excavation works adjacent to AH55, 56, 57, 60, 61, 62, 63 and all works within AH64, along with the removal of any townland boundary sections. The laying of the Grid Connection Route through bridges CH83 and CH132 will also be subject to archaeological monitoring. All monitoring works will be carried out under licence to the National Monuments Service of the DoHLGH. If any archaeological remains are identified during the course of the works, further mitigation may be required, such as preservation by record or preservation in-situ. Any further mitigation will require approval from the National Monuments Service of the DoHLGH
- A report on the testing will be compiled on completion of the work and submitted to the NMS and the Planning Authority.
- Further mitigation such as preservation in situ (avoidance), preservation by record (excavation) or buffer zones may be required depending on the results of the testing.

- Should archaeological remains be uncovered during the testing consultation with the NMS will be required regarding the best course of action and further mitigation.
- Archaeological monitoring of all groundworks, within the Proposed Wind Farm site, during the construction stage of the Proposed Project by a licensed archaeologist.
- Further mitigation such as preservation in situ (avoidance), preservation by record (excavation), buffer zones may be required depending on the results of the monitoring.
- Archaeological monitoring will be carried out under licence from the National Monuments Service (NMS) subject to the approval of a methodology for same.
- Further mitigation such as preservation in situ (avoidance) or preservation by record (excavation) may be required depending on the results of the monitoring.
- A report on the monitoring will be compiled on completion of the work and submitted to the NMS and the Planning Authority.

3.4 Traffic Management

This section of the CEMP provides an outline of the traffic management proposals for the construction phase of the Proposed Project. In the event planning permission is granted the final Traffic Management Plan will address the requirements of any relevant planning conditions, including any additional mitigation measures which are conditioned.

3.4.1 Turbine and Materials Transport Route

3.4.1.1 Proposed Wind Farm

It is envisaged that large wind turbine components will be delivered to the Proposed Wind Farm site, from the Port of Cork (Ringaskiddy) (other ports such as Galway Port, Shannon Foynes or Dublin Port could also be used), via the N28 and N40 national primary road, the M8 Motorway, N74 National Secondary Road, R639 and R505 regional roads followed by the L1291, L1283, L1282 and L1154 local roads. The proposed turbine delivery route (TDR) from the M8 to the Proposed Wind Farm site is shown on Figure 15-1a of Chapter 15.

From the Port of Cork (Ringaskiddy), the turbine delivery route is as follows;

- From the Port of Ringaskiddy the route travels west and then north for approximately 16 km via the N28 and N40 National Primary Roads before merging onto the M8 Motorway at Junction 19.
- The route then travels north on the M8 for approximately 84 km before exiting at Junction 9.
- From this point the route travel approximately 2km north on the N74 National Secondary Road and the R639 Regional road into Cashel, Co Tipperary.
- From Cashel the turbine delivery route continues north through Cashel for approximately 13.3km north on the R505 Regional road to the village of Dundrum, Co. Tipperary.
- From the village of Dundrum the turbine delivery route continues north on the L1291 local road for approximately 2km to Gortussa Cross in the townland of Gortarush Lower.
- From this point the route turns right to head northeast on the L1283 local road for approximately 3km, before turning left into third party land in the townland of Carrow in Co. Tipperary.
- At this point the route travel north for approximately 0.3km through the third-party lands.
- The turbine delivery route exits third party lands land in the townland of Carrow in Co. Tipperary and continues west for approximately 4.1km on the L1282 local road the junction with the L1154 in the townland of Scarrough, Co. Tipperary.

- From this point the route continues north for approximately 0.9km on the L1154 to the Proposed Wind Farm site entrance.

From the Port of Ringaskiddy to the site access junction on the L1154 the Turbine Delivery Route is approximately 126km.

A detailed swept path analysis was undertaken for all potential pinch points on the TDR from the turnoff from the M8 at Junction 9 onto the roundabout with the N74, to the proposed access junction off the L1155. The locations included are shown in Figure 15-1b with the assessment discussed in Section 15.1.9.

It is also envisaged that general construction traffic (including materials and staff) will travel to the site via the public road network to the southwest of the site. Traffic movements generated by the Proposed Project are discussed in Section 15.1 of Chapter 15, Material Assets

3.4.1.2 Proposed Grid Connection

It is proposed to construct a 110kV electricity substation within the Proposed Wind Farm site, as shown in Figure 4-1a and Figure 4-1b of Chapter 4. The proposed onsite 110kV substation is located within agricultural land and will be accessed via the internal Proposed Wind Farm site road network.

The footprint of the proposed onsite 110kV substation compound measures approximately 26,550 m² in area and will include 1 no. control buildings and the electrical substation components necessary to consolidate the electrical energy generated by each wind turbine and export that electricity from the onsite 110kV substation to the national grid. The layouts and elevations of the proposed onsite 110kV substation are shown on Figure 4-16 and 4-17 of Chapter 4. The construction and exact layout of electrical equipment in the onsite 110kV substation will be to ESB Networks specifications.

Further details regarding the connection between the onsite 110kV substation and the national electricity grid are provided in Section 4.3.2 of Chapter 4.

The onsite 110kV substation compound will include steel palisade fencing (approximately 2.5 metre high or as otherwise required by ESB), and internal fences will also segregate different areas within the main substation. The onsite substation will remain in place as it will be under the ownership and control of the ESB Networks and/or EirGrid and will form a permanent part of the national electricity grid.

3.4.2 Traffic Mitigation Measures During the Construction Stage

The successful completion of the Proposed Project will require significant coordination and planning and a comprehensive set of mitigation measures will be put in place before and during the construction stage of the Proposed Project in order to minimize the effects of the additional traffic generated.

A detailed **Traffic Management Plan (TMP)**, incorporating all the mitigation measures included as Appendix 15-2 of this EIAR, will be finalised and confirmatory detailed provisions in respect of traffic management agreed with the roads authority and An Garda Síochána prior to construction works commencing on Site. In addition, the traffic management measures proposed for the following construction traffic scenarios are set out for the grid connection in Appendix 15-2:

Traffic Management Plan for Carrow Renewables Wind Farm Development;

- Delivery of Abnormally sized loads,
- Traffic management measures during construction of cable grid connection

The detailed TMP will include the following:

Traffic Management Coordinator – a competent Traffic Management Co-ordinator will be appointed for the duration of the construction of the Proposed Project and this person will be the main point of contact for all matters relating to traffic management.

Delivery Programme – a programme of deliveries will be submitted to Tipperary County Council and other relevant authorities in advance of deliveries of turbine components to the Proposed Project site. Liaison with the relevant local authorities including the roads sections of local authorities that the delivery routes traverse and An Garda Síochána, during the delivery phase of the large turbine vehicles, when an escort for all convoys will be required.

Information to locals – Locals in the area will be informed of any upcoming traffic related matters e.g. delivery of turbine components at night, via letter drops and posters in public places. Information will include the contact details of the Contract Project Co-ordinator, who will be the main point of contact for all queries from the public or local authority during normal working hours. An "out of hours" emergency number will also be provided.

A Pre and Post Construction Condition Survey – A pre-condition survey of roads associated with the Proposed Project will be carried out prior to construction commencement to record the condition of the road. A post construction survey will be carried out after works are completed. Where required the timing of these surveys will be agreed with the local authority.

Implementation of temporary alterations to road network at critical junctions – At locations where required highlighted in Section 15.1.9.

Identification of delivery routes – These routes will be agreed and adhered to by all contractors.

Travel plan for construction workers to Proposed Project site– While the assessment above has assumed the worst case that construction workers will drive to the Proposed Project site, the construction company will be required to provide a travel plan for construction staff, which will include the identification of a routes to / from the site and identification of an area for parking.

Travel plan for construction workers to underground electric cabling route – Due to the transient nature of the underground grid connection construction site which will generally be on a section of the public road, construction workers will be transported to and from the site by the construction company at the beginning and end of each shift.

Drivers conduct – All drivers will follow normal rules of the road and will receive toolbox talk regarding the delivery route and planned holding points prior to any deliveries.

Standard permitted axial loads – Will not be exceeded.

Temporary traffic signs – As part of the traffic management measures temporary traffic signs will be put in place at all key junctions, including the access junction on the L1544 Local Road during the 12-18 months construction period. All measures will be in accordance with the *"Traffic Signs Manual, Section 8 – Temporary Traffic Measures and Signs for Road Works"* (DoT now DoTT&S) and *"Guidance for the Control and Management of Traffic at Roadworks"* (DoTT&S). A member of construction staff (flagman) and signage will be present at access junctions B, J, K and L on days used during the construction period.

Delivery times of large turbine components - The management plan will include the delivery of large wind turbine plant components at night in order to minimise disruption to general traffic during the construction stage.

Re-instatement works - All road surfaces and boundaries will be re-instated to pre-development condition, as agreed with the local authority engineers. All works will be done in accordance with the

Guidelines for the Opening, Backfilling and Reinstatement of Openings in Public Roads, DTTOS, September 2015.

Additional measures - Various additional measures will be put in place in order to minimise the effects of the development traffic on the surrounding road network including wheel washing facilities on Site and sweeping / cleaning of local roads as required.

It is confirmed that details for the Traffic Management Plan for the Proposed Project will be agreed with the Road Section of Tipperary County Council and Limerick County Council prior to construction and contact will be maintained with the Road and Traffic Section throughout the construction phase.

3.5 Dust Control

Construction dust can be generated from many on-site activities such as excavation and backfilling. The extent of dust generation will depend on the type of activity undertaken, the location, the nature of the dust, i.e., soil, sand, peat, etc. and the weather. In addition, dust dispersion is influenced by external factors such as wind speed and direction and/or periods of dry weather. Construction traffic movements also have the potential to generate dust as they travel along the haul route.

In periods of extended dry weather, dust suppression may be necessary along haul roads to ensure dust does not cause a nuisance. If necessary, water will be taken from stilling/settlement ponds in the Wind Farm Site's drainage system and will be pumped into a bowser or water spreader to dampen down haul roads and temporary construction compounds to prevent the generation of dust. Silty or oily water will not be used for dust suppression, because this would transfer the pollutants to the haul roads and generate polluted runoff or more dust. Water bowser movements will be carefully monitored, as the application of too much water may lead to increased runoff.

- Sporadic wetting of loose stone surface will be carried out during the construction phase to minimise movement of dust particles to the air. In periods of extended dry weather, dust suppression may be necessary along haul roads to ensure dust does not cause a nuisance. Water bowser movements will be carefully monitored to avoid, insofar as reasonably possible, increased runoff.
- All plant and materials vehicles shall be stored in dedicated areas within the site.
- Areas of excavation will be kept to a minimum, and stockpiling will be minimised by coordinating excavation, spreading and compaction.
- Turbines and construction vehicles will be transported to the site on specified haul routes only.
- Proposed Grid Connection infrastructure will be transported to the site on specified haul routes only.
- Construction materials for the Proposed Grid Connection and a small volume for the Proposed Wind Farm will be sourced locally from licenced quarries.
- The agreed haul route roads adjacent to the site will be regularly inspected for cleanliness and cleaned as necessary.
- The roads adjacent to the site entrances will be checked weekly for damage/potholes and repaired as necessary.
- The transport of construction materials around the site from the nearby quarry facilities will be covered by tarpaulin where necessary.
- Waste material will be transferred to a licensed /permitted Materials Recovery Facility (MRF) by a fully licensed waste contractor where the waste will be sorted into individual waste streams for recycling, recovery or disposal. The MRF facility will be local to the site to reduce the amount of emissions associated with vehicle movements.

When necessary, sections of the haul route will be swept using a truck mounted vacuum sweeper. It is not anticipated that vehicle or wheel washing facilities will be required as part of the construction phase of the Proposed Project because site roads will be formed before road-going trucks begin to

make regular or frequent deliveries to the site (e.g. with steel or concrete). The site roads will be well finished with compacted hardcore, and so the public road-going vehicles will not be travelling over soft or muddy ground where they might pick up mud or dirt. A road sweeper will be available if any section of the public roads requires cleaning due to construction traffic associated with the Proposed Project.

3.6 Noise Control

The operation of plant and machinery, including construction vehicles, is a source of potential impact that will require mitigation at all locations within the site.

The following proposed measures to control noise will be implemented in full include:

- limiting the hours during which site activities likely to create high levels of noise or vibration are permitted;
- establishing channels of communication between the contractor/developer, Local Authority and residents;
- appointing a site representative responsible for matters relating to noise and vibration;
- monitoring typical levels of noise and vibration during critical periods and at sensitive locations;
- keeping site access roads even to mitigate the potential for vibration from lorries.

Section 8 of BS5228-1:2009+A1:2014 as outlined in Chapter 12 of the EIAR: Noise and Vibration, further recommends a number of simple control measures as summarised below that will be employed onsite:

- Keep local residents informed of the proposed working schedule, where appropriate, including the times and duration of any abnormally noisy activity that may cause concern;
- All vehicles and mechanical plant will be fitted with effective exhaust silencers and be subject to programmed maintenance;
- Select inherently quiet plant where appropriate - all major compressors will be 'sound reduced' models fitted with properly lined and sealed acoustic covers, which will be kept closed whenever the machines are in use;
- All ancillary pneumatic percussive tools will be fitted with mufflers or silencers of the type recommended by the manufacturers;
- Machines will be shut down between work periods (or when not in use) or throttled down to a minimum.
- Regularly maintain all equipment used on site, including maintenance related to noise emissions;
- Vehicles will be loaded carefully to ensure minimal drop heights so as to minimise noise during this operation; and
- All ancillary plant such as generators and pumps will be positioned so as to cause minimum noise disturbance and if necessary, temporary acoustic screens or enclosures will be provided.

Where the BS5228 threshold levels are anticipated to be exceeded due to directional drilling activities along the underground electrical cabling route, the following are examples of measures that will be considered, where necessary, to mitigate noise emissions from these activities are as follows:

- Temporary boarding alongside the drilling rig or use of 'acoustic blanket panels' to hang from heras fencing or similar. Installation will be as close to the drilling rig as is practicable and fitted so as to interrupt any direct line of sight between the drilling rig and the closest residential receptors.
- Examples of appropriate products include Echo Noise Defender and Soundex DeciBloc. It is anticipated that this will be required should directional drilling be used

for the water crossings along the proposed underground grid connection cable route.

Where rock breaking is employed in relation to the Proposed Project, the following are examples of measures that will be employed, where necessary, to mitigate noise emissions from these activities:

- Fit suitably designed muffler or sound reduction equipment to the rock breaking tool to reduce noise without impairing machine efficiency;
- Ensure all leaks in air lines are sealed;
- Erect acoustic screen between compressor or generator and noise sensitive area;
- When possible, line of sight between top of machine and reception point needs to be obscured;
- Enclose breaker or rock drill in portable or fixed acoustic enclosure with suitable ventilation;
- Air overpressure from a blast is difficult to control because of its variability, however, much can be done to reduce the effect. A reduction in the amount of primer cord used, together with the adequate burial of any that is above the ground, can give dramatic reduction to air overpressure intensities especially in the audible frequency range. Most complaints are likely to be received from an area downwind of the blast site, and therefore, if air blast complaints are a continual problem, it would be advisable to postpone blasting during unfavourable weather conditions if possible. As air blast intensity is a function of total charge weight, then a reduction in the total amount of explosives used can also reduce the air overpressure value;
- Further guidance will be obtained from the recommendations contained within BS 5228: Part 1 and the European Communities (Construction Plant and Equipment) (Permissible Noise Levels) Regulations 1988 in relation to blasting operations.

If blasting is undertaken as part of the Proposed Project, a detailed assessment will be undertaken by a specialist blast design engineer to determine the blast design parameters; all mitigation measures specified by the blast design engineer to keep vibration values within the criteria in Section 12.6.1.1, Chapter 12 of the EIAR will be implemented.

Air overpressure from a blast is difficult to control, however, because of its variability much can be done to reduce the effect. A reduction in the amount of primer cord used, together with the adequate burial of any that is above the ground, can give dramatic reduction to air overpressure intensities especially in the audible frequency range. Should complaints arise, they are likely to be received from an area downwind of the blast site, and therefore, blasting will be postponed during unfavourable weather conditions. Furthermore, as air blast intensity is a function of total charge weight, then a reduction in the total amount of explosives used can also reduce the air overpressure value.

Further guidance will be obtained from the recommendations contained within BS 5228: Part 1 and the European Communities (Construction Plant and Equipment) (Permissible Noise Levels) Regulations 1988 in relation to blasting operations.

The methods used to minimise complaints could consist of some or all of the following:

- Restriction of hours within which blasting can be conducted (e.g. 09:00 – 18:00hrs).
- Notification to nearby residents before blasting starts (e.g. 24-hour written notification).
- The firing of blasts at similar times to reduce the 'startle' effect.
- On-going circulars informing people of the progress of the works.
- The implementation of an onsite documented complaints procedure.

- The use of independent monitoring by external bodies for verification of results.
- Trial blasts in less sensitive areas to assist in blast designs and identify potential zones of influence.

3.7 Invasive Species Management

A baseline invasive species survey was carried out at the site to identify the presence and location of any invasive species (listed under the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. No. 477 of 2011)) by a suitably qualified ecologist. As outlined in Chapter 6 of the EIAR, no Third Schedule Alien Invasive species were recorded within the footprint of the Proposed Wind Farm or Proposed Grid Connection during the survey conducted. During field surveys undertaken, Japanese Knotweed and Giant Knotweed were recorded at three locations and one location respectively, within the Proposed Wind Farm site. These species were not recorded along the Proposed Grid Connection underground cabling route or along the Proposed TDR. The identified stands of Japanese Knotweed and Giant Knotweed within the Proposed Wind Farm site are indicated in Figure 3-1 of Appendix 6-5, Invasive Species Management Plan. Infestations varied in size, but all were recorded directly adjacent to the existing road infrastructure and bordering agricultural and woodland habitat.

The coordinates of all Japanese knotweed and Giant Knotweed recorded, as well as location in relation to proposed infrastructure in Section 4.1 of Appendix 6-5, Invasive Species Management Plan.

3.7.1 Japanese Knotweed (*Reynoutria japonica*) and Giant Knotweed (*Reynoutria sachalinensis*)

Japanese Knotweed (*Reynoutria japonica*) is a tall, vigorous, ornamental plant that escaped cultivation in the late nineteenth century and has since become an aggressive invader in both rural and urban environments. The plant can grow up to 2-3m high, and its root system can extend up to 3m into the ground and 7m laterally from the parent plant. The reason this plant is such a threat is due to the nature of its regeneration. Cut fresh stems can produce fresh shoots and roots (rhizome) from nodes when immersed in soil or water. Very small fragments (0.7g) of fresh Knotweed shoot and root material have the potential to start a whole new plant (Environment Agency, 2013).

Giant Knotweed (*Reynoutria sachalinensis*) is native to Japan and parts of Eastern Asia and is closely related to Japanese Knotweed. Like Japanese Knotweed, it is highly invasive and resistant and possesses an extensive rhizome system making it difficult to eradicate. The plant can grow up to 2-4m tall during the summer months.

During field surveys undertaken, Japanese Knotweed and Giant Knotweed were recorded at three locations and one location respectively, within the Proposed Wind Farm site. These species were not recorded along the Proposed Grid Connection underground cabling route or along the Proposed TDR. The identified stands of Japanese Knotweed and Giant Knotweed within the Proposed Wind Farm site are indicated in Figure 3-1 of Appendix 6-5, Invasive Species Management Plan. Infestations varied in size, but all were recorded directly adjacent to the existing road infrastructure and bordering agricultural and woodland habitat.

The coordinates of all Japanese knotweed and Giant Knotweed recorded, as well as location in relation to proposed infrastructure, are provided in Table 3-1 of Appendix 6-5, Invasive Species Management Plan.

3.7.1.1 Proposed Management Strategy

All recordings of Japanese Knotweed and Giant Knotweed were recorded in habitats adjacent to the Proposed Wind Farm site. This species was not recorded along the Proposed Grid Connection

underground cabling route or Proposed Turbine Delivery Route (TDR). Therefore, the proposed management strategy below has been designed to ensure that there is no inadvertent spread of this species only, as a result of the Proposed Project.

3.7.1.1.1 Site Set-up

Prior to the commencement of any works, the following steps will be undertaken:

- A pre-commencement survey for Japanese Knotweed and Giant Knotweed will be undertaken by a suitably qualified ecologist to determine the locations and extent of the species within the Proposed Project site and record any changes in the extent of the infestation since the 2024 and 2025 surveys. It will also serve to identify if this species has established elsewhere within the Site.
- The locations and extent of Japanese Knotweed and Giant Knotweed within the Proposed Wind Farm site, and along the Proposed Grid Connection underground cabling route and TDR, should it establish, will be clearly marked out using hazard tape to ensure they are not disturbed. An exclusion zone surrounding each stand will also be identified and an appointed ecological clerk of works (ECoW) will inform the extent of the area to be treated as potentially contaminated. The exclusion zone will extend to 7m around the identified stands.
- The ECoW will be appointed to supervise all works carried out within the exclusion zones, when required.
- All site and turbine transport staff will receive a toolbox talk from the ECoW regarding the identification and protocols surrounding Japanese Knotweed and Giant Knotweed within the Proposed Wind Farm site.

3.7.1.1.2 Vegetation clearance

To accommodate the Proposed Project, the requirement for the removal of vegetation will arise. As stands of Japanese Knotweed and Giant Knotweed are located in proximity to the Proposed Wind Farm infrastructure, the following will be undertaken to ensure these accommodation works do not exacerbate the spread of these species into the wider environment:

- All vegetation clearance in proximity to recorded stands of Japanese Knotweed and /or Giant Knotweed will be undertaken under the supervision of the appointed ECoW. No vegetation cleared from within the 7m exclusion zone will be removed from the infested area.
- All personnel and machinery which enter the exclusion zones must be thoroughly washed down, as per the following:
 - All plant, machinery, tools and personnel will be cleaned down prior to leaving the contaminated areas.
 - Clean down will be undertaken on an impermeable membrane such as a radon barrier and following completion of the clean down operation, this will be brushed clean with sweepings left within the contaminated area to ensure that there is no potential to spread any contaminated material.
 - Power washing will be avoided to prevent potentially contaminated run-off spreading outside the site.
 - No plant, machinery, tools, or personnel will leave the exclusion zone, until authorised by the ECoW. All washed down material will remain within the 7m exclusion zone.

3.7.2 Giant Hogweed (*Heracleum mantegazzianum*)

Giant Hogweed is a highly invasive plant from the Caucasus region, and it is now found in many parts of Ireland. It spreads rapidly, outcompeting native plants, and is widely known for its immense size which

can reach 2-5m in height. Giant Hogweed is commonly found along watercourses in moist, nutrient-rich soils, in addition to disturbed areas including roadsides (Japanese Knotweed Control Ltd., 2024).

During the field surveys undertaken, Giant Hogweed was recorded at three locations along the Proposed Grid Connection underground cabling route, two in close proximity to mapped watercourses. Giant Hogweed was not recorded within the Proposed Wind Farm site or along the Proposed TDR. All recordings of this species within the Proposed Project site were recorded along the Proposed Grid Connection underground cabling route. The locations of this species are shown on Figure 3-2 of Appendix 6-5, Invasive Species Management Plan.

The coordinates of all Giant Hogweed recorded are provided in Table 3-2 of Appendix 6-5, Invasive Species Management Plan.

3.7.2.1 Proposed Management Strategy

Recordings of Giant Hogweed occur in proximity to the Proposed Grid Connection underground cabling route and therefore, the following steps will be taken to ensure that this species does not spread into the wider environment, as a result of the Proposed Project.

3.7.2.1.1 Site Set Up

- Additional pre-commencement surveys will be undertaken by a suitably qualified ecologist to determine the location and extent of the species and record any changes in the extent and/or location of this species which may have occurred since the 2024 and 2024 surveys.
- The locations and extent of Giant Hogweed along the Proposed Grid Connection underground cabling route will be clearly marked out using temporary fencing/markers to ensure they are not disturbed. An exclusion zone surrounding each stand will also be identified and will inform the extent of the area to be treated as potentially contaminated. The exclusion zone will extend to 4m around the identified stands (TII, 2020).
- An ecological clerk of works (ECoW) will be appointed to supervise all works carried out within the exclusion zones.
- All staff will receive a toolbox talk from the ECoW regarding the identification and protocols surrounding Giant Hogweed along the Proposed Grid Connection underground cabling route.
- Given that short sections of the Proposed Grid Connection underground cabling route will be laid within the above 4m exclusion zones, the measures in Sections 3.2.1.2 and 3.2.1.3 of Appendix 6-5, Invasive Species Management Plan will be in place to ensure there is no spread of this species.
- The treatment and control of invasive alien species will follow guidelines issued by Transport Infrastructure Ireland (TII) - The Management of Invasive Alien Plant Species on National Roads – Technical Guidance (TII, 2020).

3.7.2.1.2 Excavation within Contaminated Areas and Retention on-site

- The Proposed Grid Connection underground cabling route will be laid a 4m from the identified stands where possible to minimise the likelihood of encountering roots.
- Once machinery and personnel enter the contaminated area, they will not leave until they have been cleaned down following the procedure that is set out in Section 3.2.1.3 of Appendix 6-5, Invasive Species Management Plan.
- Excavated material will be kept within the contaminated area and will either be backfilled into the trench following the pipelaying operation or will remain within the contaminated zone adjacent to the trench and be graded and reseeded. No excavated material will leave the contaminated zone.
- Following works, all personnel, equipment and machinery will be cleaned down as per the methodology in Section 3.2.1.3 of Appendix 6-5, Invasive Species Management Plan, prior to exiting the contaminated area.

3.7.2.1.3 Clean Down Procedure

- All plant, machinery, tools and personnel will be cleaned down prior to leaving the contaminated areas.
- Clean down will be undertaken on an impermeable membrane such as a radon barrier and following completion of the clean down operation, this will be brushed clean with sweepings left within the contaminated area to ensure that there is no potential to spread any contaminated material.

Power washing will be avoided to prevent potentially contaminated run-off spreading outside the contaminated zone

3.7.3 Rhododendron (*Rhododendron ponticum*)

Rhododendron (*Rhododendron ponticum*) is an evergreen, acid loving shrub introduced to Ireland in the 18th Century. It can withstand considerable shade and thrives as an understorey species in woodland, though it also tolerates open conditions in suitable acid soils. In addition to shading, the foliage of rhododendron contains various compounds that have an allelopathic action on other species (inhibiting their growth) which may further inhibit plants from growing within close proximity (Higgins, 2008).

During field surveys undertaken, a small infestation of Rhododendron was recorded at one location along the Proposed Grid Connection underground cabling route, in addition to one location along the Proposed TDR within a private garden, although not within the proposed accommodation works. Rhododendron was not recorded within the Proposed Wind Farm site. The location of this species is shown on Figure 3-2 of Appendix 6-5, Invasive Species Management Plan, with the coordinates presented in Table 3-3 of Appendix 6-5, Invasive Species Management Plan.

3.7.3.1 Proposed Management Strategy

One stand of Rhododendron was recorded adjacent to the Proposed Grid Connection underground cabling route and therefore, the following steps will be taken to ensure that this species does not spread into the wider environment, as a result of the Proposed Project.

3.7.3.1.1 Site Set Up

- Additional pre-commencement surveys will be undertaken by a suitably qualified ecologist to determine the location and extent of this species and record any changes in the extent of the infestation since the 2024 and 2025 surveys.
- The locations and extent of Rhododendron along the Proposed Grid Connection underground cabling route will be clearly marked out using temporary fencing/markers to ensure they are not disturbed. An exclusion zone surrounding each stand will also be identified and will inform the extent of the area to be treated as potentially contaminated. The exclusion zone will extend to 10m around the identified stands (Higgins, 2008).
- An ecological clerk of works (ECow) will be appointed to supervise all works carried out within the exclusion zones.
- All staff will receive a toolbox talk from the ECow regarding the identification and protocols surrounding Rhododendron along the Proposed Grid Connection underground cabling route.
- Given that short sections of the Proposed Grid Connection underground cabling route will be laid within the above 10m exclusion zones, the measures in Section 3.3.1.2 and 3.3.1.3 of Appendix 6-5, Invasive Species Management Plan will be in place to ensure there is no spread of this species.

- The treatment and control of invasive alien species will follow guidelines issued by the Transport Infrastructure Ireland (TII) - The Management of Invasive Alien Plant Species on National Roads – Technical Guidance (TII, 2020).

3.7.3.1.2 **Excavation within Contaminated Areas and retention on-site**

- The Proposed Grid Connection underground cabling route will be laid as far as possible from the identified stands to minimise the likelihood of encountering roots.
- Once machinery and personnel enter the contaminated area, they will not leave until they have been cleaned down following the procedure that is set out in Section 3.3.1.3 of Appendix 6-5, Invasive Species Management Plan.
- Excavated material will be kept within the contaminated area and will either be backfilled into the trench following the pipelaying operation or will remain within the contaminated zone adjacent to the trench and be graded and reseeded. No excavated material will leave the contaminated zone.
- Following works, all personnel, equipment and machinery will be cleaned down as per the methodology in Section 3.3.1.3 of Appendix 6-5, Invasive Species Management Plan, prior to exiting the contaminated area.

3.7.3.1.3 **Clean Down Procedure**

- All plant, machinery, tools and personnel will be cleaned down prior to leaving the contaminated areas.
- Clean down will be undertaken on an impermeable membrane such as a radon barrier and following completion of the clean down operation, this will be brushed clean with sweepings left within the contaminated area to ensure that there is no potential to spread any contaminated material.

Power washing avoided to prevent potentially contaminated run-off spreading outside the contaminated zone.

3.8 **Waste Management**

This section of the CEMP provides a waste management plan (WMP) which outlines the best practice procedures during the excavation and construction phases of the project. The WMP will outline the methods of waste prevention and minimisation by recycling, recovery, and reuse at each stage of construction of the Proposed Project. Disposal of waste will be seen as a last resort.

3.8.1 **Legislation**

The Waste Management Act 1996 and its subsequent amendments provide for measures to improve performance in relation to waste management, recycling and recovery. The Act also provides a regulatory framework for meeting higher environmental standards set out by other national and EU legislation.

The Act requires that any waste related activity has to have all necessary licenses and authorisations. It will be the duty of the Waste Manager on the site of the development to ensure that all contractors hired to remove waste from the site have valid Waste Collection Permits. It will then be necessary to ensure that the waste is delivered to a licensed or permitted waste facility. The hired waste contractors and subsequent receiving facilities must adhere to the conditions set out in their respective permits and authorisations.

The Department of the Environment provides a document entitled, 'Best Practice Guidelines on the Preparation of Waste Management Plans for Construction and Demolition Projects' (2006). It is

important to emphasise that no demolition will take place at this site, however, this document was referred to throughout the process of completing this WMP.

3.8.2 Waste Management Hierarchy

The waste management hierarchy sets out the most efficient way of managing in the following order:

Prevention and Minimisation:

The primary aim of the WMP will be to prevent and thereby reduce the amount of waste generated at each stage of the project.

Reuse of Waste:

Reusing as much of the waste generated on site as possible will reduce the quantities of waste that will have to be transported off site to recovery facilities or landfill.

Recycling of Waste:

There are a number of established markets available for the beneficial use of Construction waste such as using waste concrete as fill for new roads.

At all times during the implementation of the WMP, disposal of waste to landfill will be considered only as a last resort.

3.8.3 Construction Phase Waste Management

3.8.3.1 Description of the Works

The construction of the Proposed Project will involve the construction of:

- Proposed Wind Farm: this refers to turbines and associated foundations and hardstanding areas, including access roads, underground cabling, permanent meteorological mast, temporary construction compounds, junction accommodation works, spoil management areas, borrow pits, tree felling, site drainage, operational stage signage, battery energy storage system, 110kV onsite substation, and all ancillary works and apparatus. The Proposed Wind Farm is described in detail in Chapter 4 of this EIAR.
- Proposed Grid Connection Route: this refers to underground 110kV cabling connecting to the existing Killonan 110kV substation Co. Limerick, and all ancillary works and apparatus. The Proposed Grid Connection Route is described in detail in Chapter 4 of this EIAR.

The turbines and meteorological mast will be manufactured off-site and delivered to the site where on site erection will occur.

The turbine and meteorological mast foundations will consist of stone from the onsite borrow pit and a concrete base which will contain reinforcing steel. These concrete foundations will be shuttered with steel formwork specifically designed for the works and re-usable off site on similar projects.

The new site roads and existing roads for upgrade will be constructed with rock sourced predominantly from the onsite borrow pit, with some material sourced from local quarries.

The onsite electrical substation and control buildings will be constructed on a concrete foundation with the buildings constructed with concrete masonry blocks with a timber roof structure and roof tile or slate covering. The roof structure will be made up of prefabricated roof trusses manufactured off site to minimise timber cutting on site. The construction of the underground electrical cabling (Grid Connection & Wind Farm) will consist of excavating sections of a trench, laying the ducting and cabling and backfilling.

The waste types arising from the construction phase of the Proposed Project are outlined in Table 3-2 below.

Table 3-2 Expected waste types arising during the Construction Phase

Material Type	Example	EW Code
Cables	Electrical wiring	17 04 11
Cardboard	Boxes, cartons	15 01 01
Composite packaging	Containers	15 01 05
Metals	Copper, aluminium, lead, iron and steel	17 04 07
Inert materials	Sand, stones, plaster, rock, blocks	17 01 07
Mixed municipal waste	Daily canteen waste from construction workers, miscellaneous	20 03 01
Plastic	PVC frames, electrical fittings	17 02 03
Plastic packaging	Packaging with new materials	15 01 02
Tiles and ceramics	Slates and tiles	17 01 03
Wooden packaging	Boxes, pallets	15 01 03
Tarmac/Bitumen	Road surfacing along Grid Connection underground connection cabling route	17 03 02

Hazardous wastes that may occur on site during the construction phase of the development may include oil, diesel fuel, chemicals, paints, preservatives etc. All hazardous wastes will be stored in bunded containers/areas before being collected by an authorised waste contractor and brought to an EPA licensed waste facility. As mentioned above, hazardous wastes will be kept separate from non-hazardous wastes so that contamination does not occur.

