APPENDIX 4-3

CONSTRUCTION AND ENVIRONMENTAL PLAN

Planning and Environmental Consultants

Construction and Environmental Management Plan

Proposed Knockshanvo Wind Farm, Co. Clare

DOCUMENT DETAILS

Client:	**FuturEnergt Knockshanvo Designated Activity Company**
Project Title:	**Proposed Knockshanvo Wind Farm, Co. Clare**
Project Number:	**200513**
Document Title:	**Construction and Environmental Management Plan**
Document File Name:	**CEMP F - 2024.08.29 - 200513**
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Rev	Status	Date	Author(s)	Approved By
01	Draft	13/05/2024	TM	EOS
02	Final	29/08/2024	TM	EOS

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1. INTRODUCTION

This Construction and Environmental Management Plan (CEMP) has been developed by MKO on behalf of FuturEnergy Knockshanvo Designated Activity Company (DAC) who intend to apply to An Bord Pleanála (the Board) for planning permission under sections 37E and 182A of the Planning and Development Act 2000 (as amended) to construct a wind energy development and associated components and grid connection (Proposed Development) at Knockshanvo and adjacent townlands, located in County Clare.

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 applications for the Proposed Development to be submitted to the competent authorities. Should the Proposed Development secure planning permission, the CEMP will be updated, in line with all conditions and obligations which apply to any grant of permission. The CEMP will be read in conjunction with the EIAR 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 Development.

Triggers for updates to the CEMP will comprise:

- When there is a perceived need by the Applicant to improve performance in an area of environmental impact taking into account monitoring results;
- As a result of changes in environmental legislation applicable and relevant to the Proposed Development.
- 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 provides the environmental management framework to be adhered to during the pre-commencement and construction phases of the Proposed Development and it incorporates the mitigating principles to ensure that the work is carried out in a way that minimises the potential for any environmental impacts to occur. This document will be a key contract document that the contractor will be required to implement to ensure protection of the environment.

This report is intended as a single, amalgamated document that can be used during the future phases of the project, as a single consolidated point of reference relating to all construction, environmental and drainage requirements for the Planning Authority, developer, and contractors alike.

1.1 Scope of the Construction and Environmental Plan

This report is presented as a guidance document for the pre-commencement and construction phases of the Proposed Development. Where the term 'site' is used in the CEMP it refers to all works associated with the Proposed Development (refer to Section 1.2 in Chapter 1 of the EIAR). The CEMP outlines clearly the mitigation measures and monitoring proposals that are required to be adhered to in order to complete the works in an appropriate manner.

The report is divided into nine sections, as outlined below:

- **Section 1** provides a brief introduction as to the scope of the report.

- **Section 2** outlines the Site and Proposed Development details, detailing the targets and objectives of this plan along with providing an overview of construction methodologies that will be adopted throughout the project.
- **Section 3** sets out details of the environmental controls that will be implemented on site. Site drainage measures, peat stability monitoring measures 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 project outlining the roles and responsibilities of the project team.
- **Section 5** 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 6** consists of a summary table of all mitigation proposals to be adhered to during the Proposed Development, categorised into three separate headings, 1) pre-commencement measures; 2) construction-phase measures and 3) operational-phase measures.
- **Section 7** consists of a summary table of all monitoring requirements and proposals to be adhered to during the Proposed Development, categorised into three separate headings, 1) pre-commencement measures; 2) construction-phase measures and 3) operational-phase measures.
- **Section 8** sets out a programme for the timing of the works.
- **Section 9** outlines the proposals for reviewing compliance with the provisions of this report.

2. SITE AND PROJECT DESCRIPTION

2.1 Site Location

The Wind Farm Site is located approximately 3 km south of Broadford, 3.5 km southeast from Kilkishen, and 4 km northeast from Sixmilebridge, Co. Clare. The Grid Reference co-ordinates for the approximate centre of the site are E554266 N669733. The site is accessed via local roads from the R465 Regional Road, which travels in a north-south direction between Broadford and Ardnacrusha, the R471 Regional Road which travels east-west between Sixmilebridge and Clonlara and the Crag Local Road, which travels in a northeast-southwest direction between Sixmilebridge and Broadford. The Wind Farm Site itself is served by a number of existing forestry roads.

Current land-use on the Wind Farm Site comprises coniferous forestry, biodiversity areas under Coillte management and third party lands currently being used for agriculture and forestry. Current land-use along the Grid Connection comprises of public road corridor and coniferous forestry. Land-use in the wider landscape comprises a mix of agriculture, low density residential and commercial forestry.

The Wind Farm Site is located within an area which is designated as a 'Strategic Area' for wind energy development (7 no. turbines) and within an area which is designated as 'Acceptable in Principle' (2 no. turbines) in the Wind Energy Strategy (WES) for County Clare which was published in 2017 to meet the policies and objectives of the Clare County Development Plan 2017-2023. The WES has been adopted as part of the Clare County Development Plan 2023 – 2029.

The Grid Connection includes for underground 110kV electrical cabling from the proposed onsite 110kV electrical substation within the Wind Farm Site to the Ardnacrusha 110kV electrical substation in the townlands of Castlebank and Ballykeelaun, County Clare. The underground cable route measures approximately 9.2 km in length, located within existing forestry tracks and the public road corridor. New Gas Insulated Switchgear (GIS) bay equipment will be required at Ardnacrusha 110kV electrical substation located within the existing GIS building to facilitate connection for the proposed Wind Farm.

Table 2-1 Townlands within which the project is located

Development Works	Townland
Wind Farm Site	
Wind Turbines and Associated Foundations and Hardstanding Areas, 110kV Electrical Substation, Permanent Meteorological Mast, Junction Accommodation Works, Access Roads, New Access, Underground Electrical Cabling, Temporary Construction Compounds, Borrow Pits, Site Drainage, Tree Felling, Biodiversity Enhancement, Temporary Transition Compound, Recreation & Amenity Areas, Operational Stage Site Signage and all ancillary works and apparatus.	Snaty (Massy), Hurdleston, Oatfield, Drumsillagh or Sallybank (Parker), Gortacullin, Aharinaghbeg, Knockshanvo, Cloontra, Cloghoolia, Ballycullen, Cloontra West, Formoyle More, Kilmore, Mountrice, Ballyvorgal South, Crag, Kyleglass, Court, Glenwood, Snaty (Cooper), Ballykelly, Muingboy, Drumsillagh or Sallybank (Merritt), Kyle, Belvoir, Snaty (Wilson) and Cloontra East.
Grid Connection	
Underground Cabling Route connecting to the existing Ardnacrusha 110kV electrical substation, Site Drainage, Tree Felling and all ancillary works and apparatus.	Lakyle, Knockdonagh, Castlebank, Cloghera, Roo West, Drumsillagh or Sallybank (Merritt), Glenlon South, Trough, Drumsillagh or Sallybank (Parker) and Ballykeelaun.

2.2 Description of the Development

Due to the nature of the proposed wind energy development, which will have a potential generating capacity of greater than 50 megawatts (MW), the provision of 110kV grid infrastructure will be required. The 110kV grid infrastructure will form part of the national electricity transmission network. As such, two separate planning applications are required.

The full description of the Proposed Development, as per the public planning notices, is as follows:

An Bord Pleanála – Planning Notice Project Description – Wind Farm Site

i. *Construction of 9 no. wind turbines with a blade tip height range from 179.5m to 185m inclusive, a hub height range from 102.5m to 110.5m inclusive and a rotor diameter range from 149m to 163m inclusive with associated foundations, hard-standing and assembly areas.*
ii. *Construction of 1 no. permanent 110 kV electrical substation including 2 no. control buildings, lightning protection, welfare facilities, car parking, and all associated electrical plant and apparatus, security fencing, external lighting, underground cabling, wastewater holding tank and all associated infrastructure, apparatus and landscaping;*
iii. *Underground electrical cabling (33kV) and communications cabling connecting the wind turbines to the proposed on-site 110kV electrical substation and associated ancillary works;*
iv. *Erection of 1 no. Meteorological Mast of 105 metres above existing ground level for the measuring of meteorological conditions, including a lightning rod which will extend above the mast ;*
v. *Construction of new permanent access roads and upgrade of existing roads to provide access within the site and to connect the wind turbines and associated infrastructure;*
vi. *Construction of 1 no. new permanent access to the site off the R465 regional road to serve as the sole entrance to the wind farm during its operational phase and to facilitate the delivery of the construction materials and turbine components to site during the construction, operational and decommissioning phases;*
vii. *Construction of 2 no. new permanent access points off the L-3042 and L-30144-0 local roads to facilitate traffic movement across the site during construction, operation and decommissioning phases. Both accesses will be gated and opened when required during the operational phase;*
viii. *Development of 5 no. borrow pits;*
ix. *Construction of 3 no. temporary construction compounds and associated ancillary infrastructure including temporary site offices, staff facilities and car-parking areas, all to be removed at end of construction phase;*
x. *Temporary works at 3 no. locations along the R465 regional road associated with the facilitation of turbine component and abnormal load delivery to site. These works will primarily include the trimming of vegetation and strengthening of road verges;*
xi. *Installation of a temporary transition compound to facilitate turbine blade delivery during the construction phase, within the townland of Court, Co. Limerick. The works will include installation of a temporary stone hard standing area and associated entrance and egress to and from the N69 national road and will be removed at the end of the construction phase.*
xii. *Permanent amenity works comprising the construction of 1 no. new marked trail, the development of 2 no. new viewing areas and upgrade to 1 no. existing viewing area, including the installation of associated signage and seating;*
xiii. *Permanent and temporary Site Drainage;*
xiv. *Operational Stage Site Signage;*
xv. *Ancillary forestry felling to facilitate construction and operation of the proposed development;*
xvi. *Biodiversity enhancement measures including the permanent clear-felling of land, and;*

xvii. *All related site works and ancillary development including landscaping considered necessary to facilitate the proposed development.*

This application is seeking a ten-year permission and 35 year operational life from the date of commissioning of the wind energy development.

An Bord Pleanála – Planning Notice Project Description – Grid Connection

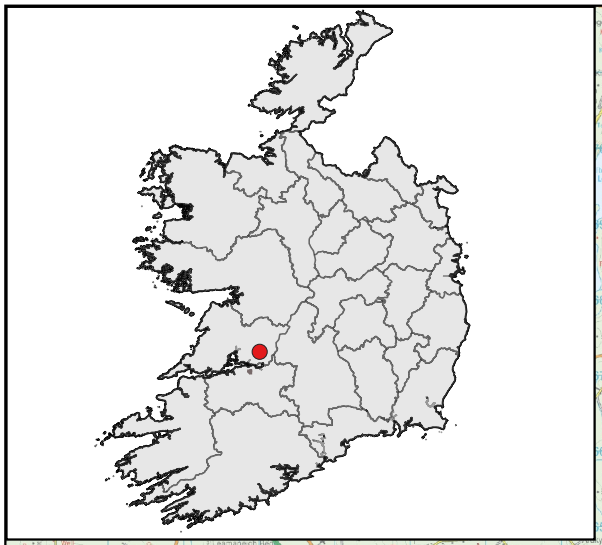
i. *The provision of underground electrical cabling (110kV) from the proposed Knockshanvo Wind Farm development to the existing Ardnacrusha 110kV electrical substation to facilitate the connection to the national grid;*
ii. *Provision of 14 joint bays, communication chambers and earth sheath links along the proposed underground electrical cabling route;*
iii. *Permanent and temporary Site Drainage;*
iv. *Ancillary forestry felling to facilitate construction and operation of the proposed development;*
v. *Reinstatement of land, road and track surface above the proposed cabling trench;*
vi. *All related site works and ancillary development considered necessary to facilitate the proposed development..*

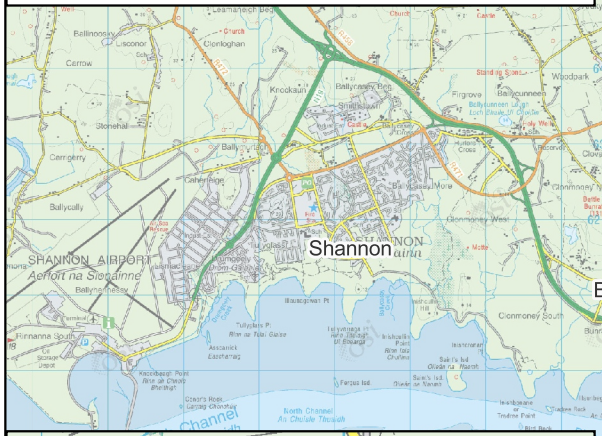
The Grid Connection includes for underground 110kV electrical cabling from the proposed onsite 110kV electrical substation within the Wind Farm Site to the Ardnacrusha 110kV electrical substation in the townlands of Castlebank and Ballykeelaun, County Clare. The underground cable route measures approximately 9.2 km in length, located within existing forestry tracks and the public road corridor.

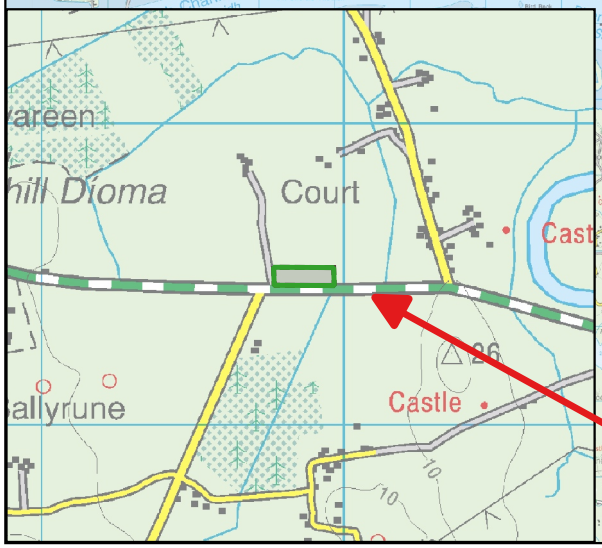
For the purpose of this CEMP, where the 'Wind Farm Site' is referred to, this relates to all components within the Wind Farm Application under Section 37E of the Planning and Development Act 2000, as amended , as described above and all associated lands.

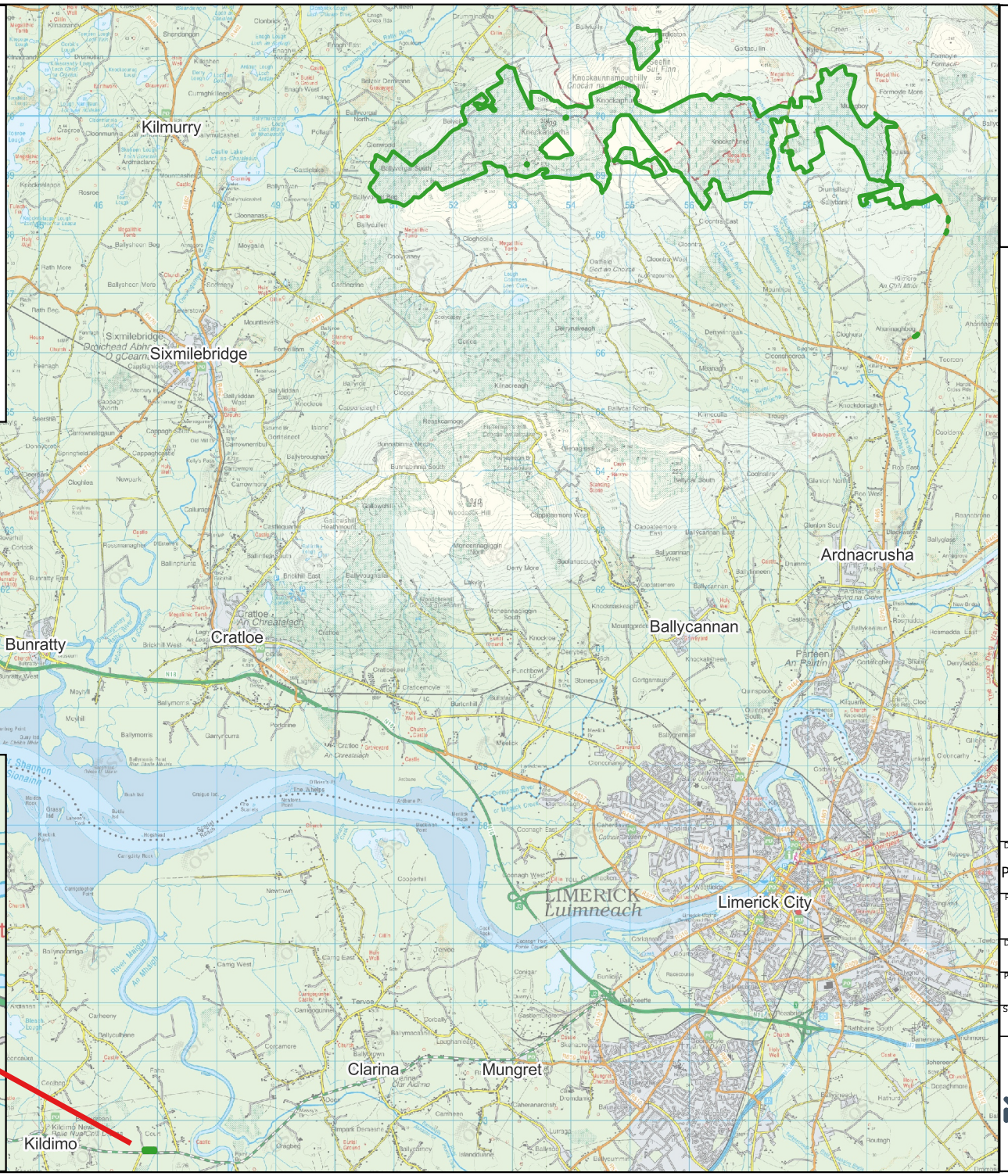
Where 'Grid Connection' is referred to, this relates to all components within the Grid Connection Application under Section 182A of the Planning and Development Act 2000, as amended, as described above and all associated lands.

Where the 'Proposed Development' is referred to, this relates to all the project components described above as part of the Planning Notice Project Descriptions i.e. the Wind Farm Site and Grid Connection. The layout of the Proposed Development is shown in Figure 2-1.