3.8.3.2 Waste Arising and Proposals for Minimisation, Refuse and Recycling of Construction Waste

Construction waste will arise on the project mainly from excavation and unavoidable construction waste including material surpluses and damaged materials and packaging waste.

Appropriate measures will be taken to ensure excess waste is not generated during construction, including:

- Ordering of materials will be on an 'as needed' basis to prevent over supply to site. Co-ordination is required with suppliers enabling them to take/buy back surplus stock;
- Purchase of materials pre-cut to length to avoid excess scrap waste generated on site;
- Request that suppliers use least amount of packaging possible on materials delivered to the site;
- Ensuring correct storage and handling of goods to avoid unnecessary damage that would result in their disposal;
- Ensuring correct sequencing of operations;
- Use reclaimed materials in the construction works.

Hazardous waste will be kept separate from all other construction waste to prevent contamination and removed appropriately.

3.8.3.3 Waste Arising from Construction Activities

All waste generated on site will be contained in waste skips at a waste storage area on site. This waste storage area will be kept tidy with skips clearly labelled to indicate the allowable material to be disposed of therein.

The expected waste volumes generated on site are unlikely to be large enough to warrant source segregation at the wind farm site. Therefore, all wastes streams generated on site will be deposited into a single waste skip. This waste material will be transferred to a Materials Recovery Facility (MRF) by a fully licensed waste contractor where the waste will be sorted into individual waste streams for recycling, recovery or disposal.

The waste generated from the turbine erection will be limited to the associated protective covers which are generally reusable. Considering the specialist nature of this packaging material the majority will be taken back by suppliers for their own reuse. Any other packaging waste generated from the turbine supply will be deposited into the on-site skips and subsequently transferred to the MRF.

It is not envisaged that there will be any waste material arising from the materials used to construct the site roads as only the quantity of stone necessary will be sourced from the on-site borrow pit and local quarries and brought on site on an 'as needed' basis.

Site personnel will be instructed at induction that under no circumstances can waste be brought to site for disposal in the on-site waste skip. It will also be made clear that the burning of waste material on site is forbidden.

3.8.3.4 Waste Arising from Decommissioning

The design life of the proposed renewable energy development is 35 years after which time a decision will be made to determine whether or not the turbines will be replaced by new turbines or if decommissioning will occur. The lengthy time frame between the completion of the construction phase and decommissioning will result in the only materials remaining on site at that time will be infrastructural material such as the turbine foundations, turbines and the granular material used to construct roads. When the site is decommissioned, cranes will disassemble each turbine tower and all equipment. The associated components will be removed from site for re-use, recycling or waste disposal. Any structural elements that are not suitable for recycling will be disposed of in an appropriate manner. All lubrication fluids will be drained down and put aside for appropriate collection, storage, transport and disposal. Any materials which cannot be re-used or recycled will be disposed of by an appropriately licenced contractor.

The waste types arising from the decommissioning of the development are outlined in Table 3-3 below.

Table 3-3 Expected Waste types arising during the Decommissioning Phase

Material Type	Example	EW Code
Cables	Electrical wiring	17 04 11
Metals	Copper, aluminium, lead, iron and rebar	17 04 07
Inert materials	Crushed stone, concrete	17 01 07
Lubricating Oils/Fluids	Oils used within wind turbines	13 02 04
Plastic	PVC frames, electrical fittings	17 02 03

3.8.3.5 Reuse

Many construction materials can be reused a number of times before they have to be disposed of:

- Concrete can be reused as aggregate for roads cable trench backfilling material.
- Plastic packaging etc. can be used to cover materials on site or reused for the delivery of other materials.

3.8.3.6 Recycling

If a certain type of construction material cannot be reused onsite, then recycling is the most suitable option. The opportunity for recycling on site will be restricted to the associated packaging from the wind turbines.

All waste that is produced during the construction phase including dry recyclables will be deposited in the on-site skip initially and sent for subsequent segregation at a remote facility. The anticipated volume of all waste material to be generated at the development is low which provides the justification for adopting this method of waste management.

3.8.3.7 Implementation

3.8.3.7.1 Roles and Responsibilities for Waste Management

Prior to the commencement of the development a Construction Waste Manager will be appointed by the Contractor. The Construction Waste Manager will be in charge of the implementation of the objectives of the plan, ensuring that all hired waste contractors have the necessary authorisations and that the waste management hierarchy is adhered to. The person nominated must have sufficient authority so that they can ensure everyone working on the development adheres to the management plan.

3.8.3.7.2 Training

It is important for the Construction Waste Manager to communicate effectively with colleagues in relation to the aims and objectives of the waste management plan. All employees working on site during the construction phase of the project will be trained in materials management and thereby, should be able to:

- Distinguish reusable materials from those suitable for recycling;
- Ensure maximum segregation at source;

- Co-operate with site manager on the best locations for stockpiling reusable materials;
- Separate materials for recovery; and
- Identify and liaise with waste contractors and waste facility operators.

3.8.3.7.3 **Record Keeping**

The WMP will provide systems that will enable all arisings, movements and treatments of construction waste to be recorded. This system will enable the contractor to measure and record the quantity of waste being generated. It will highlight the areas from which most waste occurs and allows the measurement of arisings against performance targets. The WMP can then be adapted with changes that are seen through record keeping.

The fully licensed waste contractor employed to remove waste from the site will be required to provide documented records for all waste dispatches leaving the site. Each record will contain the following:

- Consignment Reference Number Material Type(s) and EWC Code(s)
- Company Name and Address of Site of Origin
- Trade Name and Collection Permit Ref. of Waste Carrier
- Trade Name and Licence Ref. of Destination Facility
- Date and Time of Waste Dispatch
- Registration no. of Waste Carrier vehicle
- Weight of Material
- Signature of Confirmation of Dispatch detail
- Date and Time of Waste Arrival at Destination
- Site Address of Destination Facility

3.8.3.8 **Waste Management Plan Conclusion**

The WMP will be properly adhered to by all staff involved in the Proposed Project which will be outlined within the induction process for all site personnel. The waste hierarchy will always be employed when designing the plan to ensure that the least possible amount of waste is produced during the construction phase. Reuse of certain types of construction wastes will cut down on the cost and requirement of raw materials therefore further minimising waste levels.

This preliminary WMP has been prepared to outline the main objectives that are to be adhered to for the preparation of a more detailed WMP to be completed after the planning phase of the Proposed Project.

4. ENVIRONMENTAL MANAGEMENT IMPLEMENTATION

4.1 Roles and Responsibilities

The Project Developer will appoint a design team to prepare the detailed design for the Proposed Project prior to the commencement of construction and ensure all planning and environmental obligations are met. The developer will appoint a Project Contractor who will be responsible for the construction of the Proposed Project in accordance with this CEMP which will be updated by the contractor as required during the construction phase of the Proposed Project. Any updated CEMP must meet or exceed the standards and requirements set out in this document.

The Environmental Clerk of Works (ECoW) will be nominated by the Project Developer to oversee the Project Contractor's effective implementation of the Proposed Project's environmental requirements and obligations, as captured in the CEMP. The ECoW will be responsible for monitoring the works of the Project Contractor from an environmental perspective on behalf of the Project Developer. For the sake of expediency, the ECoW will report their ongoing audit findings, monitoring results and site observations to both the Project Developer and the Project Contractor, having been nominated by the developer to fulfil the role.

The ECoW will have the power to halt the works, should the need arise and will be supported by the developer to ensure the contractor adheres to such an instruction.

The ECoW will also have to call upon the Project Ecologist, Project Hydrologist, or other members of the Project Developer's design team, as required, to oversee the contractor's works on-site.

An organogram structure for the construction stage roles is as outlined below.

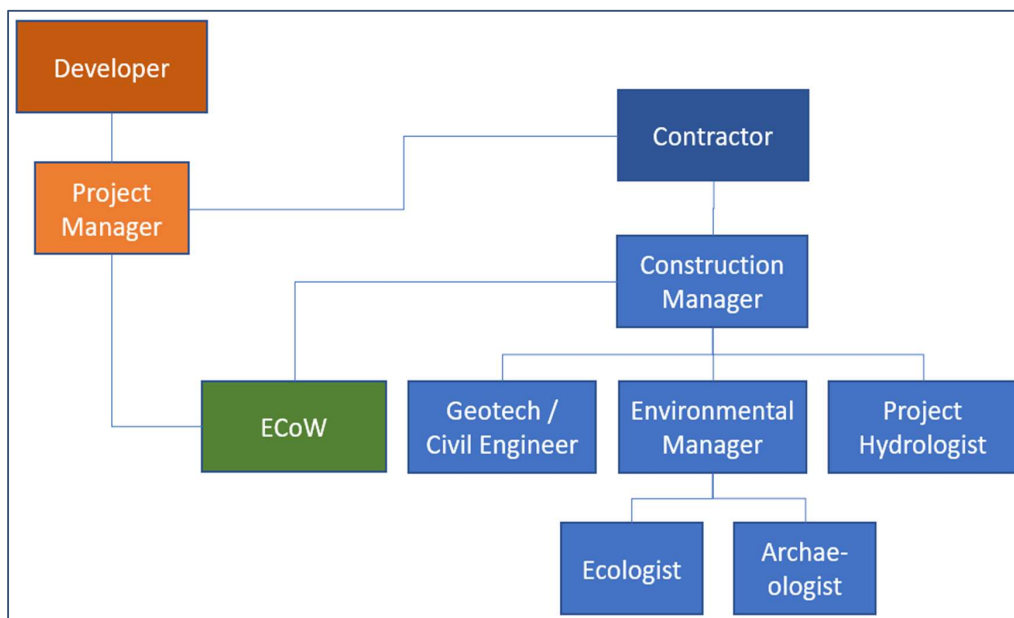


Figure 4-1 Proposed Project Organogram

Any requirement of the granted permission, for the works to be supervised by an engineer with professional indemnity insurance, who upon completion of the works, shall certify the said works, will

be adhered to. Such an engineer will be appointed to oversee and supervise the construction phase of the Proposed Project.

4.1.1 Construction Manager

The Project Contractor will be required to nominate a Construction Manager who will have responsibility for the organisation and execution of environmental requirements outlined in this CEMP or any further versions thereof. The Construction Manager will have an assigned deputy who will fulfil the role of Environmental Manager. To implement the CEMP, the Construction Manager with the assistance of the Environmental Manager will be required to:

- Implement all Proposed Project design requirements to minimise environmental risk;
- Implement all CEMP requirements and measures to minimise environmental risk;
- Ensure any site personnel responsible for directing works on site are familiar with all requirements of the CEMP;
- Propose revisions to the Proposed Project's CEMP for approval of the Project Developer, project design team and ECoW, only where any such revisions meet or exceed the standards and requirements set out in this document;
- Ensure that all environmental standards are achieved during the construction phase of the Proposed Project ;
- Promptly implement any remedial action required to rectify and close-out any non-compliant items identified by the ECoW;
- Ensure immediate notification of environmental incidents are issued to the ECoW, the Project Developer and the relevant authorities, initially by phone and as soon as is practicable by e-mail;
- Identify environmental training requirements and arrange relevant training for all levels of site-based staff/workers.
- Ensure that all construction activities are planned and performed such that minimal risk to the environment is introduced.

4.1.2 Site Environmental Clerk of Works

The Project Developer will be required to engage a qualified Environmental Engineer, Environmental Scientist, or equivalent, with experience in wind farm construction to fulfil the role of Environmental Clerk of Works (ECoW) to oversee the construction works and audit the implementation of the CEMP. The ECoW will report to the Project Developer and Project Contractor but will liaise closely with the Construction Manager in relation to the Project Contractor's day-to-day implementation of the CEMP on site. The responsibilities and duties of the ECoW will include the following:

- Review/approval of the CEMP and supporting environmental documentation and review/approval of contractor method statements;
- Undertake environmental monitoring, inspections and reviews to ensure the works are carried out in compliance with the CEMP by the Project Contractor;
- Manage the water quality monitoring programme and turbidity monitors;
- Maintain a live Actions List and accompanying map outlining any corrective actions across the site requiring attention or action by the contractor;
- Confirm for the Project Contractor that pre-commencement requirements have been met to allow construction activities to commence;
- Highlight for the contractor, any abandonment triggers that are occurring and inform the contractor that works are to cease;
- Generate environmental reports as required to show environmental data trends and ensure environmental records are maintained throughout the construction period;
- Advise site management/contractor/sub-contractors on:
 - Prevention of environmental pollution and improvement to existing working methods;

- Changes in legislation and legal requirements affecting the environment;
- Suitability and use of plant, equipment and materials to prevent pollution;
- Environmentally sound methods of working and systems to identify environmental hazards;
- Assist the contractor in coordinating the required inputs and site visits from the Project Ecologist or Project Hydrologist to support the ECoW role;
- Ensure immediate notification of any environmental incidents are issued to the Construction Manager and Project Developer;
- Support the investigation of incidents of significant, potential or actual environmental damage and ensure corrective actions are carried out, recommend means to prevent recurrence and communicate incident findings to relevant parties.
- Liaise with the Project Design Team and attend meetings to report on audit findings
- Support the contractor who will be responsible for providing toolbox talks and site induction content to ensure the requirements of the CEMP are delivered on site.
- The geotechnical design requirements of the Proposed Project are not within the remit of the ECoW.

The level, detail and frequency of reporting expected from the ECoW for the Construction Manager, Developer's Project Manager, and any Authorities or other Agencies, will be agreed by all parties prior to commencement of construction, and may be further adjusted as required during the course of the Proposed Project.

4.1.3 Project Ecologies/Ornithologist

The Project Ecologist will be available to support the ECoW on matters relating to the protection of sensitive habitats and species encountered prior to or during the construction phase of the Proposed Project. The Project Ecologist will not be full time on site but will undertake pre-commencement surveys and visit the site as required. The responsibilities and duties of the Project Ecologist/Ornithologist will include the following:

- Undertake a pre-construction transect/walkover bird survey to ensure that significant effects on breeding birds will be avoided.
- Inform and educate on-site personnel of the ornithological and ecological sensitivities within the site.
- Oversee management of ornithological and ecological issues during the construction period and advise on ornithological issues as they arise.
- Provide guidance to contractors to ensure legal compliance with respect to protected species onsite.
- Liaise with officers of consenting authorities and other relevant bodies with regular updates in relation to construction progress.

4.1.4 Project Hydrologist

The Project Hydrologist is part of the design team that will prepare the detailed drainage design for the construction phase of the Proposed Project, but will also support the ECoW in monitoring, overseeing and auditing the effective implementation of the detailed drainage design by the Project Contractor. The Project Hydrologist will not be full time on site but will be required to visit as necessary to oversee the implementation of their drainage design.

The responsibilities and duties of the Project Hydrologist will include the following:

- Preparation of detailed drainage design before construction commences;
- Input to the CEMP in respect of drainage design and water quality management;
- Attend site to support ECoW and oversee and audit the effective implementation of the detailed drainage design;

- Complete ongoing inspection and monitoring of the development, particularly in areas of drainage control in support of the ECoW in monitoring the effectiveness of the drainage design as it is implemented on-site.

4.1.5 Project Archaeologist

The Project Archaeologist will report to the Environmental Manager/ECoW and is responsible for archaeological monitoring of the site during the construction phase. This will include monitoring of site investigations and excavation works as well as the monitoring and metal detection of spoil during construction.

If new archaeological material is detected during the pre-construction re-inspection, testing or monitoring, the project archaeologist will be responsible for ensuring they are preserved by record (archaeologically excavated) and therefore permanently removed with a full record made.

4.1.6 Project Geotechnical Engineer/Civil Engineer

The Geotechnical Engineer will report to the Construction Manager and is responsible for inspection and review of geotechnical aspects associated with construction of the Proposed Project. The Geotechnical Engineer will not be full time on site but will visit site at least once a month during the construction phase civil works and on a weekly basis during site preparation/groundworks.

The responsibilities and duties of the Geotechnical Engineer will include the following:

- Visit site regularly, or at least once a month during the construction phase, to complete geotechnical audits and reviews and report any issues to the Construction Manager;
- Ensuring that identified hazards are listed in the Geotechnical Risk Register and that these are subject to ongoing monitoring; and,
- Ongoing inspection and monitoring of the Proposed Project, particularly in temporary stockpile areas, through all phases of construction (including pre, during and post construction) and ensure construction is carried out as specified in the EIAR, NIS and in relevant planning conditions.

4.2 Water Quality and Monitoring

4.2.1 Pre-Construction Baseline Monitoring

Baseline water quality field testing and laboratory analysis will be undertaken where required prior to commencement of felling and construction at the Site.

Baseline sampling will be completed on at least two occasions, and these should ideally coincide with low flow and high flow stream conditions. The high flow sampling event will be undertaken after a period of sustained rainfall, and the low flow event will be undertaken after a dry spell.

4.2.2 Construction Phase Monitoring

4.2.2.1 Daily Visual Inspections

An inspection and maintenance plan for the on-site drainage system will be prepared in advance of commencement of any works. Daily visual inspections of drains and outfalls will also be performed during the construction period to ensure suspended solids are not entering streams and rivers on site, to identify any obstructions to channels and to allow appropriate maintenance of the drainage

regime. Should the suspended solids levels measured during construction be higher than the existing levels, the source will be identified, and additional mitigation measures implemented. Any excess build-up of silt levels at dams, the settlement pond, or any other drainage features that may decrease the effectiveness of the drainage feature, will be removed.

During the construction phase field testing and laboratory analysis of a range of parameters with relevant regulatory limits and EQSs should be undertaken for each primary watercourse along the Proposed Grid Connection Route and specifically following heavy rainfall events (i.e. weekly, monthly and event based).

Inspection sheets and photographic records will be kept on site. Inspection points will include the in-situ field monitoring point locations and the laboratory analysis sampling points. Inspection points will depend on works being completed within the catchment upstream of the identified monitoring locations. Visual inspections will also be completed after major rainfall events, i.e. after events of >25mm rainfall in any 24-hour period and data including photographs will be collected by visual inspections and independently assessed by the Project Hydrologist who will monitor and advise on the records being received.

The following periodic inspection regime will be implemented:

- Daily general visual inspections of site operations and inspections of all drainage infrastructure within the site and in the surrounding area by the ECoW or a suitably qualified and competent person as delegated by the ECoW;
- Inspections to include all elements of drainage infrastructure to ensure the system is operating correctly and to identify and maintenance that is required. Any changes, such as discolouration, odour, oily sheen or litter will be noted and corrective action will be implemented. High risk locations such as settlement ponds will be inspected daily. Daily inspections checks will be completed on plant and equipment, and whether materials such as straw bales or oil absorbent materials need replacement;
- Event based inspections by the ECoW as follows:
 - >10 mm/hr (i.e. high intensity localised rainfall event);
 - >25 mm in a 24-hour period (heavy frontal rainfall lasting most of the day); or,
 - Rainfall depth greater than monthly average in 7 days (prolonged heavy rainfall over a week).
- Monthly site inspections by the Project Hydrologist/ ECoW during construction phase;
- Quarterly site inspections by the Project Hydrologist/ ECoW after construction for a period of one year following the construction phase; and,
- A written record will be maintained or available on-site within this Construction Environmental Management Plan (CEMP) which will be maintained on-site during the construction phase.

4.2.2.2 Continuous Turbidity Monitoring

Turbidity monitors or sondes can be installed where required at locations surrounding the site. The sondes will provide continuous readings for turbidity levels in the watercourse. This equipment will be supplemented by daily visual monitoring at their locations as outlined in the sections below.

4.2.2.3 Laboratory Analysis

Baseline laboratory analysis of a range of parameters with relevant regulatory limits and EQSs will be undertaken as per water monitoring programme for the Proposed Project. This will not be restricted to just these locations around the proposed renewable energy development site with further sampling points added as deemed necessary by the ECoW in consultation with the Project Hydrologist and Site Manager.

During the construction phase field testing and laboratory analysis of a range of parameters with relevant regulatory limits and EQSs should be undertaken for each primary watercourse along the Proposed Grid Connection Route and specifically following heavy rainfall events (i.e. weekly, monthly and event based).

4.2.2.4 Field Monitoring

Field chemistry measurements of unstable parameters, (pH, conductivity, temperature) will be taken at the surface water monitoring locations, as per water monitoring programme for the Proposed Project and each primary watercourse along the Proposed Grid Connection Route. These analyses will be carried out by either the ECoW or the Project Hydrologist. In-situ field monitoring will also be completed after major rainfall events, i.e. after events of >25mm rainfall in any 24-hour period. The Project Hydrologist will monitor and advise on the readings collected by in-situ field monitoring.

4.2.2.5 Monitoring Parameters

The analytical determinants of the monitoring programme (including limits of detection and frequency of analysis) will be as per S.I. No. 272 of 2009 European Communities Environmental Objectives (Surface Waters) Regulations and European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009. The likely suite of determinants will include:

- > pH (field measured)
- > Electrical Conductivity (field measured)
- > Temperature (field measured)
- > Dissolved Oxygen (field measured)
- > Total Phosphorus
- > Chloride
- > Nitrate
- > Nitrite
- > Total Nitrogen
- > Ortho-Phosphate
- > Ammonia N
- > Biochemical Oxygen Demand
- > Total Suspended Solids

4.2.3 Construction Phase Drainage Inspections & Maintenance

Drainage performance will form part of the civil works contract requirements. During the construction phase, the Project Contractor will be responsible for the effectiveness of drainage measures. This responsibility extends to drainage maintenance, to ensure that the installed drainage measures continue to perform as intended by the detailed drainage design. Silt fences, check dams, level spreaders and other drainage measures likely to form part of the detailed drainage design, require regular maintenance to ensure they continue to function effectively, and the Project Contractor is entirely responsible for this maintenance.

Regular inspections of all existing and installed drainage measures should be undertaken by the Project Contractor, especially after heavy rainfall, to check for blockages, and ensure there is no build-up of standing water within the system. The contractor will devise a system of recording the findings of these inspections. Any excess build-up of silt levels at check dams, the settlement ponds, or any other drainage features that may decrease the effectiveness of the drainage feature, will be removed. For this reason, the drainage measures installed on-site should be inspected at least weekly by the contractor and maintained as required during the construction phase of the Proposed Project to ensure good performance.

The ECoW will monitor the effectiveness of the on-site drainage during changing weather, ground or drainage conditions encountered on site, through their regular visual inspections of on-site watercourses and water monitoring programme. Where it appears that additional drainage measures will be required to ensure the drainage system remains effective, the ECoW will notify the contractor, the developer and project design team including the Project Hydrologist. The ECoW's role in this regard does not replace the need for the weekly (at least) inspections of the drainage system's measures by the Project Contractor.

4.2.4 Surface Water Monitoring Reporting

Visual inspection and laboratory analysis results of water quality monitoring shall assist in determining requirements for any necessary improvements in drainage controls and pollution prevention measures implemented on site.

It will be the responsibility of the ECoW to present the ongoing results of water quality and weather monitoring at or in advance of regular site meetings.

Reports on water quality will consider all field monitoring and visual inspections, and results of laboratory analysis completed for that period. Reports will describe how the results compare with baseline data as well as previous reports on water quality. The reports will also describe whether any deterioration or improvement in water quality has been observed, whether any effects are attributable to construction activities and what remedial measures, or corrective actions have been implemented. Any proposed alteration to sampling frequency will be agreed with the Planning Authority in advance.

4.3 Environmental Awareness and Training

4.3.1 Environmental Induction

The Environmental Induction will be integrated into the general site induction on a case-by-case basis for each member of staff employed on-site depending on their assigned roles and responsibilities on site.

Where necessary, the Environmental Induction will as a minimum include:

- A copy of the Environmental Management Site Plans and discussion of the key environmental risks and constraints;
- An outline of the CEMP structure;
- A discussion of the applicable Works Method Statement;
- The roles and responsibilities of staff, including contractors, in relation to environmental management; and,
- An outline of the environmental Incident Management Procedure.

4.3.2 Toolbox Talks

Toolbox talks would be held by the ECoW or Construction Manager at the commencement of each day, or at the commencement of new activities. The aims of the toolbox talks are to identify the specific work activities that are scheduled for that day or phase of work. In addition, the necessary work method statements and sub plans would be identified and discussed prior to the commencement of the day's activities. The toolbox talks will include training and awareness on topics including:

- On-site Ecological Sensitivities;
- Buffers to be upheld – watercourses, archaeology, ecology;

- > Sediment and Erosion Control;
- > Good site practice;
- > On-site Traffic Routes and Rules;
- > Keeping to tracks – vehicle rules;
- > Strictly adhering to the development footprint;
- > Fuel Storage;
- > Materials and waste procedures

Site meetings would be held on a regular basis involving all site personnel. The objectives of site meetings is to discuss the coming weeks activities and identify the relevant work method statements and sub plans that will be relevant to that week's activities. Additionally, any non-compliance identified during the previous week would also be discussed with the aim to reduce the potential of the same noncompliance reoccurring.

During construction of the Proposed Project , all staff will be made aware of and adhere to the Health & Safety Authority's '*Guidelines on the Procurement, Design and Management requirements of the Safety, Health and Welfare at Work (Construction) Regulations 2013*'. This will encompass the use of all necessary Personal Protective Equipment and adherence to the site Health and Safety Plan.

5. HEALTH AND SAFETY

Construction of the Proposed Project will necessitate the presence of a construction site and travel on the local public road network to and from the site. Construction sites and the machinery used on them pose a potential health and safety hazard to construction workers if site rules are not properly implemented. The Proposed Project will be constructed in accordance with all relevant Health and Safety Legislation, including:

- Safety, Health and Welfare at Work Act 2005 (No. 10 of 2005);
- Safety, Health and Welfare at Work (General Application) (Amendment) Regulations 2016 (S.I. No. 36 of 2016);
- S.I. No. 528/2021 - Safety, Health and Welfare at Work (Construction) (Amendment) Regulations 2021 and
- Safety, Health and Welfare at Work (Work at Height) Regulations 2006 (S.I. No. 318 of 2006).

The following measures below are also detailed in Chapter 18 Schedule of Monitoring and Mitigation Measures.

- A Health and Safety Plan covering all aspects of the construction process will address the Health and Safety requirements in detail. This will be prepared on a preliminary basis at the procurement stage and developed further at construction stage.
- All hazards will be identified, and risks assessed. Where elimination of the risk is not feasible, appropriate mitigation and/or control measures will be established. The contractor will be obliged under the construction contract and current health and safety legislation to adequately provide for all hazards and risks associated with the construction phase of the project. Safepass registration cards are required for all construction, delivery and security staff. Construction operatives will hold a valid Construction Skills Certificate Scheme card where required. The developer is required to ensure a competent contractor is appointed to carry out the construction works. The contractor will be responsible for the implementation of procedures outlined in the Safety and Health Plan. Public safety will be addressed by restricting site access during construction. Fencing will be erected in areas of the site where uncontrolled access is not permitted.
- Goal posts will be established, where necessary, under overhead electricity lines for the entirety of the construction phase of the Proposed Wind Farm.
- The suitability of machinery and equipment for use near power lines will be risk assessed.
- All staff will be trained on operating voltages of overhead electricity lines running the site. All staff will be trained to be aware of the risks associated with overhead lines.
- All contractors that may visit the site are made aware of the location of lines before they come on to site.
- Barriers will run parallel to the overhead line at a minimum horizontal distance of 6 metres on plan from the nearest overhead line conductor wire.
- When activities must be carried out beneath overhead lines, e.g., component delivery or substation construction, a site-specific risk assessment will be undertaken prior to any works. The risk assessment must take into account the maximum potential height that can be reached by the plant or equipment that will be used prior to any works. Overhead line proximity detection equipment will be fitted to machinery when such works are required.
- Information on safe clearances will be provided to all staff and visitors.
- Signage indicating locations and health and safety measures regarding overhead lines will be erected in canteens and on Site.

- The construction of the Proposed Grid Connection Route will be carried out in phases. Prior to commencing grid connection works in the agricultural fields in the townland of Moheragh, goal posts will be established under the 110kV and 38kV overhead lines and remain in place for the duration of the works in this area. The goal posts will not exceed a height of 4.2 metres, unless specifically agreed with ESB Networks.
- All staff will be made aware of and adhere to the Health & Safety Authority's 'Guidelines on the Procurement, Design and Management Requirements of the Safety, Health and Welfare at Work (Construction) (Amendment) Regulations 2021'. This will encompass the use of all necessary Personal Protective Equipment and adherence to the site Health and Safety Plan.

The scale and scope of the project necessitates that a Project Supervisor Design Process (PSDP) and Project Supervisor Construction Stage (PSCS) are required to be appointed in accordance with the provisions of the Health & Safety Authority's 'Guidelines on the Procurement, Design and Management Requirements of the Safety, Health and Welfare at Work (Construction) Regulations 2013'. The PSDP appointed for the construction stage shall be required to perform his/her duties as prescribed in the Safety, Health and Welfare at Work (Construction) Regulations. These duties include (but are not limited to):

- Identify hazards arising from the design or from the technical, organisational, planning or time related aspects of the project;
- Where possible, eliminate the hazards or reduce the risks;
- Communicate necessary control measures, design assumptions or remaining risks to the PSCS so they can be dealt with in the Safety and Health Plan;
- Ensure that the work of designers is coordinated to ensure safety;
- Organise co-operation between designers;
- Prepare a written Safety and Health Plan;
- Prepare a safety file for the completed structure and give it to the client; and
- Notify the Authority and the client of non-compliance with any written directions issued.

The PSCS appointed for the construction stage shall be required to perform his/her duties as prescribed in the Safety, Health and Welfare at Work (Construction) Regulations. These duties include (but are not limited to):

- Development of the Safety and Health Plan for the construction stage with updating where required as work progresses;
- Compile and develop safety file information.
- Reporting of accidents / incidents;
- Weekly site meeting with PSCS;
- Coordinate arrangements for checking the implementation of safe working procedures. Ensure that the following are being carried out:
- Induction of all Site staff including any new staff enlisted for the project from time to time;
- Toolbox talks as necessary;
- Maintenance of a file which lists personnel on site, their name, nationality, current Safe Pass number, current Construction Skills Certification Scheme (CSCS) card (where relevant) and induction date;
- Report on Site activities to include but not limited to information on accidents and incidents, disciplinary action taken and PPE compliance;
- Monitor the compliance of contractors and others and take corrective action where necessary; and
- Notify the Authority and the client of non-compliance with any written directions issued.

6. EMERGENCY RESPONSE PLAN

6.1 Overview

The Emergency Response Plan (ERP) is presented in this section of the CEMP. It provides details of procedures to be adopted in the event of an emergency. The site ERP includes details on the response required and the responsibilities of all personnel in the event of an emergency. The ERP will require updating and submissions from the contractor/PSCS and suppliers as the project progresses. Where sub-contractors that are contracted on site are governed by their own emergency response procedure a bridging arrangement will be adopted to allow for inclusion of the sub-contractor's ERP within this within this document.

This is a working document that requires updating throughout the various stages of the project.

6.1.1 Roles and Responsibilities

The chain of command during an emergency response sets out who is responsible for coordinating the response. The site Supervisor/Construction Manager will lead the emergency response which makes him responsible for activating and coordinating the emergency response procedure. The other site personnel who can be identified at this time who will be delegated responsibilities during the emergency response are presented in Figure 6-1. In a situation where the site Supervisor/Construction Manager is unavailable or incapable of coordinating the emergency response, the responsibility will be transferred to the next person in the chain of command outlined in Figure 6-1. This will be updated throughout the various stages of the Proposed Project.

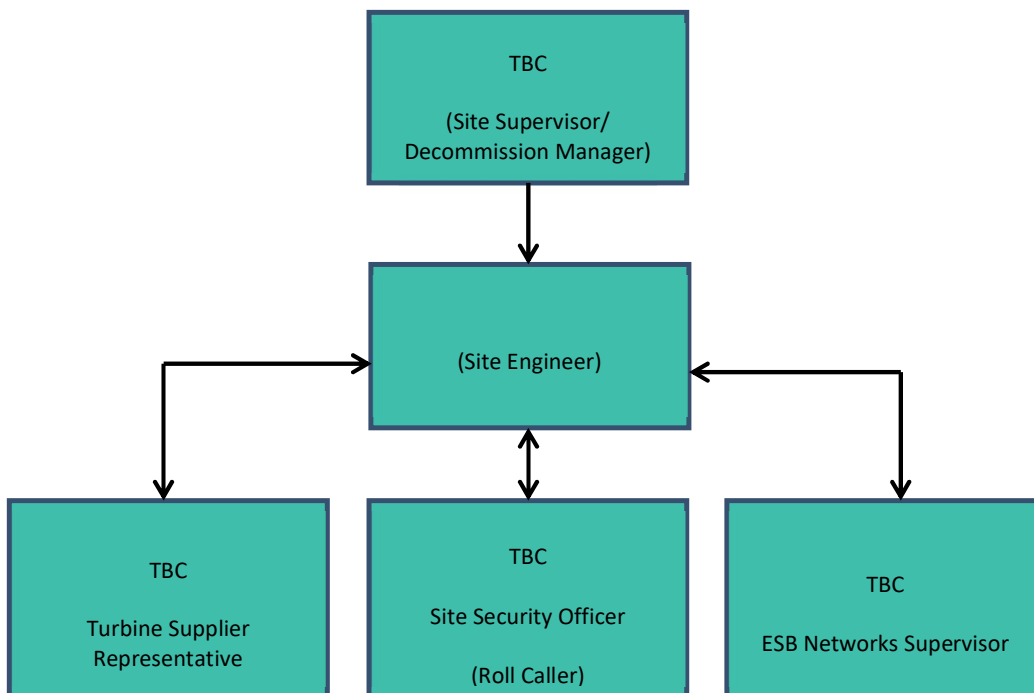


Figure 6-1 Emergency Response Procedure Chain of Command

6.1.2 Hazard Identification

In order to establish the type and scale of potential emergencies that may occur, the following hazards have been identified as being potential situations that may require an emergency response in the event of an occurrence.

Table 6-1 Hazards associated with potential emergency situations

Hazard	Emergency Situation
Construction Vehicles: Dump trucks, tractors, excavators, cranes etc.	Collision or overturn which has resulted in operator or third-party injury.
Abrasive wheels/Portable Tools	Entanglement, amputation or electrical shock associated with portable tools.
Contact with services	Electrical shock or gas leak associated with an accidental breach of underground services.
Fire	Injury to operative through exposure to fire.
Falls from heights including falls from scaffold towers, scissor lifts, ladders, roofs and turbines.	Injury to operative after a fall from a height.
Sickness	Illness unrelated to site activities of an operative e.g., heart attack, loss of consciousness, seizure.
Turbine Specific Incident	This will be included when the upon agreement and section of the final turbine type.
Siltation of watercourses, Fuel Management and Spill Control	Run-off to watercourses causing pollution.

In the event of an emergency situation associated with, but not restricted to, the hazards outlined in Table 6-1 the Site Supervisor/Construction Manager will carry out the following:

- Establish the scale of the emergency situation and identify the number of personnel, if any, have been injured or are at risk of injury.
- Where necessary, sound the emergency siren/foghorn that activates an emergency evacuation on the site. The site Supervisor/Construction Manager must proceed to the assembly point if the emergency poses any significant threat to their welfare and if there are no injured personnel at the scene that require assistance. The site Supervisor/Construction Manager will be required to use their own discretion at that point. In the case of fire, the emergency evacuation of the site should proceed, without exception. The site evacuation procedure is outlined in Section 6.1.3.
- Make safe the area if possible and ensure that there is no identifiable risk exists with regard to dealing with the situation e.g., if a machine has turned over, ensure that it is in a safe position so as not to endanger others before assisting the injured.
- Contact the required emergency services or delegate the task to someone. If delegating the task, ensure that the procedures for contacting the emergency services as set out in Section 6.3 is followed.
- Take any further steps that are deemed necessary to make safe or contain the emergency incident e.g., cordon off an area where an incident associated with electrical issues has occurred.
- Contact any regulatory body or service provider as required e.g., ESB Networks the numbers for which as provided in Section 6.3.

- Contact the next of kin of any injured personnel where appropriate.

6.1.3 Site Evacuation/Fire Drill

A site evacuation/fire drill procedure will provide basis for carrying out the immediate evacuation of all site personnel in the event of an emergency. The following steps will be taken:

- Notification of the emergency situation. Provision of a siren or foghorn to notify all personnel of an emergency situation.
- An assembly point will be designated in the construction compound area and will be marked with a sign. All site personnel will assemble at this point.
- A roll call will be carried out by the Site Security Officer to account for all personnel on site.
- The Site Security Officer will inform the Site Supervisor/Construction Manager when all personnel have been accounted for. The Site Supervisor/Construction Manager will decide the next course of action, which be determined by the situation that exists at that time and will advise all personnel accordingly.

All personnel will be made aware of the evacuation procedure during site induction. The Fire Services Acts of 1981 and 2003 require the holding of fire safety evacuation drills at specified intervals and the keeping of records of such drills.

6.1.4 Spill Control Measures

Every effort will be made to prevent an environmental incident during the construction and operational phase of the Proposed Project. Oil/fuel spillages are one of the main environmental risks that will exist on the site which will require an emergency response procedure. The importance of a swift and effective response in the event of such an incident occurring cannot be over emphasised. The following steps provide the procedure to be followed in the event of such an incident:

- Stop the source of the spill and raise the alarm to alert people working in the vicinity of any potential dangers.
- If applicable, eliminate any sources of ignition in the immediate vicinity of the incident.
- Contain the spill using the spill control materials, track mats or other material as required. Do not spread or flush away the spill.
- If possible, cover or bund off any vulnerable areas where appropriate such as drains, watercourses or sensitive habitats.
- If possible, clean up as much as possible using the spill control materials.
- Contain any used spill control material and dispose of used materials appropriately using a fully licensed waste contractor with the appropriate permits so that further contamination is limited.
- Notify the ECoW immediately giving information on the location, type and extent of the spill so that they can take appropriate action.
- The ECoW will inspect the site and will assist by providing any advice possible to ensure the necessary measures are in place to contain and clean up the spill and prevent further spillage from occurring.
- The Construction Manager will notify the appropriate regulatory body such as Kilkenny County Council, Inland Fisheries Ireland (IFI), National Parks and Wildlife Service (NPWS), etc. if deemed necessary.

The importance of a swift and effective response in the event of such an incident occurring cannot be over emphasised. Environmental incidents are not limited to just fuel spillages. Therefore, any environmental incident must be investigated in accordance with the following steps.

- The ECoW must be immediately notified.

- If necessary, the Construction Manager will inform the appropriate regulatory authority. The appropriate regulatory authority will depend on the nature of the incident.
- The details of the incident will be recorded on an Environmental Incident Form which will provide information such as the cause, extent, actions and remedial measures used following the incident. The form will also include any recommendations made to avoid reoccurrence of the incident.
- If the incident has impacted on an ecologically sensitive receptor, such as a sensitive habitat, protected species or designated conservation site (pSPA or cSAC), the ECoW will liaise with the Project Ecologist.
- If the incident has impacted on a sensitive receptor such as an archaeological feature the ECoW will liaise with the Project Archaeologist.

A record of all environmental incidents will be kept on file by the ECoW and the Project Contractor. These records will be made available to the relevant authorities such as Tipperary County Council, Limerick County Council, IFI, NPWS, etc. if required. The ECoW will be responsible for any corrective actions required as a result of the incident e.g. an investigative report, formulation of alternative construction methods or environmental sampling, and will advise the Main Contractor as appropriate.

6.2 Contacting the Emergency Services

6.2.1 Emergency Communications Procedure

In the event of requiring the assistance of the emergency services the following steps will be taken:

Stay calm. It is important to take a deep breath and not get excited. Any situation that requires 999/112 is, by definition, an emergency. The dispatcher or call-taker knows that and will try to move things along quickly, but under control.

Know the location of the emergency and the number you are calling from. This may be asked and answered a couple of times but do not get frustrated. Even though many emergency call centres have enhanced capabilities meaning they are able to see your location on the computer screen they are still required to confirm the information. If for some reason you are disconnected, at least emergency crews will know where to go and how to call you back.

Wait for the call-taker to ask questions, then answer clearly and calmly. If you are in danger of assault, the dispatcher or call-taker will still need you to answer quietly, mostly "yes" and "no" questions.

If you reach a recording, listen to what it says. If the recording says your call cannot be completed, hang up and try again. If the recording says all call takers are busy, WAIT. When the next call-taker or dispatcher is available to take the call, it will transfer you.

Let the call-taker guide the conversation. He or she is typing the information into a computer and may seem to be taking forever. There is a good chance, however, that emergency services are already being sent while you are still on the line.

Follow all directions. In some cases, the call-taker will give you directions. Listen carefully, follow each step exactly, and ask for clarification if you do not understand.

Keep your eyes open. You may be asked to describe victims, suspects, vehicles, or other parts of the scene.

Do not hang up the call until directed to do so by the call taker.

Due to the remoteness of the site it may be necessary to liaise with the emergency services on the ground in terms of locating the site. This may involve providing an escort from a designated meeting point that may be located more easily by the emergency services. This should form part of the site induction to make new personnel and sub-contractors aware of any such arrangement or requirement if applicable.

6.3 Contact Details

A list of emergency contacts is presented in Table 6-2. A copy of these contacts will be included in the Site Safety Manual and in the site offices and the various site welfare facilities.

Table 6-2 Emergency Contacts

Contact	Telephone no.
Emergency Services – Ambulance, Fire, Gardaí	999/112
Doctor – Dundrum Health Centre	062 71270
Hospital – Our Ladys County & Surgical Hospital– Cashel	062 70400
ESB Emergency Services	1850 372 999
Gardaí – Cashel Garda Station	062 75840
Health and Safety Co-ordinator - Health & Safety Services	TBC
Health and Safety Authority	1890 289 389
Inland Fisheries Ireland (IFI)	1890 347 424
Project Supervisor Construction Stage (PSCS): TBC	TBC
Project Supervisor Design Stage (PSDS): TBC	TBC
Client: Carrow Renewable Energy Ltd.	TBC

6.4 Procedure for Personnel Tracking

All operatives on site without any exception will have to undergo a site induction where they will be required to provide personal contact details which will include contact information for the next of kin.

In the event of a site operative becoming in an emergency situation where serious injury has occurred and hospitalisation has taken place, it will be the responsibility of the Site Manager or next in command if unavailable to contact the next of kin to inform them of the situation that exists.

6.5 Induction Checklist

Table 6-3 provides a list of items highlighted in this ERP which must be included or obtained during the mandatory site induction of all personnel that will work on the site. This will be updated throughout the various stages of the Proposed Project.

Table 6-3 Emergency Response Plan Items Applicable to the Site Induction Process

ERP Items to be included in Site Induction	Status
All personnel will be made aware of the evacuation procedure during site induction	
It may be necessary to liaise with and assist the emergency services on the ground in terms of locating the site. This may involve providing an escort from a designated meeting point that may be located more easily by the emergency services. This should form part of the site induction to make new personnel and sub-contractors aware of any such arrangement or requirement if applicable.	
All operatives on site without any exception will have undergone a site induction where they will be required to provide personal contact details which will include contact information for the next of kin.	

7. MITIGATION PROPOSALS

All mitigation measures relating to the pre-commencement, construction and operational phases of the Proposed Project are set out in the various sections of the Environmental Impact Assessment Report (EIAR), NIS prepared as part of the planning application to An Coimisiún Pleanála (ACP).

This section of the CEMP groups together all of the mitigation measures presented in the above documents. The Mitigation Measures are presented in the following pages and are also outlined within Chapter 18: Schedule of Mitigation and Monitoring Measures. Decommissioning Phase mitigation measures are not included in the table below, however, can be viewed in Appendix 4-6 (Decommissioning Plan) of this EIAR.

By presenting the mitigation proposals in the below format, it is intended to provide an easy to audit list that can be reviewed and reported on during the future phases of the Proposed Project. The tabular format in which the below information is presented, can be further expanded upon during the course of future project phases to provide a reporting template for site compliance audits.

Table 7-1 Proposed Mitigation Measures

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
Ch. 4: Description of the Proposed Project – Description of the Proposed Project					
Pre-Construction Phase					
MM1	Environmental Management	Ch. 4: Description of the Proposed Project	➤ All proposed activities on the site of the Proposed Project will be provided for in an environmental management plan. ➤ The CEMP includes details sets out details of the environmental controls to be implemented on site, site drainage measures, peat stability monitoring measures and a waste management plan. The CEMP also outlines the Emergency Response Procedure to be adopted in the event of an emergency in terms of site health and safety and environmental protection. In the event planning permission is granted for the Proposed Project, the CEMP will be updated prior to the commencement of the development, to address the requirements of any relevant planning conditions, including any additional mitigation measures which are conditioned and will be submitted to the Planning Authority for written approval		
MM2	Cement Based Deliveries	Ch. 4: Description of the Proposed Project Appendix 4-5: Surface Water Management Plan	➤ The arrangements for concrete deliveries to the site will be discussed with suppliers before work starts, agreeing routes, prohibiting on-site washout of trucks and discussing emergency procedures; ➤ Ready-mixed supply of wet concrete products and where possible, emplacement of pre-cast elements, will take place. Where possible pre-cast elements for culverts and concrete works will be used.		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
MM3	Pre-Construction Drainage	Appendix 4-5: Surface Water Management Plan CEMP Section 3	➤ Prior to commencement of works in sub-catchments across the site, main drain inspections will be completed to ensure ditches and streams are free from debris and blockages that may impede drainage. It is proposed to complete these inspections on a catchment-by-catchment basis as the construction works develop across the site, as works in all areas will not commence simultaneously. ➤ Drainage and associated pollution control measures will be implemented onsite before the main construction works commence. Where possible drainage controls will be installed during seasonally dry ground conditions. This will reduce the possibility of impact on surface waters by suspended sediment released during construction and entrained in surface run-off ➤ The routes of any natural drainage features will not be altered as part of the Proposed Project. Turbine locations have been selected to avoid natural watercourses. 9 no. new watercourse crossing and 2 no. upgrades to an existing crossing are proposed within the Proposed Wind Farm site. Culvert upgrades at forestry drain crossings are also proposed. ➤ There will be no direct discharges to natural watercourses. All discharges from the proposed works areas or from interceptor drains will be made over vegetated ground at an appropriate distance from natural watercourse and lakes. Buffer zones around the existing natural drainage features have informed the layout of the Proposed Project and are indicated on the drainage design drawings. ➤ Where artificial drains are currently in place in the vicinity of proposed works areas, these drains may have to be diverted around the proposed works areas to minimise the amount of water in the vicinity of works areas. Where it may not be possible to divert artificial drains around proposed work areas, the drains will be blocked to ensure sediment laden water from the works areas has no direct route to other watercourses. Where drains have to be blocked, the blocking will only take place after an alternative drainage system to handle the same water has been put in place. ➤ Existing artificial drains in the vicinity of existing site roads will be maintained in their present location where possible. If it is expected that these artificial drains will receive drainage water from works areas, check dams will be added (as specified below) to		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			control flows and sediment loads in these existing artificial drains. If road widening or improvement works are necessary along the existing roads, where possible, the works will take place on the opposite side of the road to the drain. ➤ Along the Proposed Grid Connection cable route there are 23 no. watercourse crossings, which includes natural stream/rivers and drains. All 23 no. crossings are existing culverts and bridges where works are required to accommodate the underground Proposed Grid Connection cable. No in-stream works are proposed at any of the Proposed Grid Connection cable crossing locations.		
MM4	Watercourse Inspection	Ch. 4: Description of the Proposed Project CEMP Section 2	➤ Confirmatory inspections of the proposed new no. 9 watercourse crossing and 2 no. existing watercourse crossing upgrade locations will be carried out by the Project Civil/Structural Engineer and the Project Hydrologist prior to the construction of the crossing.		
MM5	Drainage Maintenance	Ch. 9: Water Appendix 4-5: Surface Water Management Plan	➤ Any excess build-up of silt levels at check dams, the settlement ponds, or any other drainage features that may decrease the effectiveness of the drainage feature, will be removed.		
MM6	Earthworks	Appendix 4-5: Surface Water Management Plan CEMP Section 3	➤ Drainage and associated pollution control measures will be implemented onsite before the main construction works commence. Where possible drainage controls will be installed during seasonally dry ground conditions. This will reduce the possibility of impact on surface waters by suspended sediment released during construction and entrained in surface run-off.		
MM7	Forestry Felling		➤ Before the commencement of any felling works, an Environmental Clerk of Works (ECoW) will be appointed to oversee the felling and extraction works. The ECoW will have the following functions:		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
	Drainage Measures	Ch. 4: Description of the Proposed Project Ch. 9: Water CEMP Section 3	➤ Attend the site for the setup period when drainage protection works are being installed and be present on site during the remainder of the forestry felling works. ➤ Prior to the commencement of works, review and agree the positioning by the Operator of the required Aquatic Buffer Zones (ABZs), silt traps, silt fencing (see below), water crossings and onsite storage facilities for fuel, oil and chemicals (see further below). ➤ Be responsible for preparing and delivering the Environmental Tool Box Talk (TBT) to all relevant parties involved in site operations, prior to the commencement of the works. ➤ Conduct daily and weekly inspections of all water protection measures and visually assess their integrity and effectiveness. ➤ Take representative photographs showing the progress of operation onsite, and the integrity and effectiveness of the water protection measures. ➤ Collect water samples for analysis by a 3rd party accredited laboratory, adhering to the following requirements: ➤ Surface water samples shall be collected upstream and downstream of the keyhole felling site at suitable sampling locations. ➤ Sampling shall be taken from the stream / river bank, with no in-stream access permitted. ➤ The following minimum analytical suite shall be used: pH, Electrical Conductivity, Total Suspended Solids, Biochemical Oxygen Demand, Total Phosphorus, Ortho-Phosphate, Total Nitrogen, and Ammonia. ➤ Review of operator's records for plant inspections, evidence of contamination and leaks, and drainage checks made after extreme weather conditions. ➤ Prepare and maintain a contingency plan. ➤ Suspend work where potential risk to water from siltation and pollution is identified, or where operational methods and mitigation measures are not specified or agreed. ➤ Prepare and maintain a Water Protection Measure Register. This document is to be updated weekly by the ECoW. ➤ All relevant measures set out in the most recent versions of the Forestry & Water Quality Guidelines, Forest Harvesting & the Environment Guidelines and the Forest		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			Protection Guidelines will apply. In particular, to protect watercourses, the following measures will be adhered to during all /tree felling activities. ➤ Works will be overseen by an ECoW as described above. ➤ The extent of all necessary tree felling will be identified and demarcated with markings on the ground in advance of any felling commencing. ➤ All roads and culverts will be inspected prior to any machinery being brought on site to commence the felling operation. No tracking of vehicles through watercourses will occur. Vehicles will only use existing road infrastructure and established watercourse crossings. ➤ Existing drains that drain an area to be felled towards surface watercourses will be blocked, and temporary silt traps will be constructed to ensure collection of all silt within felling areas. These temporary silt traps will be cleaned out and backfilled once felling works are complete. This ensures there is no residual collected silt remaining in blocked drains after felling works are completed. No direct discharge of such drains to watercourses will occur from within felling areas. ➤ New collector drains and sediment traps will be installed during ground preparation to intercept water upgradient of felling areas and divert it away. Collector drains will be excavated at an acute angle to the contour (0.3%-3% gradient), to minimise flow velocities. ➤ All silt traps will be sited outside of buffer zones and have no direct outflow into the aquatic zone. Machine access will be maintained to enable the accumulated sediment to be excavated. Sediment will be carefully disposed of away from all aquatic zones. ➤ Where felling is required inside the buffers, silt fences will be installed around existing watercourses. Silt fences will be installed as single, double or a series of triple silt fences, depending on the space available and the anticipated sediment loading. ➤ All new collector drains will taper out before entering the aquatic buffer zone to ensure the discharging water gently fans out over the buffer zone before entering the aquatic zone. ➤ Machine combinations, such as mechanical harvesters or chainsaw felling, will be chosen which are most suitable for ground conditions at the time of felling, and which will minimise soils disturbance;		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			➤ Mechanised operations will be suspended during and immediately after heavy rainfall. ➤ Where brash is required to form brash mats, it will be laid out at harvesting stage to prevent soil disturbance by machine movement. ➤ Brash which has not been pushed into the soil will be moved within the site to facilitate the creation of mats in more demanding locations. ➤ Felling of trees will be pointed directionally away from watercourses. ➤ Felling will be planned to minimise the number of machine passes in any one area. ➤ Extraction routes, and hence brash mats, will be aligned parallel to the ground contours where possible. ➤ Harvested timber will be stacked in dry areas, and outside any 50-metre watercourse buffer zone. Straw bales and check dams will be emplaced on the down gradient side of timber storage sites. ➤ Branches, logs or debris will not be allowed to build up in aquatic zones. All such material will be removed when harvesting operations have been completed, but removing of natural debris deflectors will be avoided.		
MM8	Felling License	Ch. 4: Description of the Proposed Project CEMP Section 2	➤ The commercial forestry felling activities required as part of the Proposed Project will be the subject of a Felling Licence application to the Forest Service, in accordance with the Forestry Act 2014, the Forestry Regulations 2017 (SI 191/2017) and as per the Forest Service's policy on granting felling licenses for wind farm developments. The policy requires that a copy of the planning permission for the wind farm be submitted with the felling licence applications; therefore, the felling licenses cannot be applied for until such time as planning permission is obtained for the Proposed Project.		
MM9	Traffic Management	Ch. 4: Description of the Proposed Project Ch. 15: Material Assets	➤ In the event planning permission is granted for the Proposed Project, the Traffic Management Plan will address the requirements of any relevant planning conditions, including any additional mitigation measures, should they be conditioned. Traffic management measures included the following:		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
		CEMP Section 3	➤ Identification of a delivery schedule ➤ Details of the alterations required to the infrastructure and any other minor alteration identified; ➤ A dry run of the route using vehicles with similar dimensions. ➤ The deliveries of turbine components to the site will be made in convoys of five vehicles at a time, and at night when roads are quietest. ➤ Convoys will be accompanied by escorts at the front and rear operating a “stop and go” system. Although the turbine delivery vehicles are large, they will not prevent other road users or emergency vehicles passing, should the need arise. ➤ The delivery escort vehicles will ensure the turbine transport is carried out in a safe and efficient manner with minimal delay or inconvenience for other road users. ➤ It is not anticipated that any section of the public road network will be closed during transport of turbines, although there will be some delays to local traffic at pinch points. During these periods it may be necessary to operate local diversions for through traffic. All deliveries comprising abnormally large loads where required will be made outside the normal peak traffic periods, at night, to avoid disruption to work and school-related traffic. ➤ A full dry run of the transport operation along the proposed route will be completed using vehicles with attachments to simulate the dimensions of the wind turbine transportation vehicles. This dry run will inform the Traffic Management Plan submitted for agreement with Tipperary County Council and Cork County Council. ➤ All turbine deliveries will be provided for in the Transport Management Plan which will be finalised in advance of the construction stage, when the exact transport arrangements are known, delivery dates confirmed and escort proposals in place. The finalised Transport Management Plan will be submitted to the Planning Authority for agreement in advance of any abnormal loads using the local roads, and will provide for all necessary safety measures, including a convoy and Garda escort as required, off-peak turning/reversing movements and any necessary safety controls.		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
MM10	Waste Management	Ch. 4: Description of the Proposed Project CEMP Section 3.2	Prior to the commencement of the development a Construction Waste Manager will be appointed by the Contractor. The Construction Waste Manager will be in charge of the implementation of the objectives of the plan, ensuring that all hired waste contractors have the necessary authorisations and that the waste management hierarchy is adhered to. The person nominated must have sufficient authority so that they can ensure everyone working on the development adheres to the management plan		
Construction Phase					
MM11	Refuelling	Ch. 4: Description of the Proposed Project Ch.9: Water CEMP Section 3 Appendix 4-5: Surface Water Management Plan	- Wherever possible, vehicles will be refuelled off-site, particularly for regular road-going vehicles. On-site refuelling of machinery will be carried out at designated refuelling areas at the temporary construction compounds. - Heavy plant and machinery will be refuelled on-site by a fuel truck that will come to the site as required on a scheduled and organised basis. - Only designated trained and competent operatives will be authorised to refuel plant on-site. - Mobile measures such as drip trays and fuel absorbent mats will used during refuelling operations as required. All plant and machinery will be equipped with fuel absorbent material and pads to deal with any event of accidental spillage. The following mitigation measures are proposed to avoid release of hydrocarbons at the site: - All plant will be inspected and certified to ensure that they are leak free and in good working order prior to use at the site. - Fuels stored on site will be minimised. - Onsite refuelling will be carried out by trained personnel only; - All refuelling will be carried out outside of the designated hydrological buffer zones; - Mobile measures such as dip trays and fuel absorbent mats will be used during refuelling operations as required;		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			➤ All plant and machinery will be equipped with fuel absorbent material and pads to deal with any accidental spillage; ➤ The electrical substation compound will be bunded appropriately to 110% of the volume of oils that will be stored, and to prevent leakage of any associated chemicals to groundwater or surface water. The bunded area will be fitted with a storm drainage system and an appropriate oil interceptor; ➤ Spill kits will be available to deal with any accidental spillage in and outside the re-fuelling area. ➤ An emergency plan for the construction phase to deal with accidental spillages will be developed (refer to Section 6 of this CEMP); ➤ All hazardous wastes will be stored in bunded containers/areas before being collected by an authorised waste contractor and brought to an EPA licensed waste facility; ➤ Hazardous wastes will be kept separate from non-hazardous wastes so that contamination does not occur.		
MM12	Cement Based Products Deliveries and Management	Ch. 4: Description of the Proposed Project	➤ Only ready-mixed concrete will be used during the construction phase, with all concrete being delivered from local batching plants in sealed concrete delivery trucks. ➤ The use of ready-mixed concrete deliveries will eliminate any potential environmental risks of on-site batching. ➤ When concrete is delivered to site, only the chute of the delivery truck will be cleaned, using the smallest volume of water necessary, before leaving the site. ➤ Chute cleaning water will be isolated in temporary lined wash-out pits located near the Proposed Wind Farm site entrance. These temporary lined wash-out pits will be removed from the Proposed Wind Farm site at the end of the construction phase. Concrete trucks will be washed out fully at the batching plant, where facilities are already in place. The risks of pollution arising from concrete deliveries will be further reduced by the following: ➤ When concrete is delivered to site, only the chute of the delivery truck will be cleaned, using the smallest volume of water necessary, before leaving the site.		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			- Concrete trucks will not be washed out on the site but will be directed back to their batching plant for washout. - Site roads will be constructed to a high standard to allow transport of the turbine components around the site, and hence, concrete delivery trucks will be able to access all areas where the concrete will be needed. No concrete will be transported around the site in open trailers or dumpers so as to avoid spillage while in transport. All concrete used in the construction of turbine bases will be pumped directly into the shuttered formwork from the delivery truck. If this is not practical, the concrete will be pumped from the delivery truck into a hydraulic concrete pump or into the bucket of an excavator, which will transfer the concrete to the location where it is needed. - The arrangements for concrete deliveries to the site will be discussed with suppliers before work starts, confirming routes, prohibiting on-site washout and discussing emergency procedures. - Clearly visible signage will be placed in prominent locations close to concrete pour areas specifically stating washout of concrete lorries is not permitted on the site.		
MM13	Concrete Pouring	Ch. 4: Description of the Proposed Project Appendix 4-5: Surface Water Management Plan	- Using weather forecasting to assist in planning large concrete pours and avoiding large pours where prolonged periods of heavy rain is forecast. - Restricting concrete pumps and machine buckets from slewing over watercourses while placing concrete. - Ensuring that excavations are sufficiently dewatered before concreting begins and that dewatering continues while concrete sets. - Ensuring that covers are available for freshly placed concrete to avoid the surface washing away in heavy rain. - The small volume of water that will be generated from washing of the concrete lorry's chute will be directed into a temporary lined impermeable containment area, or a Siltbuster-type concrete wash unit (https://www.siltbuster.co.uk/sb_prod/siltbuster-roadside-concrete-washout-rcw/) or equivalent - Disposing of surplus concrete after completion of a pour in suitable off-site locations away from any watercourse or sensitive habitats.		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
MM14	Road Cleanliness	Ch. 4: Description of the Proposed Project CEMP Section 3	It is not anticipated that vehicle or wheel washing will be required as part of the construction phase of the Proposed Project because site roads will be already formed using on-site materials before other road-going trucks begin to make regular or frequent deliveries to the site (e.g. with steel or concrete). A road sweeper will be available if any section of the public roads were to be dirtied by trucks associated with the Proposed Project.		
MM15	Existing Drainage Features	Ch. 4: Description of the Proposed Project Appendix 4-5: Surface Water Management Plan CEMP Section 3	- There will be no direct discharges to any natural watercourses, with all drainage waters being dispersed as overland flows. All discharges from the proposed works areas will be made over vegetation filters at an appropriate distance from natural watercourses. The distance will vary between 5-20m depending on local slope, the nature of local soil deposits and also the type of vegetation present. Buffer zones around the existing natural drainage features have been used to inform the layout of the Proposed Project. - Minimum buffer zones of 50m around the existing natural drainage features have informed the layout of the Proposed Wind Farm. - Where artificial drains are currently in place in the vicinity of proposed works areas, these drains may have to be diverted around the proposed works areas to minimise the amount of water in the vicinity of works areas. - Where it may not be possible to divert artificial drains around proposed work areas, the drains will be blocked to ensure sediment laden water from the works areas has no direct route to other watercourses. - Where drains have to be blocked, the blocking will only take place after an alternative drainage system to handle the same water has been put in place. Existing artificial drains in the vicinity of existing site roads will be maintained in their present location where possible. - If it is expected that these artificial drains will receive drainage water from works areas, check dams will be added (as specified below) to control flows and sediment loads in these existing artificial drains. - If road widening or improvement works are necessary along the existing roads, where possible, the works will take place on the opposite side of the road to the drain.		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
MM16	Surface Water Drainage Measures	Appendix 4-5: Surface Water Management Plan	<u>Interceptor Drains</u> - Interceptor drains will be installed upgradient of any works areas to collect surface flow runoff and prevent it reaching excavations and construction areas of the site where it might otherwise have come into contact with exposed surfaces and picked up silt and sediment. The drains will be used to divert upslope runoff around the works area to a location where it can be redistributed over the ground surface as sheet flow. This will minimise the volume of potentially silty runoff to be managed within the construction area. <u>Drainage Swales</u> - Drainage swales (or collector drains) are shallow drains that will be used to intercept and collect run off from construction areas of the site during the construction phase. - Drainage swales will remain in place to collect runoff from roads and hardstanding areas of the Proposed Project during the operational phase and channel it to infiltration area for sediment settling. - Drainage swales will be installed downgradient of any works areas to collect surface flow runoff where it might have come into contact with exposed surfaces and picked up silt and sediment. Swales will intercept the potentially silt-laden water from the excavations and construction areas of the site and prevent it reaching natural watercourses. - The velocity of flow in the interceptor drains and drainage swales, particularly on sloped sections of the channel, will be controlled by check dams, which will be installed at regular intervals along the drains to ensure flow in the swale is non-erosive. Check dams will also be installed in some existing artificial drainage channels that will receive waters from works areas of the Site. <u>Level Spreaders</u>		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			> A level spreader will be constructed at the end of each interceptor drain to convert concentrated flows in the drain, into diffuse sheet flow on areas of vegetated ground. The levels spreaders will be located downgradient of any proposed works areas in locations where they will not contribute further to water ingress to construction areas of the site. > The water carried in interceptor drains will not have come in contact with works areas of the site and therefore should be free of silt and sediment. The level spreaders will distribute clean drainage water onto vegetated areas where the water will not be reconcentrated into a flow channel immediately below the point of discharge. The discharge point will be on level or only very gently sloping ground rather than on a steep slope so as to prevent erosion. > Clean four-inch stone can be placed on the outside of the spreader lip and pressed into the ground mechanically to further dissipate the flow leaving the level spreader over a larger area. <u>Vegetation Filters</u> > Vegetation filters are the existing vegetated areas of land that will be used to accept surface water runoff from upgradient areas. The selection of suitable areas to use as vegetation filters will be determined by the size of the contributing catchment, slope and ground conditions. > Vegetation filters will carry outflow from the level spreaders as overland sheet flow, removing any suspended solids and discharging to the groundwater system by diffuse infiltration. > Vegetation filters will not be used in isolation for waters that are likely to have higher silt loadings. In such cases, silt-bearing water will already have passed through stilling ponds prior to diffuse discharge to the vegetation filters via a level spreader. <u>Stilling and Settlement Ponds</u>		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			➤ Stilling or settlement ponds will be used to attenuate runoff from works areas of the site of the Proposed Project during the construction phase and will remain in place to handle runoff from roads and hardstanding areas of the Proposed Project during the operational phase ➤ The embankment that forms the sloped sides of the stilling ponds will be stabilised with vegetated turves, which will have been removed during the excavation of the stilling ponds area. ➤ Stilling ponds will be located towards the end of swales, close to where the water will be reconverted to diffuse sheet flow. Upon exiting the stilling pond system, water will be immediately reconverted to diffuse flow via a fan-shaped rock apron if there is adequate space and ground conditions allow. <u>Siltbusters</u> ➤ A “siltbuster” or similar equivalent piece of equipment will be available to filter any water pumped out of excavation areas, if necessary, prior to its discharge to stilling ponds or swales. <u>Dewatering Silt bags</u> ➤ Dewatering silt bags are an additional drainage measure that can be used downgradient of the stilling ponds at the end of the drainage swale channels and will be located, wherever it is deemed appropriate, throughout the site. ➤ The water will flow, via a pipe, from the stilling ponds into the silt bag. The silt bag will allow the water to flow through the geotextile fabric and will trap any of the finer silt and sediment remaining in the water after it has gone through the previous drainage measures. The dewatering silt bags will ensure that there will be no loss of peaty silt into the stream. <u>Culverts</u>		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			> All new proposed culverts and proposed culvert upgrades will be suitably sized for the expected peak flows in the watercourse. > Some culverts will be installed to manage drainage waters from works areas of the Proposed Project, particularly where the waters have to be taken from one side of an existing roadway to the other for discharge. The size of culverts will be influenced by the depth of the track or road sub-base. In some cases, two or more smaller diameter culverts may be used where this depth is limited, though this will be avoided as they will have a higher associated risk of blockage than a single, larger pipe. In all cases, culverts will be oversized to allow mammals to pass through the culvert. > Culverts will be installed with a minimum internal gradient of 1% (1 in 100). Smaller culverts will have a smooth internal surface. Larger culverts may have corrugated surfaces which will trap silt and contribute to the stream ecosystem. Depending on the management of water on the downstream side of the culvert, large stone may be used to interrupt the flow of water. This will help dissipate its energy and help prevent problems of erosion. Smaller water crossings will simply consist of an appropriately sized pipe buried in the sub-base of the road at the necessary invert level to ensure ponding or pooling doesn't occur above or below the culvert and water can continue to flow as necessary. <u>Silt Fences</u> > Silt fences will be installed as an additional water protection measure around existing watercourses in certain locations, particularly where works are proposed within the 50-metre buffer zone of a natural watercourse, which is inevitable where existing roads in proximity to watercourses are to be upgraded as part of the Proposed Wind Farm. These areas include around existing culverts, around the headwaters of watercourses. > Silt fences will be installed as single, double or a series of triple silt fences, depending on the space available and the anticipated sediment loading. The silt fence designs follow the technical guidance document 'Control of Water Pollution from Linear Construction Projects' published by CIRIA (Ciria, No. C648, 1996). Up to three silt fences may be deployed in series.		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			<u>Sediment Entrapment Mats</u> - Sediment entrapment mats, consisting of coir or jute matting, will be placed at the outlet of the silt bag to provide further treatment of the water outfall from the silt bag. Sedimats will be secured to the ground surface using stakes/pegs. The sedimat will extend to the full width of the outfall to ensure all water passes through this additional treatment measure <u>Check Dams</u> - The velocity of flow in the interceptor drains and drainage swales, particularly on sloped sections of the channel, will be controlled by check dams, which will be installed at regular intervals along the drains to ensure flow in the swale is non-erosive. Check dams will also be installed in some existing artificial drainage channels that will receive waters from works areas of the Site. - Check dams will restrict flow velocity, minimise channel erosion and promote sedimentation behind the dam. The check dams will be installed as the interceptor drains are being excavated. - Check dams will be used along sections of access road drains to attenuate flows and intercept silts at source. Check dams will be constructed from a 4/40mm non-friable crushed rock. - Check dams will be used along sections of access road drains to intercept silts at source - Check dams will not be used in any natural watercourses, only artificial drainage channels and interceptor drains. The check dams will be left in place at the end of the construction phase to limit erosive linear flow in the drainage swales during extreme rainfall events.		
MM17	Wastewater Management	Ch. 4: Description of the Proposed Project	Temporary port-a-loo toilets located within a staff portacabin will be used during the construction phase. Wastewater from staff toilets will be directed to a sealed storage tank, with all wastewater being tankered off site by permitted waste collector to		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			wastewater treatment plants. The nearest licenced primary wastewater treatment plant is located in Kilmihil, approximately 5.6km South of the Proposed Project. There will also be a water supply onsite for hygiene purposes, by way of a temporary storage tank. The construction compound will also include a bunded refuelling and containment area for the storage of oil, lubricants and site generators etc, and full retention oil interceptor.		
MM18	Clear-Span Watercourse Crossing	Ch. 4: Description of the Proposed Project Ch. 9: Water CEMP Section 2	It is proposed to construct a new clear-span watercourse crossing at one location within the Site and upgrade one existing crossing. The clear-span watercourse crossing methodology presented below will ensure that no instream works are necessary. The standard construction methodology for the installation of a clear-span watercourse crossing is as follows: - The access road on the approach either side of the watercourse will be completed to a formation level which is suitable for the passing of plant and equipment required for the installation of each watercourse crossing. - All drainage measures along the proposed road will be installed in advance of the works. - A foundation base will be excavated to rock or competent ground with a mechanical excavator with the foundation formed in-situ using a semi-dry concrete lean mix. The base will be excavated along the stream bank with no instream works required. - Access to the opposite side of the watercourse for excavation and foundation installation will require the installation of a temporary pre-cast concrete or metal bridge across the watercourse to provide temporary access for the excavator. Plant and equipment will not be permitted to track across the watercourse. - Once the foundation base has been completed, the pre-cast concrete box culvert will be installed using a crane which will be set up on the bank of the watercourse and will be lifted into place from the bank with no contact with the watercourse. - Where the box culvert is installed in sections, the joints will be sealed to prevent granular material entering the watercourse, - Once the crossing is in position stone backfill will be placed and compacted against the structure up to the required level above the foundations.		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			➤ Underground cabling ducting will be contained within the road make-up of the proposed crossing. The watercourse crossings will be constructed to the specifications of the OPW bridge design guidelines 'Construction, Replacement or Alteration of Bridges and Culverts - A Guide to Applying for Consent under Section 50 of the Arterial Drainage Act, 1945', and in consultation with Inland Fisheries Ireland. Abutments will be constructed from precast units combined with in-situ foundations, placed within an acceptable backfill material. Confirmatory inspections of the proposed new watercourse crossing locations will be carried out by the Project Civil/Structural Engineer and the Project Hydrologist prior to the construction of the crossing.		
MM19	Proposed Grid Connection – existing underground services, marker posts, joint bays and major watercourse crossings	Ch. 4: Description of the Proposed Project	<u>Existing Underground Services</u> ➤ Any underground services encountered along the grid cable routes will be surveyed for level and the ducting will pass over the service provided adequate cover is available. ➤ A minimum clearance of 300 mm will be required between the bottom of the ducts and the service in question. If the clearance cannot be achieved the ducting will pass under the service and again 300 mm clearance between the top of the communications duct and bottom of the service will be achieved. ➤ In deeper excavations an additional layer of marker tape will be installed between the communications duct and top level yellow marker tape. If the required separation distances cannot be achieved then a number of alternative options are available such as using steel plates laid across the width of the trench and using 35N concrete surrounding the ESB ducts where adjacent services are within 600mm, with marker tape on the side of the trench. Back fill around any utility services will be with dead sand/pea shingle. <u>Marker Posts</u>		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			➤ In deeper excavations an additional layer of marker tape will be installed between the communications duct and top level yellow marker tape. If the required separation ➤ Surface cable markers will be placed along the route where cable depth is unavoidably shallow, due to constraints such as existing services, to indicate the precise location of the UGC. These markers will be metallic plates in accordance with ESBN and EirGrid standards. ➤ Marker posts will be used on non-roadway routes to delineate the cable route and joint bay positions. Corrosion proof aluminium triangular danger sign, with 700mm base, and with centred lightning symbol, on engineering grade fluorescent yellow background shall be installed in adequately sized concrete foundations. Marker post shall also be placed in the event that burial depth is not to standard. Siting of marker posts to be dictated by ESBN as part of the detailed design process. <u>Joint Bays</u> ➤ Joints Bays are to be installed approximately every 650m - 850m along the UGC route to facilitate the jointing of 2 No. lengths of 110kV UGC. Joint Bays are 6m x 2.5m x 2.05m pre-cast concrete structures installed below finished ground level. Joint Bays will be located in the non-wheel bearing strip of roadways, however given the narrow profile of local roads this may not always be possible. Please refer to Appendices 4-2 and 4-4 for further details on joint bay construction and cable installation. ➤ Where possible, joint bays will be located in areas where there is a natural widening/wide grass margin on the road in order to accommodate easier construction, cable installation and create less traffic congestion. During construction the joint bay locations will be completely fenced off, and once they have been constructed, they will be backfilled until cables are being installed. ➤ In association with joint bays, Communication Chambers will be installed at every joint slab location to facilitate communication links. Earth Sheath Link Chambers are also be installed at every joint bay along the cable route. Earth Sheath Links are used for earthing and bonding cable sheaths of underground power cables, so that the circulating currents and induced voltages are eliminated or reduced. Earth Sheath Link Chambers and		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			Communication Chambers are located in close proximity to joint bays. Earth Sheath Link Chambers and Communication Chambers will be pre-cast concrete structures with an access cover at finished surface level. <u>Major Watercourse Crossings</u> The cable route will involve 23-no. crossings, of which 5 no. will be horizontal directional drilling (HDD) crossings and will not interact with an existing bridge structure. As there is insufficient cover and depth in the bridge to cross with the bridge deck at these 5 locations, HDD will be required. Drawings of the bridge crossings and further details on culvert crossing methodology are included in Appendix 4-1 of this EIAR. The underground cable will encounter 18 no. water culverts along the route. Existing culverts will be crossed using open trenching with either an undercrossing or overcrossing. A confirmatory site survey of all culverts has been completed as part of <u>this</u> phase of the project prior to planning to confirm the crossing methods. ➤ Inland Fisheries Ireland have published guidelines relating to construction works along water bodies entitled “Requirements for the Protection of Fisheries Habitats during Construction and Development Works at River Sites (Eastern Regional Fisheries Board, 2004)”, and these guidelines will be adhered to during the construction of the Proposed Project.		
MM20	Turbine Bases, Hardstanding and Infrastructure Foundations	Ch. 4: Description of the Proposed Project CEMP Section 2	➤ An embankment approximately 600 mm high will be constructed around the perimeter of each turbine foundation base and a fence will be erected to prevent construction traffic from driving into the excavated hole and to demarcate the working area. All necessary health and safety signage will be erected to warn of deep excavations etc. Access to and from excavated bases will be formed by excavating a pedestrian walkway to 1:12 grade. ➤ There will be a minimum of 100 mm of binding concrete laid on the formation material positioned using concrete skip and 360o excavator to protect ground formation and to give a safe working platform.		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
MM21	Temporary Construction Compound	Ch. 4: Description of the Proposed Project CEMP Section 2	The construction compounds will consist of temporary site offices, staff facilities and car-parking areas for staff and visitors. Construction materials and turbine components will be brought directly to the proposed turbine locations following their delivery to the site. The 3 no. temporary construction compounds will be constructed as follows: ➤ The area to be used for each compound will be marked out at the corners using ranging rods or timber posts. Drainage runs and associated settlement ponds will be installed around the perimeter; ➤ The compound platform will be established using a similar technique as the construction of the substation platform; ➤ A layer of geo-grid will be installed where deemed necessary by the designer and compacted layers of well graded granular material will be spread and lightly compacted to provide a hard area for Site offices and storage containers; ➤ A limited amount of fuel will have to be stored on the Proposed Project site and for the Proposed Grid Connection in appropriately bunded containers and a bunded area for oil storage will be constructed within the compound. ➤ Areas within the compound will be constructed as site roads and used as vehicle hardstanding during deliveries and for parking; ➤ A bunded containment area will be provided within the compound for the storage of lubricants, oils and site generators etc; ➤ A waste storage area will be provided within the compounds; ➤ The compounds will be fenced and secured with locked gates if necessary; and, ➤ Upon completion of the Proposed Project the temporary construction compounds will be decommissioned, granular material will be removed and the area will be allowed to vegetate naturally.		
Operational Phase					