Map Legend

- Wind Farm Site
- Site Location

Drawing Title: Proposed Wind Farm Site Location

Project Title: Knockshanvo Wind Farm

Drawn By	Checked By
SD	EOS
Project No.	Drawing No.
200513	Figure 2-1
Scale	Date
1:100,000	2024-08-09

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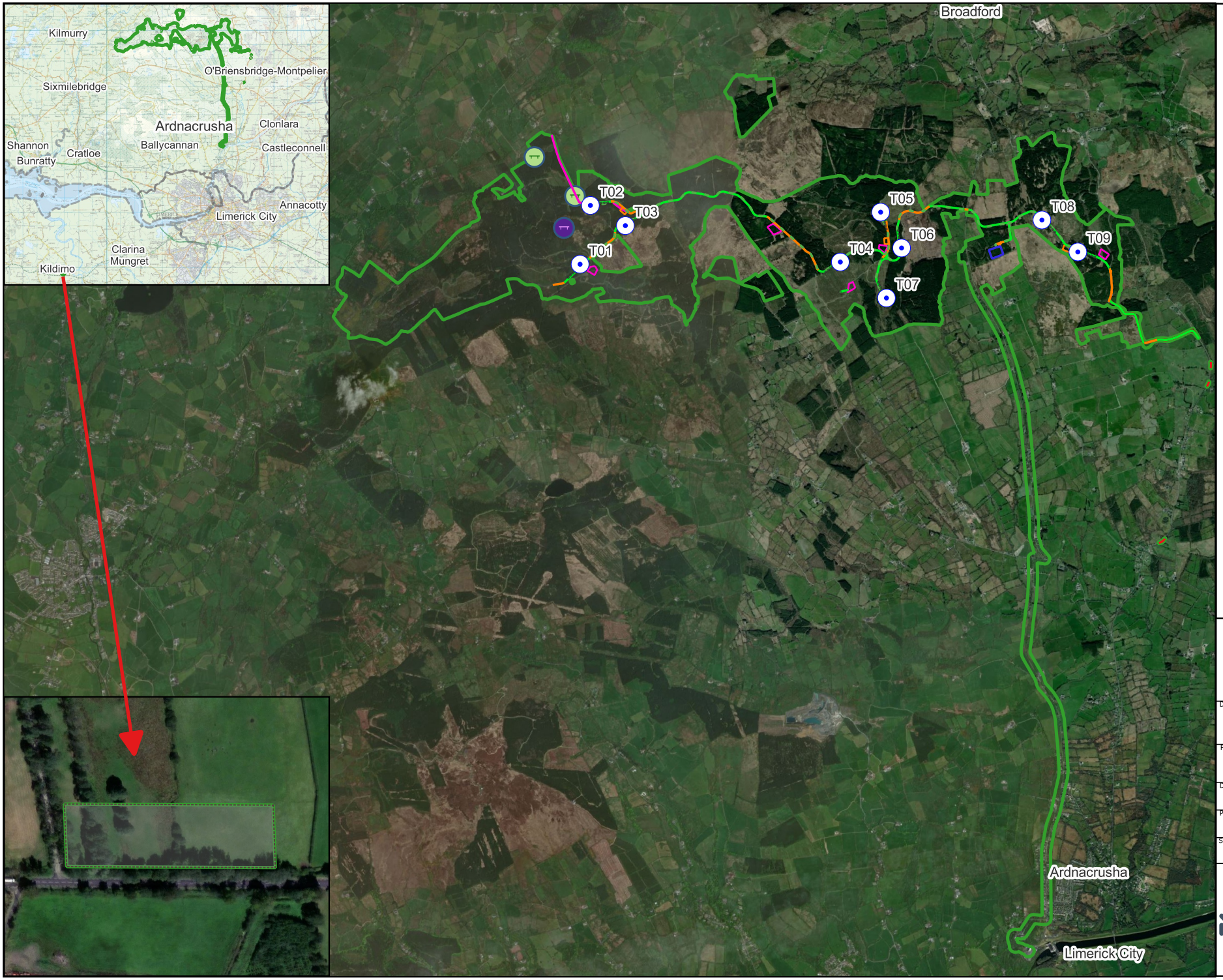

Map Legend

- Proposed Development Study Boundary
- Proposed Turbine Layout [9]
- Proposed Turbine Hardstand [9]
- Proposed 110kV Electrical Substation [1]
- Proposed Internal Underground Cabling
- Proposed Permanent Meteorological Mast [1]
- Proposed Upgrade of Existing Roads
- Proposed New Roads
- Proposed Borrow Pit [5]
- Proposed Temporary Construction Compound [3]
- Proposed Amenity Trail
- Proposed Amenity Viewing Area [2]
- Upgraded Amenity Viewing Area [1]
- Proposed Turbine Delivery Overrun Area [3]
- Proposed Turbine Delivery Temporary Transition Compound [1]
- Proposed Security Cabin [1]
- Proposed 110kV Underground Grid Connection Route

Drawing Title
Proposed Development Layout

Project Title
Knockshanvo Wind Farm

Drawn By	Checked By
SD	EOS
Project No.	Drawing No.
200513	Figure 2-2
Scale	Date
1:55,000	2024-08-01

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2.3 Targets and Objectives

In so far as the designs that have been completed to date, or are to be further completed in future, the construction phase works are designed to approved standards, which include specified materials, standards, specifications and codes of practice. The design of the project has considered environmental issues and this is enhanced by the works proposals.

The key site targets are as follows;

- 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 are completed in accordance with all planning documents for the development;
- 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,
- 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, overburden and peat material;
- 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.

2.4 Construction Methodology Wind Farm Overview

2.4.1 Introduction

The planning application for the Wind Farm Site includes the turbines and associated foundations and hard-standing areas, meteorological mast, site entrance, junction accommodation works, access roads, temporary construction compounds, temporary transition compound, 110kV electrical substation, underground cabling, borrow pits, site drainage, tree felling, amenity works, biodiversity enhancement measures and all ancillary works. The respective construction methodology for each of these components is outlined below in Section 2.4.2.

An experienced main contractor will be appointed for the civil works for the construction phase of the Proposed Development. 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 Development.

2.4.2 Overview of Proposed Construction Methodology

The proposed anticipated construction methodology is summarised under the following main headings:

- Temporary Construction Compounds;
- Borrow Pits;
- Peat Spoil Management
- Tree Felling;
- Site Drainage Systems;
- Wind Farm Site Entrance
- Site Access Roads;
- Turbine Foundations;
- Meteorological Mast Foundations:
- Crane Hardstands;
- Onsite Electrical Substation, Control Buildings;
- Site Underground Cabling
- Operation and Maintenance Control Building

2.4.3 Temporary Construction Compounds

3 no. temporary construction compounds are proposed for the Wind Farm Site. Construction compound 1 and 2 each measure approximately 68 metres by 45 metres and 3,060 m^2 in area, located in the western and central sections of the site, adjacent to the existing access road, approximately 125 metres north of Turbine No. 3, and approximately 155 metres west of Turbine No. 6, respectively.

Construction compound 3 measures approximately 104 metres by 60 metres and 6,240 m^2 in area is proposed for the east of the site, adjacent to the proposed new access road approximately 65 metres to the west of Turbine No. 9, and approximately 700 metres east of the electrical substation. The location of the proposed construction compounds is shown on the site layout drawing in Figure 2-2

The construction compounds will consist of temporary site offices, staff facilities and car-parking areas for staff and visitors. The layout of these construction compounds is shown on Figure 4-14 of Chapter 4 of the EIAR submitted to the Board for this application.

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 as discussed in Section 4.2.2 above;
- 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 Development site and for the 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 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 compounds;
- The compounds will be fenced and secured with locked gates if necessary; and,
- Upon completion of the Proposed Development the temporary construction compounds will be decommissioned and allowed to vegetate naturally.

2.4.4 Borrow Pits

It is proposed to develop five on-site borrow pits. The location of the borrow pits are shown in Figure 2-2. The borrow pits will be excavated and backfilled, as outlined in Appendix 4-2 Peat and Spoil Management Plan of the EIAR, as follows:

- Peat and overburden will be removed and temporarily stored in localised areas adjacent to the borrow pit locations before being placed into the permanent peat storage areas within the borrow pits. The rock within the proposed borrow pit footprints will be removed by either breaking or blasting depending on its excavatability, which will be determined from confirmatory ground investigation carried out at the proposed borrow pits. The ground investigation will comprise rotary core drilling with associated engineering logging including rock quality designation and strength and durability testing. Data available from the ground investigation undertaken to date indicates that the rock can be removed by breaking.
- It is proposed to construct the borrow pits so that the base of the borrow pits are below the level of the adjacent section of access road. As excavation progresses into the back edge of the borrow pits, localised deepening of the borrow pit floors may be required depending on extraction operations.
- Slopes within the excavated rock formed around the perimeter of the borrow pits will be formed at stable inclinations to suit local in-situ rock conditions. Exposed sections of the rock slopes will be left with irregular faces and declivities to promote re-vegetation and provide a naturalistic appearance.
- The stability of the rock faces within the borrow pits will be inspected by the Project Geotechnical Engineer upon excavation to ensure stability during construction works and in the long term. This inspection will allow unfavourable rock conditions to be identified and suitable mitigation measures to be applied such as removal of loose rock, in line with best practice guidelines.
- It will be necessary to construct rock buttresses founded on in-situ rock within the borrow pits to create individual cells (2 or 4 no.). The cells will be opened in sequence and filled as needed. The rock buttresses will be constructed of rock fill from the borrow pit excavation, placed and compacted in layers. The founding stratum for each rock buttress will be inspected and approved by the Project Geotechnical Engineer.

- The rock buttresses will be constructed in stages to allow infilling of peat and spoil within cells. The buttress will be constructed of selected rock fill and placed and compacted in suitable layers to form a buttress of sufficient stability to retain the placed peat and spoil.
- Infilling of the peat and spoil will commence at the back edge of the borrow pit and progress towards the borrow pit entrance/rock buttress, allowing the borrow pit to be developed and infilled in cells. The contractor excavating the rock will be required to develop the borrow pits in a way which will allow the excavated peat and spoil to be reinstated safely.
- A number of rock buttresses to form cells with the borrow pits will be required to ensure access for trucks and excavators can be achieved. See Drawings P22-153-0600-0018 to 0022 for the location of the rock buttresses. The locations of the rock buttresses shown on Drawings P22-153-0600-0018 to 0022 for the borrow pits are indicative only and may change subject to local conditions encountered on site during construction and as a result of the confirmatory ground investigation.
- The rock buttresses will be wide enough (up to 4m) to allow construction traffic access for tipping and grading during the placement of the excavated peat and spoil. The permanent side slopes of the rock buttress will be constructed at between 40 to 60 degrees.
- A rock buttress (perimeter berm) will be required on the downslope side of the borrow pits to safely retain the infilled peat and spoil. The height of the berm constructed will be greater than the height of the reinstated peat and spoil to prevent any surface peat and spoil run-off. A berm up to 7m in height will be required at each borrow pit. The highest berm is required at borrow pit 4.
- The perimeter berm will be founded on weathered bedrock i.e. competent strata. The founding stratum for the perimeter berm will be inspected and approved by the Project Geotechnical Engineer.
- A level surface in the underlying granular mineral soil or weathered bedrock will be prepared before placing and compacting the rock fill used to construct the berms. Both of these materials will be encountered at the borrow pit locations and both are suitable founding strata for the berms.
- In order to prevent water retention occurring behind the buttresses, the buttresses will be constructed of coarse boulder fill with a high permeability. The buttress will be constructed of well graded granular rock fill of 100mm up to 500mm in size. In addition, drains will be placed through the buttresses to allow surface water to drain from the surface of the placed peat. These drains will be inspected periodically, both during construction and during operation of the Proposed Development, to ensure they do not become blocked.
- A layer of geotextile will be placed on the inside face of the perimeter berm to act as a separator layer between the berm and the placed peat/spoil, to prevent the placed peat/spoil infilling any voids on the inside face of the berm, maintaining the permeability of the berm.
- The use of temporary access ramps and long reach excavators during the placement of the excavated peat and spoil will be required.
- The surface of the placed peat and spoil will be shaped using excavators to allow efficient run-off of surface water from the placed arisings.
- As the berms are slightly higher than the retained peat, drains will be provided at regular intervals through the berms, at the same level as the top of the peat surface, to prevent ponding of water around the edges of the repositories. These drains will be 150mm diameter flexible plastic drainage pipes or equivalent.
- A layer of geogrid to strengthen the surface of the placed peat within the borrow pits will be required.
- An interceptor drain will be installed upslope of the borrow pit. This drain will divert any surface water away from the borrow pit and hence prevent water from ponding and lodging during construction and also when reinstated.

- Temporary control of groundwater within the borrow pits will be required and exact measures will be determined as part of the confirmatory ground investigation programme. A temporary pump and suitable outfall locations will be required during construction.
- Perimeter drains will be installed around the individual cells within the borrow pits and will discharge to a settlement pond at the lower side/outfall location of the borrow pits.
- The acrotelm will be placed with the vegetation part of the sod facing the right way up to encourage growth of plants and vegetation at the surface of the peat and spoil within the borrow pits.
- Supervision by the Project Geotechnical Engineer is required for the development of the borrow pits.
- All the above-mentioned general guidelines and requirements will be implemented by the Contractor during construction.

Post-construction, the borrow pit areas will be permanently secured and a stock-proof fence will be erected around the borrow pit areas to prevent access to these areas. Appropriate health and safety signage will also be erected on this fencing and at locations around the fenced area.

Hardcore materials will be extracted from the borrow pits (and some turbine locations, if necessary), principally by means of rock breaking. Depending on the hardcore volume requirements, blasting may also be used as a more effective rock extraction method, capable of producing significant volumes of rock in a matter of milliseconds. Blasting will only be carried out after notifying any potentially sensitive local residents.

Where present, overburden will be stripped back and stockpiled in dedicated safe locations (please see Appendix 4-2 Peat and Spoil Management Plan) using standard tracked excavators. Two extraction methods will be used and have been assessed for breaking out the useful rock below; rock breaking and blasting.

2.4.4.1.1 *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 by a competent operator. In areas where rock of a much higher strength is encountered and cannot be removed by means of excavating then a rock breaking methodology may be used. Where rock breaking is required, a large hydraulic 360-degree excavator with a rock breaker attachment is used. 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. The large rock breaker is typically supported by a smaller rock breaker which can often be in the 30-40 tonne size range, and works to break the rocks down to a size that they can 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 away from the immediate area of the crusher until it is required elsewhere on the Wind Farm Site.

2.4.4.1.1 *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. The drilling rigs used are normally purpose built, self-

propelled machines, designed specifically for drilling blast boreholes. A drilling rig working for 3-4 days would typically drill the necessary number of boreholes required for a single blast. The locations, depth and number of boreholes are determined by the blast engineer, a specialist role fulfilled by the blasting contractor that will be employed to undertake the duties.

The blast engineer will then 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 Garda Síochána. The blast engineer sets the explosives in place in the boreholes, sets the charges, and fires the blast. The blast takes only a matter of milliseconds, but may be perceived to take longer as blast noise echoes around the area.

A properly designed blast will generate rock of a size that can be loaded directly into a mobile crusher, using the same wheeled loader description outlined above. From that point on, the same method is used for processing the rock generated from a blast, as would be used to process rock generated by rock breaking. It would be likely that a drilling rig would recommence drilling blast holes for the next blast as soon one blast finished. Rock blasting will be undertaken in line with the Safety and Health Commission for the Mining and other Extractive Industries report on *Guidance on the Safe Use of Explosives in Quarries 2001* [1]to ensure the safe use of explosives on-site. Only authorised people will handle explosives for rock blasting at the site.

2.4.5 Peat Spoil Management

The purpose of Peat and Spoil Management Plan (Appendix 4-2 of the EIAR) is to provide a management plan, with particular reference to peat stability for the construction phase of the Proposed Development. The report describes how peat and spoil, which will be excavated from infrastructure locations such as turbine bases, hardstands, borrow pits and roads, will be handled and placed/reinstated onsite. The report also provides construction details for the types of roads which will be put in place at the site and proposed peat and spoil placement/reinstatement areas which will be developed at the site. The full Peat and Spoil Management Plan, as produced by Fehily Timoney and Company (FT) is available in Appendix 4-2 of the EIAR.

2.4.5.1 Quantities

The quantity of peat and non-peat material (spoil), requiring management on the site of the Proposed Development has been calculated, as presented in Table 2-2 below. These quantities were calculated by FTC as part of the *Peat and Spoil Management Plan* in Appendix 4-2 of the EIAR.

Table 2-2 Peat and Spoil Volumes requiring management.

Infrastructure Element	Proposed Dimensions	Peat Volume (m^3)	Spoil (non-peat) Volume (m^3)
9 no. Turbines and Hardstands	27m diameter excavation footprint for turbine foundation with 95m x 35m hardstand area.	16,000	50,000
Access Roads	5m running surface with 6m wide development footprint.	40,000	32,000
3 no. Temporary Construction Compounds	Hardstanding area of 45m x 65m.	3,800	9,500

1 *https://www.hsa.ie/eng/publications_and_forms/publications/mines_and_quarries/guidance%20on%20the%20safe%20use%20of%20explosives%20in%20quarries.pdf*

Infrastructure Element	Proposed Dimensions	Peat Volume (m^3)	Spoil (non-peat) Volume (m^3)
Substation	Hardstanding area of 125m x 100m.	7,300	3,000
Met Mast	Hardstanding area of 30m x 30m	300	300
5 no. Borrow Pits	5 no. borrow pits.	14,000	28,000
Grid Connection	9.2 km in length	100	6,800
Total		**81,500**	**129,600**
Total Peat & Spoil to be managed (m^3)		**211,100**	

Note a factor of 10% (bulking factor of 10%) has been applied and is included in the excavated peat and spoil volumes above to allow for expected increase in volume upon excavation and to allow for a variation in ground conditions across the site.

It should also be noted that the excavated rock volume from turbines, hardstands and the borrow pits is not included in the total volume quoted above in Table 2-2. The excavated rock volume will be re-used on site as part of the construction works for the development and hence will not require reinstatement on site.

2.4.5.2 Peat and Spoil Usage in Restoration of Borrow Pits

Once the required volume of rock has been extracted from the borrow pit areas it is proposed to reinstate these areas with peat and overburden excavated from the works areas of the Proposed Development. The borrow pits will be extracted and reinstated in sequence, beginning with the borrow pit nearest the Wind Farm Site entrance (Borrow pit No. 5).

The construction methodology for the construction of the borrow pits, as presented in FTC's *Peat & Spoil Management Plan* in Appendix 4-2 of the EIAR, is summarised in Section 2.4.4 above. This methodology prescribes procedures that will be applied during the construction to avoid any adverse impact on peat stability.

Where possible, the acrotelm peat that has been excavated from across the site and not retained for reinstatement and landscaping works in those locations, will be stored with the vegetated side facing up so as to promote the growth of vegetation and placed across the surface of the stored peat within the borrow pit areas.

2.4.6 Tree Felling

Some of the proposed Wind Farm Site is occupied by commercial forestry. As part of the Proposed Development, tree felling will be required within and around the development footprint to allow the construction of turbine bases, bat buffers, access roads, and the other ancillary infrastructure.

It should be noted that forestry on the proposed Wind Farm Site was originally planted as a commercial crop and will be felled in the future should the Proposed Development proceed or not.

A total of 107.56 hectares of forestry will be felled for the Proposed Development. This includes a total of 48.89 hectares permanently felled within the footprint of the Wind Farm Site (including the 50m buffer to all habitat features used by bats, as discussed in Section 6.3 in Chapter 6 Biodiversity of this EIAR), approximately 5.69 hectares temporarily felled within the footprint of the Wind Farm Site and 52.98 hectares as part of the Hen Harrier Compensation and Enhancement Plan, as discussed in Appendix 6-3 of the EIAR. Figure 4-18 of Appendix 6-3 shows the extent of the areas to be felled as part of the Proposed Development.

The tree felling activities required as part of the Proposed Development 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 Development.

The proposed methodology for the forestry felling activities is as follows:

Felling works will conform to current best practice Forest Service policies and strategic guidance documents as well as Coillte produced guidance documents, including the specific guidelines listed below, to ensure that the felling works provides minimal potential impacts to the receiving environment.

- 'Standards for Felling and Reforestation' (Department of Agriculture, Food and the Marine, 2019)
- 'Forest Operations & Water Protection Guidelines' (Coillte, 2009)
- 'Methodology for Clear Felling Harvesting Operations' (Coillte, 2009)
- 'Forestry and Water Quality Guidelines' (Forest Service, 2000)
- 'Forestry Biodiversity Guidelines' (Forest Service, 2000)
- 'Forestry Protection Guidelines' (Forest Service, 2002)
- 'Forestry Harvesting and Environmental Guidelines' (Forest Service, 2000)

The proposed methodology that will be implemented for the forestry felling activities is as follows:

- The extent of all necessary forestry felling areas will be identified and demarcated with markings on the ground in advance of any felling commencing.
- All roads and culverts will be inspected by the ecological clerk of works (ECoW) and contractor prior to any machinery being brought on site to commence the felling operation.
- Existing drains that drain an area to be felled towards surface watercourses will be blocked, and temporary silt/sediment traps (i.e. check dam / silt fence) 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.
- 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.
- Sediment traps will be sited in drains downstream of felling areas. Machine access will be maintained to enable the accumulated sediment to be excavated.
- Sediment removed from traps will be carefully disposed of in the areas for peat and spoil management as identified in the Peat and Spoil Management Plan in Appendix 4-2 of the EIAR.
- Machine combinations (i.e. hand-held or mechanical) will be chosen which are most suitable for ground conditions at the time of felling, and which will minimise soils disturbance; however, the general proposed machine combination will comprise a harvester and a low-ground pressure harvester with a 14-tonne bunk capacity.
- Trees will be cut manually inside the 50m construction watercourse buffer and using machinery to extract whole trees only;
- Brash mats will be put in place to support vehicles on soft ground, reducing peat and mineral soils erosion and avoiding the formation of rutted areas, in which surface water ponding can occur.
- Brash mat renewal will take place when they become heavily used and worn. Provision will be made for brash mats along all off-road routes, to protect the soil from compaction and rutting.

- No tracking of vehicles through watercourses will occur. Vehicles will only use existing road infrastructure and established watercourse crossings.
- Brash which has not been pushed into the soil will be moved to facilitate the creation of mats elsewhere within the site.
- 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 prior to removal off site to authorised saw mills.

2.4.7 Site Drainage Systems

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 Development.

No routes of any natural drainage features will be altered as part of the Proposed Development and turbine locations and associated new roadways were originally selected to avoid natural watercourses, and existing roads are to be used wherever possible. 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 Development.

In addition, construction operations will adopt best working practices which are outlined in Section 3.2.3 below. The development of the site will be phased accordingly. The construction of the drainage will start from the downstream sections and progress upstream, connecting conveyance systems with other drainage features as each development phase progresses. They will be designed with sufficient flexibility to respond to an early phase incoming flow during the construction phase.

Detailed measures to address surface water management based upon the design criteria and philosophy will be implemented. 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. Surface water management and drainage design is dealt with in Section 3.2 of this CEMP, Section 4.2 of the EIAR and in Chapter 9 of the EIAR.

2.4.8 Wind Farm Site Entrance

It is proposed to access the Wind Farm Site via a newly proposed access track off the R465 Regional Road to the east of the site. The proposed entrance takes the form of a priority type junction with the R465 forming the priority route. This entrance will be created to facilitate the delivery of the construction materials and turbine components. The site entrance was subject to Autotrack assessment to identify the turning area required, as described in Section 15.1 of the Traffic and Transport Assessment in Chapter 15: Material Assets of the EIAR. Appropriate sightlines will be established to the north and south of the proposed site entrance for the safe egress of traffic. The visibility splays at the main site entrance off the R465, as shown in Figure 15-7 of the EIAR, will require to be provided and kept clear of obstruction during construction, operation and decommissioning phases. The proposed works will result in a permanent site access from the regional road, which will also form the sole entrance to the Proposed Development during the operational phase.

The location of the Wind Farm Site entrance is shown on the site layout drawing in Figure 2-2.

In the event planning permission is granted for the Proposed Development, the final Traffic Management Plan will address the requirements of any relevant planning conditions, including any additional mitigation measures which are conditioned.

The construction methodology for the site access follows the same methodology as the site roads, as discussed below in Section 2.4.9.

2.4.9 Site Access Roads

The road construction design has taken into account the following key factors as stated in the Fehily Timoney & Company's (FT) Peat & Spoil Management Plan in Appendix 4-2 of the EIAR:

- *Buildability considerations*
- *Maximising use of existing infrastructure*
- *Minimise excavation arisings*
- *Serviceability requirements for construction and wind turbine delivery and maintenance vehicles*
- *Requirement to minimise disruption to peat hydrology*

The access roads on site will be constructed as excavate and replace (founded) type construction, which, given the ground conditions and type of terrain present, this is deemed the most appropriate construction approach. Floating road construction will not be undertaken on the Proposed Development.

The total length of new proposed access road to be constructed on site is 9.3km (see Drawings P20-153-0600- 0013 to 0015 of the Peat and Spoil Management Plan – Appendix 4-2 of the EIAR).

The proposed make-up of the founded access roads is a minimum stone thickness of 750mm. The requirement for a layer of geotextile and geogrid and the necessary stone thickness will be confirmed at pre-construction stage.

See the Peat & Spoil Management Plan (Appendix 4-2) for the Proposed Development for further detail on how peat and spoil will be managed during road construction.

2.4.9.1 Upgrade to Existing Roads or Tracks

The construction methodology for upgrading of existing sections of excavated roads or tracks, as presented in FTC's *Peat & Spoil Management Plan* in Appendix 4-2 of this EIAR, is summarised below. This methodology includes procedures that are to be included in the construction to avoid any adverse impact on peat stability.

1. *Access road construction will be to the line and level requirements as per design/planning conditions.*

2. *For upgrading of existing access roads (Type A) the following guidelines apply:*
    a. *Excavation of the access road will take place to a competent stratum beneath the peat, removing all peat and any soft clay and backfilling with suitable granular fill.*
    b. *Benching of the excavation will be required between the existing section of access road and the widened section of access road where the depth of excavation exceeds 500mm.*
    c. *The surface of the existing access track will be overlaid with up to 500mm of selected granular fill.*
    d. *Access roads will be finished with a layer of capping across the full 6m width of the track.*

e. *A layer of geogrid/geotextile may be required at the surface of the existing access road and at the base of the widened section of access road, where shallow groundwater or surface water is encountered, and where there is a cohesive subgrade to prevent missing of materials(to be confirmed by the designer).*
f. *For excavations in peat, side slopes will not greater than 1 (v): 3 (h). This slope inclination will be reviewed during construction, as appropriate. Where areas of weaker peat are encountered then slacker slopes will be required to ensure stability.*

3. *The finished road width will have a running width of 5m, with wider section on bends and corners.*

4. *On side long sloping ground any road widening works required will be done on the upslope side of the existing access road, where possible. Where not possible, a specific Risk Assessment Method Statement (RAMS) from the contractor will be produced, detailing how the downslope works will be undertaken, including that all plant would operate from the already constructed section of track, with no loading of the peat on the downslope slope, limiting the length of ground to be stripped/excavated at any one time.*

2.4.9.2 Construction of New Excavated Roads

Excavate and replace type access roads are the conventional method for construction of access roads on peatland sites and the preferred construction technique in shallow peat provided sufficient placement/reinstatement capacity is available on site for the excavated peat, as is the case for the Proposed Development Site (see FTC's *Peat & Spoil Management Plan* in Appendix 4-2 of this EIAR for how peat and spoil will be managed on site).

The construction methodology for the construction of excavated roads, as presented in FTC's *Peat & Spoil Management Plan* in Appendix 4-2 of this EIAR, is summarised below. This methodology includes procedures which will be implemented during the construction phase to avoid any adverse impact on peat stability.

1. *Prior to commencing the construction of the excavated roads, movement monitoring posts will be installed in areas where the peat depth is greater than 2.0m.*

2. *Interceptor drains will be installed upslope of the access road alignment to divert any surface water away from the construction area.*

3. *Excavation of roads will be to the line and level given in the design requirements. Excavation will take place to a competent stratum beneath the peat.*

4. *Road construction will be carried out in sections of approximately 50m lengths i.e. no more than 50m of access road will be excavated without re-placement with stone fill.*

5. *Once excavated, peat will be temporarily stored in localised areas adjacent to excavations for roads and hardstands before being placed into the permanent peat storage areas within the borrow pits. All peat placement areas will be upslope of founded roads/hardstands and will be inspected by the Project Geotechnical Engineer before material is temporarily stored in the area.*

6. *Excavation of materials with respect to control of peat stability.*
    a. *Acrotelm (top about 0.3 to 0.4m of peat) will be required for landscaping and will be stripped and temporarily stockpiled either alongside the roads,*

or in clearfell areas around turbines/hardstands for re-use as required. Acrotelm stripping will be undertaken prior to main excavations.

b. *The acrotelm will be placed with the vegetation part of the sod facing the right way up to encourage growth of plants and vegetation.*
c. *All catotelm peat (peat below about 0.3 to 0.4m depth) will be transported immediately on excavation to the designated placement areas.*

7. *Excavation side slopes in peat will not greater than 1 (v): 3 (h). This slope inclination will be reviewed during construction. Should areas of weaker peat be encountered then slacker slopes will be required. Battering of the side slopes of the excavations will be carried out as the excavation progresses.*

8. *End-tipping of stone onto the road during the construction/upgrading of the access road will be carefully monitored to ensure the excessive impact loading, which may adversely affect the adjacent peat, is limited.*

9. *The excavated access road will be constructed with a minimum of 750mm of selected granular fill. Granular fill will be placed and compacted in layers in accordance with the TII Specification for Road Works[2].*

10. *Access roads will be finished with a layer of capping across the full width of the road.*

11. *A layer of geogrid/geotextile will be required at the surface of the competent stratum, where this stratum is cohesive in nature.*

12. *Where slopes of greater than 5 degrees are encountered along with relatively deep peat (i.e., greater than 1.5m) and where it is proposed to construct the access road perpendicular to the slope contours, it is best practice to start construction at the bottom of the slope and work towards the top, where possible. This method avoids any unnecessary loading to the adjacent peat and greatly reduces any risk of peat instability.*

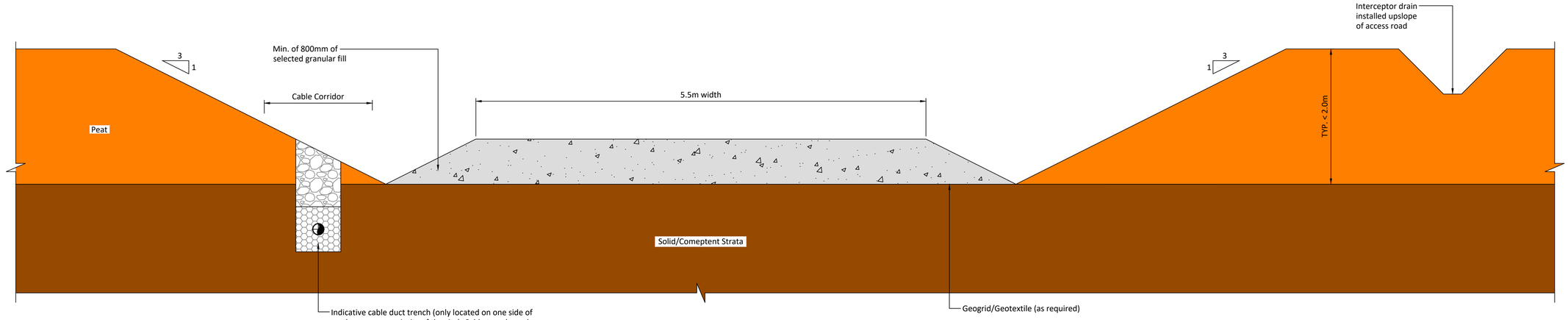
13. *Where the above is not possible, a specific Risk Assessment Method Statement (RAMS) from the contractor will be produced, detailing how the downslope works will be undertaken, including that all plant would operate from the already constructed section of track, with no loading of the peat on the downslope slope and limiting the length of ground to be stripped/excavated at any one time. Movement monitoring posts (as described in the Peat & Spoil Management Plan, Appendix 4-2) will also be installed downslope of the works area to allow for ongoing monitoring during the construction works.*

14. *A final surface layer will be placed over the excavated road and graded to accommodate wind turbine construction and delivery traffic.*

15. *The construction and upgrading of access roads in areas of deep peat (greater than 2m) will be inspected on a routine basis (by the Site Manager/Ecological Clerk of Works/Project Geotechnical Engineer) during the works, particularly before/following tracking by heavy vehicular loads.*

A section of a new excavated road is shown in Figure 2-3 below.

[2] *TII Specification for Road Works Series 600 – Earthworks (including Erratum No. 1), June 2013, CC-SPW-00600. Available at: https://www.tiipublications.ie/library/CC-SPW-00600-03.pdf*



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Rev.	Description	App By	Date
A	FOR INFORMATION	BDH	02.08.23
B	FOR INFORMATION	BDH	01.05.24

PROJECT: KNOCKSHANVO WIND FARM		CLIENT: MKO	
SHEET: TYPE B - NEW EXCAVATE AND REPLACE ACCESS ROAD	Date: 01.05.24	Project number: P20-153	Scale (@ A1): 1:25
	Drawn by: POR	Drawing Number: Figure 2-3	Rev: B
	Checked by: IH		

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1 May 2024

2.4.9.3 Construction Methodology – Access Roads

Site roads will be constructed to each turbine base and at each base a crane hard standing will be constructed to the turbine manufacturer's specifications.

The road excavations will follow a logical route working away from the borrow pit locations. Excavated material will be transported back to the borrow pits in haul trucks.

When the road formation layer has been reached, stone from the on-site borrow pit shall be placed to form the road foundation. In the event of large clay deposits being encountered in sections of road, a geotextile layer will be required at sub base level. The sub grade will be compacted with the use of a roller. The final surface course on the road will not be provided until all turbine bases have been poured. This prevents damage to the surface course due to stone and concrete trucks movements. The road will be upgraded prior to the arrival of the first turbine. All roads will be maintained for the duration of the operation of the Proposed Development.

2.4.10 Turbine Foundations

Each wind turbine is secured to a reinforced concrete foundation that is installed below the finished ground level. After the foundation level of each turbine has been formed using piling methods or on competent strata, the bottom section of the turbine tower "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 (Plate 2-1 below).The wind turbines and meteorological mast foundations will be a reinforced concrete base designed to Eurocode 2/BS8110. Foundation loads will be provided by wind turbine and mast supplier, and factors of safety will be applied to these in accordance with European design regulations.

Plate 2-1 Turbine 'Anchor Cage' and finished turbine base

The turbine will be anchored to the foundation using a bolt assembly which will be cast into the concrete. Foundations will be formed a minimum of one metre below the base of the peat layer on stiff subsoil material or bedrock, or at a suitable level directed by the Geotechnical Engineer/Designer. The foundations will be constructed 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 peat 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;
- No material will be removed from site and storage areas will be stripped of vegetation prior to stockpiling in line with best working practices;
- 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;
- Archaeological monitoring of all groundworks during the construction stage of the Proposed Development will be carried out by a licensed archaeologist.

- The foundation excavation will be raised to formation level by compacted layers of well graded granular material, spread and compacted to provide a hard area for the turbine foundation.

Standard excavated reinforced concrete bases will be completed as follows:

- A layer of concrete blinding will be laid 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 will be protected from rainfall during curing and all surface water runoff from the curing concrete will be prevented from entering surface water drainage directly;
- High tensile steel reinforcement will be fixed 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;
- Ductwork will be installed as required, and formwork erected around the steel cage and propped from the backside as required;
- 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;
- Concrete will be placed using a concrete pump and compacted 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;
- Steel shutters will be used to pour the circular chimney section;
- Earth wires will be placed around the base; and,
- The foundation will be backfilled with a cohesive material, where possible using the material arising during the excavation and landscaped using the vegetable soil set aside during the excavation.
- Soil, rock and other materials excavated during construction will be managed in line with the recommendations/ best practice guidelines outlined in Section 4.4.2 of Chapter 4 of the EIAR.

Reinforced concrete piled foundations will be completed 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;
- No material will be removed from site and placement areas will be stripped of vegetation prior to placement in line with best working practices;
- A piling platform for the piling rig will be constructed. This will be done by laying geotextile on the existing surface and a stone layer will then be placed on top of the geotextile by an excavator and compacted in order to give the platform sufficient bearing capacity for the piling rig.
- 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 peat from collapsing. The borehole is then extended to a suitable depth into the subsoil/bedrock.
- 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.
- As the auger is removed concrete is pumped into the borehole.
- Reinforcing steel on the top of the pile will tie to the foundation base steel.
- The procedure for standard excavated reinforced concrete bases as outlined below can be applied from here.

2.4.11 Meteorological Mast

One permanent meteorological mast is proposed as part of the Proposed Development. The meteorological mast will be equipped with wind monitoring equipment at various heights. The mast will be located at E556203 N669109 as shown on the site layout drawing in Figure 2-2. The mast will be a self-supporting slender structure 105 metres in height with a lightening mast on top. The mast will be constructed on a hard standing area measuring 21m by 14m and accommodate the crane that will be used to erect the mast. Approximately 75 m of new track roads will be required to access the meteorological mast hard standing area.

The meteorological mast foundation will comprise a gravity type foundation. Given the ground conditions present at the proposed meteorological mast, the foundation will be founded on glacial till, or weathered bedrock. The founding depth for the met mast foundation is envisaged to be 0.5 to 1.0m below ground level. At the underside of the met mast foundation, a layer of structural up-fill (class 6N) will be required. The meteorological mast will be supported by guyed lattices.

2.4.12 Crane Hardstands

All crane pads 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 (refer to Section 2.4.9 above) and will measure approximately to the turbine manufacturer's requirements. The position of the crane pads varies between turbine locations depending on topography, position of the site access road, and the turbine position.

2.4.13 Onsite Electrical Substation and Control Building

It is proposed to construct one 110 kV electricity substation within the Wind Farm Site, as shown in Figure 2-2. The proposed onsite 110kV electrical substation will have 2 no. control buildings, associated electrical plant and equipment, a wastewater holding tank and will be constructed in accordance with EirGrid substation specifications and requirements. The construction and electrical components of the electricity substation will be to EirGrid specifications[3]. Further details regarding the connection between the site substation itself and then on to the national electricity grid are provided in Section 4.3.1 of the EIAR and Drawings No. '05783-DR-150' to '05783-DR-160' in Appendix 4-5 of Chapter 4 of the EIAR.

The footprint of the proposed onsite electrical substation compound measures approximately 13,450 square metres, and will include 2 no. wind farm control buildings and the electrical substation components necessary to consolidate the electrical energy generated by each wind turbine, and export that electricity from the wind farm substation to the national grid. The onsite substation will be a permanent development under the ownership of the ESB/EirGrid. The layout and elevation of the onsite substation is shown on Drawings No. 05783-DR-150 and 05783-DR-101 in Appendix 4-5 of this EIAR.

The substation compound will be surrounded by an approximately 2.4-metre-high steel palisade fence, and internal fences will also segregate different areas within the main substation.

The onsite substation and associated control buildings will be constructed by the following methodology:

- The area of the onsite substation will be marked out using ranging rods or wooden posts and the soil and overburden stripped and will be either temporarily stockpiled

[3] *EirGrid Document XDS-GFS-00-001-R4 110/220/400kV Substation General Requirements (2019). Available at: https://cms.eirgrid.ie/sites/default/files/publications/6-110-220-400-kV-Substation-General-Requirements.pdf*

locally at the substation location, or transported immediately on excavation to one of the 5 no. borrow pits.

- The dimensions of the onsite substation area have been designed to meet the requirements of EirGrid and the necessary equipment to safely and efficiently operate the permitted wind farms;
- A generator will be temporarily located in the area of the onsite substation to provide a local electricity supply during construction;
- 2 no. control buildings will also be built within the onsite 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 damp proof course 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 concrete 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 electrical equipment will be installed and commissioned.
- Perimeter fencing will be erected.
- The construction and components of the substation have been designed to EirGrid specifications.

The Operation and Maintenance Control Buildings will be constructed using the following methodology:

- 2 no. control buildings will be built within the onsite 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.
- Perimeter fencing will be erected.

The internal layout and components will be finished to the wind farm operator's design specifications

2.4.14 Site Underground Cabling

Each turbine will be connected to the on-site electricity substation via an underground 33 kV (kilovolt) electricity cable. Fibre-optic cables will also connect each wind turbine to the wind farm control buildings in the onsite 110kV electrical substation compound. The electricity and fibre-optic cables running from the turbines to the onsite substation compound will be run in cable ducts approximately 1.3 metres below the ground surface, in the roadways. The route of the cable ducts will follow the

access track from each turbine location to the proposed onsite 110kV electrical substation, and are visible on the site layout drawings included as Appendix 4-1 of the EIAR. Figure 2-4 below shows two variations of a cable trench, one for off-road trenches (to be installed on areas of soft ground that will not be trafficked) and one for on-road trenches (to be used where trenches run along or under a roadway).