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
MM22	Wastewater Management	Ch. 4: Description of the Proposed Project	> The proposed wastewater storage tank will be fitted with an automated alarm system that will provide sufficient notice that the tank requires emptying. > The wastewater storage tank alarm will be part of a continuous stream of data from the site's turbines, wind measurement devices and electrical substation that will be monitored remotely 24 hours a day, 7 days per week. Only waste collectors holding valid waste collection permits under the Waste Management (Collection Permit) Regulations, 2007(as amended), will be employed to transport wastewater away from the site.		
MM23	Electrical Substation and BESS	Ch. 4: Description of the Proposed Project CEMP Section 2	> The area of the on-site substation will be marked out using ranging rods or wooden posts and the soil and overburden stripped and will be either temporarily stockpiled locally at the substation location, or transported immediately on excavation to one of the designated spoil management areas; > Perimeter fencing will be erected > The construction and components of the substation have been designed to EirGrid specifications. > The electrical substation and BESS compound will be bunded appropriately to the volume of oils likely to be stored, and to prevent leakage to groundwater or surface water. The bunded area will be fitted with a storm drainage system and an appropriate oil interceptor;		
Decommissioning Phase					
MM24	Decommissioning	Ch. 4: Description of the Proposed Project Appendix 4-6: Decommissioning Plan	> Prior to the end of the operational period the Decommissioning Plan will be updated in line with decommissioning methodologies that exist at the time and will agree with the competent authority at that time.		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
MM25	Decommissioning	Ch. 4: Description of the Proposed Project Appendix 4-6: Decommissioning Plan	> The wind turbines proposed as part of the Proposed Project are expected to have a lifespan of 35 years. Following the end of their useful life, the wind turbines may be replaced with a new set of turbines, subject to planning permission being obtained, or the Proposed Project will be decommissioned fully. The onsite 110kV electrical substation and 110kV electrical cabling will remain in place as it will be under the ownership of the ESB and will form a permanent part of the national electricity grid. > Upon decommissioning of the Proposed Project, the wind turbines will be disassembled in reverse order to how they were erected. All above ground turbine components will be separated and removed off-site for recycling. > Turbine hardstands and foundations will remain in place underground and will be left to revegetate naturally. Leaving the turbine hardstands and foundations in-situ is considered a more environmentally prudent option, as to remove that volume of reinforced concrete from the ground could result in significant environment nuisances such as noise, dust and/or vibration. > Site roadways will be left in situ, as appropriate to facilitate on-going forestry operations. Underground cables, including grid connection, will be removed and the ducting left in place. > A decommissioning plan will be agreed with the local authorities three months prior to decommissioning the Proposed Project.		
MM26	Surface Water Drainage Measures	Appendix 4-5: Surface Water Management Plan	<u>Interceptor Drains</u> > On completion of the construction phase works, it is envisaged that the majority of the interceptor drains could be removed. At that stage, there will be no open excavations or large areas of exposed ground that are likely to give rise to large volumes of potentially silt-laden run off. > Any areas in which works were carried out to construct roads, turbine bases or hardstands, will have been built up with large grade hardcore, which even when		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			compacted in place, will retain sufficient void space to allow water to infiltrate the subsurface of these constructed areas. ➤ It is not anticipated that roadways or other installed site infrastructure will intercept ground-conveyed surface water runoff to any significant extent that would result in scouring or over-topping or spill over. ➤ Where the drains are to be removed, they will be backfilled with the material from the diversion dike. Interceptor drains will be retained in certain locations, for example where roadways are to be installed on slopes, to prevent the roadways acting of conduits for water that might infiltrate the roadway sub-base. In these cases, interceptor drains will be maintained in localised areas along the roadway with culverts under the roadway, which will allow the intercepted water to be discharged to vegetation filters downgradient of the roadway. ➤ Similarly, in localised hollows where water is likely to be funnelled at greater concentrations than on broader slopes, interceptor drains, and culverts may be left in situ following construction.		
Ch. 5: Population and Human Health: Population and Human Health					
Pre-construction Phase					
MM27	Human Health	Ch. 5: Population and Human Health	At the outset of the Proposed Project, during the constraints mapping process detailed in Ch. 3: Site Selection & Reasonable Alternatives of this EIAR, all sensitive receptors within c. 1.63km of the area suitable for siting wind turbines within the EIAR Site Boundary were identified and mapped. ➤ This included all occupied and unoccupied dwellings, businesses, stud farms and schools. In addition, a planning history search to identify properties that may have been granted planning permission, but not yet been constructed, was carried out. Any property with a		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			valid planning permission for a dwelling house was also added to the sensitive receptors' dataset. All inhabitable dwellings (existing, proposed and permitted) and other sensitive receptors (inclusive of schools, businesses and stud farms) within 1.63km of the proposed turbines have been considered as part of the following shadow flicker assessment. There are 104 no. sensitive receptors located within 1.63km of proposed turbine locations.		
MM28	Property Values	Ch. 5: Population and Human Health	The Proposed Wind Farm has been designed in accordance with the parameters set out in the Guidelines and with cognisance of the draft Guidelines, adhering to the required setback distances from sensitive receptors set out in those documents.		
MM29	Traffic and Transport	Ch. 5: Population and Human Health Ch. 15 Material Assets	➤ A pre-condition survey of roads associated with the Proposed Project will be carried out prior to construction commencement to record the condition of the road. A post construction survey will be carried out after works are completed. Where required the timing of these surveys will be agreed with the local authority. ➤ A competent Traffic Management Coordinator will be appointed for the duration of the construction of the Proposed Project and this person will be the main point of contact for all matters relating to traffic management. ➤ Locals in the area will be informed of any upcoming traffic related matters e.g. delivery of turbine components at night, via letter drops and posters in public places. Information will include the contact details of the Contract Project Coordinator, who will be the main point of contact for all queries from the public or local authority during normal working hours. An "out of hours" emergency number will also be provided. ➤ Liaison with the relevant local authorities including the roads sections of local authorities that the delivery routes traverse, and An Garda Síochána, during the delivery phase of the large turbine vehicles, when an escort for all convoys will be required.		
Construction Phase					

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
MM30	Human Health	Ch. 5: Population and Human Health CEMP Section 5	The Proposed Project will be constructed, operated and decommissioned in accordance with all relevant Health and Safety Legislation, including: ➤ Safety, Health and Welfare at Work Act 2005 (No. 10 of 2005); ➤ Safety, Health and Welfare at Work (General Application) (Amendment) Regulations 2016 (S.I. No. 36 of 2016); ➤ S.I. No. 291/2013 - Safety, Health and Welfare at Work (Construction) Regulations 2013 and ➤ Safety, Health and Welfare at Work (Work at Height) Regulations 2006 (S.I. No. 318 of 2006). The following measures will be taken: ➤ A Health and Safety Plan covering all aspects of the construction process will address the Health and Safety requirements in detail. This will be prepared on a preliminary basis at the procurement stage and developed further at construction stage. ➤ All hazards will be identified, and risks assessed. Where elimination of the risk is not feasible, appropriate mitigation and/or control measures will be established. The contractor will be obliged under the construction contract and current health and safety legislation to adequately provide for all hazards and risks associated with the construction phase of the project. Safepass registration cards are required for all construction, delivery and security staff. Construction operatives will hold a valid Construction Skills Certificate Scheme card where required. The developer is required to ensure a competent contractor is appointed to carry out the construction works. The contractor will be responsible for the implementation of procedures outlined in the Safety and Health Plan. Public safety will be addressed by restricting Site access during construction. Fencing will be erected in areas of the Site where uncontrolled access is not permitted. ➤ The suitability of machinery and equipment for use near power lines will be risk assessed.		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			➤ All staff will be trained on operating voltages of overhead electricity lines running the Site. All staff will be trained to be aware of the risks associated with underground cables. All contractors that may visit the Site are made aware of the location of lines before they come on to Site. ➤ When activities must be carried out beneath overhead lines, e.g., component delivery or substation construction, a site-specific risk assessment will be undertaken prior to any works. The risk assessment must take into account the maximum potential height that can be reached by the plant or equipment that will be used prior to any works. ➤ Information on safe clearances will be provided to all staff and visitors. ➤ Signage indicating locations and health and safety measures regarding electrical cables will be erected in canteens and on Site. ➤ All staff will be made aware of and adhere to the Health & Safety Authority's 'Guidelines on the Procurement, Design and Management Requirements of the Safety, Health and Welfare at Work (Construction) (Amendment) Regulations 2021'. This will encompass the use of all necessary Personal Protective Equipment and adherence to the Site Health and Safety Plan. ➤ The suitability of machinery and equipment for use near power lines will be risk assessed. ➤ All staff will be trained on operating voltages of electricity cables running the Site. All staff will be trained to be aware of the risks associated with overhead lines. All contractors that may visit the Site are made aware of the location of lines before they come on to Site. ➤ When activities must be carried out beneath overhead lines, e.g., component delivery or substation construction, a site-specific risk assessment will be undertaken prior to any works. The risk assessment must take into account the maximum potential height that can be reached by the plant or equipment that will be used prior to any works. ➤ Information on safe clearances will be provided to all staff and visitors. ➤ Signage indicating locations and health and safety measures regarding electrical cables will be erected in canteens and on Site. ➤ All staff will be made aware of and adhere to the Health & Safety Authority's 'Guidelines on the Procurement, Design and Management Requirements of the Safety, Health and		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			Welfare at Work (Construction) (Amendment) Regulations 2021'. This will encompass the use of all necessary Personal Protective Equipment and adherence to the Site Health and Safety Plan. ➤ The suitability of machinery and equipment for use near power lines will be risk assessed. ➤ All staff will be trained on operating voltages of electricity cables running the Site. All staff will be trained to be aware of the risks associated with overhead lines. All contractors that may visit the Site are made aware of the location of lines before they come on to Site. ➤ When activities must be carried out beneath overhead lines, e.g., component delivery, a site-specific risk assessment will be undertaken prior to any works. The risk assessment must take into account the maximum potential height that can be reached by the plant or equipment that will be used prior to any works. ➤ Overhead line proximity detection equipment will be fitted to machinery when such works are required. The scale and scope of the project requires that a Project Supervisor Design Process (PSDP) and Project Supervisor Construction Stage (PSCS) are required to be appointed in accordance with the provisions of the Health & Safety Authority's 'Guidelines on the Procurement, Design and Management Requirements of the Safety, Health and Welfare at Work (Construction) Regulations 2013'. The PSDP appointed for the construction stage shall be required to perform his/her duties as prescribed in the Safety, Health and Welfare at Work (Construction) Regulations. These duties include (but are not limited to): ➤ When activities must be carried out beneath overhead lines, e.g., component delivery, a site-specific risk assessment will be undertaken prior to any works. The risk assessment must take into account the maximum potential height that can be reached by the plant or equipment that will be used prior to any works.		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			➤ Overhead line proximity detection equipment will be fitted to machinery when such works are required. ➤ Identify hazards arising from the design or from the technical, organisational, planning or time related aspects of the project; ➤ Where possible, eliminate the hazards or reduce the risks; ➤ Communicate necessary control measures, design assumptions or remaining risks to the PSCS so they can be dealt with in the Safety and Health Plan; ➤ Ensure that the work of designers is coordinated to ensure safety; ➤ Organise co-operation between designers; ➤ Prepare a written Safety and Health Plan; ➤ Prepare a safety file for the completed structure and give it to the client; and ➤ Notify the Authority and the client of non-compliance with any written directions issued.		
Operational Phase					
MM31	Human Health	Ch. 5: Population and Human Health Appendix 4-4	➤ Prepare a safety file for the completed structure and give it to the client; and ➤ Access to the turbines is through a door at the base of the structure, which will be locked at all times outside maintenance visits. The doors will only be unlocked as required for entry by authorised personnel and will be locked again following their exit. ➤ Staff associated with the project will conduct frequent visits, which will include inspections to establish whether any signs have been defaced, removed, faded, or are becoming hidden by vegetation or foliage, with prompt action taken as necessary. ➤ Signs will also be erected at suitable locations across the Site as required for the ease and safety of operation of the wind farm. These signs include: ➤ Buried cable route markers at 50m (maximum) intervals and change of cable route direction; ➤ Directions to relevant turbines at junctions; ➤ “No access to Unauthorised Personnel” at appropriate locations; ➤ Speed limits signs at Site entrance and junctions ➤ “Warning these Premises are alarmed” at appropriate locations;		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			➤ "Danger HV" at appropriate locations; ➤ "Warning – Keep clear of structures during electrical storms, high winds or ice conditions" at Site entrance; ➤ "No unauthorised vehicles beyond this point" at specific Site entrances; and ➤ Other operational signage required as per Site-specific hazards. ➤ The proposed substation, which will be operated by Eirgrid/ESBN will be locked and fenced off from public access. The substation will be operational remotely and manually 24 hours per day, 7 days a week. Supervisory operational and monitoring activities will be carried out remotely using a SCADA system, with the aid of computers connected via a telephone modem link. ➤ Periodic service and maintenance work which include some vehicle movement. ➤ For operational and inspection purposes, substation access is required. ➤ Servicing of the substation equipment will be carried out in accordance with the manufacturer's specifications, which would be expected to entail the following: ○ Six-month service – three-week visit ○ Annual service – six-week visit ○ Weekly and daily visits as required. ➤ An operational phase Health and Safety Plan will be developed to fully address identified Health and Safety issues associated with the operation of the Site. Access for emergency services will be available at all times. ➤ A Fire Risk Management and Emergency Response Plan has been developed in relation to the effects on the environment and health and safety of the proposed Battery Energy Storage System following a fire emergency. The report outlines the mitigation design, procedures and actions to protect lives and safety of site and emergency services personnel, the protection of the environment, minimisation of damage and disruption and the return to normal operations. The report states the design factors which contribute to reducing the escalation in the severity of a potential incident, facilities for the emergency services and the safeguarding of the environment through fire water retention.		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
MM32	Shadow Flicker	Ch. 5: Population and Human Health	<u>Screening Measures</u> In the event of an occurrence of shadow flicker exceeding guideline threshold values of 30 minutes per day at residential receptor locations, mitigation options will be discussed with the affected homeowner, including: ➤ Installation of appropriate window blinds in the affected rooms of the residence; ➤ Planting of screening vegetation; ➤ Other site-specific measures which might be agreeable to the affected party and may lead to the desired mitigation. If agreement can be reached with the homeowner, then it would be arranged for the required mitigation to be implemented in cooperation with the affected party as soon as practically possible and for the full costs to be borne by the wind farm operator. <u>Wind Turbine Control Measures</u> The draft Guidelines limit of zero shadow flicker occurrences at any sensitive receptors will be adhered to and shadow flicker control units will be fitted with shadow flicker control units to allow the turbines to be controlled to prevent the occurrence of shadow flicker at properties surrounding the wind farm. The shadow flicker control units will be added to any required turbines. All predicted incidents of shadow flicker will be pre-programmed into the wind farm's control software. The wind farm's SCADA control system can be programmed to shut down any particular turbine at any particular time on any given day to avoid any shadow flicker occurrences at properties which are not naturally screened nor can be screened in any other manner. In order to ensure that the model and SCADA system is accurate and working well a site visit will be carried out to verify the system. The shadow flicker prediction data will be used to		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			select dates on which a shadow flicker event could be observed at one or multiple affected properties and the following process will be adhered to. 1. Recording the weather conditions at the time of the site visit, including wind speeds and direction (i.e. blue sky, intermittent clouds, overcast, moderate breeze, light breeze, still etc.). 2. Recording the house number, time and duration of site visit and the observation point GPS coordinates. 3. Recording the nature of the sensitive receptor, its orientation, windows, landscaping in the vicinity, any elements of the built environment in the vicinity, vegetation. 4. In the event of shadow flicker being noted as occurring the details of the duration (times) of the occurrence will be recorded. 5. The data will then be sent to the wind farm operational team to confirm that the model and SCADA system are working. 6. Following 12 months of full operation of the Proposed Project a report can be prepared for the Local Authority describing the shadow flicker mitigation measures used at the wind farm and confirming the implementation and successful operation of the system.		
Ch. 6: Biodiversity					
Pre-construction					
MM33	Invasive Species Management	Ch. 6: Biodiversity Appendix 6-5	During field surveys, a search for Invasive Alien Species (IAS) listed under the 'Third Schedule' of Regulations 49 and 50 of the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. 477 of 2011) and the 'First Schedule' of the European Union (Invasive Alien Species) Regulations 2024 (S.I. 374 of 2024) was conducted.		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			Four species were identified either within or directly adjacent to the Site during the multidisciplinary walkover surveys and dedicated aquatic surveys carried out by MKO throughout 2024 and 2025. Those species were: ➤ Giant Hogweed (<i>Heracleum mantegazzianum</i>) ➤ Japanese Knotweed (<i>Reynoutria japonica</i>) ➤ Giant Knotweed (<i>Reynoutria sachalinensis</i>) ➤ Rhododendron (<i>Rhododendron ponticum</i>) Proposed Wind Farm site Japanese Knotweed and Giant Knotweed During field surveys undertaken, Japanese Knotweed and Giant Knotweed were recorded at three locations and one location respectfully, within the Proposed Wind Farm site. Prior to the commencement of any works, the following steps will be undertaken: ➤ A pre-commencement survey for Japanese Knotweed and Giant Knotweed will be undertaken by a suitably qualified ecologist to determine the locations and extent of the species within the Proposed Project site and record any changes in the extent of the infestation since the 2024 and 2025 surveys. It will also serve to identify if this species has established elsewhere within the Site. ➤ The locations and extent of Japanese Knotweed and Giant Knotweed within the Proposed Wind Farm site, and along the Proposed Grid Connection underground cabling route and TDR, should it establish, will be clearly marked out using hazard tape to ensure they are not disturbed. An exclusion zone surrounding each stand will also be identified and an appointed ecological clerk of works (ECoW) will inform the extent of the area to be treated as potentially contaminated. The exclusion zone will extend to 7m around the identified stands.		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			➤ The ECoW will be appointed to supervise all works carried out within the exclusion zones, when required. ➤ All site and turbine transport staff will receive a toolbox talk from the ECoW regarding the identification and protocols surrounding Japanese Knotweed and Giant Knotweed within the Proposed Wind Farm site. To accommodate the Proposed Project, the requirement for the removal of vegetation will arise. As stands of Japanese Knotweed and Giant Knotweed are located in proximity to the Proposed Wind Farm infrastructure, the following will be undertaken to ensure these accommodation works do not exacerbate the spread of these species into the wider environment: ➤ All vegetation clearance in proximity to recorded stands of Japanese Knotweed and /or Giant Knotweed will be undertaken under the supervision of the appointed ECoW. No vegetation cleared from within the 7m exclusion zone will be removed from the infested area. ➤ All personnel and machinery which enter the exclusion zones must be thoroughly washed down, as per the following: • All plant, machinery, tools and personnel will be cleaned down prior to leaving the contaminated areas. • Clean down will be undertaken on an impermeable membrane such as a radon barrier and following completion of the clean down operation, this will be brushed clean with sweepings left within the contaminated area to ensure that there is no potential to spread any contaminated material. • Power washing will be avoided to prevent potentially contaminated run-off spreading outside the site. • No plant, machinery, tools, or personnel will leave the exclusion zone, until authorised by the ECoW. All washed down material will remain within the 7m exclusion zone.		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			Proposed Grid Connection Giant Hogweed Giant Hogweed was recorded at three locations along the Proposed Grid Connection underground cabling route. Prior to the commencement of any works, the following site setup procedures will be carried out: ➤ Additional pre-commencement surveys will be undertaken by a suitably qualified ecologist to determine the location and extent of the species and record any changes in the extent and/or location of this species which may have occurred since the 2024 and 2025 surveys. ➤ The locations and extent of Giant Hogweed along the Proposed Grid Connection underground cabling route will be clearly marked out using temporary fencing/markers to ensure they are not disturbed. An exclusion zone surrounding each stand will also be identified and will inform the extent of the area to be treated as potentially contaminated. The exclusion zone will extend to 4m around the identified stands (TII, 2020). ➤ An ecological clerk of works (ECoW) will be appointed to supervise all works carried out within the exclusion zones. ➤ All staff will receive a toolbox talk from the ECoW regarding the identification and protocols surrounding Giant Hogweed along the Proposed Grid Connection underground cabling route. ➤ Given that short sections of the Proposed Grid Connection underground cabling route will be laid within the above 4m exclusion zones, the measures below will be in place to ensure there is no spread of this species.		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			➤ The treatment and control of invasive alien species will follow guidelines issued by Transport Infrastructure Ireland (TII) - The Management of Invasive Alien Plant Species on National Roads – Technical Guidance (TII, 2020). Rhododendron Rhododendron was recorded at one location along the Proposed Grid Connection underground cabling route and one location along the proposed Turbine Delivery Route. Prior to the commencement of any works, the following site setup procedures will be carried out: ➤ Additional pre-commencement surveys will be undertaken by a suitably qualified ecologist to determine the location and extent of this species and record any changes in the extent of the infestation since the 2024 and 2025 surveys. ➤ The locations and extent of Rhododendron along the Proposed Grid Connection underground cabling route will be clearly marked out using temporary fencing/markers to ensure they are not disturbed. An exclusion zone surrounding each stand will also be identified and will inform the extent of the area to be treated as potentially contaminated. The exclusion zone will extend to 10m around the identified stands (Higgins, 2008). ➤ An ecological clerk of works (ECoW) will be appointed to supervise all works carried out within the exclusion zones. ➤ All staff will receive a toolbox talk from the ECoW regarding the identification and protocols surrounding Rhododendron along the Proposed Grid Connection underground cabling route. ➤ Given that short sections of the Proposed Grid Connection underground cabling route will be laid within the above 10m exclusion zones, the measures below will be in place to ensure there is no spread of this species.		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			➤ The treatment and control of invasive alien species will follow guidelines issued by the Transport Infrastructure Ireland (TII) - The Management of Invasive Alien Plant Species on National Roads – Technical Guidance (TII, 2020). Excavation within Contaminated Areas and Retention on-site ➤ The Proposed Grid Connection underground cabling route will be laid a 4m from the identified stands where possible to minimise the likelihood of encountering roots. ➤ Once machinery and personnel enter the contaminated area, they will not leave until they have been cleaned down following the procedure that is set out below. ➤ Excavated material will be kept within the contaminated area and will either be backfilled into the trench following the pipelaying operation or will remain within the contaminated zone adjacent to the trench and be graded and reseeded. No excavated material will leave the contaminated zone. ➤ Following works, all personnel, equipment and machinery will be cleaned down as per the methodology below, prior to exiting the contaminated area. Clean Down Procedure ➤ All plant, machinery, tools and personnel will be cleaned down prior to leaving the contaminated areas. ➤ Clean down will be undertaken on an impermeable membrane such as a radon barrier and following completion of the clean down operation, this will be brushed clean with sweepings left within the contaminated area to ensure that there is no potential to spread any contaminated material. Power washing will be avoided to prevent potentially contaminated run-off spreading outside the contaminated zone.		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
MM34	Otter	Ch. 6: Biodiversity	Habitat Loss Due to the time that can elapse between the original surveys, any future planning consent and construction, a pre-construction survey for otter will be carried out no more than 10 to 12 months prior to construction, as per NRA (2008) guidance, to identify the presence of any new breeding sites. The pre-construction survey will aim to ensure that adequate mitigation, as provided below under 'Disturbance, Mortality' is provided at each watercourse crossing (or other habitat of value to otters) affected by the Proposed Project. Disturbance/Mortality No significant effects are anticipated. However, taking a precautionary approach, and due to the time that can elapse between the original surveys, any future planning consent and construction, a pre-construction otter survey will be carried out by a qualified ecologist to identify the presence of any breeding sites within the Site, that may have been established in the intervening period. The requirement for a pre-construction survey does not represent a lacuna in the survey assessment but is fully in line with industry best practice. Any holts identified within 50m of proposed infrastructure will subsequently be monitored for a minimum period of 2 weeks using remote cameras in order to ascertain use by otter and levels of activity. If an active otter holt is identified and works can be undertaken safely then an exclusion zone will be set up around the hold as follows: ➤ Exclusion zone fencing and appropriate signage will be put in place between working areas and otter holt exclusion zones to ensure that there will be no encroachment of the breeding site exclusion zones by construction activities. If a newly established and active holt was identified within an area where works could not avoid direct impacts on the holt, the holt would likely need to be excluded, with the provision of a derogation licence from NPWS, prior to works commencing. This would involve the		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			erection of one-way fencing, only allowing egress from the holt and will be undertaken in line with current guidelines by an appropriately qualified ecologist in advance of construction works commencing. ➤ Currently based on the finding of the surveys and current information regarding the Site, no derogation licence is required for this application, as no breeding sites have been recorded in close proximity to the Proposed Project. However, should the pre-commencement surveys identify a new breeding site and exclusion is required, a derogation licence must be in place from the NPWS.		
MM35	Badger	Ch. 6: Biodiversity	Disturbance/Mortality Prior to the commencement of any construction works associated with the Proposed Wind Farm, Proposed Grid Connection Route and Turbine Delivery Route, the following measures will be undertaken for the avoidance of disturbance and/or direct mortality to badger and to ensure no additional setts have been established since the original surveys undertaken. The following measures are in line with <i>Guidelines For The Treatment Of Badgers Prior To The Construction Of National Road Schemes</i> (TII 2009). From a precautionary basis, a pre-commencement badger survey will be undertaken in accordance with standard best practice guidance prior to the commencement of site works to determine whether the identified sett is still in use and to ensure that no additional setts in close proximity to proposed infrastructure have been established. In the event that a badger sett is identified within or immediately adjacent to the Proposed Project footprint, mitigations as per the above referenced TII document will be implemented for the new sett. In relation to the identified setts in close proximity to Proposed Wind Farm road infrastructure, an exclusion of the existing setts will be carried out to ensure no badgers are		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			present within the setts during construction works. The exclusion will be carried out in line with TII guidelines as follows: - Local NPWS staff will be informed in advance of the exclusion works. - The exclusion will not take place during badger breeding season (December to June inclusive) - One way exclusion gates will be installed on each sett entrance. - The one-way gates will be left in place for a period of 21 days and works will proceed immediately after once exclusion of badgers has been confirmed by an Ecologist. - An Ecologist will monitor the gates every 3 to 5 days during the 21-day period to ensure badgers do not succeed in re-entering the sett. - If badgers succeed in re-entering during the 21-day period, the exclusion process and 21-day period must start again. All of the above works will be undertaken or supervised by an appropriately qualified ecologist.		
MM36	Marsh Fritillary	Ch. 6: Biodiversity	Direct Effects/Mortality Construction works will occur within approximately 50m of identified marsh fritillary populations west of Turbine 3 and the associated proposed road infrastructure. The following mitigations will be applied at these construction locations: ➤ A pre-commencement survey for marsh fritillary larvae will be undertaken at the suitable time of year in advance of construction throughout footprint areas of the Proposed Wind Farm. ➤ If active larval webs are recorded within the Proposed Project footprint, these webs will be translocated by a suitably qualified ecologist to adjacent suitable existing foraging habitat outside of the Proposed Project footprint. This will be achieved by translocating a sod of earth with entire, intact devils' bit scabious plants upon which the larvae are feeding.		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			➤ Larval webs and associated food plants would only be translocated by the ECoW to existing breeding areas. ➤ Existing breeding areas will be fully fenced off with a minimum exclusion zone distance of 5 metres near Turbine 3. ➤ ECoW supervision will be required for construction of components near existing breeding areas (Turbine 3 and the associated proposed access road infrastructure). ➤ Where suitable marsh fritillary habitat occurs in close proximity to Proposed Wind Farm infrastructure, side casting of material will be to the opposite side of the proposed infrastructure to where the suitable habitat occurs.		
MM37	Red Squirrel/ Pine Marten	Ch. 6: Biodiversity	Disturbance/Mortality Due to time that can elapse between the original surveys, any future planning consent and construction, a pre-construction survey for pine marten/red squirrel will be carried out to identify the presence of any new breeding sites. These surveys will focus on areas of conifer plantation to be felled and all suitable habitat within 50m of the felling blocks. Any potential breeding sites should be monitored to ascertain if they are active breeding sites. Surveys will be undertaken in line with Nature Scot and NRA guidelines. Should active dreys/dens be identified within the blocks to be felled, the following mitigations and best practice procedures will be followed to ensure that no breeding site for either red squirrel or pine marten are impacted: ➤ Felling works within 50m of any drey or den to be undertaken in October–January inclusive, this will avoid the main breeding season (February–September) when vulnerable young are most likely to be found within breeding sites for both species. ➤ Any breeding sites within forestry identified within the 50m buffer that wouldn't be directly affected by felling works but may be affected by disturbance related impacts		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			should be clearly marked out with an exclusion zone and works/access through these areas avoided as much as possible. ➤ Plant machinery will be turned off when not in use. ➤ Operating machinery will be restricted to the Proposed Wind Farm works site area (and outside any exclusion zone)		
MM38	Bats	Ch. 6: Biodiversity	Loss of, or Damage to, Roosts On a precautionary basis, a pre-commencement inspection of the trees proposed for trimming along the TDR will be undertaken prior to works to reassess their baseline condition and ensure no significant potential roosting features have developed over time. This measure is in line with best practice guidance to assess any changes in baseline given the likely lapse in time from when the surveys were undertaken and when the construction phase will take place.		
Construction Phase					
MM39	Surface Watercourses and Sensitive Aquatic Faunal Species	Ch. 4: Description of the Proposed Project Ch. 6: Biodiversity Ch.9 Hydrology & Hydrogeology	Mitigation measures addressing surface watercourses and sensitive aquatic faunal species are dealt with in Section MM13.		
MM40	Bats	Ch. 6: Biodiversity Appendix 6-2	The below describes the best practice and site-specific mitigation measures that are in place to avoid and reduce the potential for significant effects on local bat populations. Noise Restrictions		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			During the construction phase, plant machinery will be turned off when not in use and all plant and equipment for use will comply with the Construction Plant and Equipment Permissible Noise Levels Regulations (S.I. No. 632 of 2001, as amended). <u>Lighting Restrictions</u> Where lighting is required, directional lighting will be used to prevent overspill on to woodland/forestry edges. Exterior lighting post construction, will be designed to minimize light spillage, thus reducing the effect on areas outside the Development, and consequently on bats i.e. Lighting will be directed away from mature trees/treelines located within the Wind Farm Site boundary to minimize disturbance to bats. Directional accessories can be used to direct light away from these features, e.g. through the use of light shields (Stone, 2013). The luminaries will be of the type that prevent upward spillage of light and minimize horizontal spillage away from the intended lands. Any proposed lighting around the Wind Farm Site will be designed in accordance with the Institute of Lighting Professionals Guidance Note 08/23 Bats and artificial lighting at night. In addition, the applicant commits to the use of lights during operation and decommissioning (such that they are necessary) in line with the following guidance that is provided in the Dark Sky Ireland Lighting Recommendations: ➤ Every light needs to be justifiable, ➤ Limit the use of light to when it is needed, ➤ Direct the light to where it is needed, ➤ Reduce the light intensity to the minimum needed, ➤ Use light spectra adapted to the environment,		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			➤ When using white light, use sources with a “warm” colour temperature (less than 3000K). With regard to the potential for lighting to increase collision risk, it is noted that there will be some illumination of the turbines in the form of aviation lighting. Post-construction monitoring will be carried out to assess any potential changes in bat activity patterns and collision risk. Significant effects as a result of lighting are not anticipated; however, if in the course of this monitoring, any potential for significant effects on bats is identified, specific measures including curtailment, will be implemented to avoid any such impacts. <u>Bat Felling Buffers</u> In accordance with NatureScot (2021) and NIEA (2021) guidance, a minimum 50 m buffer is applied between turbine blade tips and habitat features used by bats (e.g. hedgerows, treelines). Although increased buffers of 100–200m are recommended around woodland by Eurobats Publication No. 6 and NIEA, these recommendations are not currently supported by empirical evidence from the UK or Ireland and are not routinely applied in wind farm planning. For the Proposed Wind Farm, a 50 m buffer between turbine blade tip and the nearest habitat feature has been implemented, based on a conservative worst-case turbine specification (the turbine model to be installed on the Proposed Wind Farm site will have an overall ground-to-blade tip height of 185m, rotor diameter of 163m, and hub height of 103.5m). Buffer distances were calculated using the Natural England formula (NatureScot, 2021) and have been incorporated into the turbine layout.		
MM41	Marsh Fritillary	Ch. 6: Biodiversity Ch. 10: Air	Dust Mitigation The following mitigation applies to construction areas within 20m of recorded marsh fritillary larval webs (in line with Table 4 of Institute of Air Quality Management		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			(IAQM) Guidance on the Assessment of Dust from Demolition and Construction 2024): ➤ Groundworks (i.e. works with potential to create dust) associated with Turbine 3 will be fully supervised by an ECoW. ➤ The ECoW will regularly monitor adjacent marsh fritillary larval web areas on a daily basis for potential signs of dust deposition or any other habitat degradation. ➤ Dust level thresholds and weather will also be monitored. ➤ If any signs of habitat degradation are noted, the dust-producing works will be immediately halted and further mitigation to protect larval web areas from dust will be implemented in advance of resuming work. ➤ The ECoW will have power to halt construction works if required as outlined above. ➤ Standard dust suppression measures are outlines in Chapter 10: Air, in addition to measures outlines in the CEMP (Appendix 4-2).		
MM42	Invasive Species – Site Hygiene and Biosecurity Measures	Ch. 6: Biodiversity Appendix 6-5	➤ All works in relation to the invasive species will be supervised by an ECoW. ➤ All staff will be given a Toolbox Talk, by a suitably qualified person or ecologist, on invasive species removal in relation to Japanese Knotweed, Giant Knotweed, Giant Hogweed, and Rhododendron and their management on site. ➤ The contractor will assign a member of their team as Environmental Officer to ensure the management plan is adhered to throughout the proposed works. ➤ A designated bio-secure area/exclusion zone will be set up at recorded invasive species locations to prevent disturbance in these areas. Invasive species will be marked with hazard tape in order to identify the species prior to vegetation clearance works and to keep it separate from other brash material. ➤ All machinery should be thoroughly cleaned down prior to arriving on the site to avoid the potential spread of invasive species from elsewhere.		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			➤ Machinery that is used for excavation and onsite removal of invasive material will not be used for any other works until they are fully cleaned down and then visually inspected by a specialist to ensure no fragments of invasive plant material are present. ➤ Prior to leaving the invasive species exclusion zones, all boots and clothing will be thoroughly brushed down to remove any contaminated material prior to leaving the area. ➤ As a precautionary measure, machinery will be thoroughly cleaned down before exiting the Site to prevent potential spread of invasive species elsewhere. ➤ Clean down will be carried out using brushes and shovels and power washing will be avoided insofar as possible. This is to prevent potentially contaminated run-off spreading outside the Site. ➤ Material used for tracking machinery out of the contaminated areas onsite e.g. plywood will be thoroughly cleaned down under supervision of the ECoW prior to removal off site. ➤ Any soil and topsoil required on the Site will be sourced from a stock that has been screened for the presence of any invasive species and where it is confirmed that none are present. ➤ Any material (excluding soil and topsoil, which is covered in the above measure) imported to the Site should be screened for invasive species by a suitably qualified ecologist before transportation to the Site.		
Operational Phase					
MM43	Bats	Ch. 6: Biodiversity Appendix 6-2	Blade Feathering NIEA Guidelines also recommend that, in addition to buffers applied to habitat features, all wind turbines are subject to 'feathering' of turbine blades when wind speeds are below the cut-in speed of the proposed turbine. This means that the turbine blades are pitched at 90 degrees or parallel to the wind to reduce their rotation speed to below two revolutions per		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			minute while idling. This measure has been shown to significantly reduce bat fatalities (by up to 50%) in some studies (NIEA, 2021). In accordance with NIEA Guidelines, blade feathering will be implemented as a standard across all proposed turbines when wind speeds are below the cut-in speed of the turbine. <u>Operational Monitoring</u> Year 1: Bat Activity Surveys - The post-construction surveys will be carried out as per the pre-construction survey effort. Static monitoring will take place at each turbine during the bat activity season (between April and October) (NatureScot, 2021, NIEA, 2021). Full spectrum recording detectors will be utilised for the same duration as during pre-application surveys and at the same density (NatureScot, 2021). The assessment of bat activity levels will include the use of 'Ecobat' (or similar alternative), a web-based interface, allowing uploaded activity data to be contrasted with a comparable reference range, allowing objective and robust interpretation. Walked survey transects will also be conducted. Key weather parameters and other factors that are known to influence collision risk will be monitored and shall include: ➤ Windspeed in m/s (measured at nacelle height) ➤ Temperature (°C) ➤ Precipitation (mm/hr) Carcass Searches - Carcass searches, to monitor and record bat fatalities, shall be conducted at each turbine in accordance with most recent guidance (NatureScot/NIEA). This shall include searcher efficiency trials and an assessment of scavenger removal rates to determine the appropriate correction factor to be applied in relation to determining an accurate estimate of		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			collision mortality. Surveys should cover all activity seasons and the use of a trained dog detection team will be carried out to ensure maximum efficiency. Years 2 & 3: Monitoring surveys shall continue in Year 2 and 3, and where a curtailment requirement has been identified, the success of the curtailment strategy shall be assessed in line with the baseline data collected in the preceding year(s). The performance of the curtailment programme in terms of its ability to respond to the changes in bat abundance based on temperature and wind speed shall be analysed to confirm it is neither significantly over- nor under- curtailing during different periods of bat activity. At the end of each year, the efficacy of the mitigation/curtailment programme shall be reviewed, and any identified efficiencies incorporated into the programme. The requirement for continued post-consent monitoring will also be considered. Should no bat fatalities be recorded in Year 1, curtailment (where applicable) in Year 2 and Year 3 could be reduced/re-evaluated or removed with monitoring continuing to inform this strategy.		
Decommissioning Phase					
MM44	Decommissioning Phase	Ch. 6: Biodiversity	The same mitigation to prevent significant impacts on water quality and associated aquatic fauna and other terrestrial fauna during construction will be applicable to the decommissioning phase. It can be concluded that following the implementation of preventative mitigation, there is no potential for the decommissioning of the Proposed Project to result in significant effects on biodiversity.		
Ch. 7: Birds					
Pre-Construction Phase					