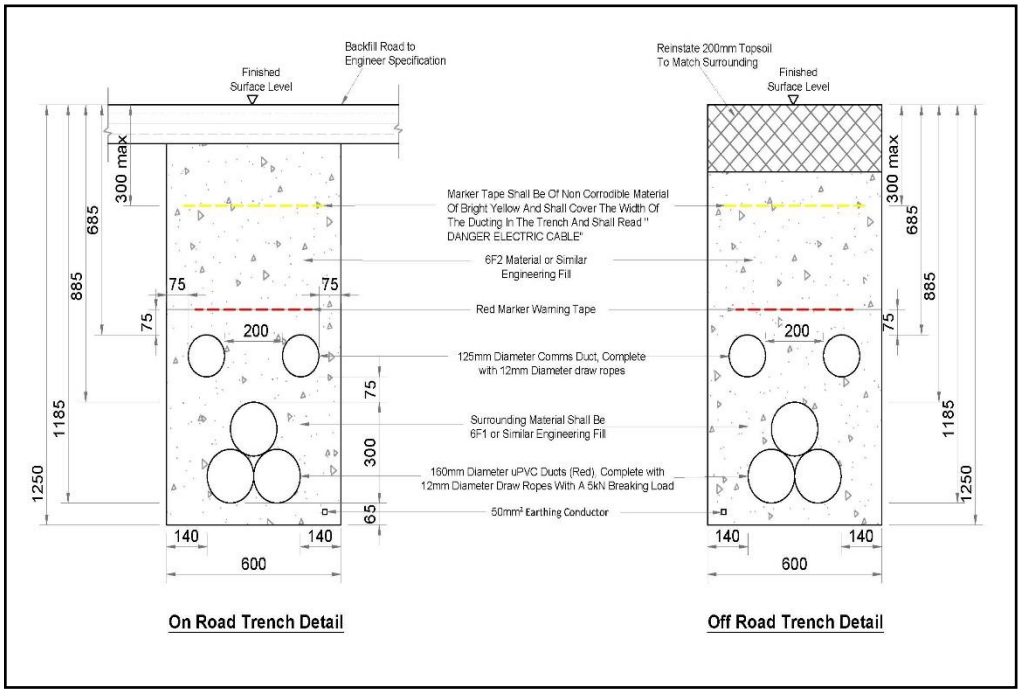

Figure 2-4 Typical Collector Cable trench cross-section detail

The transformer in each turbine is connected to the substation through a network of buried electrical cables. The ground is trenched using a mechanical excavator. The top layer of soil is removed and saved so that it is replaced on completion. The cables are bedded with suitable material unless the ground conditions are such that no bedding is required. The cables will be laid at a depth that meets all national and international requirements, and will be approximately 1.3m below ground level; a suitable marking tape is installed between the cables and the surface. On completion, the ground will be reinstated as previously described above. The route of the cable ducts will follow the access track to each turbine location and are visible on the site layout drawings included as Appendix 4-1 of the EIAR.

Clay plugs will be installed at regular intervals of not greater than 50 metres along the length of the trenches to prevent the trenches becoming conduits for runoff water. While the majority of the cable trenches will be backfilled with native material, clay subsoils of low permeability will be used to prevent conduit flow in the backfilled trenches. This material will be imported onto the Wind Farm Site should sufficient volumes not be encountered during the excavation phase of roadway and turbine foundation construction. Further details of the Site Cabling Construction Methodology are outlined in Appendix 4-5 of the EIAR.

2.4.15 Culvert Crossings on the Wind Farm Site

Culverts will be required where site roads, crane pads and turbine pads cross main forestry drainage networks.

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.

All culverts will be inspected weekly to ensure they are not blocked by debris, vegetation or any other material that may impede conveyance. Any watercourse crossings required will be installed outside of the salmonid spawning season, October to June in any year, in accordance with Inland Fisheries Ireland best practice (IFI, 2016). This will ensure no potential impacts on salmonid spawning habitat.

All of the above works will be supervised by the Environmental Clerk of Works and the project hydrologist.

2.4.16 Amenity Works

The Proposed Development will provide approximately 1.4km of a dedicated amenity trail in the form of a new track within and connecting to the 12 O'Clock Hills Trailhead. This amenity trail in the townlands of Snaty (Wilson) and Snaty (Massy) will allow walkers to relocate from the existing trail on the public road, into the forest environment, thus increasing the appeal and safety of the existing trail. Two new viewing areas and one upgrade to an existing viewing area will be provided by the Proposed Development. The new viewing area will be placed along the northern end of the existing 12 O'Clock Hills' Fairy Trail, while upgrades will be made to the existing viewing area at the Lower Summit of Knockanuarha. Seating, signage and fixed binoculars are proposed for these two viewing areas, where there will be long-ranging views available. The proposed amenity trail and viewing areas are illustrated in Figure 4-15 of the EIAR.

Development works for this amenity trail will require felling of one row trees and the inclusion of a hardcore track. Please refer to Section 2.4.6 for tree felling methodology. Due to the proposal to incorporate a turbine hardstand area into this amenity trail, it will not be possible to open this trail until the operational stage of the Proposed Development.

2.5 Construction Methodology Grid Connection Overview

The planning application for the Proposed Development under Section 182A of the Planning and Development Act 2000, as amended, comprises the connection to the national electricity grid from the proposed onsite 110kV electrical substation at the eastern end of the Wind Farm Site (as part of the Wind Farm Site planning application under Section 37E of the Planning and Development Act 2000, as amended) to the existing Ardnacrusha 110kV substation via underground 110kV electrical cabling, measuring approximately 9.2 km in total, located within the public road corridor, forestry tracks and agricultural land for the entirety of the route.

2.5.1 Overview of Proposed Construction Methodology

The proposed anticipated construction methodology is summarised under the following main headings:

- Grid Connection Cabling
- Grid Connection Construction Methodology
  - Existing Underground Services
  - Joint Bays
- Culvert Crossings on the Wind Farm Site
- Grid Connection Site Drainage
- Ancillary Forestry Felling

2.5.2 Grid Connection Cable Trench from substation to National Grid

A connection between the Wind Farm Site and the national electricity grid will be necessary to export electricity from the proposed Wind Farm.

It is proposed to construct a 110kV electrical substation at the eastern end of the Wind Farm Site and to connect from here to the existing Ardnacrusha 110kV electrical substation via underground 110kV electrical cabling, measuring approximately 9.2 km in total, utilising public local road networks, existing Coillte forest access tracks, existing private forestry access tracks and private agricultural lands.

The underground cabling works will consist of the installation of ducts in an excavated trench to accommodate power cables, and a fibre communications cables to allow communications between the proposed 110kV onsite substation and the existing 110kV Ardnacrusha substation. The proposed Grid Connection will involve 2 No. bridge crossings including 2 No. horizontal directional drilling (HDD) crossings. The underground cable will encounter 5 no. water culverts along the Grid Connection route.

The proposed Grid Connection works will require a road opening licence from Clare County Council. A Traffic Management Plan (TMP) (Appendix 15-2 of the EIAR) will be agreed with the local authority prior to the commencement of the development. The TMP will outline the location of traffic management signage, together with the location of any necessary road closures and the routing of appropriate diversions. Where diversions are required, these will be agreed with the local authority in advance of the works commencing.

The underground cable for the Grid Connection will be a single circuit connection consisting of 3 no. 160mm diameter high-density polyethylene (HDPE) power cable ducts, 2 no. 125mm diameter HDPE communications ducts and 1 no. 63mm diameter earth continuity duct to be installed in an excavated trench, to a width of between 600mm and 825mm, and a maximum depth of 1,315mm. Minimum trench depths will depend on the crossings and space restrictions, where ducting arrangements can run flat, where crossings are very shallow. Please refer to TLI Drawing No. '05783-DR-113' in Appendix 4-5 of the EIAR for ducting in flat formation. For trench designs there will be variations on the design to adapt to service crossings and watercourse crossings. Existing services will be under crossed, where possible. For instances where a crossing will be required, please refer to TLI Drawing No's '05783-DR-116', '05783-DR-117', '05783-DR-118', '05783-DR-119', '05783-DR-120' & 05783-DR-121' in Appendix 4-5 of the EIAR.

The Grid Connection route utilises public local road networks (8,077m), existing access tracks (460m), private forestry access tracks and private lands (650m). The following methodology as outlined in the Construction Methodology Statement provided by TLI (Appendix 4-5 of the EIAR) will be followed during the trenching works:

- The Contractor, and their appointed Site Manager, will prepare a targeted Method Statement concisely outlining the construction methodology and incorporating all mitigation and control measures included within the planning application and accompanying reports and as required by planning conditions where relevant;
- All existing underground services shall be identified on site prior to the commencement of construction works;
- At watercourse crossings, the contractor will be required to adhere to the environmental control measures outlined in this CEMP;
- Where the cable route intersects with culverts, the culvert will remain in place (where possible) and the ducting will be installed either above or below the culvert to

provide minimum separation distances in accordance with ESB and Uisce Éireann specifications[4];

- In the event that existing culverts require movement/reinstatement for ducting installation, the trench will be installed to the desired width and be supported by rapid hardening wet concrete grade C25/30 between the culvert and the pipe ducting. Existing culverts will be supported until the rapid hardening concrete sets, the desired backfill will be reinstated with the desired backfill as per guidelines for the opening (Guidelines for Managing Openings in Public Roads, 2017[5]). Once the ducts are installed the culvert will be reinstated to match existing levels and dimensions;
- Traffic management measures will be implemented as described in the Traffic Management chapter, and detailed Traffic Management Plan (see Appendix 15-2)
- Excavated material will be temporarily stockpiled onsite for re-use during reinstatement. Stockpiles will be restricted to less than 2m in height. Stockpiles will be located a minimum of 50m from surface water features and all stockpiling locations will be subject to approval by the Site Manager and ECoW. Please refer to Appendix 4-5 of the EIAR for Grid Connection construction methodology;
- Excavated material will be employed to backfill the trench and any surplus material will be transported off site and disposed at a fully authorised soil recovery site, as identified in Appendix 4-3 of the EIAR;
- Any earthen (sod) banks to be excavated will be carefully opened with the surface sods being stored separately and maintained for use during reinstatement;
- The excavated trench will be dewatered if required, from a sump installed within the low section of the opened trench. Where dewatering is required, dirty water will be fully and appropriately attenuated, through silt bags, before being discharged to vegetation or surface water drainage feature;
- Reinstatement of Private Land - Where required, grass will be reinstated by either seeding or by replacing with grass turves;
- No more than a 100m section of trench will be opened at any one time. The second 100m will only be excavated once the majority of reinstatement has been completed on the first;
- The excavation, installation and reinstatement process will take on average of 1 no. day to complete a 100m section;
- Where the cable is being installed in a roadway, temporary reinstatement may be provided to allow larger sections of road to be permanently reinstated together;
- Following the installation of ducting, pulling the cable will take approximately 1 no. day between each joint bay, with the jointing of cables taking approximately 1 week per joint bay location.

For the trenching and ducting works, the following step by step methodology will apply:

- Grade, smooth and trim trench floor when the required 1315mm depth and 825mm width have been obtained.
- Place bedding layer of Cement Bound Granular Mixture B (CBGM B) material in accordance with the specification and compact it so that the compacted thickness is as per the drawings.

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[4] *ESB Document PE424-F7001-R00-001-001 HV Cables – General Construction Methodology (2012). Available at: http://eirgridlaoiskilkenny.ie/media/pdf/21%20The%20Final%20Planning%20Application%20(Jan%202013)/Vol%203B%20Environmental%20Supplemantal%20Documents/Supplementary%20Environmental%20Documents/4%20Underground%20Cables%20Construction%20Methodology.pdf*
Uisce Éireann Document IW-CDS-5050-03 Code of Practice for Water Infrastructure (2020). Available at: https://www.water.ie/docs/connections/faqs/Water-Code-of-Practice.pdf
EirGrid Documents CDS-GFS-00-001-R1 110kV, 220kV and 400kV Underground Cable Functional Specification (2021). Available at: https://www.eirgrid.ie/site-files/library/EirGrid/110kV-Underground-Cable-Functional-Specification-General-Requirements.pdf
[5] *Department of Transport, Tourism and Sport Guidelines for Managing Openings in Public Roads (2017). Available at: https://www.gov.ie/pdf/?file=https://assets.gov.ie/44340/93268cf8e49943cb836fda4f6ea6dfd0.pdf#page=null*

- Lay the bottom row of ducts in trefoil formation as detailed on the design drawings. Use spacers as appropriate to establish horizontal duct spacing. Fit a secure cap / bung to the end of each duct run to prevent the ingress of dirt or water.
- Carefully surround and cover ducts with CBGM B in accordance with the design drawings and specifications and thoroughly compact without damaging ducts
- Place cable protection strips on compacted CBGM B directly over the ducts.
- Lay the top row of ducts onto the freshly compacted CBGM B including the cable protection strips above the bottom row of ducts. Place a secure cap at the end of each duct to prevent the ingress of dirt or water.
- Carefully surround and cover ducts with CBGM B material in accordance with the drawings and thoroughly compact without damaging ducts.
- Place red cable protection strip on top of compacted CBGM B over each set of ducts as shown on the drawings.
- Place and thoroughly compact CBGM B material or Clause 804 backfill or soil backfill as specified and place warning tape at the depth shown on the drawings.
- For concrete and asphalt/bitmac road sections, carry out immediate permanent reinstatement in accordance with the specification and to the approval of the local authority and/or private landowners, unless otherwise agreed with local authorities.
- Clean and test the ducts in accordance with the specification by pulling through a brush and mandrel. Install 12 mm polypropylene draw rope in each duct and seal all ducts using robust duct end seals fitted with rope attachment eyes in preparation for cable installation at a later date. All the works should be witnessed by ESBN Clerk of Works (CoW) as required.

The proposed on-site 110kV electrical substation will be connected to the existing 110kV Ardnacrusha electrical substation via underground 110kV electrical cabling which will be constructed to EirGrid specifications[6], guided by the methodology outlined above.

Plate 2-2 Cable Trench View

[6] *https://www.eirgrid.ie/site-files/library/EirGrid/110kV-Underground-Cable-Functional-Specification-General-Requirements.pdf*

2.5.2.1 Existing Underground Services

Any underground services encountered along the grid cable 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 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.

2.5.2.2 Joint Bays

Joint bays are 6m x 2.5m x 2.05m 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 grid ducting route approximately every 700 metres – 850 metres along the route. Please refer to Appendix 4-5 of the EIAR 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 are required at every joint bay location to facilitate communication links between the proposed onsite 110kV electrical substation and the existing 110kV electrical substation at Ardnacrusha. Earth Sheath Link Chambers are also required 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 Communication Chambers are located in close proximity to Joint Bays. Earth Sheath Link Chambers and Communication Chambers will typically be pre-cast concrete structures with an access cover at finished surface level.

Marker posts will be used on non-roadway routes to delineate the duct route and joint bay positions.

2.5.2.3 Grid Connection Watercourse/Culvert Crossings

The cable route will involve 2 No. bridge crossings, both of which will be horizontal directional drilling (HDD) crossings and will not interact with the existing bridge structure. As there is insufficient cover and depth in the bridge to cross with the bridge deck, HDD will be required, The methodology of which is outlined in Section 2.5.2.3.1 below. Drawings of the 2 no. bridge crossings and further details on culvert crossing methodology are included in Appendix 4-5 of the EIAR.

Where the cable route intersects with existing watercourses, a detailed construction method statement will be prepared by the Contractor prior to the commencement of construction and is to be approved by the Local Authority and relevant environmental agencies.

The underground cable will encounter 5 no. water culverts along the route. Existing culverts will be crossed using open trenching with an undercrossing, due to the depth of the culvert. A confirmatory site survey of all culverts has been completed as part of this phase of the project prior to planning to confirm the crossing methods. The locations of the bridges and culverts are shown on the site layout

drawings included in Appendix 4-5 of the EIAR. The schedule of culvert crossing methodologies is shown in Appendix A of Appendix 4-5 of the EIAR.

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 Development.

2.5.2.3.1 Horizontal Directional Drilling

It is proposed to implement Horizontal Directional Drilling (HDD) for 2 no. crossings. However, following confirmatory site investigations prior to construction it may be necessary to utilise HDD for additional crossings.

HDD is a method of drilling under obstacles such as bridges, culverts, railways, water courses, etc. in order to install cable ducts under the obstacle. This method is employed where installing the ducts using standard installation methods is not possible. The proposed HDD methodology is as follows: -

- A works area of circa .40 square metres will be fenced on both sides of the river crossing.
- The drilling rig and fluid handling units will be located on one side of the bridge and will be stored on double bunded 0.5mm PVC bunds which will contain any fluid spills and storm water run-off.
- Entry and exit pits (1m x 1m x 2m) will be excavated using an excavator, the excavated material will be temporarily stored within the works area and used for reinstatement or disposed of to a licensed facility.
- A 1m x 1m x 2m steel box will be placed in each pit. This box will contain any drilling fluid returns from the borehole.
- The drill bit will be set up by a surveyor, and the driller will push the drill string into the ground and will steer the bore path under the watercourse.
- A surveyor will monitor drilling works to ensure that the modelled stresses and collapse pressures are not exceeded.
- The drilled cuttings will be flushed back by drilling fluid to the steel box in the entry pit.
- Once the first pilot hole has been completed a hole-opener or back reamer will be fitted in the exit pit and will pull a drill pipe back through the bore to the entry side.
- Once all bore holes have been completed, a towing assembly will be set up on the drill and this will pull the ducting into the bore.
- The steel boxes will be removed, with the drilling fluid disposed of to a licensed facility.
- The ducts will be cleaned and proven and their installed location surveyed.
- The entry and exit pits will be reinstated to the specification of ESB Networks, EirGrid and Clare County Council.
- A transition coupler will be installed at either side of the bridge/following the horizontal directional drilling as per ESBN and EirGrid requirements, this will join the HDD ducts to the standard ducts.

A joint bay or transition chamber will be installed on either side of the bridge following the horizontal directional drilling as per ESB/Eirgrid requirements.

3. ENVIRONMENTAL MANAGEMENT

3.1 Introduction

This CEMP includes all best practice measures required to construct the Proposed Development. 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, NIS and all other relevant planning documents. The following sections give an overview of the drainage design, 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 will result in significantly less erosion and siltation. Construction activities in the hydrological buffer zones will 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 could potentially be impacted. Given that this site has an established drainage network and existing watercourse crossing points, there will be no adverse impacts on watercourses.

3.2.2 Site Drainage Principles

The site drainage features have been outlined in Chapter 4, Section 4.2.14 and 4.3.2 of the EIAR in addition to the drainage design and management for the Proposed Development. 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 Development. The Proposed Development's drainage design has therefore been proposed specifically with the intention of having no negative impact on the water quality of the site and its associated rivers and lakes, and consequently no impact on downstream catchments and ecological ecosystems.

No routes of any natural drainage features will be altered as part of the Proposed Development. Turbine locations and associated new roadways were originally selected to avoid natural watercourses, and existing roads are to be used wherever possible. 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. Buffer zones around the existing natural drainage features have been used to inform the layout of the Proposed Development.

3.2.3 Best Practice Guidance

The drainage design has been prepared based on experience of the project team of other renewable energy sites in peat-dominated environments, and in accordance with a number of best practice guidance documents.