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
MM45	Design of the Proposed Project	Ch. 7: Birds	> Hard standing areas have been designed to the minimum size necessary to accommodate the turbine model that is selected. > The Proposed Project avoids wildlife refuge sites (e.g. waterbodies) > The Proposed Grid Connection routes have been selected to utilise built infrastructure for the majority of its length (i.e. cables to be laid within public roads). Cables will be laid underground to avoid effects on roadside hedgerows and disturbance to nesting birds.		
Chapter 7: Birds					
Construction Phase					
MM46	Birds (Construction Phase)	Ch. 7: Birds	Works will commence outside the bird nesting season (1st of March to 31st of August inclusive). Any requirement for construction works to run into the subsequent breeding season following commencement will be informed by construction phase bird surveys		
MM47	Birds (Construction Phase)	Ch. 7: Birds	The removal of woody vegetation will be undertaken in full compliance with Section 40 of the Wildlife Act 1976 – 2022. Where sections of woody vegetation are removed for the purposes of the junction and road upgrades, these will be replaced with suitable hedge/tree species which are common in the local context.		
MM48	Birds (Construction Phase)	Ch. 7: Birds	During the construction phase, noise limits, noise control measures, hours of operation (i.e. dusk and dawn is high faunal activity time) and selection of plant items will be considered in relation to disturbance of birds. All plant and equipment for use will comply with the European Communities (Noise Emission By Equipment For Use Outdoors) Regulations, 2001, as amended (SI 632/2001). Plant machinery will also be turned off when not in use.		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
MM49	Birds (Construction Phase)	Ch. 7: Birds Ch 9: Hydrology & Hydrogeology	Water protection measures will be implemented around existing watercourses as outlined in Chapter 9 of this EIAR, to protect the use of watercourses by birds"		
MM50	Birds (Construction Phase)	Ch. 7: Birds	If winter roosting or breeding activity of birds of high conservation concern are identified, the roost or nest site will be located and no works shall be undertaken within a species-specific disturbance buffer in line with industry best practice (e.g. Goodship and Furness, 2022). No works shall be permitted within the buffer until it can be demonstrated that the roost/nest is no longer occupied."		
MM51	Birds (Construction Phase)	Ch. 7: Birds	An Environmental Clerk of Works and Project Ecologist will be appointed. Duties will include: ➤ Organise the undertaking of a pre-construction and construction phase walkover bird survey to ensure that significant effects on birds will be avoided. Inform and educate on-site personnel of the ornithological and ecological sensitivities within the Proposed Wind Farm site. ➤ Oversee management of ornithological issues during the construction period and advise on ornithological issues as they arise. ➤ Provide guidance to contractors to ensure legal compliance with respect to protected species onsite. ➤ Liaise with officers of consenting authorities and other relevant bodies with regular updates in relation to construction progress as necessary		
MM52	Birds (Kestrel Nest Boxes)	Ch. 7: Birds	As per the RSPB recommendations, the following are prerequisites for the programme of kestrel nest box installation: ➤ The nest boxes will be built of an exterior grade plywood or other robust timber. Preservative can extend the life of the box but will only be applied to		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			the outside of the box. Only use selected water-based preservatives, which are known to be safe for animals, such as Sadolin. CCA pressure-treated timber will not be used. The nest box design should follow the RSPB design recommendations: https://www.rspb.org.uk/birds-and-wildlife/advice/how-you-can-help-birds/nestboxes/nestboxes-for-owls-and-kestrels/kestrel-nestboxes/ ➤ As previously outlined, the nest boxes must be in place the winter before the first breeding season of the construction phase. ➤ The nest box should be located with clear flight paths on a pole specifically erected for the purpose away from woodland edges to avoid predation of nests by pine martens, with the entrance facing away from the prevailing wind direction. ➤ The nest boxes should be securely attached and sited a minimum of 5m high. ➤ Angle the box so that the floor slopes slightly away from the entrance. To ensure that the eggs remain in the sheltered end of the box should they roll. ➤ The floor panel of the nest box should be replaced if it shows signs of rotting. ➤ Annual monitoring will be scheduled to record information on occupancy, to inform the installation of additional nest boxes and to clean out a build-up of debris as required		
Operational Phase					
MM53	Birds (Operational Phase Surveys)	Ch. 7: Birds	No significant operational phase impacts requiring mitigation were identified		
Decommissioning Phase					

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
MM54	Decommissioning	Ch. 7: Birds	During the decommissioning phase, disturbance limitation measures will be as per the construction phase		
Ch. 8: Land, Soils and Geology Land, Soils & Geology					
Construction Phase					
MM55	Effects on Land / Land-Take	Ch. 8: Land, Soils and Geology	- Following the construction phase areas of the Proposed Wind Farm site will be replaced by hardstand areas with a permanent development footprint of 21.6ha. This represents a change in landcover of 3.14%. - The loss of coniferous forestry (51.6ha) and grassland (13.94ha) will not have a significant effect on land at the Proposed Wind Farm site due to the small development footprint. The loss of this land is minimal on a local and regional scale and therefore, the effects of land loss is negligible. The loss will be offset by the works proposed as part of the Proposed Biodiversity Enhancement and Management Plan. - All felling operations will be completed in line with the Forest Service's published policy and will be subject of a Limited Felling Licence (LFL). The Forest Service policy requires replacement or replanting on a hectare for hectare basis for the footprint of the infrastructure developments. Therefore, while the loss of coniferous forestry will be a permanent change to the land at these locations, all forestry lost will be replaced elsewhere within Ireland as per the Forest Service felling policy		
MM56	Soil, Subsoil and Bedrock Excavation (Proposed Wind Farm:)	Ch. 8: Land, Soils and Geology	- Placement of turbines and associated infrastructure in areas with suitable ground conditions where appropriate (based on detailed site investigation data); - The soils and subsoils which will be removed during the construction of turbine hardstands will be localised to the turbine locations. The soil/subsoil will be placed/spread locally alongside the excavations or stored within the 3 no. designated spoil management areas and 2 no. borrow pits; - Excavated subsoils shall be excavated and stored separately to topsoil; this will prevent mixing of materials and facilitate reuse afterwards;		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			> At the identified spoil management areas, the vegetative topsoil layer will be removed to allow for spoil to be placed and upon reaching the recommended height, the vegetative topsoil layer will be reinstated; > The spoil placed within the spoil management areas will be restricted to a maximum height of 1m and then capped with topsoil; > The placement of spoil within the spoil management areas will require the use of long reach excavators, low ground pressure machinery and possibly bog mats in particular for drainage works; > It will be ensured that the surface of the placed spoil will be shaped to allow efficient run-off of surface water. Shaping of the surface of the spoil will be carried out as placement of spoil at management area progresses. This will reduce the likelihood of debris run-off and reduce the risk of instability of the placed spoil; > Finished/shaped side slopes in the placed spoil will be not greater than 1 (v): 3 (h). This slope inclination will be reviewed during construction, as appropriate; > Where available, the topsoil will be placed on the finished surface with the vegetation part of the sod facing the right way up to encourage growth of plants and vegetation at the surface of the placed spoil within the management areas; > Supervision by the Project Geotechnical Engineer will be carried out for the works; and, > An interceptor drain will be installed upslope of the designated spoil management areas to divert any surface water away from these areas. This will help ensure stability of the placed spoil and reduce the likelihood of debris run-off. (interceptor drains will not be required at all areas as the existing drainage network can function as interceptor drains – silt fences will be installed upgradient of the spoil management areas in these locations).		
MM57	Soil, Subsoil and Bedrock Excavation (Proposed Grid Connection)	Ch. 8: Land, Soils and Geology	> Any overburden excavated from the cable trench will be transported to the spoil management areas; and, > Some excess spoil material or pavements materials containing tar generated during the cable route construction will be transported by permitted waste contractors to a suitable permitted/licensed site for disposal/recovery.		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
MM58	Contamination of Soil/Subsoil by Leakages and Spillages	Ch. 8: Land, Soils and Geology Appendix 4-3	- On-site re-fuelling will be undertaken using a refuelling truck with spill kits kept on site for accidental leakages or spillages; - Only designated trained operatives will be authorised to refuel plant on-site; - Taps, nozzles or valves associated with refuelling equipment will be fitted with a lock system; - All fuel storage areas will be bunded appropriately for the duration of the construction phase. All bunded areas will be fitted with a storm drainage system and an appropriate oil interceptor. Ancillary equipment such as hoses, pipes will be contained within the bunded area; - Fuel and oil stores including tanks and drums will be regularly inspected for leaks and signs of damage; - The electrical control building and BESS (at the substation) will be bunded appropriately to the volume of oils likely to be stored and to prevent leakage of any associated chemicals to groundwater or surface water. - The bunded area will be fitted with a storm drainage system and an appropriate oil interceptor; - The plant used during construction will be regularly inspected for leaks and fitness for purpose; and, - An emergency response plan for the construction phase to deal with accidental spillages is contained within the Construction and Environmental Management Plan (Appendix 4-3)		
MM59	Erosion of Exposed Subsoils	Ch. 8: Land, Soils and Geology	- Soil and subsoils removed from the development locations and access roads will be reinstated within the Proposed Wind Farm site; - The upper vegetative layer (where still present) of excavated soil will be stored with the vegetation part of the sod facing the right way up to encourage growth of plants and vegetation at the surface of the stored spoil within the borrow pits and spoil repository areas; Re-seeding and spreading/planting will also be carried out in these areas; and, - Brash/bog mats will be put in place to support vehicles on soft ground, reducing soil and subsoil erosion and avoiding the formation of rutted areas, in which surface water ponding can occur.		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
MM60	Potential Effects from the Proposed Biodiversity Enhancement and Management Plan	Ch. 8: Land, Soils and Geology	All proposed habitat management and enhancement works will be in accordance with the best practice Forest Service regulation, policies and strategic guidance documents as well as Coillte, DAFM and NatureScot guidance documents to ensure minimal potential negative effects on the local soil and subsoil environment. ➤ Given the nature of the restoration measures the following mitigation measures are proposed: ➤ Before any works are completed silt fences will be installed to limit the movement of entrained sediment in surface water runoff; ➤ Proposed off-road routes will be walked in advance of any machinery; ➤ All machinery operators will be experienced; ➤ The Proposed Wind Farm site will be walked before a machine goes off-road; ➤ Bog mats will be used where the excavator is required to travel over wet ground; and, ➤ A low ground pressure excavator with wide tracks (1.9m or greater) will be used to reduce compaction of the soil and subsoils.		
MM61	Potential Effects from Turbine Delivery Route Works	Ch. 8: Land, Soils and Geology	➤ All works are minor and localised and cover very small areas; ➤ These works are distributed over a wide area; and, ➤ All works are temporary in nature.		
Operational Phase					
MM62	Site Road Maintenance	Ch. 8: Land, Soils and Geology	➤ Use of aggregate from authorised quarries for use in road and hardstand maintenance.		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
MM63	Site Vehicle/Plant Use	Ch. 8: Land, Soils and Geology Appendix 4-3	> Vehicles used during the operational phase will be refuelled off site before entering the site; > No fuels will be stored on-site during the operational phase; > Spill kits will be available in all site vehicles to deal with an accidental spillage and breakdowns; and, > An emergency plan for the operational phase to deal with accidental spillages and breakdowns will be contained in the Construction and Environmental Management Plan (Appendix 4-3).		
MM64	Use of Oils in Transformers	Ch. 8: Land, Soils and Geology	> All transformers and substation areas will be bunded to 110% of the volume of oil used in each transformer/substation; > An emergency plan for the operational phase to deal with accidental spillages will be contained in the Construction and Environmental Management Plan; and, > The BESS compound will be bunded for capture of any potential chemical leaks.		
Decommissioning Phase					
MM65	Decommissioning Phase	Ch. 8: Land, Soils and Geology	The potential impacts associated with decommissioning of the Proposed Project will be similar to those associated with construction but at a reduced magnitude due to the reduced scale of the works. Mitigation measures applied during decommissioning activities will be similar to those applied during construction where relevant. Some of the impacts will be avoided by leaving elements of the Proposed Project in place, including the bases which will be rehabilitated by covering with local topsoil/peat in order to regenerate vegetation which will reduce runoff and sedimentation effects. Mitigation measures to avoid contamination by accidental fuel leakage and compaction of soil by on-site plant will be implemented as per the construction phase mitigation measures.		
Ch. 9: Hydrology & Hydrogeology					