There is no one guidance document that deals with drainage management and water quality controls for wind farms and other renewable energy developments. However, a selection of good practice approaches have been adopted in preparation of this drainage design, and these are taken from the various best practice guidance documents listed below. These relate to infrastructure and operational works on forested sites, forest road design, water quality controls for linear projects, forestry road drainage and management of geotechnical risks. To achieve best practice in terms of water protection through construction management all drainage management is 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 (2004): *Forests and Water Guidelines*, Fourth Edition. Publ. Forestry Commission, Edinburgh;
- Coillte (2009): *Forest Operations & Water Protection Guidelines;*
- Forest Services (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;
- COFORD (2004): *Forest Road Manual – Guidelines for the Design, Construction and Management of Forest Roads;*
- *Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters* (Inland Fisheries Ireland, 2016);
- Inland Fisheries Ireland (2016): *Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters;*
- Scottish Natural Heritage (2010): *Good Practice During Wind Farm Construction;*
- CIRIA (Construction Industry Research and Information Association) (2006): *Guidance on 'Control of Water Pollution from Linear Construction Projects'* (CIRIA Report No. C648, 2006);
- CIRIA 2006: *Control of Water Pollution from Construction Sites - Guidance for Consultants and Contractors (*CIRIA C532, 2006).
- *Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment* (DoHPLG, 2018); and,
- *Guidance on the preparation of the EIA Report* (Directive 2011/92/EU as amended by 2014/52/EU), (European Union, 2017).

3.2.4 Site Drainage Design and Management

The proposed site drainage features for this site are outlined in Section 4.2.14 and 4.3.2 of the EIAR. The following sections give an outline of drainage management arrangements in terms of pre-construction and construction phases of the Proposed Development.

3.2.4.1 Pre-Construction Drainage

The Wind Farm Site is located across 2 no. regional surface water catchments. The east and south of the Wind Farm Site is located in a total of 6 no. river sub-basins, 3 no. sub-basins in the Lower Shannon surface water catchment and 3 no. sub-basins in the Shannon Estuary North catchment. The Wind Farm Site is drained by several 1st and 2nd order streams. These natural watercourses originate within the Wind Farm Site boundaries and flow downslope before discharging into the Owenogarney River to the northwest and the Blackwater river to the south. In places the natural drainage is further facilitated

by a network of manmade drains. These manmade drains are concentrated within the areas of coniferous forestry and along sections of the existing forestry access roads. The routes of any natural drainage features will not be altered as part of the Proposed Development. Turbine locations have been selected to avoid natural watercourses. This existing drainage system will continue to function as it is during the pre-construction phase.

The proposed Grid Connection route will involve 2 no. bridge crossings (which will be crossed using HDD). It will also encounter 5 no. water culverts along the proposed route. It is proposed to cross these culverts using open trenching as outlined in Section 4.3.1.1.3 of the EIAR.

Prior to commencement of works in sub-catchments across the site, main drain inspections will be competed 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 in conjunction with the main construction works. 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.

3.2.4.2 Construction Phase Drainage

Drainage water from any works areas on the Wind Farm Site will not be directed to any natural watercourses within the site. Two distinct methods will be employed to manage drainage water within the 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 and construction areas. The second method involves collecting any drainage waters from works areas within the site that might carry silt or sediment, to allow attenuation and settlement prior to controlled diffuse release. Grid Connection drainage measures are discussed in Section 2.5.3 above and in Section 4.3.2 of the EIAR.

The drainage design is intended to maximise erosion control, which is more effective than having to control sediment during high rainfall. Such a system also requires less maintenance. The area of exposed ground will be minimised. The drainage measures will prevent runoff from entering the works areas of the site from adjacent ground, to minimise the volume of sediment-laden water that has to be managed. Sediment laden run-off from any construction area will be isolated from natural clean run-off.

Best practice and practical experience on other similar projects suggest that in addition to the drainage plans that are included in and as part of this application, there are additional site-based decisions 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 are outlined within Section 4 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 6 below, and to ensure protection of all watercourses.

A detailed drainage design for the Proposed Development, incorporating all principles and measures outlined in this drainage design description, has been prepared, and is included in Appendix 4-4 of the EIAR. The drainage design employs the various measures further described in the sub-sections below and is cognisant of the relevant guidance documents as outlined in Chapter 9 of the EIAR.

3.2.4.2.1 *Interceptor Drains*

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.

The interceptor drains will be installed in advance of any main construction works commencing. The material excavated to make the drain will be compacted on the downslope edge of the drain to form a diversion dike.

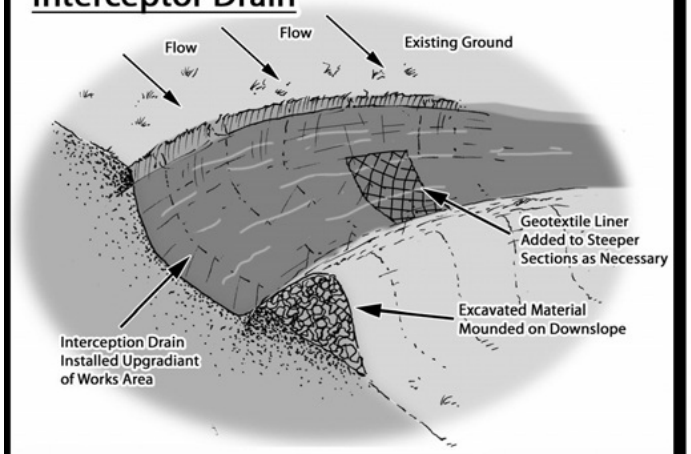
The velocity of flow in the interceptor will be controlled by check dams (see Section 3.2.4.2.3 below), which will be installed at regular intervals along the drains to ensure flow in the channel is non-erosive. On steeper sections where erosion risks are greater, a geotextile membrane will be added to the channel.

Interceptor drains will be installed horizontally across slopes to run in parallel with the natural contour line of the slope. Intercepted water will travel along the interceptor drains to areas downgradient of works areas, where the drain will terminate at a level spreader (see Section 3.2.4.2.4 below).

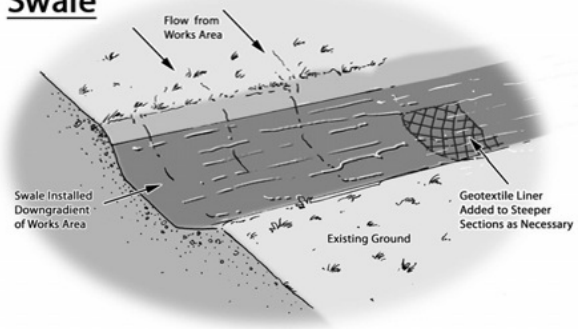
Across the entire length of the interceptor drains, the design elevation of the water surface along the route of the drains will not be lower than the design elevation of the water surface in the outlet at the level spreader. Figure 3-1 below shows an illustrative drawing of an interceptor drain.

Drainage Design Measures

Interceptor Drain



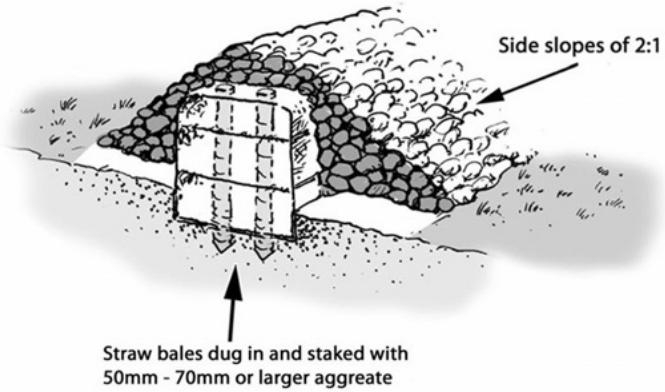
Swale



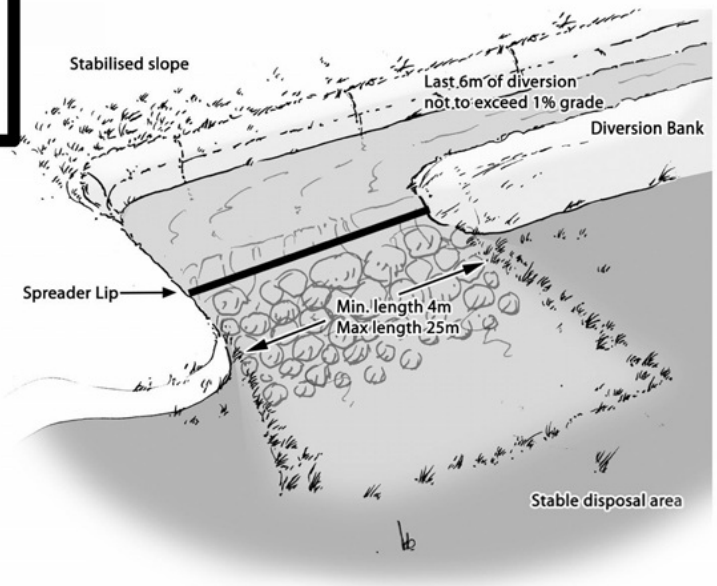
Check Dam (Stone Dam in Drain)

Check Dam

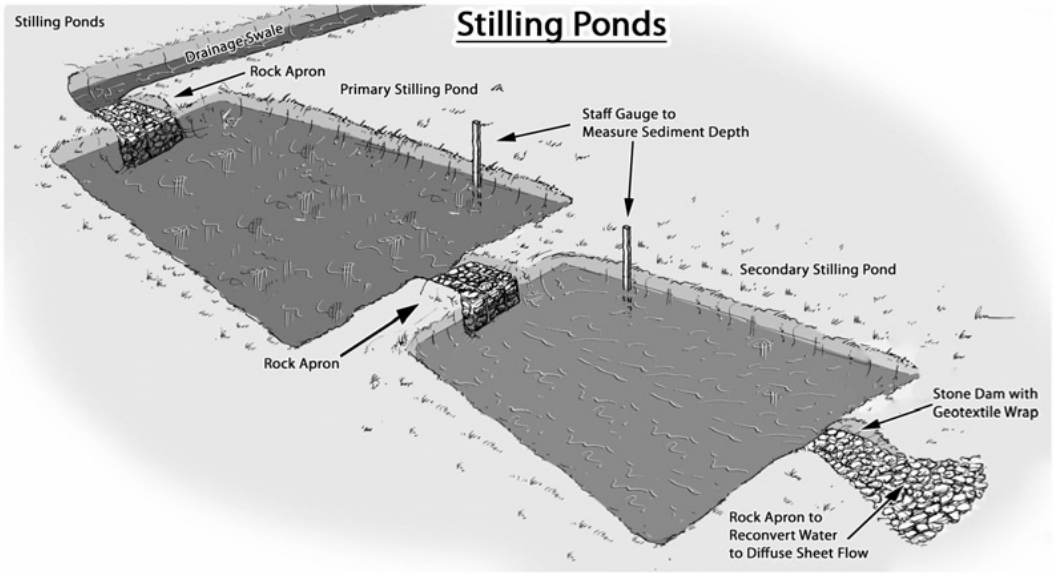
(Straw Bale & Stone Dam - Cross Section)



Level Spreader



Stilling Ponds



Drawing Title	Typical Drainage Design	Drawing No.	Fig 3-1	Scale	NTS
Project Title	Clonymeath Solar			Date	200931
Drawn By	Joseph O'Brien	Checked By	Stephen Corrigan	Project No.	16-03-21

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3.2.4.2.2 Swales

Drainage swales are shallow drains that will be used to intercept and collect run off from construction areas of the site during the construction phase. A swale is an excavated drainage channel located along the downgradient perimeter of construction areas, used to collect and carry any sediment-laden runoff to a sediment-trapping facility and stabilised outlet. Swales are proven to be most effective when a dike is installed on the downhill side. They are similar in design to interceptor drains and collector drains described above. Figure 3-1 shows an illustrative example of a drainage swale.

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.

Drainage swales will be installed in advance of any main construction works commencing. The material excavated to make the swale will be compacted on the downslope edge of the drain to form a diversion dike.

3.2.4.2.3 Check Dams

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 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 may also be installed in some of the existing artificial drainage channels on the site, downstream of where drainage swales connect in.

The proposed check dams will be made up of straw bales or stone, or a combination of both depending on the size of the drainage swale it is being installed in. Where straw bales are to be used, they will be secured to the bottom of the drainage swale with stakes. Clean 4-6 inch stone will be built up on either side and over the straw bale to a maximum height of 600mm over the bottom of the interceptor drain. In smaller channels, a stone check dam will be installed and pressed down into place in the bottom of the drainage swale with the bucket of an excavator. Figure 3-1, above, shows illustrative examples of check dams.

The check dams will be installed at regular intervals along the interceptor drains to ensure the bottom elevation of the upper check dam is at the same level as the top elevation of the next down-gradient check dam in the drain as this ensures the velocity of flow in the drain is controlled. The centre of the check dam will be approximately 150mm lower than the edges to allow excess water to overtop the dam in flood conditions rather than cause upstream flooding or scouring around the dams.

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.

Check dams are designed to reduce velocity and control erosion and are not specifically designed or intended to trap sediment, although sediment is likely to build up. If necessary, any excess sediment build up behind the dams will be removed. For this reason, check dams will be inspected and maintained regularly to ensure adequate performance. Maintenance checks will also ensure the centre elevation of the dam remains lower than the sides of the dam.

3.2.4.2.4 *Level Spreader*

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 re-concentrated 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. Figure 3-1, above, shows an illustrative example of a level spreader.

The slope in the channel leading into the spreader will be less than or equal to 1%. The slope downgradient of the spreader onto which the water will dissipate will have a grade of less than 6%. The availability of slopes with a grade of 6% or less will determine the locations of level spreaders. If a slope grade of less than 6% is not available in the immediate area downgradient of a works area at the end of a diversion drain, a piped slope drain (see Section 3.2.4.2.5 below) will be used to transfer the water to a suitable location.

The spreader lip over which the water will spill will be made of a concrete kerb, wooden board, pipe, or other similar piece of material that can create a level edge similar in effect to a weir. The spreader will be level across the top and bottom to prevent channelised flow leaving the spreader or ponding occurring behind the spreader. The top of the spreader lip will be 150mm above the ground behind it. The length of the spreader will be a minimum of four metres and a maximum length of 25 metres, with the actual length of each spreader to be determined by the size of the contributing catchment, slope and ground conditions.

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.

3.2.4.2.5 *Piped Slope Drains*

Piped slope drains will be used to convey surface runoff from diversion drains safely down slopes to flat areas without causing erosion. Once the runoff reaches the flat areas it will be reconverted to diffuse sheet flow. Level spreaders will only be established on slopes of less than 6% in grade. Piped slope drains will be used to transfer water away from areas where slopes are too steep to use level spreaders.

The piped slope drains will be semi-rigid corrugated pipes with a stabilised entrance and a rock apron at the outlet to trap sediment and dissipate the energy of the water. The base of drains leading into the top of the piped slope drain will be compacted and concavely formed to channel the water into the corrugated pipe. The entrance at the top of the pipe will be stabilised with sandbags if necessary. The pipe will be anchored in place by staking at approximately 3-4 metre intervals or by weighing down with compacted soil. The bottom of the pipe will be placed on a slope with a grade of less than 1% for a length of 1.5 metres, before outflowing onto a rock apron.

The rock apron at the outlet will consist of 6-inch stone to a depth equal to the diameter of the pipe, a length six times the diameter of the pipe. The width of the rock apron will be three times the diameter of the pipe where the pipe opens onto the apron and will fan out to six times the diameter of the pipe over its length. Figure 3-1, above, shows a diagrammatic example of a piped slope drain and rock apron.

Piped slope drains will be inspected weekly and following rainfall events. Inlet and outlets will be checked for sediment accumulation and blockages. Stake anchors or fill over the pipe will be checked

for settlement, cracking and stability. Any seepage holes where pipe emerges from drain at the top of the pipe will be repaired promptly.

3.2.4.2.6 *Vegetation Filters*

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.

3.2.4.2.7 *Stilling Ponds*

Stilling ponds will be used to attenuate runoff from works areas of the Wind Farm Site during the construction phase. The purpose of the stilling ponds is to intercept runoff potentially laden with sediment and to reduce the amount of sediment leaving the disturbed area by reducing runoff velocity. Reducing runoff velocity will allow larger particles to settle out in the stilling ponds, before the run-off water is redistributed as diffuse sheet flow in filter strips downgradient of any works areas.

Stilling ponds will be excavated/constructed at each required location as two separate ponds in sequence, a primary pond and a secondary pond. The points at which water enters and exits the stilling ponds will be stabilised with rock aprons, which will trap sediment, dissipate the energy of the water flowing through the stilling pond system, and prevent erosion. The primary stilling pond will reduce the velocity of flows to less than 0.5 metres per second to allow settlement of silt to occur. Water will then pass from the primary pond to the secondary pond via another rock apron. The secondary stilling pond will reduce the velocity of flows to less than 0.3 metres per second. Water will flow out of the secondary stilling pond through a stone dam, partially wrapped in geo-textile membrane, which will control flow velocities and trap any sediment that has not settled out. Figure 3-1, above, shows an illustrative example of a stilling pond system.

Water will flow by gravity through the stilling pond system. The stilling ponds will be sized according to the size of the area they will be receiving water from, but will be sufficiently large to accommodate peak flows storm events and accounts for climate change. The stilling ponds will be dimensioned so that the length to width ratio will be greater than 2:1, where the length is the distance between the inlet and the outlet. Where ground conditions allow, stilling ponds will be constructed in a wedge shape, with the inlet located at the narrow end of the wedge. Each stilling pond will be between 1-1.5 metres in depth. Deeper ponds will be used to minimise the excavation area needed for the required volume. The proposed locations of the drainage measures that will be installed prior to wind farm construction commencing are identified on the drainage plans in Appendix 4-5 of the EIAR.

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 require perimeter fencing and signage to ensure that there are no health and safety risks to workers.

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 to allow. Otherwise, a swale will be used to carry water exiting the stilling pond system to a level spreader to reconvert the flow to diffuse sheet flow.

A water level indicator such as a staff gauge will be installed in each stilling pond with marks to identify when sediment is at 10% of the stilling pond capacity. Sediment will be cleaned out of the still pond when it exceeds 10% of pond capacity. Stilling ponds will be inspected weekly and following rainfall events. Inlet and outlets will be checked for sediment accumulation and anything else that might interfere with flows.

3.2.4.2.8 *Siltbuster*

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.

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.

The unit stills the incoming water/solids mix and routes it upwards between a set of inclined plates for separation. Fine particles settle onto the plates and slide down to the base for collection, whilst treated water flows to an outlet weir after passing below a scum board to retain any floating material. The inclined plates dramatically increase the effective settling area of the unit giving it a very small footprint on site and making it highly mobile. Figure 3-2 below shows an illustrative diagram of the Siltbuster.

The Siltbuster units are now considered best practice for the management of dirty water pumped from construction sites. The UK Environment Agency and the Scottish Environmental Protection Agency have all recommended/specified the use of Siltbuster units on construction projects.

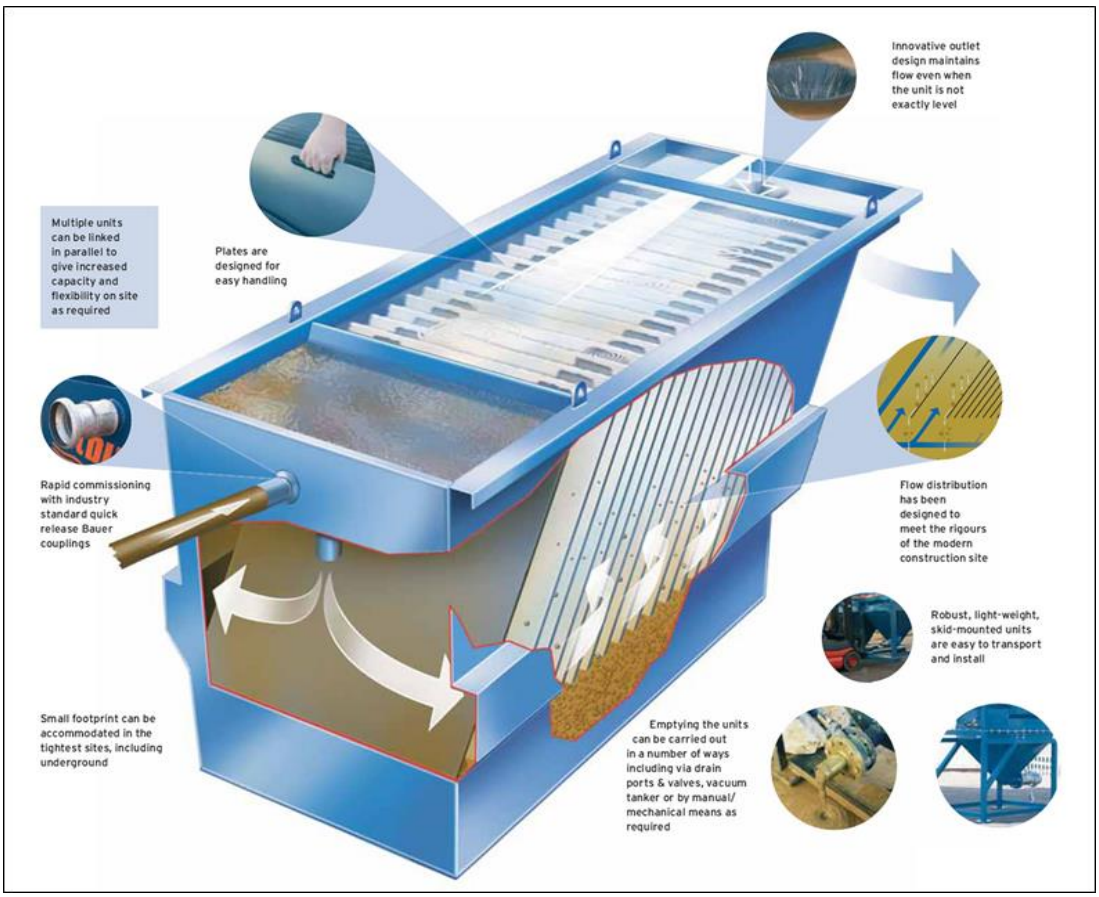

Figure 3-2 Siltbuster (Source: https://www.siltbuster.co.uk/sb_prod/siltbuster-fb50-settlement-unit/)

3.2.4.2.9 Silt Bags

Dewatering silt bags allow the flow of water through them while trapping any silt or sediment suspended in the water. The silt bags provide a passive non-mechanical method of removing any remaining silt contained in the potentially silt-laden water collected from works areas within the site.

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.

The dewatering silt bag that will be used will be approximately 3 metres in width by 4.5 metres (see Plate 3-1 and Plate 3-2 below) in length and will be capable of trapping approximately four tonnes of silt. The dewatering silt bag, when full, will be removed from site by a waste contractor with the necessary waste collection permit, who will then transport the silt bag to an appropriate, fully licensed waste facility.

Plate 3-1 Silt Bag with water being pumped through

Plate 3-2 Silt bag under inspection

3.2.4.2.10 Sedimats

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 as shown in Plate 3-3 below.

Plate 3-3 Typical Sedimat Details (Source: https://www.hy-tex.co.uk/)

3.2.4.2.11 Culverts

Some culverts may be installed to transport drainage waters from works areas of the Proposed Development, particularly where the waters have to be taken from one side of an existing roadway to the other for discharge and treatment. 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. Furthermore, all new proposed culverts and proposed culvert upgrades will be suitably sized for the 100-yr flood flow from the upstream catchment with an included factor (+20%) for climate change.

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.

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

3.2.4.2.12 Silt Fences

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 stream, which is inevitable where existing roads in proximity to watercourses are to be upgraded as part of the Proposed Development. These areas include around existing culverts, around the headwaters of watercourses, and the proposed locations are indicated on the detailed drainage design drawings included in Appendix 4-5 of the EIAR.

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 Construction Industry Research and Information Association (Ciria, No. C648, 1996). Up to three silt fences may be deployed in series.

All silt fencing will be formed using Terrastop Premium or equivalent silt fence product.

Site fences will be inspected regularly, at least once a week, to ensure water is continuing to flow through the fabric, and the fence is not coming under strain from water backing up behind it. Standard silt fence details are shown below in Plate 3-4.

Plate 3-4 Silt Fence Details

3.2.4.2.13 Preparative Site Drainage Management

All materials and equipment necessary to implement the drainage measures outlined above 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 drainage design measures as necessary. The drainage measures outlined in the above will be installed prior to, or at the same time as the works they are intended to drain.

3.2.4.2.14 Pre-emptive Site Drainage Management

The works programme for the initial construction stage of the development will also take account of weather forecasts and predicted rainfall in particular. Large excavations and movements of peat/subsoil or vegetation 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.

The following forecasting systems are available and will be used on a daily basis and reviewed by an EcoW, as required, to allow site staff to direct proposed and planned construction activities:

- General Forecasts: Available on a national, regional and county level from the Met Eireann website (www.met.ie/forecasts). These provide general information on weather patterns including rainfall, wind speed and direction but do not provide any quantitative rainfall estimates;
- MeteoAlarm: Alerts to the possible occurrence of severe weather for the next 2 days. Less useful than general forecasts as only available on a provincial scale;
- 3-hour Rainfall Maps: Forecast quantitative rainfall amounts for the next 3 hours but does not account for possible heavy localised events;
- Rainfall Radar Images: Images covering the entire country are freely available from the Met Eireann website (www.met.ie/latest/rainfall_radar.asp). The images are a composite of radar data from Shannon and Dublin airports and give a picture of current rainfall extent and intensity. Images show a quantitative measure of recent rainfall. A 3-hour record is given and is updated every 15 minutes. Radar images are not predictive; and,
- Consultancy Service: Met Eireann provide a 24-hour telephone consultancy service. The forecaster will provide interpretation of weather data and give the best available forecast for the area of interest.

Using the threshold rainfall values, listed below, will allow work to be safely controlled (from a water quality perspective) in the event of forecasting of an impending high rainfall intensity event.

Works will be suspended if forecasting suggests either of the following is likely to occur:

- >10 mm/hr (i.e. high intensity local rainfall events);
- >25 mm in a 24-hour period (heavy frontal rainfall lasting most of the day); or,
- >half monthly average rainfall in any 7 days.

Prior to works being suspended the following control measures will be completed:

- Secure all open excavations;
- Provide temporary or emergency drainage to prevent back-up of surface runoff; and,
- Avoid working during heavy rainfall (listed above) and for up to 24 hours after heavy events to ensure drainage systems are not overloaded.

3.2.4.2.15 *Reactive Site Drainage Management*

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 ECoW or supervising hydrologist will respond to changing weather, ground or drainage conditions on the ground as the project proceeds, to ensure the effectiveness of the drainage design is maintained. 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 the situation on the ground at a particular time.

Daily visual inspections of 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. 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.

3.2.4.3 Drainage Maintenance

Regular inspections (weekly and monthly) of all installed drainage features will be undertaken. Additional event based inspections will also be completed, i.e. after heavy rainfall in order to check for blockages and to ensure there is no build-up of standing water at parts of the drainage systems where it is not intended. The inspection of the drainage system will be the responsibility of the ECoW or the supervising hydrologist.

If necessary, any excess sediment build up behind check dams will be removed. For this reason, check dams will be inspected and maintained weekly during the construction phase of the project to ensure adequate performance. Maintenance checks will also ensure the centre elevation of the dam remains lower than the sides of the dam.

Check dams will also be inspected following rainfall events to ensure the structure of the dam is still effective in controlling flow. Any scouring around the edges of the check dams or overtopping of the dam in normal flow conditions will be rectified by reinforcement of the check dam.

Drainage swales will be regularly inspected for evidence of erosion along the length of the swale. If any evidence of erosion is detected, additional check dams will be installed to limit the velocity of flow in the channel and reduce the likelihood of erosion occurring in the future.

A water level indicator such as a staff gauge will be installed in each stilling pond with marks to identify when sediment is at 50% of the trap's capacity. Sediment will be cleaned out of the silt trap when it

exceeds 50% of trap capacity. Silt traps will be inspected weekly during the construction phase of the Proposed Development and following rainfall events. Inlet and outlets will be checked for sediment accumulation and anything else that might interfere with flows.

The frequency of drainage system inspections will be reduced following completion of the construction phase of the Proposed Development. Weekly inspections during the construction phase will be reduced to monthly, bi-monthly and eventually quarterly inspections during the operational phase up until the site has revegetated and the natural silt controls regenerate. The frequency will be increased or decreased depending on the effectiveness of the measures in place and the amount of remedial action required in any given period.

Site drainage construction methodology, incorporating all principles and measures outlined in the drainage design descriptions above is included in Appendix 4-4 of the EIAR.

3.2.5 Forestry Felling

A total of 107.56 hectares of forestry will be felled for the Proposed Development. This includes a total of 48.89 hectares permanently felled within the footprint of the Wind Farm Site (including the 50m buffer to all habitat features used by bats, as discussed in Section 6.3 in Chapter 6 Biodiversity of this EIAR), approximately 5.69 hectares temporarily felled within the footprint of the Wind Farm Site and 52.98 hectares as part of the Hen Harrier Compensation and Enhancement Plan, as discussed in Appendix 6-3 of the EIAR. Figure 4-18 of Appendix 6-3 shows the extent of the areas to be felled as part of the Proposed Development.

The tree felling activities required as part of the Proposed Development 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 Development.

Potential water quality effects during tree felling are outlined in Section 9.5.2 of the EIAR. These effects have the potential to affect the water quality and fish stocks of downstream water bodies.

Forestry operations will conform to current best practice Forest Service regulations, policies and strategic guidance documents as well as Coillte and Department of Agriculture Food and the Marine (DAFM) guidance documents, including the specific guidelines listed in Section 9.5.2 of the EIAR.

Mitigation by Avoidance:

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 (2000) guidance document "Forestry and Water Quality Guidelines" are shown in Table 3-1 below.

With moderate slopes existing across much of the Wind Farm Site, a 10m setback for felling will be established along all aquatic zones. Buffer zone widths will be increased at vulnerable hydrological features where deemed necessary. This will ensure water quality is protected during the felling operations. However, most of the Proposed Development infrastructure is located outside of the 50m hydrological buffer zone, thereby limiting the felling which will occur in close proximity to natural watercourses.

The setback distance from sensitive hydrological features means that adequate room is maintained for the proposed mitigation measures (discussed below) to be properly installed and operate effectively. The buffer/setback zone will:

- Avoid physical damage (river/stream banks and river/stream beds) to watercourses and the associated release of sediment;
- Avoid peat/soil disturbance and compaction within close proximity to surface watercourses;
- Avoid the entry of suspended sediment from works into watercourses; and,
- Avoid the entry of suspended sediment from the 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.

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

In addition to the application of buffer/setback zones, the following supplementary mitigation measures will be employed during felling works:

Mitigation by Design:

Mitigation measures which will reduce the risk of entrainment of suspended solids and nutrient release in surface watercourses comprise best practice methods which are set out as follows:

- 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 vehicles 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 peat and mineral soil disturbance and erosion and avoiding the formation of rutted areas, in which surface water ponding can occur. Brash mat renewal will take place when they become heavily used and worn. Provision will 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. An ECoW will monitor forecasts and determine when works should be suspended;
- 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 peat disposal 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. Straw bales and check dams to 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 (refer to Pre-Emptive Site Drainage Management below);
- 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.

Silt Traps:

Silt traps will be strategically placed down-gradient within forestry drains near streams. The main purpose of the silt traps and drain blocking is to slow water flow, increase residence time, and allow settling of silt in a controlled manner.

Timing of Site Felling Works:

Felling will only be carried out during periods of low 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.

Drain Inspection and Maintenance:

The following items will be carried out during pre-felling inspections and after:

- Communication with tree felling operatives will be undertaken in advance to determine whether any areas have been reported where there is unusual water logging or bogging of machines;
- Inspection of all areas reported as having unusual ground conditions;
- Inspection of main drainage ditches and outfalls. During pre-felling inspections the main drainage ditches will be identified. Ideally the pre-felling inspection will be carried out during rainfall;
- Following tree felling all main drains will be inspected to ensure that they are functioning;
- Extraction tracks nears drains need to be broken up and diversion channels created to ensure that water in the tracks spreads out over the adjoining ground;
- Culverts on drains exiting the site will be unblocked; and,
- All accumulated silt will be removed from drains and culverts, and silt traps, and this removed material will be deposited away from watercourses to ensure that it will not be carried back into the trap or stream during subsequent rainfall.

Surface Water Quality Monitoring:

Sampling will be completed by the ECoW 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;
- It is advantageous if the upstream location is outside/above the forest in order to evaluate the impact of land-uses other than forestry;
- 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.

Also, daily surface water monitoring forms will also be utilised at every works site near any watercourse. These will be taken daily and kept on site for record and inspection.

3.2.5.1 Forestry Felling Drainage Management

Before the commencement of any felling works, an ECoW will be appointed to oversee the keyhole 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 keyhole felling works.
- Prior to the commencement of works, review and agree the positioning by the Operator of the required Aquatic Buffer Zones (ABZs – refer to Table 3-1 above), 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 will be collected upstream and downstream of the keyhole felling site at suitable sampling locations.
    - Sampling will be taken from the stream / river bank, with no in-stream access permitted.
    - The following minimum analytical suite will be used:
        - pH,
        - Electrical Conductivity,
        - Temperature
        - 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.

3.2.6 Borrow Pit Drainage

An interceptor drain will be installed upslope of the borrow pit. This drain will divert any surface water away from the borrow pit and hence prevent water from ponding and lodging during construction and also when reinstated.

Temporary control of groundwater within the borrow pits will be required and exact measures will be determined as part of the confirmatory ground investigation programme. A temporary pump and suitable outfall locations will be required during construction. Perimeter drains will be installed around the individual cells within the borrow pits and will discharge to a settlement pond at the lower side/outfall location of the borrow pits.

During the construction phase of the project, it will be necessary to keep the borrow pit area free of standing water while rock is still being extracted. This will be achieved by using a mobile pump, which will pump water into the same series of drains, settlement ponds and level spreader, which will receive the water from the outfall.

3.2.7 Cable Trench Drainage

Cable trenches are typically developed in short sections (no more than 100m at any one time), 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 upgradient side of the trench. Where any rainfall cause runoff from the excavated material, the material will be contained in the downgradient cable trench. Excess subsoil will be removed from the cable trench works area immediately upon excavation, and in the case of the Proposed Development, will be transported to one of the peat repository areas, the on-site borrow pit or used for landscaping and reinstatements of other areas elsewhere on site.

The excavated trench will be dewatered if required, from a sump installed within the low section of the opened trench. Where dewatering is required, dirty water will be fully and appropriately attenuated, through silt bags, before being discharged to vegetation or surface water drainage feature;

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.

3.3 Refuelling, Fuel and Hazardous Materials

The following mitigation measures will be implemented in full 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 Proposed Development site.
- On site re-fuelling of machinery will be carried, as required, out using a mobile double skinned fuel bowser:
    - The fuel bowser, a double-axel custom-built refuelling trailer will be re-filled off site, and will be towed around the site by a 4x4 jeep to where machinery is located.

- The 4x4 jeep will also carry fuel absorbent material and pads in the event of any accidental spillages.
- The fuel bowser will be parked on a level area in the construction compound when not in use and 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 all refuelling operations;

- Onsite 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 is included in Section 5 of this CEMP below. Spill kits will be available to deal with and accidental spillage in and outside the re-fuelling area.

3.4 Cement Based Products Control Measures

The following mitigation measures will be implemented in full to avoid release of cement leachate from the site:

- No batching of wet-cement products will occur on the Wind Farm Site or along the Grid Connection route. Ready-mixed supply of wet concrete products and/or emplacement of pre-cast elements will take place;
- Pre-cast elements for culverts and concrete works will be used;
- No washing out of any plant used in concrete transport or concreting operations will be allowed on-site;
- Where concrete is delivered to the Proposed Development site, only the chute will be cleaned, using the smallest volume of water possible. 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 is to be isolated in temporary lined wash-out pits located near proposed wind farm site compound. These temporary lined wash-out pits will be removed from the wind farm site at the end of the construction phase;
- The contractor will use weather forecasting to plan dry days for pouring concrete; and,
- The contractor will ensure pour site is free of standing water and plastic covers will be ready in case of sudden rainfall event.

Plate 3-5 Typical concrete shoot wash out areas

3.4.1 Concrete Pouring

Because of the scale of the main concrete pours that will be required to construct the Wind Farm, the main pours will be planned days or weeks in advance. Special procedures will be adopted in advance of and during all concrete pours to minimise the risk of pollution. These will include:

- 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 (see Section 4.2.14.3.8 above).
- Disposing of surplus concrete after completion of a pour in suitable off-site locations away from any watercourse or sensitive habitats.

3.5 Peat Stability Management

Peat instability or failure refers to a significant mass movement of a body of peat that would have an adverse impact on wind farm development and the surrounding environment. Peat failure excludes localised movement of peat that could occur below an access road, creep movement or erosion type events. In the absence of appropriate mitigation, the consequence of peat failure at the study area may result in:

- Death or injury to site personnel;
- Damage to machinery;
- Damage or loss of access tracks;
- Drainage disrupted;
- Site works damaged or unstable;
- Contamination of watercourses, water supplies by sediment particulates; and,
- Degradation of the environment.

3.5.1 General recommendations for Good Construction

Based on the mitigation measures given in the FT's Peat Management Plan (Appendix 4-2 of the EIAR) and Geotechnical and Peat Stability Report (Appendix 8-1) reports being strictly adhered to during construction and the detailed peat stability assessment carried out, it has been showed that the site has an acceptable margin of safety.

The risk assessment at each turbine location identified a number of control measures to further reduce the potential risk of peat failure. Access roads to turbines will be subject to the same relevant control measures that apply to the nearest turbine as detailed in the FT Geotechnical and Peat Stability Assessment Report.

The following measures which will be implemented in full during the construction phase of the project will assist in the management of the risks for this site.

- Appointment of experienced and competent contractors;
- The site will be supervised by experienced and qualified personnel;

- Allocate sufficient time for the project (be aware that decreasing the construction time has the potential to increase the risk of initiating a localised peat movement);
- Undercutting of slopes and unsupported excavations will not occur;
- A managed robust drainage system as set out above;
- Prevent placement of loads/overburden on marginal ground;
- Set up, maintain and report findings from monitoring systems (as outlined in the Geotechnical and Peat Stability Assessment);
- Ensure construction method statements are developed and agreed before commencement of construction and are followed by the contractor; and,
- Revise and amend the Construction Risk Register as construction progresses to ensure that risks are managed and controlled for the duration of construction.
- Maintain hydrology of area as far as possible by maintaining existing drains to water pressures in the peat to avoid peat becoming "boyant".
- Use of experienced geotechnical staff for site investigations
- Use of experienced contractors and trained operators to carry out the work.
- Confirmatory ground investigation to determine peat, mineral soil and bedrock condition and properties.
- Uncontrolled concentrated water discharge onto peat slopes identified as being unsuitable for such discharge will be avoided. All water discharged from excavations during work will be piped over areas specifically assessed as being unsuitable and hence directly into suitable drainage lines.
- All excavations will be suitably supported to prevent collapse and development of tension cracks.
- Avoidance of placing fill and excavations in the vicinity of steeper peat slopes, that is at the crest or toe of the slope.
- Installation and regular monitoring of geotechnical instrumentation during construction in areas of possible poor ground, such as deeper peat deposits.
- Site reporting procedures will be implemented to ensure that working practices are suitable for the encountered ground conditions. Ground conditions will be assessed by a suitably experienced geotechnical engineer.
- Regular briefing of all site staff (e.g., toolbox talks) to provide feedback on construction and ground performance and to promote reporting of any observed change in ground conditions.
- Routine inspection of Proposed Development site by the Contractor and Project Geotechnical Engineer will be undertaken and will include an assessment of ground stability conditions (e.g., cracking, excessive floating road settlement, disrupted surface, closed-up drains) and drainage conditions (e.g., blocked drains, absence of water in previously flowing drains, springs, etc.).