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
Construction Phase					
MM66	Clear Felling of Coniferous Plantation	Ch. 9: Hydrology & Hydrogeology	Forestry operations will conform to current best practice Forest Service regulations, policies and strategic guidance documents as well as Coillte and DAFM guidance documents, including the specific guidelines listed below, to ensure that felling, planting and other forestry operations result in minimal potential negative effects to the receiving environment. ➤ Forestry Standards Manual (Forest Service, 2015) ➤ Environmental Requirements for Afforestation (Forest Service, 2016a) ➤ Land Types for Afforestation (Forest Service, 2016b) ➤ Forest Protection Guidelines (Forest Service, 2002) ➤ Forest Operations and Water Protection Guidelines (Coillte, 2013) ➤ Forestry and Water Quality Guidelines (Forest Service, 2000b) ➤ Forestry and the Landscape Guidelines (Forest Service, 2000c) ➤ Forestry and Archaeology Guidelines (Forest Service, 2000d) ➤ Forest Biodiversity Guidelines (Forest Service, 2000e) ➤ Forests and Water, Achieving Objectives under Ireland's River Basin Management Plan 2018-2021 (DAFM, 2018) ➤ Coillte Planting Guideline SOP ➤ A Guide to Forest Tree Species Selection and Silviculture in Ireland (Horgan et al., 2003) ➤ Management Guidelines for Ireland's Native Woodlands. Jointly published by the National Parks & Wildlife Service (Cross and Collins, 2017) ➤ Native Woodland Scheme Framework (Forest Service, 2018) ➤ Code of Best Forest Practice (Forest Service, 2000) <u>Mitigation by Avoidance:</u> ➤ There is a requirement in the Forest Service Code of Practice and in the FSC Certification Standard for the installation of buffer zones adjacent to aquatic zones at planting stage. Minimum buffer zone widths recommended in the Forest Service		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			(2000) guidance document “Forestry and Water Quality Guidelines” are shown in Error! Reference source not found.		
MM67	Earthworks Resulting in Suspended Solids Entrainment in Surface Waters	Ch. 4: Description of the Proposed Project Ch. 9: Hydrology & Hydrogeology Appendix 4-3 CEMP Section 3	Proposed Mitigation Measures: <u>Mitigation by Avoidance</u> ➤ The key mitigation measure during the construction phase is the avoidance of sensitive hydrological features where possible, by application of suitable buffer zones (i.e. 50m to main watercourses) at the Proposed Wind Farm site. ➤ From Error! Reference source not found. it can be seen that all of the key areas of the Proposed Wind Farm infrastructure are actually significantly away from the 50m delineated buffer zones with the exception of access road watercourse crossing locations (8 no. proposed new crossings and 2 no. existing crossings proposed for upgrade). The hardstand at proposed turbine location T5 partially encroach the 50m buffer zone. ➤ The large setback distance from sensitive hydrological features means that adequate room is maintained for the proposed drainage mitigation measures (discussed below) to be properly installed and operate effectively. The proposed buffer zone will: ➤ Avoid physical damage (river/stream banks and river/stream beds) to watercourses and associated release of sediment; ➤ Avoid excavations within close proximity to surface watercourses; ➤ Avoid the entry of suspended sediment from earthworks into watercourses; and, ➤ Avoid the entry of suspended sediment from the construction phase drainage system into watercourses, achieved in part by ending drain discharge outside the buffer zone and allowing percolation across the vegetation of the buffer zone. <u>Mitigation by Design:</u> ➤ Source controls:		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			➤ Interceptor drains, vee-drains, diversion drains, flume pipes, erosion and velocity control measures such as use of sand bags, oyster bags filled with gravel, filter fabrics, and other similar/equivalent or appropriate systems. ➤ Small working areas, covering stockpiles, weathering off stockpiles, cessation of works in certain areas. ➤ In-Line controls: ➤ Interceptor drains, vee-drains, oversized swales, erosion and velocity control measures such as check dams, sand bags, oyster bags, straw bales, flow limiters, weirs, baffles, silt bags, silt fences, sedimats, filter fabrics, and collection sumps, temporary sumps, sediment traps, pumping systems, settlement ponds, temporary pumping chambers, or other similar/equivalent or appropriate systems. ➤ Treatment systems: ➤ Temporary sumps and ponds, temporary storage lagoons, sediment traps, and settlement ponds, and proprietary settlement systems such as Siltbuster, and/or other similar/equivalent or appropriate systems. ➤ It should be noted for this site that an extensive network of forestry and agricultural drains already exists, and these will be integrated and enhanced as required and used within the wind farm development drainage system. The integration of the existing drainage network and the Proposed Wind Farm network is relatively simple. The key elements being the upgrading and improvements to existing water treatment elements, such as in line controls and treatment systems, including silt traps, settlement ponds and buffered outfalls. ➤ The main elements of interaction with existing drains will be as follows: ➤ Apart from interceptor drains, which will convey clean runoff water to the downstream drainage system, there will be no direct discharge (without treatment for sediment reduction, and attenuation for flow management) of runoff from the proposed wind farm drainage into the existing site drainage network. This will reduce the potential for any increased risk of downstream flooding or sediment transport/erosion; ➤ Silt traps will be placed in the existing drains upstream of any streams where construction works / tree felling is taking place, and these will be diverted into proposed interceptor drains, or culverted under/across the works area;		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			➤ Runoff from individual turbine hardstanding areas will be not discharged into the existing drain network but discharged locally at each turbine location through settlement ponds and buffered outfalls onto vegetated surfaces; ➤ Buffered outfalls which will be numerous over the site will promote percolation of drainage waters across vegetation and close to the point at which the additional runoff is generated, rather than direct discharge to the existing drains of the site; and, ➤ Drains running parallel to the existing roads requiring widening will be upgraded, widening will be targeted to the opposite side of the road. Velocity and silt control measures such as check dams, sand bags, oyster bags, straw bales, flow limiters, weirs, baffles, silt fences will be used during the upgrade construction works. Regular buffered outfalls will also be added to these drains to protect downstream surface waters. ➤ It should be noted that 2.6km of the Proposed Wind Farm roads already exist (as forestry tracks) and are proposed for upgrade. The upgrading of these roads, albeit presents a potential short-term potential non-significant effect on surface water quality during construction, will be a positive effect in the long-term with regard to improved drainage controls. Pre-commencement Temporary Drainage Works ➤ Prior to the commencement of road upgrades (or new road/hardstand or turbine base installs) the following key temporary drainage measures will be installed: ➤ All existing dry forestry or agricultural drains that intercept the proposed works area will be temporarily blocked down-gradient of the works using check dams/silt traps; ➤ Clean water interceptor drains will be installed upgradient of the works areas; ➤ Check dams/silt fence arrangements (silt traps) will be placed in all existing drains that have surface water flows and also along existing roadside drains; and, ➤ A double silt fence perimeter will be placed down-slope of works areas that are located inside the watercourse 50m buffer zone. Silt Fences: ➤ Silt fences will be emplaced within drains down-gradient of all construction areas. Silt fences are effective at removing heavy settleable solids such as those present in the		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			glacial tills that overlie the site. This will act to prevent entry to water courses of sand and gravel sized sediment, released from excavation of mineral sub-soils of glacial and glacio-fluvial origin, and entrained in surface water runoff. Inspection and maintenance of these of these structures during construction phase is critical to their functioning to stated purpose. They will remain in place throughout the entire construction phase. Double silt fences will be placed within drains down-gradient of all construction areas inside the hydrological buffer zones. Silt Bags: ➤ Silt bags will be used where small to medium volumes of water need to be pumped from excavations. As water is pumped through the bag, the majority of the sediment is retained by the geotextile fabric allowing filtered water to pass through. Silt bags will be used with natural vegetation filters or sedimats Sediment entrapment mats, consisting of coir or jute matting, will be placed at the silt bag location to provide further treatment of the water outfall from the silt bag. Sedimats will be secured to the ground surface using stakes/pegs. The sedimat will extend to the full width of the outfall to ensure all water passes through this additional treatment measure. Settlement Ponds: ➤ The Proposed Wind Farm infrastructure footprint has been divided into drainage catchments (based on topography, outfall locations, and catchment size) and stormwater runoff rates based on the 10-year return period rainfall event were calculated for various catchment areas in order to size the settlement ponds as shown in Error! Reference source not found. below. ➤ The 10-year return period rainfall event is a recommendation of the IFI relating to a previous application in County Clare (i.e. Cahermurphy 2 Wind Farm, Co. Clare - Planning Ref P20/658) and has been applied to this current application also. ➤ The location and dimensions of proposed settlement ponds are shown on the Proposed Wind Farm site drainage plan drawings (Appendix 4-3).		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
MM68	Effects on Groundwater Levels during Excavation Works	Ch. 9: Hydrology & Hydrogeology	Impact Assessment/Proposed Mitigation Measures by Design: The proposed 2 no. borrow pits are located in competent SILTSTONE/SANDSTONE bedrock which is generally unproductive in terms of groundwater flow. Similar bedrock types underlie the proposed turbine locations. Also, the topographical and hydrogeological setting of the proposed borrow pits and turbine locations means no significant groundwater dewatering is anticipated to be required during the operation of the borrow pit or turbine base construction. Moreover, direct rainfall and surface water runoff will be the main inflows that will require water volume and water quality management. For the avoidance of doubt, we would generally define dewatering as a requirement to permanently drawdown the local groundwater table by means of over pumping, e.g. as would be required for the operation of a bedrock quarry in a valley floor. We consider that this example is very different in scale and operation from the proposed operation of a temporary shallow borrow pit on the side of a hill. In order to explain this thoroughly we will outline our reasoning in a series of bullet points as follows: ➤ Firstly, the proposed borrow pit areas are located on the top of hills/ridges where the ground elevation is between 250 and 320m OD; ➤ All proposed turbine locations are at elevations in excess of 200m OD; ➤ These elevations are well above the elevations of the local valleys and streams; ➤ The proposed borrow pits will be between approximately 8 – 10mbgl which is notable. However, in the context of the topographical/elevated setting of the proposed borrows pits, this depth range is relatively shallow; ➤ The local bedrock comprises SILTSTONE/SANDSTONE and is confirmed to have low intrinsic permeability due to the competency of the rock. This means that groundwater flows will be limited to seepages at worst;		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			> The flow paths (i.e. the distance from the point of recharge to the point of discharge) in this type of geology is short, localised, and will also be relatively shallow; > No regional groundwater flow regime, i.e. large volumes of groundwater flow, will be encountered at these elevations; > Therefore, shallow groundwater inflows will largely be fed by recent rainfall, and possibly by limited groundwater seepage from localised shallow bedrock; > The sloping nature of the ground/ridges on the hills where the borrow pits is proposed along with the coverage of soil means groundwater recharge is going to be very low; > As such the shallow groundwater flow system will be small in comparison to the expected surface water flows from the bog surface; > This means that there will be a preference for high surface water runoff as opposed to groundwater recharge and flow; and, > Hence, we consider that the management of surface water will form the largest proportion of water to be managed and treated. > Similarly, no significant groundwater dewatering is anticipated to be required during the construction of the turbine bases.		
MM69	Surface Water Quality from Excavation Dewatering	Ch. 4: Description of the Proposed Project Ch. 9: Hydrology & Hydrogeology Appendix 4-3 CEMP Section 3	Management of excavation inflows and subsequent treatment prior to discharge into the drainage network will be undertaken as follows: > Appropriate interceptor drainage, to prevent upslope surface runoff from entering excavations will be put in place; > If required, pumping of excavation inflows will prevent build-up of water in the excavation; > The interceptor drainage will be discharged to the site constructed drainage system or onto natural vegetated surfaces and not directly to surface waters; > The pumped water volumes will be discharged via volume and sediment attenuation ponds adjacent to excavation areas, or via specialist treatment systems such as a silt bags or silt buster; > There will be no direct discharge to surface watercourses, and therefore no risk of hydraulic loading or contamination will occur;		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			➤ Daily monitoring of excavations by a suitably qualified person will occur during the construction phase. If high levels of seepage inflow occur, excavation work will immediately be stopped and a geotechnical assessment undertaken; ➤ At the turbine locations and borrow pits adequately sized settlement ponds will be constructed to treat pumped water prior to discharge into a local manmade drain; and, ➤ A mobile 'Siltbuster' or similar equivalent specialist treatment system can be made available at turbine locations for emergencies in order to treat sediment polluted waters from settlement ponds or excavations should they occur. Siltbusters are mobile silt traps that can remove fine particles from water using a proven technology and hydraulic design in a rugged unit. The mobile units are specifically designed for use on construction-sites. They will be used as final line of defence if needed		
MM70	Hydrocarbons	Ch. 4: Description of the Proposed Project Ch. 9: Hydrology & Hydrogeology CEMP Section 3 Appendix 4-5: Surface Water Management Plan	Mitigation measures proposed to avoid release of hydrocarbons at the Site are as follows: ➤ On site re-fuelling of machinery will be carried out using a dedicated fuel truck. The fuel truck will also carry fuel absorbent material and pads in the event of any accidental spillages; ➤ Mobile measures such as drip trays and fuel absorbent mats will be used during all refuelling operations; ➤ On-site refuelling will be carried out by trained personnel only; ➤ A permit to fuel system will be put in place; ➤ Fuels stored on site will be minimised. Fuel storage areas if required will be bunded appropriately for the fuel storage volume for the time period of the construction and fitted with a storm drainage system and an appropriate oil interceptor; ➤ The plant used during construction will be regularly inspected for leaks and fitness for purpose; and, ➤ An emergency plan for the construction phase to deal with accidental spillages will be included within the Construction and Environmental Management Plan (Appendix 4.3). Spill kits will be available to deal with and accidental spillage in and outside the re-fuelling area		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
MM71	Effects due to new Watercourse s along the Proposed Grid Connection	Ch. 9: Hydrology & Hydrogeology	➤ All proposed 9 no. new stream crossings and 2 no. upgrades will be bottomless or clear span structures, and the existing banks will remain undisturbed. No in-stream excavation works are proposed and therefore there will be no direct impact on the stream at the proposed crossing location; ➤ Where the proposed cable route follows an existing road or road proposed for upgrade, the cable will pass over or below the culvert within the access road; ➤ All guidance / mitigation measures proposed by the OPW or the Inland Fisheries Ireland⁴ is incorporated into the design of the proposed crossings; ➤ As a further precaution, near stream construction work, will only be carried out during the period permitted by Inland Fisheries Ireland for in-stream works according to the Eastern Regional Fisheries Board (2004) guidance document "Requirements for the Protection of Fisheries Habitat during Construction and Development Works at River Sites", i.e., May to September inclusive. This time period coincides with the period of lowest expected rainfall, and therefore minimum runoff rates. This will minimise the risk of entrainment of suspended sediment in surface water runoff, and transport via this pathway to surface watercourses (any deviation from this will be done in discussion with the IFI); ➤ During the near stream construction work double row silt fences will be emplaced immediately down-gradient of the construction area for the duration of the construction phase. There will be no batching or storage of cement allowed in the vicinity of the crossing construction areas; ➤ All new river/stream crossings will require a Section 50 application (Arterial Drainage Act, 1945). The river/stream crossings will be designed in accordance with OPW guidelines/requirements on applying for a Section 50 consent; and, ➤ All crossings will be designed to accommodate a 100-year design flood with allowance for 300mm freeboard		

⁴ Inland Fisheries Ireland (2016): Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
MM72	Use of Cement Based Products	Ch. 4: Description of the Proposed Project Appendix 4-5: Surface Water Management Plan CEMP Section 3 Ch. 9: Hydrology & Hydrogeology	> No batching of wet-concrete products will occur on site. Ready-mixed supply of wet concrete products and where possible, emplacement of pre-cast elements, will take place; > Where possible pre-cast elements for culverts and concrete works will be used; > Where concrete is delivered on site, only the chute will be cleaned, using the smallest volume of water practicable. No discharge of cement contaminated waters to the construction phase drainage system or directly to any artificial drain or watercourse will be allowed. Chute cleaning water will be undertaken at lined concrete washout ponds; > Weather forecasting will be used to plan dry days for pouring concrete; and, > The pour site will be kept free of standing water and plastic covers will be ready in case of sudden rainfall event.		
MM73	Effects on Designated Sites	Ch. 9: Hydrology & Hydrogeology	Drainage mitigation measures for surface water quality protection during the construction phase are summarised again below: (Please refer to Sections Error! Reference source not found., Error! Reference source not found., Error! Reference source not found., Error! Reference source not found. and Error! Reference source not found. and above for the full description of these measures and how they will be applied). > The proposed mitigation measures which will include 50m buffer zones for avoidance of sensitive hydrological features (streams and rivers); > Pre-construction drainage control measures (Section Error! Reference source not found.); > Robust drainage control measures (i.e. interceptor drains, swales, settlement ponds and treatment trains such as Siltbuster) will ensure that the quality of runoff from Proposed Development areas will be very high; and,		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			➤ Best practice measures with regard use of oils, fuels (Section Error! Reference source not found.) and cement based compounds (Section Error! Reference source not found.).		
MM74	Effects on Local Groundwater Well Supplies from Excavations	Ch. 9: Hydrology & Hydrogeology	We are satisfied that the Proposed Project will not impact in any significant way on any potential down-gradient private wells for the following reasons: ➤ The large set back distances between turbine locations/borrow pit locations and downstream potential well locations (>700m); ➤ The elevation difference between turbine locations/borrow pit locations and downstream potential well locations (>50m); ➤ The short groundwater flowpath distances (30 – 300m); ➤ The Proposed Wind Farm will involve relatively shallow excavations (3.5m - 8mbgl) which are typically located on elevated ground where thereby lessens the true depth of the excavation; ➤ The moderate - low permeability of the glacial deposits in which the turbine gravity base foundations will be constructed; ➤ The low permeability and low recharge characteristics of the underlying SILTSTONE/SANDSTONE aquifer that underlies the Proposed Wind Farm site; ➤ Localised groundwater flow patterns in the glacial deposits which is towards local streams that flow through the Proposed Wind Farm site; ➤ Groundwater flow patterns are expected towards the internal watercourses that drain the proposed Wind Farm site; and, ➤ The shallow excavation depths required for Proposed Grid Connection cable and joint bays		
MM75	Surface Water Quality Effects of the	Ch. 9: Hydrology & Hydrogeology	Pre-commencement Temporary Drainage Works: Prior to the commencement of 110kV substation or cable trenching the following key temporary drainage measures will be installed:		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
	Proposed Grid Connection Earthworks Works and Watercourse Crossings		> All existing roadside drains (where present) that intercept the proposed works area will be temporarily blocked down-gradient of the works using check dams/silt traps; > Culverts, manholes and other drainage inlets (where present) will also be temporarily blocked; > A double silt fence perimeter will be placed along the road verge on the down-slope side of works areas that are located inside the watercourse 50m buffer zone on the Levally Stream tributary. The following mitigation measures are proposed for the underground cabling watercourse crossing works: > No stock-piling of construction materials will take place along the grid route; > No refuelling of machinery or overnight parking of machinery is permitted in this area; > No concrete truck chute cleaning is permitted in this area; > Works will not take place at periods of high rainfall, and will be scaled back or suspended if heavy rain is forecast; > Local road drainage, culverts and manholes will be temporarily blocked during the works; > Machinery deliveries will be arranged using existing structures along the public road; > All machinery operations will take place away from the stream and ditch banks, apart from where crossings occur. Although no instream works are proposed or will occur; > Any excess construction material will be immediately removed from the area and sent to a licenced waste facility; > No stockpiling of materials will be permitted in the constraint zones; > Spill kits will be available in each item of plant required to complete the stream crossing; and, > Silt fencing will be erected on ground sloping towards watercourses at the stream crossings if required. Fracture Blow-out (Frac-out) Prevention and Contingency Plan for HDD:		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			> The drilling fluid/bentonite will be non-toxic and naturally biodegradable (i.e. Clear Bore Drilling Fluid or similar will be used); > The area around the drilling fluid batching, pumping and recycling plants will be bunded using terram and/or sandbags to contain any potential spillage; > One or more lines of silt fencing will be placed between the works area and the adjacent river; > Spills of drilling fluid will be cleaned up immediately and transported off-site for disposal at a licensed facility; > Adequately sized skips will be used where temporary storage of arisings are required; > The drilling process / pressure will be constantly monitored to detect any possible leaks or breakouts into the surrounding geology or local watercourse; > This will be gauged by observation and by monitoring the pumping rates and pressures. If any signs of breakout occur then drilling will be immediately stopped; > Any frac-out material will be contained and removed off-site; > The drilling location will be reviewed, before re-commencing with a higher viscosity drilling fluid mix; and, > If the risk of further frac-out is high, a new drilling alignment will be sought at the crossing location		
MM76	Siltbuster and Effect on Downstream Surface Water Quality (Proposed Project)	Ch. 9: Hydrology & Hydrogeology	Measures employed to prevent overdosing and potential chemical carryover: > The siltbuster system comprises an electronic in-line dosing system which provides an accurate means of adding agents so overdosing does not occur; > Continued monitoring and water analysis of pre and post treated water by means of an inhouse lab and dedicated staff, means the correct amount of chemical is added by the dosing system; > Dosing rates of chemical to initiate settlement is small, being in the order of 2-10 mg/L and the vast majority of the chemical is removed in the deposited sediment; > Final effluent not meeting the discharge criteria is recycled and retreated, which has a secondary positive effect of reducing carryover; and,		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			➤ Use of biodegradable chemical agents can be used at very sensitive sites		
MM77	Effects on Surface Water and Groundwater WFD Status (Proposed Project)	Ch. 9: Hydrology & Hydrogeology	Mitigation measures relating to the protection of surface water drainage regimes and surface water quality at the Proposed Project site have been detailed in Section Error! Reference source not found. (clear felling), Section Error! Reference source not found. (suspended solids), Section Error! Reference source not found. (hydrocarbons), Section Error! Reference source not found. (cement-based products) and Sections Error! Reference source not found. & Error! Reference source not found. (hydromorphological changes). Similarly, mitigation measures for the protection of groundwater quantity and quality have been detailed in Section Error! Reference source not found. (groundwater levels), Section Error! Reference source not found. (hydrocarbons) and Section Error! Reference source not found. Error! Reference source not found. (cement-based products). The implementation of these mitigation measures will ensure the protection of downstream SWBs and underlying GWBs		
MM78	Effects on Public Water Supplies (Surface Water and Groundwater)	Ch. 9: Hydrology & Hydrogeology	Impact Assessment Proposed Mitigation Measures: There is no Proposed Project infrastructure located inside the Ironmills PWS and therefore no potential for alteration of groundwater flowpaths or groundwater quality effects. As described in Section Error! Reference source not found. above, investigations carried out on the source have not identified a strong hydraulic connection between the Multeen River and abstraction boreholes and therefore potential indirect effects via surface water pathways are not likely. Therefore, the likelihood of the Multeen River acting as a pathway for contaminants (i.e. runoff) between the Proposed Wind Farm site and the source is very low. Nonetheless, the Proposed Wind Farm drainage mitigation as described in Sections Error! Reference source not found. and Error! Reference source not found. will ensure the protection of downstream surface waters including the Multeen River. Also, the filtering effects of the sand and gravel		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			deposits that surround the source boreholes means any suspended sediments in the Mulkear River would not be able to enter the well during pumping. The Proposed Grid Connection cable passes through the Doon WS source protection area for approximately 150m within the carriageway of the R505. However, due to the fact that cable will be laid within the R505 carriageway along with the shallow nature of the trench excavation no effects on groundwater flowpaths sustaining the spring will occur. There is an existing watermain within the public road which was placed without disrupting the spring. The R505 carriageway is elevated some 8m above the elevation of spring, therefore shallow groundwater flowpath underneath the R505 carriageway are not likely. It is understood from the source protection that groundwater levels upslope of the spring are 2 – 3m below ground level, which is deeper than the proposed cabling earthworks (~1.2mbgl). Spills and leaks of fuels hydrocarbons do however present a risk to the source spring during the Proposed Grid Connection construction phase. To mitigate this risk, no refuelling or handling of fuels/oil/lubricants/chemicals will be permitted within 100m of the mapped source protection area boundary. In addition, to present potential leaching of cement from the cable trenching, a geotextile liner will be placed around the founding layer (lean mix concrete) where concrete is to be poured. Also, there will be clear signage in place inside the source protection area to remind construction workers that the area is inside a drinking water protection area and that there are restrictions around the use of fuels/oil/lubricants/chemicals. Due to the large downstream distance to the surface water DWPA's in the Suir and Shannon, along with the proposed drainage control and pollution prevention mitigation no effects on these surface water abstractions will occur.		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
MM79	Biodiversity Enhancement and Management Plan (BEMP) and Potential Hydrological /Water Quality Effects	Ch. 9: Hydrology & Hydrogeology	All proposed habitat management and enhancement works will be in accordance with the best practice Forest Service regulation, policies and strategic guidance documents as well as Coillte, DAFM and NatureScot guidance documents to ensure minimal potential negative effects on the local peat, soil and subsoil environment. Given the nature of the restoration measures the following mitigation measures are proposed: ➤ Before any works are completed silt fences will be installed to limit the movement of entrained sediment in surface water runoff; ➤ Proposed off-road routes will be walked in advance of any machinery; ➤ All machinery operators will be experienced; ➤ The Proposed Wind Farm site will be walked before a machine goes off-road; ➤ Bog mats will be used where the excavator is required to travel over wet ground; and, ➤ A low ground pressure excavator with wide tracks (1.9m or greater) will be used to reduce compaction of the peat and subsoils.		
MM80	Potential Effects from Turbine Delivery Route Works (Proposed Wind Farm)	Ch. 9: Hydrology & Hydrogeology	➤ All works are minor and localised and cover very small areas; ➤ These works are distributed over a wide area; ➤ All works are temporary in nature; ➤ All areas will be reinstated shortly after the works and reseeded; and, ➤ Application of the Pre-Construction Drainage Measures (see Section Error! Reference source not found.) for surface water quality protection.		
Operational Phase					

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
MM81	Replacement of Natural Surfaces with Lower Permeability Surfaces	Ch. 4: Description of the Proposed Project Ch. 9: Hydrology & Hydrogeology Appendix 4-3 CEMP Section 3	Proposed Mitigation by Design: The operational phase drainage system of the Proposed Project will be installed and constructed in conjunction with the road and hardstanding construction work as described below and as shown on the Drainage drawings submitted with this planning application (Appendix 4-3): ➤ Interceptor drains will be installed up-gradient of all proposed infrastructure to collect clean surface runoff, in order to minimise the amount of runoff reaching areas where suspended sediment could become entrained. It will then be directed to areas where it can be re-distributed over the ground by means of a level spreader; ➤ Swales/road side drains will be used to collect runoff from access roads and turbine hardstanding areas of the site, likely to have entrained suspended sediment, and channel it to settlement ponds for sediment settling; ➤ On steep sections of access road transverse drains ('grips') will be constructed in the surface layer of the road to divert any runoff off the road into swales/road side drains; ➤ Check dams will be used along sections of access road drains to intercept silts at source. Check dams will be constructed from a 4/40mm non-friable crushed rock; ➤ Settlement ponds, emplaced downstream of road swale sections and at turbine locations, will buffer volumes of runoff discharging from the drainage system during periods of high rainfall, by retaining water until the storm hydrograph has receded, thus reducing the hydraulic loading to watercourses; and, ➤ Settlement ponds have been designed in consideration of the greenfield runoff rate. ➤ As described above the proposed integration of the wind farm drainage with the existing forestry drainage is a key component of the proposed drainage management within the development. By integration we mean maintaining surface water flowpaths where they already exist, avoid creation of new or altered surface water flowpaths, and maintaining the drainage regime (i.e. normal flow) within each forestry compartment. Critically, there will be no alteration of the catchment size contributing to each of the main downstream watercourses. All wind farm drainage water captured within individual site sub-		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			catchments will be attenuated and released within the same sub-catchments that it was captured.		
MM82	Effects from Surface Water Runoff	Ch. 4: Description of the Proposed Project Ch. 9: Hydrology & Hydrogeology CEMP Section 3	The mitigation measures outlined in Sections Error! Reference source not found. and Error! Reference source not found. will ensure all surface water runoff from upgraded roads and new road surfaces (including hardstand, turbine base areas and substation) will be captured and treated prior to discharge/release. Settlement ponds, checks dams and buffered outfalls will prevent roads acting as preferential flowpaths by providing attenuation and water quality treatment. It is proposed that bedrock from on-site borrow pits will be used to construct the sub-base layer of proposed upgraded and new access roads, hardstand areas and turbine base areas. Once installed the subbase layer will be overlain by a clean capping layer of high-grade stone material which will be sourced from local quarries also		
MM83	Runoff Resulting in Contamination of Surface Waters	Ch. 9: Hydrology & Hydrogeology	Mitigation measures for sediment control are the same as those outlined above for the construction phase. Mitigation measures for control of hydrocarbons during maintenance works are similar to those outlined in Section 9.5.2.5		
MM84	Potential Water Quality Effects from BESS Fire Water	Ch. 9: Hydrology & Hydrogeology Appendix 4-4	The proposed fire-water retention design (refer to Appendix 4-4 for the Fire Risk Management & Emergency Response Plan) for the proposed BESS compound will include capture, contain, and hold contaminated runoff from the worst-credible fire scenarios while keeping it away from drains, groundwater, and off-site receptors.		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
	Contamination		The objectives of the fire water containment are to: ➤ Contain all firewater and contaminated rainfall from a worst-case BESS fire without uncontrolled release; ➤ Segment the compound so a single incident doesn't flood the entire compound or escape the boundary with necessary bunding; ➤ Provide positive isolation of surface water drains (automatic/manual penstocks), defaulting to "closed on alarm."; and, ➤ Be chemically compatible with expected contaminants (HF, metals, electrolytes, plastics by-products) and allow safe sampling, treatment, and removal. Dedicated Firewater Retention Tank(s) will provide the most effective and suitable measure for retaining firewater. The tanks will be rendered impermeable by the use of an appropriate liner and integrity tested. All integrity testing of the tanks will be completed by a suitably qualified competent person and be in line with the Environmental Protection Agency's (EPA) guidance. All the BESS compound drainage systems will divert automatically to the firewater retention tanks on activation of the site fire detection and alarm system. If storm water management is being used for the dual purpose with firewater retention, then the outlet will be fitted with an automatic valve linked to the fire detection system. Automatic shut-off valves will be tested and maintained as per the site's Safety Statement and Maintenance Procedures. The fire water retention tanks will be kept clean, and free of debris. After the fire, the retained water will be sampled, treated, or removed by licensed hazardous-waste contractors		
Decommissioning Phase					
MM85	Decommissioning Phase	Ch. 9: Hydrology & Hydrogeology	The potential impacts associated with decommissioning of the Proposed Project will be similar to those associated with construction but of a reduced magnitude, due to the reduced		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			scale of the proposed decommissioning works in comparison to construction phase works. Mitigation measures to avoid contamination by accidental fuel leakage and compaction of soil by on-site plant will be implemented as per the construction phase mitigation measures.		
Ch. 10: Air Quality					
Construction Phase					
MM86	Exhaust Emissions	Ch 10	> All construction vehicles and plant used onsite during the construction phase will be maintained in good operational order. If a vehicle requires repairs this work will be carried out, thereby minimising any emissions that arise. > Turbines components will be transported to the Site on specified routes only, unless otherwise agreed with the Planning Authority. > All machinery will be switched off when not in use. > Users of the Site will be required to ensure that all plant and vehicles are suitably maintained to ensure that emissions of engine generated pollutants are kept to a minimum. > The majority of aggregate materials for the construction of the Proposed Project will be obtained from the borrow pits on site. This will significantly reduce the number of delivery vehicles accessing the site, thereby reducing the amount of emissions associated with vehicle movements. > The Materials Recovery Facility (MRF) facility will be local to the Proposed Wind Farm site to reduce the amount of emissions associated with vehicle movements. The nearest licensed waste facility to the Proposed Wind Farm site is Cashel Recycling Centre located approximately 15.8km to the southeast of the Proposed Wind Farm site. Thurles Recycling Centre is located approximately 16.1km to the northeast of the Proposed Wind Farm site.		
MM87	Dust Emissions	Ch 10	> Sporadic wetting of loose stone surface will be carried out during the construction phase to minimise movement of dust particles to the air. In periods of extended dry weather, dust suppression may be necessary along haul roads to ensure dust does not cause a nuisance. > Water bowser movements will be carefully monitored to avoid, insofar as reasonably possible, increased runoff.		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			> All plant and materials vehicles shall be stored in dedicated areas within the Proposed Wind Farm site. > Areas of excavation will be kept to a minimum, and stockpiling will be minimised by coordinating excavation, spreading and compaction. > Turbines and construction traffic will be transported to the Site on specified haul routes only. > Proposed Grid Connection infrastructure will be transported to the Site on specified haul routes only. > Construction materials for the Proposed Grid Connection and a small volume for the proposed Wind Farm site will be sourced locally from licenced quarries. > The agreed haul route road adjacent to the Proposed Wind Farm site will be regularly inspected for cleanliness and cleaned as necessary. > The roads adjacent to the Site entrances will be checked weekly for damage/potholes and repaired as necessary. > The transportation of materials from the borrow pits around the Proposed Wind Farm site will be covered by tarpaulin or similar covered vehicles where necessary. > The transportation of construction materials from locally sourced quarries for the Proposed Grid Connection infrastructure and a small volume for the Proposed Wind Farm site will be covered by tarpaulin where necessary. > If necessary, excavated material will be dampened prior to transport to the spoil management areas. > Waste material will be transferred to a licensed/permitted Materials Recovery Facility (MRF) by a fully licensed waste contractor where the waste will be sorted into individual waste streams for recycling, recovery or disposal. The MRF facility will be local to the Proposed Project to reduce the amount of emissions associated with vehicle movements. > A Construction and Environmental Management Plan (CEMP) will be in place throughout the construction phase (see Appendix 4-3). The CEMP includes dust suppression measures		
Operational Phase					