3.5.2 Peat and Spoil Usage in Restoration of the Borrow Pit

The general construction methodology for the construction of the borrow pits, as presented in FT's Peat & Spoil Management Plan in Appendix 4-2 of the EIAR, is outlined in Section 2.4.4 above. This methodology includes procedures that will be implemented as part of the construction phase to minimise any adverse impact on peat stability.

3.5.3 Placement of Excavated Material in Peat Placement Areas

The placement of peat and spoil, excavated during the construction phase of the Proposed Development, as presented in FT's Peat & Spoil Management Plan in Appendix 4-2 of the EIAR, is outlined in Section 2.4.5 above. This methodology includes procedures that are to be included in the construction to minimise any adverse impact on peat stability.

3.6 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 site 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 ponds in the site's drainage system, and will be pumped into a bowser or water spreader to dampen down haul roads and site 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.

Proposed measures that will be implemented in full to control dust include:

- 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 will be carried out along haul roads to ensure dust does not cause a nuisance. Water bowser movements will be carefully monitored to avoid, increased runoff.
- All plant and materials vehicles for the Proposed Development will be stored in dedicated areas within the 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 Wind Farm Site on specified haul routes only.
- Grid Connection infrastructure will be transported to the Grid Connection 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 Wind Farm Site will be checked weekly by the Site Manager for cleanliness and cleaned as necessary.
- The roads adjacent to the Wind Farm Site entrances will be checked weekly for damage/potholes and repaired as necessary.
- The transportation of materials from the borrow pits around the Wind Farm Site will be covered by tarpaulin or similar covered vehicles.
- 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 .
- In periods of extended dry weather, 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 an appropriately licensed waste contractor. The MRF facility will be local to the Proposed Development to reduce the amount of emissions associated with vehicle movements.

3.7 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. Proposed measures that will be implemented in full to control noise include:

- No plant used on site will be permitted to cause an on-going public nuisance due to noise.
- The best means practicable, including proper maintenance of plant, will be employed to minimise the noise produced by on site operations.
- All vehicles and mechanical plant will be fitted with effective exhaust silencers and maintained in good working order for the duration of the contract.
- Compressors will be attenuated models fitted with properly lined and sealed acoustic covers which will be kept closed whenever the machines are in use and all ancillary pneumatic tools shall be fitted with suitable silencers.
- Machinery that is used intermittently will be shut down during periods when not in use.
- Any plant, such as generators or pumps, which is required to operate close to NSL's outside of general construction hours will be surrounded by an acoustic enclosure or portable screen.
- During the course of the construction programme, supervision of the works will include ensuring compliance with the limits detailed in Section 11.3.2 using methods outlined in British Standard BS 5228-1:2009+A1:2014 *Code of practice for noise and vibration control on construction and open sites – Noise*.
- 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 Saturday. However, to ensure that optimal use is made of good weather periods or at critical periods within the programme (i.e. concrete pours, rotor/tower deliveries) it will be necessary on occasion to work outside of these hours.

Where rock breaking is employed, the following are examples of measures that will be employed, 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.
- 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

In respect of the Grid Connection construction, a solid hoarding will be employed at rock breaking plant where there are Noise Sensitive Locations (NSLs) are within 25m of the activity. Such a measure will be expected to reduce rock breaking noise at the NSL by 10 decibels.

3.8 Vibration

Specific to blasting the following mitigation measures will be employed to control the impact during blasts:

- Trial blasts may be undertaken to obtain scaled distance analysis;
- Ensuring appropriate burden to avoid over or under confinement of the charge;
- Accurate setting out and drilling;
- Appropriate charging;
- Appropriate stemming with appropriate material such as sized gravel or stone chipping;
- Delay detonation to ensure small maximum instantaneous charges;
- Decked charges and in-hole delays;
- Blast monitoring to enable adjustment of subsequent charges;

- Good blast design to maximise efficiency and reduce vibration;
- Avoid using exposed detonating cord on the surface.

3.9 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. Three Third Schedule Invasive Flora Species were recorded within the EIAR site boundary (including Grid Connection route and turbine delivery route accommodation areas) which are as follows:

- Japanese Knotweed (*Reynoutria japonica)*
- Rhododendron (*Rhododendron ponticum*)
- Himalayan knotweed (*Persicaria wallichii*)

Mitigation has been provided in relation to the control of a small stand of Rhododendron identified within the footprint of a proposed existing road to be upgraded, located to the northwest of T4. The infestation is approx. 4m in width and is located adjacent to the road on the western side. Due to the construction works associated with the upgrade of this road, in the absence of mitigation there is potential for spread of this species to other habitats within the Proposed Development Site and outside of the Proposed Development Site. This could occur via dispersal of seeds locally, or inappropriate disposal of the plant material whereby seeds or propagatable material are spread to another area. Vector material may also be spread to other sites as a result of entrainment within machinery or staff clothing.

The following measures will be in place to avoid impacts to biosecurity as a result of construction of the Proposed Development:

Rhododendron regrows vigorously when cut. As a result, some method of stump killing or removal is always necessary. Any untreated cut stump will regrow and in most cases flower within 3-4 years. The following measures will be in place:

- A pre-commencement survey for invasive species within the footprint of the Proposed Wind Farm Site will be carried out by a suitably qualified ecologist to ensure there is no new growth of Third Schedule invasive species in these areas.
- If additional invasive species are recorded within the construction areas, an Invasive Species Management Plan will be prepared in advance of construction which will incorporate the measures necessary to prevent spread additional to the measures laid out below.
- A Toolbox Talk will be given by the Environmental Clerk of Works or Ecological Clerk of Works in relation to the management of invasive species within construction areas.
- The infested area will be demarcated and works in the vicinity of the infestation will only be carried out under supervision by a suitably qualified Ecological Clerk of Works or Environmental Clerk of Works.
- In advance of construction of the road upgrade works in the vicinity of the infested area, it will be necessary to completely remove the infestation outside of the flowering period (May to July) and dig the roots completely out. The effectiveness of this technique is increased by removing all viable roots. To avoid regrowth, stumps will be turned upside down and soil will be brushed off roots. The roots are relatively shallow, seldom being deeper than 45cm.[7]

[7] *TII (2020) - The Management of Invasive Alien Plant Species on National Roads – Technical Guidance GE-ENV-01105*

- Once the supervising ecologist confirms that the material is dried out and non-viable, it will be chipped and composted on-site.
- It is envisaged that no contaminated soil is to be removed from the Proposed Development Site but is to be reinstated within the site, thus negating the need for transport off-site, further risk of spread, and licencing requirements. Should potentially contaminated spoil be required to be removed from the site, it will be transported to a suitably licenced waste facility and will require a licence from the NPWS prior to its transportation.

In order to avoid the potential for spread of invasive species into the Proposed Development Site:

- Any construction material imported into the Proposed Development Site will come from a source confirmed to be free of invasive species.
- All plant and machinery will be thoroughly cleaned before entering and exiting the Proposed Development Site.

3.10 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 Development. Disposal of waste will be seen as a last resort.

3.10.1 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 Environmental Protection Agency provides a document entitled, 'Best Practice Guidelines for the Preparation of Resource & Waste Management Plans for Construction and Demolition Projects' (2021).

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.

3.10.2 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 and Demolition 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.

3.10.3 Construction Phase Waste Management

3.10.3.1 Description of the Works

The construction of the development will involve the construction of 9 no. turbines, new and upgrade of site access roads, internal cabling and the underground cable route, substation, control buildings and all associated infrastructure.

The turbines will be manufactured off site and delivered to site where on site erection will occur.

The turbine foundations will consist of stone from on-site borrow pits 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 construction of the substation will comprise of a concrete foundation with concrete masonry blocks and a timber roof structure with 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 site roads will be constructed with rock won from on-site borrow pits.

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

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

Material Type	Example	LOW 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

Material Type	Example	LOW Code
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

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.

3.10.3.2 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.

3.10.3.3 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 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.

3.10.3.4 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.
- Excavated material can be reused for reinstatement of the areas around turbine foundations and adjacent to site roads.

3.10.3.5 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.

3.10.4 Implementation

3.10.4.1 Roles and Responsibilities

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.

3.10.4.2 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, will 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.

3.10.4.2.1 *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 List of Waste (LOW) 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

3.10.4.3 Waste Management Plan Conclusion

The WMP will be properly adhered to by all staff involved in the 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 Development.

4. ENVIRONMENTAL MANAGEMENT IMPLEMENTATION

4.1 Roles and Responsibilities

The Site Supervisor/Construction Manager and/or ECoW are the project focal point relating to construction-related environmental issues.

In general, the ECoW will maintain responsibility for monitoring the works and Contractors/Sub-contractors from an environmental perspective. The ECoW will act as the regulatory interface on environmental matters by reporting to and liaising with Clare County Council and other statutory bodies as required.

The ECoW will report directly to the Site Supervisor/Construction Manager. An ECoW, Project Ecologist, Project Hydrologist, Project Geotechnical engineer will visit the site regularly and report to the Site Environmental Office. This structure provides a "triple lock" review/interaction by external specialists. An organogram structure for the construction stage is as follows:

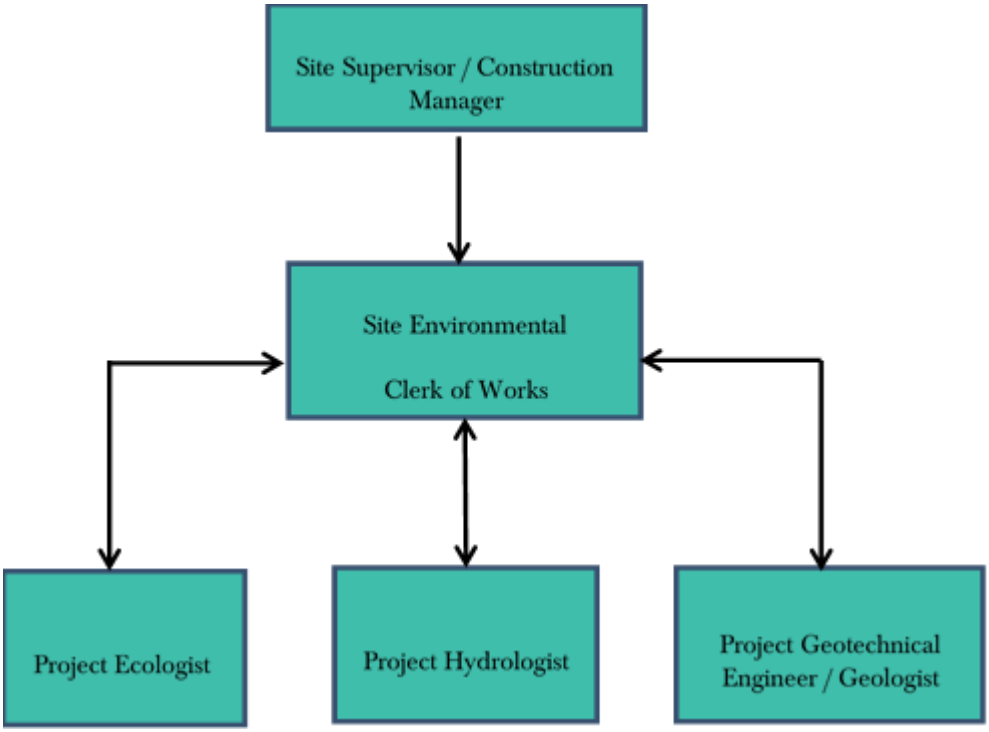

Figure 4-1 Site Management Chain of Command

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, including site stability, will certify the said works, will be adhered to. Such an engineer will be appointed to oversee and supervise the construction phase of the project.

4.1.1 Construction Manager /Site Supervisor

The Construction Manager / Site Supervisor will have overall responsibility for the organisation and execution of all related environmental activities as appropriate, in accordance with regulatory and project environmental requirements. The duties and responsibilities of the Site Supervisor/Construction Manager will include:

- Ensure that all works are completed safely and with minimal environmental risk;
- Approve and implement the CEMP and supporting environmental documentation, and ensure that all environmental standards are achieved during the construction phase of the project;
- Take advice from the Environmental Clerk of Works on legislation, codes of practice, guidance notes and good environmental working practice relevant to their work;
- Ensure compliance through audits and management site visits;
- Ensure timely notification of environmental incidents; and,
- Ensure that all construction activities are planned and performed such that minimal risk to the environment is introduced.

Ensure that all construction activities are planned and performed such that minimal risk to the environment is introduced.

4.1.2 Environmental Clerk of Works

The main contractor 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), and to monitor all site works and to ensure that methodologies and mitigation are followed throughout construction to avoid negatively impacting on the receiving environment.

The ECoW will report to the Site Supervisor/Construction Manager. The responsibilities and duties of the ECoW will include the following:

- Preparation and update of the CEMP as required, and supporting environmental documentation and review/approval of contractor method statements;
- Undertake inspections and reviews to ensure the works are carried out in compliance with the CEMP;
- Monitor the implementation of the CEMP, particularly all proposed/required Environmental Monitoring;
- Generate environmental reports as required to show environmental data trends and incidents 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;
- Ensure the specified mitigation measures are initiated and adhered to during the construction phase;
- Liaise with Project Ecologist, Project Hydrologist, Project Geotechnical Engineer and any other members of the project team to ensure regular site visits and audits/inspections are completed;
- Ensure adequate arrangements are in place for site personnel to identify potential environmental incidents;
- Ensure that details of environmental incidents are communicated in a timely manner to the relevant regulatory authorities, initially by phone and followed up as soon as is practicable by e-mail;
- 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; and,

- Identify environmental training requirements and arrange relevant training for all levels of site based staff/workers.

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 project.

4.1.3 Project Ecologist

The Project Ecologist will report to the ECoW and is responsible for the protection of sensitive habitats and species encountered during the construction phase of the proposed renewable energy development. The Project Ecologist will not be full time on site but will visit the site at least once a month during construction.

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

- Review and input to the final construction phase CEMP in respect of ecological matters;
- In liaison with Environmental Clerk of Works, oversee and provide advice on all relevant ecology mitigation measures set out in the EIAR and planning permission conditions;
- Regular inspection and monitoring of the development, through all phases of construction/operation and provide ecological advice as required;
- Carry out ecological monitoring and survey work as may be required by the planning authority.

Carry out ecological monitoring and survey work as may be required by the planning authority.

4.1.4 Project Hydrologist

The Project Hydrologist will report to the ECoW and is responsible for inspection and review of drainage and water quality aspects associated with construction of the proposed renewable energy development. The Project Hydrologist will not be full time on site but will visit the site at least once a month during construction and on a weekly basis during site preparation/groundworks.

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

- Assist in compiling a detailed drainage design before construction commences and attend the site to set out and assist with micro siting of drainage controls. This will be completed over several site visits at the start of the construction phase;
- Review and input to the final construction phase CEMP in respect of drainage and water quality management;
- Following the initial stage of drainage construction regular site visits will be required, at least once a month, to complete hydrological and water quality audits and reviews and report any issues noted to the Site Supervisor/Construction Manager; and,
- Complete ongoing inspection and monitoring of the development, particularly in areas of drainage control, through all phases of construction (including pre, during and post construction) and ensure construction is carried out as specified in the EIAR, and in relevant planning conditions.

4.1.5 Project Geotechnical Engineer/Geologist

The Geotechnical Engineer or Project Geologist will report to the ECoW and is responsible for inspection and review of geotechnical aspects associated with construction of the proposed renewable energy development. The Geotechnical Engineer will not be full time on site but will visit site at least once a month during the construction phase and on a weekly basis during site preparation/groundworks.

The responsibilities and duties of the Geotechnical Engineer or Geologist 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 Site Supervisor/Construction Manager;
- Ensuring that identified hazards are listed in the Construction Risk Register and that these are subject to ongoing monitoring; and,
- Ongoing inspection and monitoring of the development, particularly in areas of peatland and the 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.

5. EMERGENCY RESPONSE PLAN

An 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 in terms of site health and safety and environmental protection.

5.1 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/Project Supervisor of the Construction Stage (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.

5.1.1 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 5-1. 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 5-1. This will be updated throughout the various stages of the project.

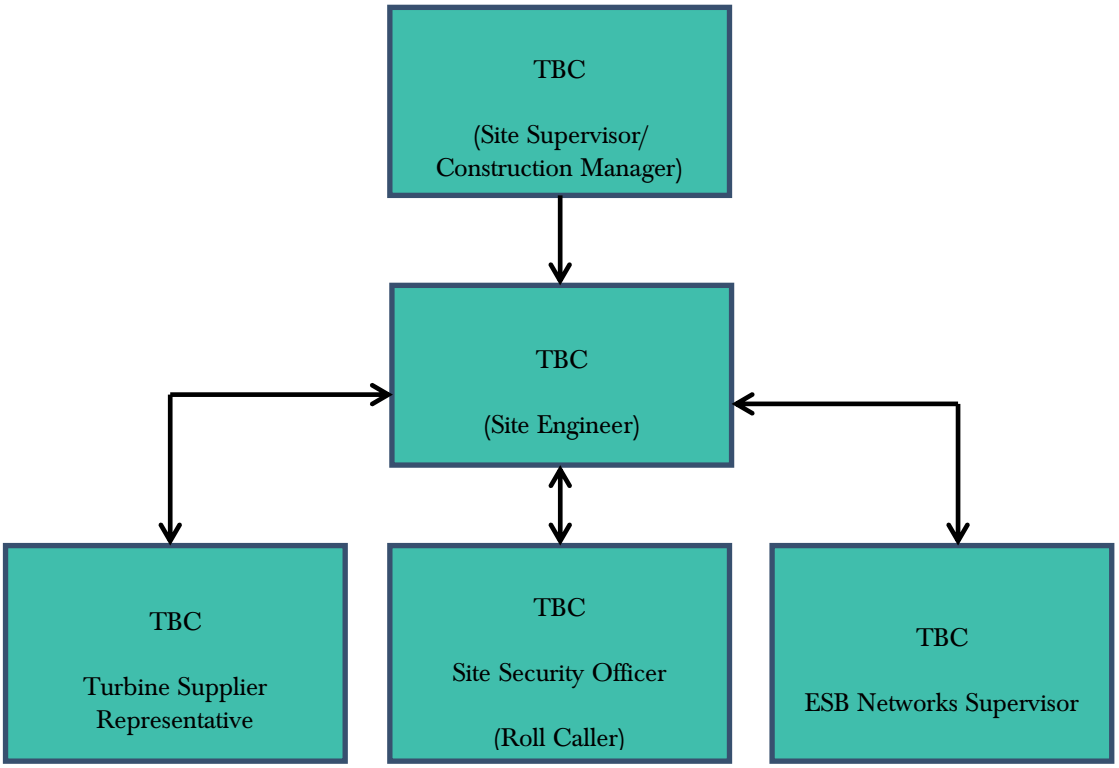

Figure 5-1 Emergency Response Procedure Chain of Command

5.1.2 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 5-1 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

In the event of an emergency situation associated with, but not restricted to, the hazards outlined in Table 5-1 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/fog-horn 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 will proceed, without exception. The site evacuation procedure is outlined in Section 5.1.3.
- 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 5.3 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 5.4.
- Contact the next of kin of any injured personnel where appropriate.

5.1.3 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 fog-horn 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

5.2 Environmental Emergency Response Procedure

5.2.1 Excessive Peat Movement

Where there is excessive peat movement or continuing peat movement recorded at a monitoring location, or identified at any location within the site, but no apparent signs of distress to the peat (e.g. cracking, surface rippling) then the following will be carried out.

- All construction activities will cease within the affected area.
- Increased monitoring at the location will be carried out. The area will be monitored, as appropriate, until such time as movements have ceased.
- Re-commencement of limited construction activity will only start following a cessation of movement and the completion of a geotechnical risk assessment by a geotechnical engineer.