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
MM88	Exhaust Emissions	Ch 10	- Any vehicles or plant brought onsite during the operational phase will be maintained in good operational order that comply with the Road Traffic Acts 1961 as amended, thereby minimising any emissions that arise. - When stationary, delivery and on-site vehicles will be required to turn off engines		
MM89	Dust Emissions	Ch 10	Maintenance vehicles brought onsite during the operational phase will be maintained in good operational order, thereby minimising any dust emissions that arise.		
Decommissioning Phase					
MM90	Decommissioning	Ch 10	The mitigation measures prescribed for the construction phase of the Proposed Project will be implemented during the decommissioning phase thereby minimising any potential impacts		
Ch. 11: Climate					
Construction Phase					
MM91	Greenhouse Gas Emissions	Ch. 10: Air Quality Ch.11: Climate Ch. 15: Material Assets Appendix 4-3	- All construction vehicles and plant will be maintained in good operational order while on-site, thereby minimising any emissions that arise. - When stationary, delivery and on-site vehicles will be required to turn off engines. - Turbines and construction materials will be transported to the Site on specified routes only unless otherwise agreed with the Planning Authority. Please see Chapter 15 Material Assets for details. - It is intended to obtain the majority of materials for the construction of the Proposed Wind Farm from the proposed on-site borrow pits (with some material being imported from local licenced quarries as needed). This will significantly reduce the number of delivery vehicles accessing the Site, thereby reducing the amount of emissions associated with vehicle movements. - A Construction and Environmental Management Plan (CEMP) (Appendix 4-3) will be in place throughout the construction phase.		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			➤ The CEMP (Appendix 4-3) includes a Waste Management Plan (WMP) which outlines the best practice procedures that will occur during the construction phase relating to waste material. • The WMP outlines the methods of waste prevention and minimisation by recycling, recovery and reuse at each stage of construction of the Proposed Project. Disposal of waste will be seen as a last resort. • Section 4.3.4.7 of Chapter 4 for this EIAR refers to the methodology that will be utilised to manage on-site waste. This waste material will be transferred to a licensed /permitted Materials Recovery Facility (MRF) by a fully licensed waste contractor, • The MRF facility will be local to the Proposed Project site to reduce the amount of emissions associated with vehicle movements. ➤ Where applicable, low carbon intensive construction materials will be sourced and utilised on-site.		
Operational Phase					
MM92	Greenhouse Gas Emissions	Ch. 11: Climate Appendix 6-1	➤ Ensure that all maintenance and monitoring vehicles will be maintained in good operational order while on-site, and, when stationary, be required to turn off engines thereby minimising any emissions that arise. ➤ As detailed in Appendix 6-1, a BMEP, for the Proposed Wind Farm has identified biodiversity enhancement and management activities such as the protection and maintenance of species rich grassland habitat within the Proposed Wind Farm site, native woodland management and riparian woodland planting and linear connectivity.		
Decommissioning Phase					
MM93	Decommissioning Phase	Ch. 11: Climate	Any impact and consequential effect that occurs during the decommissioning phase are similar to that which occur during the construction phase, be it of less impact. The mitigation measures prescribed for the construction phase of the Proposed Project will be implemented during the decommissioning phase thereby minimising any potential impacts.		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
Ch. 12: Noise and Vibration Noise & Vibration					
Construction Phase					
MM94	Construction Phase (Noise)	Ch. 12: Noise and Vibration	The contract documents will specify that the Contractor undertaking the works will be obliged to take specific noise abatement measures and comply with the recommendations of British Standard BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Noise. To ameliorate any potential noise impacts that may present during the construction phase, a schedule of noise control measures has been formulated in accordance with best practice guidance. These are outlined in the Construction and Environmental Management Plan (CEMP) that has been prepared for the Proposed Project. The following list of measures will be considered, where necessary, to ensure compliance with the relevant construction noise criteria: ➤ Limiting the hours during which site activities likely to create high levels of noise or vibration are permitted; ➤ Establishing channels of communication between the contractor/developer, Local Authority and residents; ➤ Monitoring typical levels of noise and vibration during critical periods and at sensitive locations; ➤ Selection of plant with low inherent potential for generation of noise and/ or vibration where practical; ➤ Placing of noise generating / vibratory plant as far away from sensitive properties as practical within the site constraints, and; ➤ The hours of construction activity will be limited to avoid unsociable hours where possible. Construction operations shall generally be restricted to between 7:00hrs and 19:00hrs Monday to Friday and 07:00 to 13:00 Saturday. However, to ensure that optimal use is made of good weather periods or at critical periods within the programme (i.e. concrete pours, turbine component deliveries) it could occasionally be necessary to work out of these hours.		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			Where rock breaking is employed in relation to the proposed borrow pit location or other locations across the Site, the following are examples of measures that will be employed, where necessary, to mitigate noise emissions from these activities: ➤ Fit suitably designed muffler or sound reduction equipment to the rock breaking tool to reduce noise without impairing machine efficiency. ➤ Ensure all leaks in air lines are sealed. ➤ Use a dampened bit to eliminate ringing. Air overpressure from a blast is difficult to control, however, because of its variability much can be done to reduce the effect. A reduction in the amount of primer cord used, together with the adequate burial of any that is above the ground, can give dramatic reduction to air overpressure intensities especially in the audible frequency range. Most complaints are likely to be received from an area downwind of the blast site, and therefore, if air blast complaints are a continual problem, it would be advisable to postpone blasting during unfavourable weather conditions if possible. As air blast intensity is a function of total charge weight, then a reduction in the total amount of explosives used can also reduce the air overpressure value. Further guidance will be obtained from the recommendations contained within BS 5228: Part 1 and the European Communities (Construction Plant and Equipment) (Permissible Noise Levels) Regulations 1988 in relation to blasting operations. The methods used to minimise impacts will consist of the following: ➤ Restriction of hours within which blasting can be conducted (e.g. 09:00 – 18:00hrs). ➤ The firing of blasts at similar times to reduce the ‘startle’ effect. ➤ On-going circulars informing people of the progress of the works. ➤ The implementation of an onsite documented complaints procedure. ➤ The use of independent monitoring for verification of results.		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			➤ Trial blasts in less sensitive areas to assist in blast designs and identify potential zones of influence.		
MM95	Construction Phase (Vibration)	Ch. 12: Noise and Vibration	The assessment presented in Section Error! Reference source not found. has demonstrated that there will be no significant vibration impacts associated with the construction of the Proposed Project and that no specific mitigation measures are required, it is recommended that vibration from construction activities will be limited to the values set out in Section Error! Reference source not found. It should be noted that these limits are not absolute but provide guidance as to magnitudes of vibration that are very unlikely to cause cosmetic damage. Magnitudes of vibration slightly greater than those in the table are normally unlikely to cause cosmetic damage, but construction work creating such magnitudes should proceed with caution. Where there is existing damage, these limits may need to be reduced by up to 50%. If blasting is undertaken as part of the Proposed Project, a detailed assessment will be undertaken by a specialist blast design engineer to determine the blast design parameters; all mitigation measures specified by the blast design engineer to keep vibration values within the criteria in Error! Reference source not found. will be implemented		
Operational Phase					
MM96	Operational Phase (Noise)	Ch. 12: Noise and Vibration	An assessment of the operation noise levels has been undertaken in accordance with best practice guidelines and procedures as outlined in Section 12.3.2.2.1 of Chapter 12. The findings of the assessment have determined that mitigation measures are required to reduce noise levels from the proposed turbines to within the criteria. Modern wind turbines can be programmed to run in reduced modes of operation (or low noise modes) to achieve the required attenuation in specific wind conditions (i.e., wind speed and direction). Operating the turbines in reduced noise modes, referred to as curtailment, typically results in a corresponding reduction in energy generation capacity for the turbine(s).		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			For any turbine curtailment strategy that is developed, consideration must be given to the practical benefits. Such curtailment may unnecessarily reduce the electrical power generating capacity of a wind farm, for an imperceptible change to the overall turbine noise levels. When curtailment for exceedance, consideration should be given to the background noise at the specific NSL to avoid unnecessarily curtailing turbine noise when the result would yield an imperceptible change to the overall turbine noise levels. A curtailment scheme has been developed for the Proposed Project to reduce noise levels at 6 m/s for daytime periods presented in Table 12 24. Where no value is shown, the turbine operates in standard mode. This curtailment scheme would have to be verified by the manufacturer based on the control and physical limitation of the turbine. If the Proposed Wind Farm is granted, the curtailment scheme identified here will be brought forward and proven as part of the noise management plan		
Decommissioning Phase					
MM97	Decommissioning Phase (Noise)	Ch. 12: Noise and Vibration	The noise and vibration impacts associated with any decommissioning of the Site are considered to be comparable to those outlined in relation to the construction of the Proposed Project		
Ch. 13: Cultural Heritage Cultural Heritage					
Pre-Commencement, Construction, Operation and Decommissioning					
MM98	Indirect and Direct Construction Phase	Ch. 13: Cultural Heritage	The construction of the Proposed Windfarm will not result in any direct, negative effects on the recorded archaeological, architectural or cultural heritage resource as none of these sites are located within the footprint of the development that requires excavations and ground works.		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			The construction of the Proposed Grid Connection Route will not result in any direct negative impacts on recorded archaeological sites, although the route will pass through the Zone of Notification associated with seven sites (AH55, 56, 57, 60, 61, 62, 63). It is possible that excavations works associated with the laying of the Grid Connection may result in a direct, negative (permanent) impact on remains that may be associated with the recorded monuments. The sensitivity of the sites is high and the magnitude of impact may be high, resulting (prior to the application of mitigation) in a potential significant significance of effect. The construction of the Grid Connection Route will not result in direct impacts on bridges BH5, BH17, BH24 and the bridge within BH25. At these locations the Grid Connection Route will be laid adjacent to the bridge structure and cross the watercourse by means of directional drilling. The construction of the Proposed Turbine Delivery Route will be partially located within AH64, which is a Zone of Archaeological Potential surrounding a possible Deserted Medieval Village, which also contains a number of other archaeological monuments located beyond the 50m study area. It is possible that excavations works associated with the widening of the road may result in a direct, negative (permanent) impact on remains within AH64. The sensitivity of the site is high and the magnitude of impact may be high, resulting (prior to the application of mitigation) in a potential significant significance of effect. No direct impacts are predicted on the bridge within AH64, which is a recorded monument and a protected structure (BH31/AH54). It is possible that the construction of the Proposed Wind Farm, Grid Connection Route and Turbine Delivery Route interventions, in greenfield and bogland or forested areas, will result in direct, negative (permanent) effects on previously unrecorded archaeological remains that may survive within these areas with no surface expression. Construction effects comprise topsoil stripping and excavations associated with the installation of turbines, crane pads, access roads, temporary construction compound, borrow pits, substation and launch/reception compounds. The sensitivity of any potential sites may vary from medium to		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			high and the magnitude of impact may vary from low to very high, resulting (prior to the application of mitigation) in potential significance of effect that may vary from slight to very significant. The construction of the Grid Connection Route will result in in direct, negative (permanent) effects on two bridges location along the proposed Grid Connection Route – CH83 and CH132. Here the cable will be laid through the bridge structures. The sensitivity off the boundaries is medium and the magnitude of impact is low, resulting in a slight significance of effect in both cases. The construction of the Proposed Wind Farm will result in five direct, negative (permanent) impacts on sections of townland boundaries (Carrowkeale, Carrow, Moheragh and Glenpaudeen). The sensitivity off the boundaries is medium and the magnitude of impact is low, resulting in a slight significance of effect in each case. The Proposed Grid Connection Route will cross 29 townland boundaries and run along 12 townland boundaries. At all but one location the cable route is located within the existing road, and as such no impacts are anticipated. A section of the townland boundary between Kishyquirk and Cloghnadromin will be removed where the Proposed Grid Connection Route runs through a section of greenfield. The sensitivity off the boundary is medium and the magnitude of impact is low, resulting in a slight significance of effect. During the construction of the Proposed Project, all topsoil stripping in greenfield areas will be subject to archaeological monitoring. This will also include any excavation works adjacent to AH55, 56, 57, 60, 61, 62, 63 and all works within AH64, along with the removal of any townland boundary sections. The laying of the Grid Connection Route through bridges CH83 and CH132 will also be subject to archaeological monitoring. All monitoring works will be carried out under licence to the National Monuments Service of the DoHLGH. If any archaeological remains are identified during the course of the works, further mitigation may be required, such as preservation by record or preservation in-situ. Any further mitigation will require approval from the National Monuments Service of the DoHLGH.		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			POTENTIAL MITIGATION STRATEGIES FOR CULTURAL HERITAGE REMAINS Mitigation is defined as features of the design or other measures of the proposed development that can be adopted to avoid, prevent, reduce or offset negative effects. The best opportunities for avoiding damage to archaeological remains or intrusion on their setting and amenity arise when the site options for the development are being considered. Damage to the archaeological resource immediately adjacent to developments may be prevented by the selection of appropriate construction methods. Reducing adverse effects can be achieved by good design, for example by screening historic buildings or upstanding archaeological monuments or by burying archaeological sites undisturbed rather than destroying them. Offsetting adverse effects is probably best illustrated by the full investigation and recording of archaeological sites that cannot be preserved in situ. DEFINITION OF MITIGATION STRATEGIES ARCHAEOLOGICAL RESOURCE The ideal mitigation for all archaeological sites is preservation in situ. This is not always a practical solution, however. Therefore, a series of recommendations are offered to provide ameliorative measures where avoidance and preservation in situ are not possible. <i>Archaeological Test Trenching</i> can be defined as ‘a limited programme of intrusive fieldwork which determines the presence or absence of archaeological features, structures, deposits, artefacts or ecofacts within a specified area or site on land, inter-tidal zone or underwater. If such archaeological remains are present field evaluation defines their character, extent, quality and preservation, and enables an assessment of their worth in a local, regional, national or international context as appropriate’ (CIfA 2020a).		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			<i>Full Archaeological Excavation</i> can be defined as ‘a programme of controlled, intrusive fieldwork with defined research objectives which examines, records and interprets archaeological deposits, features and structures and, as appropriate, retrieves artefacts, ecofacts and other remains within a specified area or site on land, inter-tidal zone or underwater. The records made and objects gathered during fieldwork are studied and the results of that study published in detail appropriate to the project design’ (CIfA 2020b). <i>Archaeological Monitoring</i> can be defined as ‘a formal programme of observation and investigation conducted during any operation carried out for non-archaeological reasons. This will be within a specified area or site on land, inter-tidal zone or underwater, where there is a possibility that archaeological deposits may be disturbed or destroyed. The programme will result in the preparation of a report and ordered archive (CIfA 2020c). <i>Underwater Archaeological Assessment</i> consists of a programme of works carried out by a specialist underwater archaeologist, which can involve wade surveys, metal detection surveys and the excavation of test pits within the sea or riverbed. These assessments are able to access and assess the potential of an underwater environment to a much higher degree than terrestrial based assessments. ARCHITECTURAL RESOURCE The architectural resource is generally subject to a greater degree of change than archaeological sites, as structures may survive for many years but their usage may change continually. This can be reflected in the fabric of the building, with the addition and removal of doors, windows and extensions. Due to their often more visible presence within the landscape than archaeological sites, the removal of such structures can sometimes leave a discernable ‘gap’ with the cultural identity of a population. However, a number of mitigation measures are available to ensure a record is made of any structure that is deemed to be of special interest, which may be removed or altered as part of a proposed development.		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			<i>Conservation Assessment</i> consists of a detailed study of the history of a building and can include the surveying of elevations to define the exact condition of the structure. These assessments are carried out by Conservation Architects and would commonly be carried out in association with proposed alterations or renovations on a Recorded Structure. <i>Building Survey</i> may involve making an accurate record of elevations (internal and external), internal floor plans and external sections. This is carried out using an EDM (Electronic Distance Measurer) and GPS technology to create scaled drawings that provide a full record of the appearance of a building at the time of the survey. <i>Historic Building Assessment</i> is generally specific to one building, which may have historic significance, but is not a Protected Structure or listed within the NIAH. A full historical background for the structure is researched and the site is visited to assess the standing remains and make a record of any architectural features of special interest. These assessments can also be carried out in conjunction with a building survey. <i>Written and Photographic record</i> provides a basic record of features such as stone walls, which may have a small amount of cultural heritage importance and are recorded for prosperity. Dimensions of the feature are recorded with a written description and photographs as well as some cartographic reference, which may help to date a feature		
Ch. 14: Landscape and Visual Landscape & Visual					
Construction Phase					
MM99	Landscape Effects during Construction	EIAR Chapter 14 Section 14.7.2.1	The above predicted landscape effects during construction assume the implementation of the following mitigation measures for the Proposed Wind Farm and Proposed Grid Connection Route. All construction activities will follow best practice methods to reduce impacts upon the environment and landscape of the Site. Further details are presented in the Construction and Environmental Management Plan (CEMP) contained in Appendix 4-5 of this EIAR. The		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			following measures should be implemented to mitigate landscape effects during the construction phase of the Proposed Project: ➤ In all circumstances, excavation depths and volumes will be minimised, and excavated material will be re-used where possible. ➤ For the proposed Grid Connection, where the cable trench is to be located in the road verge, subsoil will be piled on-site and re-used after cabling works. Should any medium planting be removed, it should be replaced with the same or similar species whenever it is not possible to salvage and reinstate. ➤ Any areas of bare soil remaining after the landscaping phase will be seeded as soon as possible with a grass-seed mix to minimise sediment run-off.		
MM 100	Visual Effects during Construction	EIAR Chapter 14 Section 14.7.2.2	General housekeeping measures, necessary for Health & Safety requirements, will ensure that the active construction areas will be kept tidy, mitigating localised visual impacts during the construction phase		
Operational Phase					
MM 101	Landscape Effects during Operation	EIAR Chapter 14 Section 14.7.3.1.3	Regarding mitigation measures to help reduce landscape effects of the Proposed Wind Farm, this LVIA points to the Biodiversity Management and Enhancement Plan (BMEP) which has been prepared as part of this EIAR (see Appendix 6-4). The BMEP will have the dual effect of providing ecological enhancement to the landscape area of the Proposed Wind Farm site as well as potential visual screening of some lower lying infrastructure of the Proposed Wind Farm, thereby also mitigating effects on landscape character during the Operational Phase. The following measures from the BMEP which have been included in the Proposed Wind Farm design are deemed to have the effect of avoiding or reducing direct effects on landscape receptors, meaning individual landscape features and the landscape character of the Proposed Wind Farm site as a whole:		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			➤ New planting and management of native woodland habitat within the Proposed Wind Farm site, including new planting of advance stock native trees. ➤ Riparian woodland planting and linear connectivity to create commuting for foraging fauna and other protected fauna. ➤ Protection and maintenance of high diversity wet grassland habitat which occurs outside the development footprint within the Proposed Wind Farm site.		
Ch. 15: Material Assets Material Assets					
Material Assets - Traffic					
Pre-Construction, Construction and Operational Phase					
MM 102	Traffic	Ch. 15: Material Assets	Mitigation by Design ➤ Selection of the most appropriate delivery route to transport the wind turbine components, requiring the minimum remedial works to accommodate the vehicles. Selection of the shortest Proposed Grid Connection diversion routes, minimising the impacts on the existing road network and traffic.		
MM 103	Traffic	Ch. 15: Material Assets	➤ The successful completion of the Proposed Project will require significant coordination and planning and a comprehensive set of mitigation measures will be put in place before and during the construction stage of the Proposed Project in order minimize the effects of the additional traffic generated. A detailed Traffic Management Plan (TMP), incorporating all the mitigation measures included as Appendix 15-2 of this EIAR, will be finalised and confirmatory detailed provisions in respect of traffic management agreed with the roads authority and An Garda Síochána prior to construction works commencing on Site. In addition, the traffic management measures proposed for the following construction traffic scenarios are set out for the grid connection in Appendix 15-2:		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
MM 104	Delivery of abnormal loads	Ch. 15: Material Assets	The detailed TMP will include the following: ➤ Traffic Management Coordinator – a competent Traffic Management Co-ordinator will be appointed for the duration of the construction of the Proposed Development and this person will be the main point of contact for all matters relating to traffic management. ➤ Delivery Programme – a programme of deliveries will be submitted to Tipperary County Council and other relevant authorities in advance of deliveries of turbine components to the Proposed Project site. Liaison with the relevant local authorities including the roads sections of local authorities that the delivery routes traverse and An Garda Síochána, during the delivery phase of the large turbine vehicles, when an escort for all convoys will be required. ➤ Information to locals – Locals in the area will be informed of any upcoming traffic related matters e.g. delivery of turbine components at night, via letter drops and posters in public places. Information will include the contact details of the Contract Project Co-ordinator, who will be the main point of contact for all queries from the public or local authority during normal working hours. An "out of hours" emergency number will also be provided. ➤ A Pre and Post Construction Condition Survey – A pre-condition survey of roads associated with the Proposed Development will be carried out prior to construction commencement to record the condition of the road. A post construction survey will be carried out after works are completed. Where required the timing of these surveys will be agreed with the local authority. ➤ Implementation of temporary alterations to road network at critical junctions – At locations where required highlighted in Section 15.1.9.		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			➤ Identification of delivery routes – These routes will be agreed and adhered to by all contractors. ➤ Travel plan for construction workers to Proposed Project site– While the assessment above has assumed the worst case that construction workers will drive to the Proposed Project site, the construction company will be required to provide a travel plan for construction staff, which will include the identification of a routes to / from the site and identification of an area for parking. ➤ Travel plan for construction workers to underground electric cabling route – Due to the transient nature of the underground grid connection construction site which will generally be on a section of the public road, construction workers will be transported to and from the site by the construction company at the beginning and end of each shift. ➤ Drivers conduct – All drivers will follow normal rules of the road and will receive toolbox talk regarding the delivery route and planned holding points prior to any deliveries. ➤ Standard permitted axial loads – Will not be exceeded. ➤ Temporary traffic signs – As part of the traffic management measures temporary traffic signs will be put in place at all key junctions, including the access junction on the L58333 during the 12 month construction period. All measures will be in accordance with the “Traffic Signs Manual, Section 8 – Temporary Traffic Measures and Signs for Road Works” (DoT now DoTT&S) and “Guidance for the Control and Management of Traffic at Roadworks” (DoTT&S). A member of construction staff (flagman) and signage will be present at access junctions B, J, K and L on days used during the construction period. ➤ Delivery times of large turbine components – The management plan will include the delivery of large wind turbine plant components at night in order to minimise disruption to general traffic during the construction stage.		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			➤ Re-instatement works – All road surfaces and boundaries will be re-instated to pre-development condition, as agreed with the local authority engineers. All works will be done in accordance with the Guidelines for the Opening, Backfilling and Reinstatement of ➤ Openings in Public Roads, DTTOS, September 2015. ➤ Additional measures – Various additional measures will be put in place in order to minimise the effects of the development traffic on the surrounding road network including wheel washing facilities on Site and sweeping / cleaning of local roads as required. ➤ It is confirmed that details for the Traffic Management Plan for the Proposed Project will be agreed with the Road Section of Tipperary County Council, Limerick County Council and TII prior to construction and contact will be maintained with the Road and Traffic Section throughout the construction phase		
MM 105	General Traffic Management	Ch. 15: Material Assets	➤ Due to the very low volumes of traffic forecast to be generated during this stage no mitigation measures are required		
Decommissioning Phase					
MM 106	Decommissioning Phase	Ch. 15: Material Assets	In the event that the Proposed Project is decommissioned after the 35 years of operation, a decommissioning plan, will be prepared for agreement with the local authority. This plan will include a material recycling / disposal and traffic management plan will be prepared for agreement with the local authority prior to decommissioning, in accordance with Scottish Natural Heritage report (SNH) <i>Research and Guidance on Restoration and Decommissioning of Onshore Wind Farms</i> (SNH, 2013).		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
Material Assets - Other					
Construction Phase					
MM 107	Electricity	Ch. 15: Material Assets	➤ Goal posts will be established under overhead lines for the entirety of the construction phase. They will not exceed a height of 4.2 metres, unless specifically agreed with ESB Networks ➤ The suitability of machinery and equipment for use near power lines will be risk assessed. ➤ All staff will be trained on the routes and operating voltages of overhead electricity lines running across the proposed main site entrance. All staff will be trained to be aware of the risks associated with overhead lines. All contractors that may visit the sites are made aware of the location of lines before they come on to site. ➤ Barriers will run parallel to the overhead line at a minimum horizontal distance of 6 metres on plan from the nearest overhead line conductor wire. ➤ Prior to the delivery of turbines to the Proposed Project site, a dry run of the route using vehicles with similar dimensions will occur. Please see Section 15.1.9 above for details. ➤ When activities must be carried out beneath overhead lines, e.g. component delivery or grid cable laying, a site-specific risk assessment will be undertaken prior to any works. The risk assessment must take into account the maximum potential height that can be reached by the plant or equipment that will be used is undertaken prior to any works. Overhead line proximity detection equipment will be fitted to machinery when such works are required. ➤ Information on safe clearances will be provided to all staff and visitors.		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			➤ Signage indicating locations and health and safety measures regarding overhead lines will be erected in canteens and on site. ➤ All staff will be made aware of and adhere to the Health & Safety Authority's 'Guidelines on the Procurement, Design and Management Requirements of the Safety, Health and Welfare at Work (Construction) (Amendment) Regulations 2021'. This will encompass the use of all necessary Personal Protective Equipment and adherence to the site Health and Safety Plan. ➤ All health and safety measures as detailed in Section 5 of Construction Environment Management Plan and Chapter 5 Population and Human Health will be adhered to during the construction, operation and decommissioning phases. ➤ Any area where excavations are planned will be surveyed and all existing services will be identified prior to commencement of any works. ➤ Liaison will be had with the relevant sections of the Local Authority including all the relevant area engineers to ensure all services are identified. ➤ Excavation permits will be completed, and all plant operators and general operatives will be inducted and informed as to the location of any services. ➤ The contractor must comply with and standard construction codes of practice in relation to working around electricity, gas, water, sewage and telecommunications networks		
MM 108	Water	Ch. 15: Material Assets	➤ In advance of any construction activity, the contractor will undertake pre-commencement surveys to confirm the presence or otherwise of any services such as water supply. If found to be present, the relevant service provider will be consulted with in order to determine the requirement for specific excavation or relocation methods and to schedule a suitable time to carry out works. In the event that water mains are encountered the water supply will be turned off by the utility so work can commence on		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			diverting the service. The section of existing pipe will be removed and will be replaced with a new pipe along the new alignment of the service. The works will be carried out in accordance with the specifications of the relevant utility provider.		
MM 109	Broadband	Ch. 15: Material Assets	- Any area where excavations are planned will be surveyed and all existing services will be identified prior to commencement of any works. - Liaison will be had with the relevant sections of the Local Authority including all the relevant area engineers to ensure all services are identified. - Excavation permits will be completed, and all plant operators and general operatives will be inducted and informed as to the location of any services. - The contractor must comply with and standard construction codes of practice in relation to working around electricity, gas, water, sewage and telecommunications networks.		
Operational Phase					
MM 110	Telecommunications	Ch. 15: Material Assets Appendix 15-5	Prior to the operational phase of the Proposed Wind Farm, a testing exercise will be carried out to determine there are no impacts on any radio links which traverse the Site. Al Bridges, as outlined in Appendix 15-4 and Appendix 15-5, listed a series of mitigation measures in the event that there is an impact on a link. It should be noted that in both telecommunication impact assessments, for EIR and Enet, it was concluded that there will be no impacts to any links based on the current position of the proposed turbines and their distances from existing links. Listed within the Letter of Reliance Appendix 1 of Appendix 15-4 'Carrow Wind Farm EIR Telecommunications Impact Assessment Report', the following mitigation measures are presented:		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			➤ Eir would be re-consulted in the event of a successful planning application. ➤ During the Construction Phase of the wind farm, it would be proposed that wind turbine T03 would be constructed and yaw wind turbine T03 on a perpendicular, worst-case-scenario, bearing into the microwave radio link. ➤ Eir would then monitor the telecommunications radio link performance to check for interference / loss of performance. ➤ Eir would provide evidence-based demonstrable results of any wind turbine interference impacts. ➤ If interference is detected and can be demonstrated to be attributable to the wind turbine T03, then the mitigation measure as described in the Report should be implemented to the agreement of Eir. ➤ It would be an agreed condition of planning that wind turbine T03 would not become operational until all impacts from wind turbine T03 would be remediated according to the agreed mitigation measure proposal. All costs of the mitigation measure strategy would be borne by the developer. The findings of the Carrow Wind Farm EIR Telecommunications Impact Assessment Report shows that mitigation measures are not likely to be required. The results of the 3D analysis indicate that the proposed turbines will not obstruct any of the Eir microwave radio links. Listed within the Letter of Reliance Appendix 1 of Appendix 15-5 'Carrow Wind Farm Enet Telecommunications Impact Assessment Report', the following mitigation measures are presented: ➤ Enet would be re-consulted in the event of a successful planning application. ➤ During the Construction Phase of the wind farm, it would be proposed that wind turbine T09 would be constructed and yaw wind turbine T09 on a perpendicular, worst-case-scenario, bearing into the microwave radio link. ➤ Enet would then monitor the telecommunications radio link performance to check for interference / loss of performance.		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			➤ Enet would provide evidence-based demonstrable results of any wind turbine interference impacts. ➤ If interference is detected and can be demonstrated to be attributable to the wind turbine T09, then the mitigation measure as described in the Report should be implemented to the agreement of Enet. ➤ It would be an agreed condition of planning that wind turbine T09 would not become operational until all impacts from wind turbine T09 would be remediated according to the agreed mitigation measure proposal. All costs of the mitigation measure strategy would be borne by the developer. The findings of the Carrow Wind Farm Enet Telecommunications Impact Assessment Report shows that mitigation measures are not likely to be required. The results of the 3D analysis indicate that the proposed turbines will not obstruct any of the Enet microwave radio links.		
MM 111	Aviation	Ch. 15: Material Assets	➤ The scoping response from the IAA and DoD sets out lighting requirements for turbines as detailed above. These requirements will be complied with for the Proposed Project and any further details will be agreed in advance of construction with the IAA, i.e. crane erection. The coordinates and elevations for built turbines will be supplied to the IAA, as is standard practice for wind farm developments.		
MM 112	Electricity	Ch. 15: Material Assets	➤ All waste generated on-site will be contained in waste skip at a waste storage area on Site. This waste storage area will be kept tidy with skips clearly labelled to indicate the allowable material to be disposed of therein. The expected waste volumes generated on Site are unlikely to be large enough to warrant source segregation at the Site. Therefore, all waste streams generated on site will be deposited into a single waste skip. The waste material will be transferred to a Materials Recovery Facility (MRF) by a fully licenced waste contractor where the waste will be sorted into individual waste stream for recycling, recovery or disposal.		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			➤ Site personnel will be instructed at induction that under no circumstances can waste be brought on to Site for disposal in the on-site waste skip. It will also be made clear that the burning of waste material on Site is forbidden.		
MM 113	Telecommunications	Ch. 15: Material Assets	The 'Wind Energy Development Guidelines for Planning Authorities' (Department of the Environment, Heritage and Local Government, 2006) state that interference with broadcast communications can be overcome by the installation of deflectors or repeaters where required. Developers are advised to contact individual local and national broadcasters and mobile phone operators to inform them of proposals to develop wind farms. This consultation has been carried out by MKO as part of the assessment of the Proposed. Both the adopted 2006 and the 2019 draft 'Wind Energy Development Guidelines for Planning Authorities' produced by the Department of the Environment, Heritage and Local Government (DOEHLG) state that interference with broadcast communications can be overcome by the installation of deflectors or repeaters where required. 2rn (formerly RTÉ Transmission Network Ltd.), replied on the 7th of February 2024 to a scoping request from MKO stating that there is no fixed linking within the area. 2rn has recommended that a protocol agreement be put in place for the Proposed Wind Farm if the Site goes ahead. The Protocol Document ensures that in the event of any interference occurring to 2rn television or radio reception due to operation of a wind farm, the required measures as set out in the document, will be carried out by the developer to rectify this. The Protocol Document ensures that the appropriate mitigation is carried out in the event of any unanticipated broadcast interference arising to RTÉ television or radio reception as a result of the proposed Wind Farm.		
MM 114	Aviation	Ch. 15: Material Assets	As no impacts were identified by the IAA or DoD, no mitigation measures are required. However, the following IAA and DoD requests will be complied with should the Proposed Project be consented: <u>Irish Aviation Authority</u>		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			➤ Agree an aeronautical obstacle warning light scheme for the wind farm development ➤ Provide as-constructed coordinates in WGS84 format together with ground and blade tip height elevations at each wind turbine location and ➤ Notify the Authority of intention to commence crane operations with at least 30 days prior notification of their erection. <u>Department of Defence</u> ➤ All turbines should be illuminated by Type C, Medium intensity, Fixed Red obstacle lighting with a minimum output of 2,000 candela to be visible in all directions of azimuth and to be operational H24/7 days a week. Obstacle lighting should be incandescent or, if LED or other types are used, of a type visible to Night Vision equipment. Obstacle lighting used must emit light at the near InfraRed (IR) range of the electromagnetic spectrum, specifically at or near 850 nanometres (nm) of wavelength. Light intensity to be of similar value to that emitted in the visible spectrum of light.		
Decommissioning Phase					
MM 115	Decommissioning Phase	Ch. 15: Material Assets	Any impact and consequential effect that occurs during the decommissioning phase will be similar to that which occurs during the construction phase, however to a lesser extent.		

8. MONITORING PROPOSALS

All monitoring proposals relating to the pre-commencement, construction and operational phases of the Proposed Project are set out in various sections of the EIAR, NIS and Biodiversity Enhancement Plan prepared as part of the planning application to An Coimisiún Pleanála (ACP).

This section of the Construction and Environment Management Plan groups together all of the monitoring proposals presented in the EIAR. The monitoring proposals are presented in the following pages. The monitoring proposals are also outlined within Chapter 18: Schedule of Mitigation and Monitoring Measures. Decommissioning Phase monitoring measures are not included in the table below, however, can be viewed in Appendix 4-6 (Decommissioning Plan) of this EIAR.

By presenting the monitoring proposals in the below format, it is intended to provide an easy to audit list that can be reviewed and reported on during the future phases of the Proposed Project. The tabular format in which the below information is presented, can be further expanded upon during the course of future project phases to provide a reporting template for site compliance audits

Table 8-1 Proposed Monitoring Measures

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Frequency	Reporting Period	Responsibility
Pre-Construction Phase						
MX1	Drainage Maintenance	Ch. 4: Description of the Proposed Project, 9 CEMP Section 3,4 Appendix 4-5: Surface Water Management Plan	➤ Prior to commencement of works in sub-catchments across the site, main drain inspections will be completed to ensure ditches and streams are free from debris and blockages that may impede drainage. It is proposed to complete these inspections on a catchment-by-catchment basis as the construction works develop across the site, as works in all areas will not commence simultaneously. ➤ Drainage and associated pollution control measures will be implemented onsite before the main construction works commence. Where possible drainage controls will be installed during seasonally dry ground conditions. This will reduce the possibility of impact on surface waters by suspended sediment released during construction and entrained in surface run-off. ➤ The routes of any natural drainage features will not be altered as part of the Proposed Project. Turbine locations have been selected to avoid natural watercourses. It is proposed that 9 no. new clear span watercourse crossings are required, while 2 no. crossings will be required or upgraded within the Proposed Wind Farm site. ➤ There will be no direct discharges to natural watercourses. All discharges from the proposed works areas or from interceptor drains will be made over vegetated ground at an appropriate distance from natural watercourse and lakes. Buffer zones around the existing natural drainage features have informed the	On going	Monthly	Project Hydrologist

			layout of the Proposed Project and are indicated on the drainage design drawings. - Where artificial drains are currently in place in the vicinity of proposed works areas, these drains may have to be diverted around the proposed works areas to minimise the amount of water in the vicinity of works areas. Where it may not be possible to divert artificial drains around proposed work areas, the drains will be blocked to ensure sediment laden water from the works areas has no direct route to other watercourses. Where drains have to be blocked, the blocking will only take place after an alternative drainage system to handle the same water has been put in place. - Existing artificial drains in the vicinity of existing site roads will be maintained in their present location where possible. If it is expected that these artificial drains will receive drainage water from works areas, check dams will be added (as specified below) to control flows and sediment loads in these existing artificial drains. If road widening or improvement works are necessary along the existing roads, where possible, the works will take place on the opposite side of the road to the drain.			
MX2	Surface Water Management Plan	Appendix 4-5: Surface Water Management Plan Ch. 9: Water	- Water quality field testing and laboratory analysis will be undertaken prior to commencement of felling and construction at the Site. - Analysis will be for a range of parameters with relevant regulatory limits along with Environmental Quality Standard's (EQSs) and sampling will be undertaken for each stream that drains from the construction site. - Baseline sampling will be completed on at least two occasions, and these will coincide with low flow and high flow stream conditions. The high flow sampling event will be undertaken	As required	As required	Project Hydrologist

			after a period of sustained rainfall, and the low flow event will be undertaken after a dry spell. ➤ There is an existing drainage network across the Site and runoff drains relatively freely to local watercourses and streams. This existing drainage system will continue to function as it is during the pre- construction phase. ➤ However, prior to commencement of works in sub-catchments across the Site, main drain inspections will be completed to ensure ditches and streams are free from debris and blockages that may impede drainage. These inspections will be done on a catchment-by-catchment basis as the construction works develop across the Site, as works in all areas will not commence simultaneously.			
MX3	Environmental Management	CEMP Section 4	➤ The Project Developer will be required to engage a qualified Environmental Engineer, Environmental Scientist, or equivalent, with experience in wind farm construction to fulfil the role of Environmental Clerk of Works (ECoW) to oversee the construction works and audit the implementation of the CEMP. The ECoW will report to the Project Developer and Project Contractor but will liaise closely with the Construction Manager in relation to the Project Contractor's day-to-day implementation of the CEMP on site. ➤ The Environmental Clerk of Works (ECoW) will be nominated by the Project Developer to oversee the Project Contractor's effective implementation of the Proposed Project's environmental requirements and obligations, as captured in the CEMP. The ECoW will be responsible for monitoring the works of the Project Contractor from an environmental perspective on behalf of the Project Developer. For the sake of expediency, the ECoW will report their ongoing audit findings, monitoring results and site observations to both the Project Developer and			ECoW

			the Proposed Contractor, having been nominated by the developer to fulfil the role. > The level, detail and frequency of reporting expected from the ECoW for the Construction Manager, Developer's Project Manager, and any Authorities or other Agencies, will be agreed by all parties prior to commencement of construction, and may be further adjusted as required during the course of the Proposed Project.			
MX4	Invasive Species	Ch. 6: Biodiversity Appendix 6-5	Prior to the commencement of any works, the following steps will be undertaken: > A pre-commencement survey for Japanese Knotweed and Giant Knotweed will be undertaken by a suitably qualified ecologist to determine the locations and extent of the species within the Proposed Project site and record any changes in the extent of the infestation since the 2024 and 2025 surveys. It will also serve to identify if this species has established elsewhere within the Site. > The locations and extent of Japanese Knotweed and Giant Knotweed within the Proposed Wind Farm site, and along the Proposed Grid Connection underground cabling route and TDR, should it establish, will be clearly marked out using hazard tape to ensure they are not disturbed. An exclusion zone surrounding each stand will also be identified and an appointed ecological clerk of works (ECoW) will inform the extent of the area to be treated as potentially contaminated. The exclusion zone will extend to 7m around the identified stands. > The ECoW will be appointed to supervise all works carried out within the exclusion zones, when required. > All site and turbine transport staff will receive a toolbox talk from the ECoW regarding the identification and protocols surrounding Japanese Knotweed and Giant Knotweed within the Proposed Wind Farm site.	Once	As required	Project Ecologist ECoW

MX5	Fauna	Ch. 6: Biodiversity	<u>Otter:</u> - Due to the time that can elapse between the original surveys, any future planning consent and construction, a pre-construction survey for otter will be carried out no more than 10 to 12 months prior to construction, as per NRA (2008) guidance, to identify the presence of any new breeding sites. The pre-construction survey will aim to ensure that adequate mitigation, as provided below under 'Disturbance, Mortality' is provided at each watercourse crossing (or other habitat of value to otters) affected by the Proposed Project. <u>Badger</u> - Due to time that can elapse between the original surveys, any future planning consent and construction, a pre-construction badger survey will be carried out to identify the presence of any setts that may have been established in the intervening period. <u>Red Squirrel and Pine Marten:</u> - Due to time that can elapse between the original surveys, any future planning consent and construction, a pre-construction survey for pine marten/red squirrel will be carried out to identify the presence of any new breeding sites. These surveys will focus on areas of Conifer plantation (WD4) to be felled and all suitable habitat within 50m of the felling blocks. Any potential breeding sites should be monitored to ascertain if they are active breeding sites. Surveys will be undertaken in line with Nature Scot and TII guidelines.	Once	As required	Project Ecologist
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			Bats: ➤ Robust pre-construction bat surveys are undertaken to establish baseline activity and assess the potential risks associated with turbine operation. Survey design and impact assessment were guided by current legislation, scientific literature, and best-practice guidance, with full consideration given to spatial, temporal, and behavioural patterns relevant to bat ecology.			
MX6	Birds	Ch. 7: Birds Appendix 7-7: Bird Monitoring Programme	➤ It is proposed that construction works will commence outside the bird nesting season (1st of March to 31st of August inclusive) to avoid the most sensitive time of the year for most bird species with the potential to use the site and its environs. Pre-commencement confirmatory surveys will be undertaken within one month prior to the initiation of works at the Proposed Project to identify sensitive sites (e.g. roosts). ➤ Any requirement for construction works to run into the subsequent breeding or winter seasons following commencement will be subject to a repeat of the pre-commencement bird surveys to confirm the absence of breeding or roosting birds of conservation concern. These surveys will be conducted once per month during the breeding season (April to July) and once at the start of the winter season (October). The survey will aim to identify sensitive sites (e.g., nests or roosts depending on the season in question). ➤ This monitoring will involve surveying onsite and to a 500m radius of the development footprint/works areas. Monitoring will be undertaken by a suitably qualified ornithologist. The survey period will include one month prior to the initiation of works, four visits between April and July and one visit during the winter period (October). If a sensitive area is identified, the nest/roost sites will be located, and no works shall be	Once	As required	Project Ornithologist

			undertaken within a species-specific buffer in line with best practice guidance (e.g. Forestry Commission Scotland, 2006; Goodship and Furness 2022; Ruddock and Whitfield, 2007). No works within the buffer zone shall be permitted until it can be demonstrated that the species is no longer reliant on the area for breeding or roosting. ➤ All site staff and subcontractors will be made aware of any restrictions to be imposed by means of a toolbox talk and a map of the 'no-work zone' will be made available to all construction staff. The restricted area will also be marked off using hazard-tape fencing to alert all personnel on site to the suspension of works within that area.			
MX7	Tree Felling	Ch. 9: Hydrology & Hydrogeology	Sampling will be completed before, during (if the operation is conducted over a protracted time) and after the felling activity. The 'before' sampling will be conducted within 4 weeks of the felling activity commencing, preferably in medium to high water flow conditions. The "during" sampling will be undertaken once a week or after rainfall events. The 'after' sampling will comprise as many samplings as necessary to demonstrate that water quality has returned to pre-activity status (i.e., where an impact has been shown). Criteria for the selection of water sampling points include the following: ➤ Avoid man-made ditches and drains, or watercourses that do not have year-round flows, i.e. avoid ephemeral ditches, drains or watercourses; ➤ Select sampling points upstream and downstream of the forestry activities;	As Required	Monthly	ECoW

			➤ It is advantageous if the upstream location is outside/above the forest in order to evaluate the impact of land-uses other than forestry; ➤ Where possible, downstream locations will be selected: one immediately below the forestry activity, the second at exit from the forest, and the third some distance from the second (this allows demonstration of no impact through dilution effect or contamination by other land-uses where impact increases at third downstream location relative to second downstream location); and, ➤ The above sampling strategy will be undertaken for all on-site sub-catchments streams where tree felling is proposed.			
Construction Phase						
MX8	Health and Safety	Ch. 4: Description of the Proposed Project CEMP Section 5	The PSCS appointed for the construction stage shall be required to perform his/her duties as prescribed in the Safety, Health and Welfare at Work (Construction) Regulations. These duties include (but are not limited to): ➤ Development of the Safety and Health Plan for the construction stage with updating where required as work progresses; ➤ Compile and develop safety file information. ➤ Reporting of accidents / incident ➤ Weekly site meeting with PSCS; ➤ Coordinate arrangements for checking the implementation of safe working procedures. Ensure that the following are being carried out: ➤ Induction of all Site staff including any new staff enlisted for the project from time to time; ➤ Toolbox talks as necessary; ➤ Maintenance of a file which lists personnel on site, their name, nationality, current Safe Pass number, current Construction	Daily	Daily	PSCS

			Skills Certification Scheme (CSCS) card (where relevant) and induction date; ➤ Report on Site activities to include but not limited to information on accidents and incidents, disciplinary action taken and PPE compliance; ➤ Monitor the compliance of contractors and others and take corrective action where necessary; and ➤ Notify the Authority and the client of non-compliance with any written directions issued.			
MX9	Water Quality and Monitoring – Forestry Felling Drainage Measures	Ch. 4: Description of the Proposed Project Ch. 9: Hydrology & Hydrogeology CEMP Section 3, 4	Before the commencement of any felling works, an Environmental Clerk of Works (ECOW) will be appointed to oversee the felling and extraction works. The ECOW will have the following functions: ➤ Attend the site for the setup period when drainage protection works are being installed and be present on site during the remainder of the forestry felling works. ➤ Prior to the commencement of works, review and agree the positioning by the Operator of the required Aquatic Buffer Zones (ABZs), silt traps, silt fencing (see below), water crossings and onsite storage facilities for fuel, oil and chemicals (see further below). ➤ Be responsible for preparing and delivering the Environmental Tool Box Talk (TBT) to all relevant parties involved in site operations, prior to the commencement of the works. ➤ Conduct daily and weekly inspections of all water protection measures and visually assess their integrity and effectiveness. ➤ Take representative photographs showing the progress of operation onsite, and the integrity and effectiveness of the water protection measures. ➤ Collect water samples for analysis by a 3rd party accredited laboratory, adhering to the following requirements:	As required	As Necessary	ECOW

			○ Surface water samples shall be collected upstream and downstream of the keyhole felling site at suitable sampling locations. ○ Sampling shall be taken from the stream / river bank, with no in-stream access permitted. ○ The following minimum analytical suite shall be used: pH, Electrical Conductivity, Total Suspended Solids, Biochemical Oxygen Demand, Total Phosphorus, Ortho-Phosphate, Total Nitrogen, and Ammonia. ➤ Review of operator's records for plant inspections, evidence of contamination and leaks, and drainage checks made after extreme weather conditions. ➤ Prepare and maintain a contingency plan. ➤ Suspend work where potential risk to water from siltation and pollution is identified, or where operational methods and mitigation measures are not specified or agreed.			
MX10	Water Quality and Monitoring	Ch. 4: Description of the Proposed Project Ch. 9: Hydrology & Hydrogeology CEMP Section 4	An inspection and maintenance plan for the on-site drainage system will be prepared in advance of commencement of any works. Daily visual inspections of drains and outfalls will also be performed during the construction period to ensure suspended solids are not entering streams and rivers on site, to identify any obstructions to channels and to allow appropriate maintenance of the drainage regime. Should the suspended solids levels measured during construction be higher than the existing levels, the source will be identified, and additional mitigation measures implemented. Any excess build-up of silt levels at dams, the settlement pond, or any other drainage features that may decrease the effectiveness of the drainage feature, will be removed. During the construction phase field testing and laboratory analysis of a range of parameters with relevant regulatory limits and EQSs should be undertaken for each primary watercourse along the	Daily	As Necessary	ECoW

			Proposed Grid Connection Route and specifically following heavy rainfall events (i.e. weekly, monthly and event based). Inspection sheets and photographic records will be kept on site. Inspection points will include the in-situ field monitoring point locations and the laboratory analysis sampling points. Inspection points will depend on works being completed within the catchment upstream of the identified monitoring locations. Visual inspections will also be completed after major rainfall events, i.e. after events of >25mm rainfall in any 24-hour period and data including photographs will be collected by visual inspections and independently assessed by the Project Hydrologist who will monitor and advise on the records being received. The following periodic inspection regime will be implemented: ➤ Daily general visual inspections of site operations and inspections of all drainage infrastructure within the site and in the surrounding area by the ECoW or a suitably qualified and competent person as delegated by the ECoW; ➤ Inspections to include all elements of drainage infrastructure to ensure the system is operating correctly and to identify and maintenance that is required. Any changes, such as discolouration, odour, oily sheen or litter will be noted and corrective action will be implemented. High risk locations such as settlement ponds will be inspected daily. Daily inspections checks will be completed on plant and equipment, and whether materials such as straw bales or oil absorbent materials need replacement; ➤ Event based inspections by the ECoW as follows: ➤ >10 mm/hr (i.e. high intensity localised rainfall event); ➤ >25 mm in a 24-hour period (heavy frontal rainfall lasting most of the day); or,			
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			➤ Rainfall depth greater than monthly average in 7 days (prolonged heavy rainfall over a week). ➤ Monthly site inspections by the Project Hydrologist/ ECoW during construction phase; ➤ Quarterly site inspections by the Project Hydrologist/ ECoW after construction for a period of one year following the construction phase; and, ➤ A written record will be maintained or available on-site within this Construction Environmental Management Plan (CEMP) which will be maintained on-site during the construction phase			
MX11	Reactive Site Drainage Management	Ch. 4: Description of the Proposed Project Appendix 4-3	In line with the requirements of the EIAR, the final drainage design prepared for the Proposed Project prior to commencement of construction will provide for reactive management of drainage measures. The effectiveness of drainage measures designed to minimise runoff entering works areas and capture and treat silt-laden water from the works areas, will be monitored continuously by the ECoW or supervising hydrologist on-site. The contractor is solely responsible for the implementation of the detailed drainage design on site. The ECoW is responsible for monitoring the effectiveness of the drainage design as it is implemented on-site. The ECoW or supervising hydrologist will respond to changing weather, ground or drainage conditions on the ground as the Proposed Project proceeds, to ensure the effectiveness of the drainage design is maintained in so far as is possible. This may require the installation of additional check dams, interceptor drains or swales as deemed necessary on-site. The drainage design may have to be modified on the ground as necessary, and the modifications will draw on the various features outlined above in whatever combinations are deemed to be most appropriate to situation on the ground as a particular time. In the event that works are giving rise to siltation of watercourses, the ECoW or supervising hydrologist will stop all works in the	As required	As Necessary	ECoW

			immediate area around where the siltation is evident. The source of the siltation will be identified and additional drainage measures such as those outlined above will be installed in advance of works recommencing			
MX12	Surface Water Drainage Measures Monitoring	Appendix 4-5: Surface Water Management Plan	Daily visual inspections of the installed drains and outfalls will be performed during the construction period to ensure suspended solids are not entering streams and rivers on site, to identify any obstructions to channels and to allow appropriate maintenance of the drainage regime. Should the suspended solids levels measured during construction, at the pre-determined sampling locations, be higher than the baseline levels, the source will be identified, and additional mitigation measures implemented. Inspection sheets and photographic records will be kept on site. Inspection points will include the in-situ field monitoring point locations, the laboratory analysis sampling points and continuous monitoring locations. Inspection points will depend on works being completed within the catchment upstream of the identified monitoring locations. Visual inspections will also be completed after major rainfall events, i.e., after events of >25mm rainfall in any 24-hour period and data including photographs will be collected by visual inspections and independently assessed by the supervising hydrologist who will monitor and advise on the records being received. Daily Visual Inspection locations will be confirmed by the Project Hydrologist prior to the commencement of the construction phase. A Daily Visual Check Sheet Template is included in Appendix C. Daily Visual Inspections are subject to change upon commencement of construction activity and works in progress within the catchment areas. The following periodic inspection regime will be implemented:	As required	Monthly	ECoW

			➤ Daily general visual inspections of site operations and inspections of all watercourses within the site and in the surrounding area by the ECoW or a suitably qualified and competent person as delegated by the ECoW; ➤ Inspections to include all elements of drainage infrastructure to ensure the system is operating correctly and to identify any maintenance that is required. Any changes, such as discolouration, odour, oily sheen or litter shall be noted and corrective action shall be implemented. High risk locations such as settlement ponds will be inspected daily. Daily inspections checks will be completed on plant and equipment, and whether materials such as straw bales or oil absorbent materials need replacement; ➤ Event based inspections by the Environmental Clerk of Works as follows: ➤ >10 mm/hr (i.e. high intensity localised rainfall event); ➤ >25 mm in a 24-hour period (heavy frontal rainfall lasting most of the day); or, ➤ Rainfall depth greater than monthly average in 7 days (prolonged heavy rainfall over a week). ➤ Monthly site inspections by the Project Hydrologist/ Environmental Clerk of Works of the drainage measures during construction phase; ➤ Quarterly site inspections by the Project Hydrologist/ Environmental Clerk of Works of the drainage measures after construction for a period of one year following the construction phase; and, ➤ A written record will be maintained or available on-site within this Construction Environmental Management Plan (CEMP) which will be maintained on-site during the construction phase.			
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MX13	Surface Water Quality and Monitoring	Ch. 9: Water CEMP Section 4	Visual inspection and monthly laboratory analysis results of water quality monitoring shall assist in determining requirements for any necessary improvements in drainage controls and pollution prevention measures implemented on site. It will be the responsibility of the Environmental Clerk of Works to present the ongoing results of water quality and weather monitoring at or in advance of regular site meetings. Reports on water quality will consider all field monitoring and visual inspections, and results of laboratory analysis completed for that period. Reports will describe how the results compare with baseline data as well as previous reports on water quality. The reports will also describe whether any deterioration or improvement in water quality has been observed whether any effects are attributable to construction activities and what remedial measures or corrective actions have been implemented. Any proposed alteration to sampling frequency will be agreed with Tipperary County Council in advance	Daily	As Necessary	ECoW
MX14	Surface Water Quality and Monitoring	Appendix 4-5: Surface Water Management Plan	The analytical determinants of the monitoring programme (including limits of detection and frequency of analysis) will be as per S.I. No. 272 of 2009 European Communities Environmental Objectives (Surface Waters) Regulations and European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009. The likely suite of determinants will include: > pH (field measured) > Electrical Conductivity (field measured) > Temperature (field measured) > Dissolved Oxygen (field measured) > Alkalinity (pH measured) > Total Phosphorus	As required	Monthly	ECoW

			> Chloride > Nitrate > Nitrite > Total Nitrogen > Orthophosphate > Total Ammonia as N > Biochemical Oxygen Demand > Total Suspended Solids > True colour > Dissolved organic carbon			
MX15	Surface Water Quality and Monitoring	Appendix 4-5: Surface Water Management Plan	Field chemistry measurements of unstable parameters, (pH, conductivity, temperature) will be taken at the surface water monitoring locations, as per water monitoring programme for the overall wind farm development and each primary watercourse along the route and also at all installed sonde locations. These analyses will be carried out by either the ECoW or the Project Hydrologist. In-situ field monitoring will be completed on a weekly basis. In-situ field monitoring will also be completed after major rainfall events, i.e., after events of >25mm rainfall in any 24-hour period. The Project Hydrologist will monitor and advise on the readings collected by in-situ field monitoring	Weekly	As Necessary	ECoW
MX16	Tree Felling	Ch. 9: Water	> Daily surface water monitoring forms (for visual inspections and field chemistry measurements) will be utilised at every works site near any watercourse. These will be taken daily and kept on site for record and inspection. > Checking and maintenance of roads and culverts will be on-going through any felling operation. No tracking of vehicle through watercourses will occur, as vehicles will use road infrastructure and existing watercourse crossing points. Existing drains will not be disturbed during felling works;	As Required	Monthly	ECoW

MX17	Plant and Equipment Inspections	Ch. 9: Water	➤ The plant used will be regularly inspected for leaks and fitness for purpose.	As Required	Monthly	ECoW
MX18	Traffic and Transport	CEMP Section 3	➤ The agreed haul route roads adjacent to the site will be regularly inspected for cleanliness and cleaned as necessary. ➤ The roads adjacent to the site entrances will be checked weekly or damage/potholes and repaired as necessary.	As required	Weekly	ECoW
MX19	Biodiversity	CEMP Section 4	The Project Ecologist will be available to support the ECoW on matters relating to the protection of sensitive habitats and species encountered prior to or during the construction phase of the Proposed Project. The Project Ecologist will not be full time on site but will undertake pre-commencement surveys and visit the site as required. The responsibilities and duties of the Project Ecologist/Ornithologist will include the following: ➤ Undertake a pre-construction transect/walkover bird survey to ensure that significant effects on breeding birds will be avoided. ➤ Inform and educate on-site personnel of the ornithological and ecological sensitivities within the Site. ➤ Oversee management of ornithological and ecological issues during the construction period and advise on ornithological issues as they arise. ➤ Provide guidance to contractors to ensure legal compliance with respect to protected species onsite. ➤ Liaise with officers of consenting authorities and other relevant bodies with regular updates in relation to construction progress.	As required	As required	Project Ecologist/Ornithologist

MX20	Spoil Management, Borrow Pits	Ch. 4: Description of the Proposed Project CEMP Section 4	The Geotechnical Engineer will report to the Construction Manager and is responsible for inspection and review of geotechnical aspects associated with construction of the Proposed Project. The Geotechnical Engineer will not be full time on site but will visit site at least once a month during the construction phase civil works and on a weekly basis during site preparation/groundworks. The responsibilities and duties of the Geotechnical Engineer will include the following: ➤ Visit site regularly, or at least once a month during the construction phase, to complete geotechnical audits and reviews and report any issues to the Construction Manager; ➤ Ensuring that identified hazards are listed in the Geotechnical Risk Register and that these are subject to ongoing monitoring; and, ➤ Ongoing inspection and monitoring of the Proposed Project , particularly in temporary stockpile areas, through all phases of construction (including pre, during and post construction) and ensure construction is carried out as specified in the EIAR, NIS and in relevant planning conditions.	As required	As required	Geotechnical Engineer
MX21	Exhaust Emissions	Ch. 10: Air Quality	All construction vehicles and plant used onsite during the construction phase will be maintained in good operational order. If a vehicle requires repairs this work will be carried out, thereby minimising any emissions that arise	As required	As required	Site Supervisor/Construction Manager
MX22	Archaeological Monitoring	Ch. 13: Cultural Heritage CEMP Section 4	➤ All monitoring works will be carried out under licence to the National Monuments Service of the DoHLGH. If any archaeological remains are identified during the course of the works, further mitigation may be required, such as preservation by record or preservation in-situ. Any further mitigation will	As Required	As Required	Project Archaeologist

			require approval from the National Monuments Service of the DoHLGH			
Operational Phase						
MX23	Drainage Inspections	CEMP Section 3 Ch. 9: Water	> An inspection and maintenance plan for the on-site construction drainage system will be prepared in advance of commencement of any works. Regular inspections of all installed drainage systems will be undertaken, especially after heavy rainfall, to check for blockages, and ensure there is no build-up of standing water in parts of the systems where it is not intended. Inspections will also be undertaken after tree felling. > Any excess build-up of silt levels at dams, the settlement pond, or any other drainage features that may decrease the effectiveness of the drainage feature, will be removed. Checks will be carried out on a daily basis. During the construction phase field testing and laboratory analysis of a range of parameters with relevant regulatory limits and EQSs will be undertaken for each primary watercourse, and specifically following heavy rainfall events.	Monthly	Monthly	ECoW
MX24	Bats	Ch. 6: Biodiversity Appendix 6-2	To assess the effects of the Proposed Project on bat activity, at least 3 years of post-construction monitoring is proposed. Post-construction monitoring will include static detector surveys, walked survey transects and corpse searching to record any bat fatalities resulting from collision. At the end of each year, the efficacy of any mitigation/curtailment programme shall be reviewed, and any identified efficiencies incorporated into the programme. To assess the effects of the Proposed Project on bat activity, at least 3 years of post-construction monitoring is proposed. Post-	Years 1, 2, 3	Annually	Project Ecologist

			construction monitoring will include static detector surveys, walked survey transects and corpse searching to record any bat fatalities resulting from collision. The results of post-construction monitoring shall be utilised to assess any potential changes in bat activity patterns and to monitor the implementation of the mitigation strategy. If the monitoring identifies a curtailment requirement (i.e. significant bat fatalities encountered), a curtailment programme, in line with relevant guidelines, will be devised around key activity periods and weather parameters, as well as a potential increase in buffers. At the end of each year, the efficacy of the mitigation and monitoring plan will be reviewed, and any identified efficiencies incorporated into the programme. This approach allows for an evidence-based review of the potential for bat fatalities at the Proposed Wind Farm, post construction, to ensure that the necessary measures, based on a new baseline post-construction, are implemented for the protection of bat species locally. The effectiveness of any mitigation or curtailment needs to be monitored in order to determine (a) whether it is working effectively (i.e. the level of bat mortality is incidental), and (b) whether the curtailment regime can be refined such that turbine down-time can be minimised whilst ensuring that it remains effective at preventing casualties. The below subsections provide additional detail on the proposed survey effort, timing, and mitigation. <u>Monitoring Year 1</u> <u>Bat activity surveys</u>			
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			The post-construction surveys will be carried out as per the pre-construction survey effort. Static monitoring will take place at each turbine during the bat activity season (between April and October) (NatureScot, 2021, NIEA, 2021). Full spectrum recording detectors will be utilised for the same duration as during pre-application surveys and at the same density (NatureScot, 2021). Walked survey transects will also be conducted. Key weather parameters and other factors that are known to influence collision risk will be monitored and shall include: ➤ Windspeed in m/s (measured at nacelle height) ➤ Temperature (°C) ➤ Precipitation (mm/hr) <u>Carcass searches</u> Carcass searches, to monitor and record bat fatalities, shall be conducted at each turbine in accordance with most recent guidance. This shall include searcher efficiency trials and an assessment of scavenger removal rates to determine the appropriate correction factor to be applied in relation to determining an accurate estimate of collision mortality. Surveys should cover all activity seasons and the use of a trained dog detection team will be carried out to ensure maximum efficiency. <u>Monitoring Years 2&3</u> Monitoring surveys shall continue in Year 2 and 3, and where a curtailment requirement has been identified, the success of the curtailment strategy shall be assessed in line with the baseline data			
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			collected in the preceding year(s). The performance of the curtailment programme in terms of its ability to respond to the changes in bat abundance based on temperature and wind speed shall be analysed to confirm it is neither significantly over- nor under- curtailment during different periods of bat activity. At the end of each year, the efficacy of the mitigation/curtailment programme shall be reviewed, and any identified efficiencies incorporated into the programme. The requirement for continued post-construction monitoring will also be considered. Should no bat fatalities be recorded in Year 1, curtailment (where applicable) in Year 2 and Year 3 could be reduced/re-evaluated or removed with monitoring continuing to inform this strategy.			
MX25	Birds	Ch. 7: Birds Appendix 7-7: Bird Monitoring Programme	The programme of works will monitor parameters associated with collision, displacement/barrier effects and habituation during the lifetime of the project. Surveys will be scheduled to coincide with years 1, 2, 3, 5, 10 & 15 of the lifetime of the wind farm. Monitoring measures are based on guidelines issued by NatureScot (SNH, 2009 and NatureScot, 2025). The following individual components will be implemented: ➤ Monthly flight activity surveys: vantage point surveys. ➤ Targeted bird collision surveys (corpse searches) will be undertaken with trained dogs. The surveys will include detection and scavenger trials, to correct for these two biases and ensure the resulting data is robust. The proposed Bird Monitoring Programme was not put forward in response to any identified significant effect but rather as a best practice measure (as per guidance outlined in NatureScot, 2009). The monitoring programme is comprehensive and considered entirely adequate in this regard. The results of this monitoring will be reported to the Planning Authority following each monitoring	Years 1,2,3,5, 10 and 15	Monthly	Project Ornithologist

			year and will include recommendations that may inform additional mitigation or adaptation if required.			
MX26	Noise and Vibration	Ch. 12: Noise and Vibration	Prior to the commissioning of the wind farm, the developer will submit a Noise Complaint Monitoring Programme (NCMP) to the planning authority for written agreement. The NCMP will include a detailed methodology for noise measurements and procedures for recording results and a protocol for managing complaints. Compliance noise surveys will be undertaken to verify compliance with any noise conditions applied to the development. It is common practice to commence surveys within six months of a wind farm being commissioned. The guidance outlined in the IOA GPG and Supplementary Guidance Note 5: Post Completion Measurements (July 2014) will be taken into account. In the unlikely event that an exceedance of the noise criteria is identified as part of the commissioning assessment, implementation of noise reduced operational modes resulting in curtailment of turbine operation will be implemented for specific turbines in specific wind conditions to ensure turbine noise levels are within the relevant noise criterion curves/planning conditions limits. Such curtailment can be applied using the wind farm SCADA system without undue effect on the wind turbine performance. Following implementation of these measures, noise surveys will be repeated to confirm compliance with the noise criteria.	Once within six months	As Required	Noise Consultant
Decommissioning Phase						
MX27	Decommissioning	Appendix 4-6: Decommissioning	As noted in the Scottish Natural Heritage report (SNH) <i>Research and Guidance on Restoration and Decommissioning of Onshore Wind Farms</i> (SNH, 2013) reinstatement proposals for a wind farm are made approximately 30 years in advance, so within the lifespan of the wind farm, technological advances and preferred approaches to	End of Operational Life	As Required	Developer Appointed/ Contractor

		Plan Section 1	reinstatement are likely to change. According to the SNH guidance, it is therefore: <i>“best practice not to limit options too far in advance of actual decommissioning but to maintain informed flexibility until close to the end-of-life of the wind farm”.</i> In this regard, this Decommissioning Plan will be reviewed and updated prior to commencement of decommissioning works to take account of the relevant conditions of the planning permission and current health and safety standards.			
MX28	Decommissioning	Appendix 4-6: Decommissioning Plan Section 3	In general, the ECoW will maintain responsibility for monitoring the decommissioning works and Contractors/Sub-contractors from an environmental perspective. The ECoW will act as the regulatory interface on environmental matters. The Site Manager will be responsible for reporting to and liaising with GCC and other statutory bodies as required.	End of Operational Life	As Required	Site Manager/ ECoW
MX29	Decommissioning	Appendix 4-6: Decommissioning Plan Section 3	The Site Manager in consultation with the ECoW will be responsible for employing the services of a suitably qualified ecologist and any other suitably qualified professionals as required throughout the decommissioning works.	End of Operational Life	As Required	Site Manager/ ECoW
MX30	Decommissioning	Appendix 4-6: Decommissioning Plan Section 3	Prior to decommissioning, a suitably qualified ecologist will complete an invasive species survey of the Site to identify invasive species where any minor excavation will be required. If present in these areas, the ecologist will propose suitable management measures.	End of Operational Life	As Required	Project Ecologist

MX31	Health and Safety	Appendix 4-6: Decommissioning Plan Section 4	➤ Report on Site activities to include but not limited to information on accidents and incidents, disciplinary action taken and PPE compliance; ➤ Monitor the compliance of contractors and others and take corrective action where necessary; and ➤ Notify the Authority and the client of non-compliance with any written directions issued.	End of Operational Life	As Required	PSCS
MX32	Birds	Appendix 7-7: Bird Monitoring Programme	➤ It is proposed that decommissioning works will commence outside the bird nesting season (1st of March to 31st of August inclusive) to avoid the most sensitive time of the year for most bird species with the potential to use the site and its environs. Pre-commencement confirmatory surveys will be undertaken within one month prior to the initiation of works at the Proposed Project to identify sensitive sites (e.g. roosts). ➤ Any requirement for decommissioning works to run into the subsequent breeding or winter seasons following commencement will be subject to a repeat of the pre-commencement bird surveys to confirm the absence of breeding or roosting birds of conservation concern. These surveys will be conducted once per month during the breeding season (April to July) and once at the start of the winter season (October). The survey will aim to identify sensitive sites (e.g., nests or roosts depending on the season in question). ➤ This monitoring will involve surveying onsite and to a 500m radius of the development footprint/works areas. Monitoring will be undertaken by a suitably qualified ornithologist. The survey period will include one month prior to the initiation of works, four visits between April and July and one visit during the winter period (October). If breeding or roosting activity is identified, the nest/roost sites will be located, and no works shall be undertaken within a species-specific buffer in line with best practice guidance (e.g. Forestry Commission Scotland,	End of Operational Life	As Required	Project Ornithologist

			2006; Goodship and Furness 2022; Ruddock and Whitfield, 2007). No works within the buffer zone shall be permitted until it can be demonstrated that the species is no longer reliant on the nesting or roosting areas. > All site staff and subcontractors will be made aware of any restrictions to be imposed by means of a toolbox talk and a map of the 'no-work zone' will be made available to all construction staff. The restricted area will also be marked off using hazard-tape fencing to alert all personnel on site to the suspension of works within that area.			
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9. PROGRAMME OF WORKS

9.1 Construction Schedule

The construction phase will take approximately 12-18 months to complete from starting on site to the commissioning of the electrical system and export of electricity from site.

The EIAR stipulates that in the interest of breeding birds, construction will not commence during the breeding bird season, which runs from April to July. The EIAR stipulates that construction may commence between August to the end of March, so that construction activities are ongoing by the time the next breeding bird season comes around and can continue throughout the next breeding season.

Works during the construction phase of the development, including delivery of construction materials will generally take place between 7 a.m. and 7 p.m. daily Monday to Saturday with large concrete pours requiring an earlier start when deemed necessary. Delivery of abnormal loads such as turbine tower sections and blades will take place at night outside of peak traffic hours.

The phasing and scheduling main construction task items are outlined in Figure 9-1 below.

		Year 1				Year 2	
ID	Task Name	Q1	Q2	Q3	Q4	Q1	Q2
1	Site Health and Safety						
2	Grid Connection						
3	Site Compounds						
4	Site Roads						
5	Substation and Electrical Works						
6	Turbine Hardstands						
7	Turbine Foundations						
8	Backfilling and Landscaping						
9	Turbine Delivery and Erection						
10	Substation Commissioning						
11	Turbine Commissioning						

Figure 9-1 Indicative Construction Schedule

10. COMPLIANCE AND REVIEW

10.1 Site Inspections and Environmental Audits

Routine inspections of construction activities will be carried out on a daily and weekly basis by the ECoW and the Site Supervisor/Construction Manager to ensure all controls to prevent environmental impact, relevant to the construction activities taking place at the time, are in place.

Environmental inspections will ensure that the works are undertaken in compliance with this CEMP and all other planning application documents. Only suitably trained staff will undertake environmental site inspections.

10.2 Auditing

An Environmental audit will first be carried out prior to the construction phase of the Proposed Project to ensure the implementation of pre-construction mitigation measures, completion of baseline studies and implementation of pre-construction felling mitigation measures. Further environmental audits will be carried on a monthly basis during the construction phase of the Proposed Project and again after the commissioning of the wind turbines and substation.

In contrast to monitoring and inspection activities, audits are designed to shed light on the underlying causes of non-compliance, and not merely detect the non-compliance itself. In addition, audits are the main means by which system and performance improvement opportunities may be identified. Environmental audits will be carried out by the ECoW on behalf of the Project Developer, in an and objective manner. Environmental audits will be conducted at planned intervals to determine whether the CEMP is being properly implemented and maintained. The results of environmental audits will be provided to the Project Developer and Project Contractor.

An audit of compliance with the pre-commencement mitigation measures will be completed by the ECoW prior to the commencement of the construction phase of the Proposed Project. An audit of compliance with the construction phase mitigation measures will be completed monthly during the construction phase. The findings of each audit will be documented by the ECoW within the EMP for the site. The findings of each audit will be made available to Tipperary County Council on request.

Once the Proposed Project is operational and turbines have been commissioned, a report of compliance with operational phase mitigation measures will be prepared.

10.3 Environmental Compliance

The following definitions shall apply in relation to the classification of Environmental Occurrences during construction of the wind farm:

Environmental Near Miss: An occurrence which if not controlled or due to its nature could lead to an Environmental Incident.

Environmental Incident: Any occurrence which has potential, due to its scale and nature, to migrate from source and have an environmental impact beyond the site boundary.

Environmental Exceedance Event: An environmental exceedance event occurs when monitoring results indicate that limits for a particular environmental parameter (as indicated in the Environmental Monitoring Programme) has been exceeded.

An exceedance will immediately trigger an investigation into the reason for the exceedance occurring and the application of suitable mitigation where necessary.

Exceedance events can be closed out on achieving a monitoring result below the assigned limit for a particular environmental parameter.

Environmental Non-Compliance: Non-fulfilment of a requirement and includes any deviations from established procedures, programs and other arrangements related to the EMP.

10.4 Corrective Action Procedure

A corrective action is implemented to rectify an environmental problem on-site. Corrective actions will be implemented by the Site Supervisor/Construction Manager, as advised by the Site Environmental Clerk of Works. Corrective actions may be required as a result of the following:

- > Environmental Audits;
- > Environmental Inspections and Reviews;
- > Environmental Monitoring;
- > Environmental Incidents; and,
- > Environmental Complaints.

A Corrective Action Notice will be used to communicate the details of the action required to the main contractor. A Corrective Action Notice is a form that describes the cause and effect of an environmental problem on site and the recommended corrective action that is required. The Corrective Action Notice, when completed, will include details of close out and follow up actions.

If an environmental problem occurs on site that requires immediate attention, direct communications between the Site supervisor/Construction Manager and the Site Environmental Clerk of Works will be conducted. This in turn will be passed down to the site staff involved. A Corrective Action Notice will be completed at a later date.

10.5 Construction Phase Review

The Project Contractor's CEMP will be the subject of review by the ECoW on behalf of the Project Developer whenever a revised version of the CEMP is presented for approval.