5.2.2 Onset of Peat Slide

Where there is the onset or actual detachment of peat (e.g. cracking, surface rippling) then the following will be carried out.

- On alert of a peat slide incident, all construction activities will cease and all available resources will be diverted to assist in the required mitigation procedures.
- Where considered possible action will be taken to prevent a peat slide reaching any watercourse. This will take the form of the construction of check barrages on land. Due to the terrain, the possible short run-out length to watercourses, speed of movement and the inability to predict locations it may not be possible to implement any on-land prevention measures, in this case a watercourse check barrage will be implemented.
- For localised peat slides that do not represent a risk to a watercourse and have essentially come to rest the area will be stabilised initially by rock infill, if required. The failed area and surrounding area will then be assessed by the engineering staff

and stabilisation procedures implemented. The area will be monitored, as appropriate, until such time as movements have ceased.

5.2.3 Spill Control Measures

Every effort will be made to prevent an environmental incident during the construction phase of the 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 ensure the necessary measures are in place to contain and clean up the spill and prevent further spillage from occurring.
- The ECoW will notify the appropriate regulatory body such as Clare County Council, and the Environmental Protection Agency (EPA), 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 will be immediately notified.
- If necessary, the ECoW 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 Main Contractor. These records will be made available to the relevant authorities such as Clare County Council, EPA 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.

5.3 Contact the Emergency Services

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 will form part of the site induction to make new personnel and sub-contractors aware of any such arrangement or requirement if applicable.

5.4 Contact Details

A list of emergency contacts is presented in Table 5-2. 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 5-2 Emergency Contacts

Contact	Telephone no.
Emergency Services – Ambulance, Fire, Gardaí	999/112
Doctor – Corbally Medical	061 340 628
Hospital – University Hospital Limerick	061 301 111
ESB Emergency Services	1850 372 999

Contact	Telephone no.
Gas Networks Ireland Emergency	1850 20 50 50
Gardaí – Sixmilebridge Garda Station.	061 369 133
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
FuturEnergy Knockshanvo Designated Activity Company (DAC)	TBC

5.4.1 Procedure for Personal 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.

5.5 Induction Checklist

Table 5-3 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 project.

Table 5-3 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	
Due to the remoteness of the site 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 will 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 undergo a site induction where they will be required to provide personal contact details which will include contact information for the next of kin.	

6. MITIGATION MEASURES

All mitigation measures relating to the pre-commencement and construction phase of the Proposed Development were set out in the various sections of the EIAR, NIS prepared as part of the planning permission applications to An Bord Pleanála.

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.

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 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 6-1 Site Preparation and Mitigation Measures

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
EIAR Chapter 4 – Description of the Proposed Development					
Pre-Commencement Phase					
MM1	Environmental Management	EIAR Section 4	All proposed activities on the site of the Proposed Development will be provided for in an environmental management plan. This EIAR Chapter should be read in conjunction with the CEMP, which includes more detailed information on the environmental management framework to be adhered to during the pre-commencement and construction phases.		
MM2	Environmental Management	EIAR Section 4	The on-site construction staff will be responsible for implementing the mitigation measures specified in the EIAR and compiled in the Audit Report. Their implementation will be overseen by the ECoW or supervising hydrogeologists, environmental scientists, ecologists or geotechnical engineers, depending on who is best placed to advise on the implementation. The system of auditing referred to above ensures that the mitigation measures are maintained for the duration of the construction phase, and into the operational phase where necessary.		
MM3	Drainage Inspection	CEMP Section 3	Prior to commencement of works in sub-catchments across the site, main drain inspections will be competed 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 in conjunction with the main construction works. 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.		
MM4	Site Drainage Plan	EIAR Section 4 CEMP Section 4	A detailed drainage design for the Proposed Development, incorporating all principles and measures outlined in Section 4.7 of the EIAR, has been prepared, and is included in Appendix A of Appendix 4-4 of this EIAR.		
MM5	Preparative Site Drainage Management,	CEMP Section 3	All materials and equipment necessary to implement the drainage measures outlined above 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 drainage design measures as necessary. The drainage measures outlined in the above will be installed prior to, or at the same time as the works they are intended to drain.		
MM6	Preparative Site Drainage Management,	CEMP Section 3	Prior to commencement of works in sub-catchments across the site, main drain inspections will be competed 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.		
MM7	Waste Management	CEMP Section 3	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.		
MM8	Felling	EIAR Section 4	Construction will not commence (excluding any activity associated with the biodiversity and enhancement plan), until the forestry which hosted the 2023 hen harrier nest is no longer suitable for hen harrier. This forestry was planted in 2018. It is considered that pre-thicket forestry is suitable for breeding hen harrier within the first ten years of planting. It is therefore considered that during the normal course of events, this forestry block will become unsuitable for hen harrier in c. 2028. Before construction works can begin, habitat surveys must be undertaken to demonstrate that the forestry is no longer suitable for breeding hen harrier. The forestry must be confirmed to be unsuitable closed canopy forestry. These surveys will be conducted after the breeding season has ended (September/October) by a suitably qualified		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			ornithologist, at the location of the 2023 hen harrier nest site, from 2026 onward, until it can be demonstrated that the forestry is no longer suitable for breeding hen harrier.		
MM9	Felling Licence	EIAR Section 4 CEMP Section 4	The tree felling activities required as part of the Proposed Development will be the subject of a Limited Felling Licence (LFL) application to the Forest Service in accordance with the "Forestry Act" and the Forestry Regulations 2017 (SI 191/2017) and as per the Forest Service's policy on granting felling licenses for wind farm developments.		
MM10	Peat Management	EIAR Section 4	Prior to commencing the construction of the excavated roads movement monitoring posts will be installed in areas where the peat depth is greater than 2.0m. Interceptor drains will be installed upslope of the access road alignment to divert any surface water away from the construction area.		
MM11	Invasive Species Management	CEMP Section 3	To establish good site hygiene to ensure the control of any potential spread of invasive species during construction works, a risk assessment and method statement must be provided by the Contractor prior to commencing works.		
MM12	Invasive Species Management	CEMP Section 3	Mitigation has been provided in relation to the control of a small stand of Rhododendron identified within the footprint of a proposed existing road to be upgraded, located to the northwest of T4. The infestation is approx. 4m in width and is located adjacent to the road on the western side. Due to the construction works associated with the upgrade of this road, in the absence of mitigation there is potential for spread of this species to other habitats within the Proposed Development Site and outside of the Proposed Development Site. This could occur via dispersal of seeds locally, or inappropriate disposal of the plant material whereby seeds or propagatable material are spread to another area. Vector material may also be spread to other sites as a result of entrainment within machinery or staff clothing. The following measures will be in place to avoid impacts to biosecurity as a result of construction of the Proposed Development: Rhododendron regrows vigorously when cut. As a result, some method of stump killing or removal is always necessary. Any untreated cut stump will regrow and in most cases flower within 3-4 years. The following measures will be in place: › A pre-commencement survey for invasive species within the footprint of the Proposed Wind Farm Site will be carried out by a suitably qualified ecologist to ensure there is no new growth of Third Schedule invasive species in these areas. › If additional invasive species are recorded within the construction areas, an Invasive Species Management Plan will be prepared in advance of construction which will incorporate the measures necessary to prevent spread additional to the measures laid out below. › A Toolbox Talk will be given by the Environmental Clerk of Works or Ecological Clerk of Works in relation to the management of invasive species within construction areas. › The infested area will be demarcated and works in the vicinity of the infestation will only be carried out under supervision by a suitably qualified Ecological Clerk of Works or Environmental Clerk of Works. › In advance of construction of the road upgrade works in the vicinity of the infested area, it will be necessary to completely remove the infestation outside of the flowering period (May to July) and dig the roots completely out. The effectiveness of this technique is increased by removing all viable roots. To avoid regrowth, stumps will be turned upside down and soil will be brushed off roots. The roots are relatively shallow, seldom being deeper than 45cm.8 › Once the supervising ecologist confirms that the material is dried out and non-viable, it will be chipped and composted on-site. › It is envisaged that no contaminated soil is to be removed from the Proposed Development Site but is to be reinstated within the site, thus negating the need for transport off-site, further risk of spread, and licencing requirements. Should potentially contaminated spoil be required to be removed from the site, it will be transported to a suitably licenced waste facility and will require a licence from the NPWS prior to its transportation. In order to avoid the potential for spread of invasive species into the Proposed Development Site: › Any construction material imported into the Proposed Development Site will come from a source confirmed to be free of invasive species. › All plant and machinery will be thoroughly cleaned before entering and exiting the Proposed Development Site.		

[8] *TII (2020) - The Management of Invasive Alien Plant Species on National Roads – Technical Guidance GE-ENV-01105*

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
MM13	Traffic Management	EIAR Section 4	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 Limerick and Clare County Councils. 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.		
MM14	Health and Safety	EIAR Section 4	All relevant Site Health & Safety procedures, in accordance with the relevant Health and Safety Legislation and guidance (listed in Section 5.5 of Chapter 5: Population and Human Health of the EIAR), including the preparation of the Health & Safety Plan, erection of the relevant and appropriate signage on site, inductions and toolbox talks will take place prior to and throughout the construction phase of the Proposed Development.		
Construction Phase					
MM15	Refuelling	EIAR Section 4 CEMP Section 3	› All plant will be inspected and certified to ensure that they are leak free and in good working order prior to use at the Proposed Development site. › On site re-fuelling of machinery will be carried, as required, out using a mobile double skinned fuel bowser: › The fuel bowser, a double-axel custom-built refuelling trailer will be re-filled off site, and will be towed around the site by a 4x4 jeep to where machinery is located. › The 4x4 jeep will also carry fuel absorbent material and pads in the event of any accidental spillages. › The fuel bowser will be parked on a level area in the construction compound when not in use and 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 all refuelling operations; › Onsite 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 is included in Section 5 of this CEMP. Spill kits will be available to deal with and accidental spillage in and outside the re-fuelling area.		
MM16	Concrete Deliveries and Management	EIAR Section 4 CEMP Section 3	The following mitigation measures will be implemented in full to avoid release of cement leachate from the site: › No batching of wet-cement products will occur on the Wind Farm Site or along the Grid Connection route. Ready-mixed supply of wet concrete products and/or emplacement of pre-cast elements will take place; › Pre-cast elements for culverts and concrete works will be used; › No washing out of any plant used in concrete transport or concreting operations will be allowed on-site; › Where concrete is delivered to the Proposed Development site, only the chute will be cleaned, using the smallest volume of water possible. 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 is to be isolated in temporary lined wash-out pits located near proposed wind farm site compound. These temporary lined wash-out pits will be removed from the wind farm site at the end of the construction phase; › The contractor will use weather forecasting to plan dry days for pouring concrete; and, › The contractor will ensure pour site is free of standing water and plastic covers will be ready in case of sudden rainfall event. Because of the scale of the main concrete pours that will be required to construct the Wind Farm, the main pours will be planned days or weeks in advance. Special procedures will be adopted in advance of and during all concrete pours to minimise the risk of pollution. These will include: › 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 (see Section 4.2.14.3.8 above). › 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
MM17	Road Cleanliness	EIAR Section 4	A road sweeper will be available if any section of the public roads were to be dirtied by trucks associated with the Proposed Development.		
MM18	Watercourse Buffers	EIAR Section 4	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 Development.		
MM19	Water Discharge	EIAR Section 4 CEMP Section 2	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 Development.		
MM20	Drainage Swales	EIAR Section 4 CEMP Section 2	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. Drainage swales will be installed in advance of any main construction works commencing. The material excavated to make the swale will be compacted on the downslope edge of the drain to form a diversion dike.		
MM21	Interceptor Drains	EIAR Section 4 CEMP Section 2	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. The interceptor drains will be installed in advance of any main construction works commencing. The material excavated to make the drain will be compacted on the downslope edge of the drain to form a diversion dike.		
MM22	Check Dams	EIAR Section 4 CEMP Section 3	Check dams will not be used in any natural watercourses, only artificial drainage channels and interceptor drains. Check dams are designed to reduce velocity and control erosion and are not specifically designed or intended to trap sediment, although sediment is likely to build up. If necessary, any excess sediment build up behind the dams will be removed. For this reason, check dams will be inspected and maintained regularly to insure adequate performance. Maintenance checks will also ensure the centre elevation of the dam remains lower than the sides of the dam.		
MM23	Level Spreaders	EIAR Section 4 CEMP Section 3	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 are not likely to contribute further to water ingress to construction areas of the site.		
MM24	Piped Slope Drains	EIAR Section 4 CEMP Section 3	Piped slope drains will be used to convey surface runoff from diversion drains safely down slopes to flat areas without causing erosion. Once the runoff reaches the flat areas it will be reconverted to diffuse sheet flow. Level spreaders will only be established on slopes of less than 6% in grade. Piped slope drains will be used to transfer water away from areas where slopes are too steep to use level spreaders.		
MM25	Vegetation Filters	EIAR Section 4	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.		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
		CEMP Section 3	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.		
MM26	Stilling Ponds	EIAR Section 4 CEMP Section 3	Stilling or settlement ponds will be used to attenuate runoff from works areas of the site of the Proposed Development during the construction phase and will remain in place to handle runoff from roads and hardstanding areas of the Proposed Development during the operational phase.		
MM27	Dewatering Silt Bag	EIAR Section 4 CEMP Section 3	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.		
MM28	Siltbuster	EIAR Section 4 CEMP Section 3	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. Siltbusters are mobile silt traps that can remove fine particles from water using a proven technology and hydraulic design in a rugged unit.		
MM29	Sedimats	EIAR Section 4 CEMP Section 3	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		
MM30	Culverts	EIAR Section 4 CEMP Section 3	Some culverts may be installed to transport drainage waters from works areas of the Proposed Development, particularly where the waters have to be taken from one side of an existing roadway to the other for discharge and treatment. 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. Furthermore, all new proposed culverts and proposed culvert upgrades will be suitably sized for the 100-yr flood flow from the upstream catchment with an included factor (+20%) for climate change. 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. All culverts will be inspected regularly to ensure they are not blocked by debris, vegetation or any other material that may impede conveyance.		
MM31	Silt Fences	EIAR Section 4 CEMP Section 3	› 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 stream, which is inevitable where existing roads in proximity to watercourses are to be upgraded as part of the Proposed Development.		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
MM32	Forestry Felling	CEMP Section 3	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 (2000) guidance document With moderate slopes existing across much of the Wind Farm Site, a 10m setback for felling will be established along all aquatic zones. Buffer zone widths will be increased at vulnerable hydrological features where deemed necessary. This will ensure water quality is protected during the felling operations. However, most of the Proposed Development infrastructure is located outside of the 50m hydrological buffer zone, thereby limiting the felling which will occur in close proximity to natural watercourses. The setback distance from sensitive hydrological features means that adequate room is maintained for the proposed mitigation measures (discussed below) to be properly installed and operate effectively. The buffer/setback zone will: › Avoid physical damage (river/stream banks and river/stream beds) to watercourses and the associated release of sediment; › Avoid peat/soil disturbance and compaction within close proximity to surface watercourses; › Avoid the entry of suspended sediment from works into watercourses; and, › Avoid the entry of suspended sediment from the 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. Mitigation measures which will reduce the risk of entrainment of suspended solids and nutrient release in surface watercourses comprise best practice methods which are set out as follows: › 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 vehicles 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 peat and mineral soil disturbance and erosion and avoiding the formation of rutted areas, in which surface water ponding can occur. Brash mat renewal will take place when they become heavily used and worn. Provision will 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. An ECoW will monitor forecasts and determine when works should be suspended; › 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 peat disposal 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. Straw bales and check dams to 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 (refer to Pre-Emptive Site Drainage Management below); › 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.		
MM33	Borrow Bit Drainage	CEMP Section 3	An interceptor drain will be installed upslope of the borrow pit. This drain will divert any surface water away from the borrow pit and hence prevent water from ponding and lodging during construction and also when reinstated.		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			Temporary control of groundwater within the borrow pits will be required and exact measures will be determined as part of the confirmatory ground investigation programme. A temporary pump and suitable outfall locations will be required during construction. Perimeter drains will be installed around the individual cells within the borrow pits and will discharge to a settlement pond at the lower side/outfall location of the borrow pits. During the construction phase of the project, it will be necessary to keep the borrow pit area free of standing water while rock is still being extracted. This will be achieved by using a mobile pump, which will pump water into the same series of drains, settlement ponds and level spreader, which will receive the water from the outfall.		
MM34	Peat Management	EIAR Section 4 CEMP Section 2, 3	The following measures which will be implemented in full during the construction phase of the project will assist in the management of the risks for this site. › Appointment of experienced and competent contractors; › The site will be supervised by experienced and qualified personnel; › Allocate sufficient time for the project (be aware that decreasing the construction time has the potential to increase the risk of initiating a localised peat movement); › Undercutting of slopes and unsupported excavations will not occur; › A managed robust drainage system as set out above; › Prevent placement of loads/overburden on marginal ground; › Set up, maintain and report findings from monitoring systems (as outlined in the Geotechnical and Peat Stability Assessment); › Ensure construction method statements are developed and agreed before commencement of construction and are followed by the contractor; and, › Revise and amend the Construction Risk Register as construction progresses to ensure that risks are managed and controlled for the duration of construction. › Maintain hydrology of area as far as possible by maintaining existing drains to › water pressures in the peat to avoid peat becoming “boyant”. › Use of experienced geotechnical staff for site investigations › Use of experienced contractors and trained operators to carry out the work. › Confirmatory ground investigation to determine peat, mineral soil and bedrock condition and properties. › Uncontrolled concentrated water discharge onto peat slopes identified as being unsuitable for such discharge will be avoided. All water discharged from excavations during work will be piped over areas specifically assessed as being unsuitable and hence directly into suitable drainage lines. › All excavations will be suitably supported to prevent collapse and development of tension cracks. › Avoidance of placing fill and excavations in the vicinity of steeper peat slopes, that is at the crest or toe of the slope. › Installation and regular monitoring of geotechnical instrumentation during construction in areas of possible poor ground, such as deeper peat deposits. › Site reporting procedures will be implemented to ensure that working practices are suitable for the encountered ground conditions. Ground conditions will be assessed by a suitably experienced geotechnical engineer. › Regular briefing of all site staff (e.g., toolbox talks) to provide feedback on construction and ground performance and to promote reporting of any observed change in ground conditions. › Routine inspection of Proposed Development site by the Contractor and Project Geotechnical Engineer will be undertaken and will include an assessment of ground stability conditions (e.g., cracking, excessive floating road settlement, disrupted surface, closed-up drains) and drainage conditions (e.g., blocked drains, absence of water in previously flowing drains, springs, etc.).		
MM35	Dust Control	CEMP Section 3 EIAR Section 4	Proposed measures that will be implemented in full to control dust include: › 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 will be carried out along haul roads to ensure dust does not cause a nuisance. Water bowser movements will be carefully monitored to avoid, increased runoff. › All plant and materials vehicles for the Proposed Development will be stored in dedicated areas within the 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 Wind Farm Site on specified haul routes only. › Grid Connection infrastructure will be transported to the Grid Connection 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 Wind Farm Site will be checked weekly by the Site Manager for cleanliness and cleaned as necessary. › The roads adjacent to the Wind Farm Site entrances will be checked weekly for damage/potholes and repaired as necessary. › The transportation of materials from the borrow pits around the Wind Farm Site will be covered by tarpaulin or similar covered vehicles.		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			› 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 . › In periods of extended dry weather, 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 an appropriately licensed waste contractor. The MRF facility will be local to the Proposed Development to reduce the amount of emissions associated with vehicle movements.		
MM36	Noise Control	CEMP Section 3 EIAR Section 4	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. Proposed measures that will be implemented in full to control noise include: › No plant used on site will be permitted to cause an on-going public nuisance due to noise. › The best means practicable, including proper maintenance of plant, will be employed to minimise the noise produced by on site operations. › All vehicles and mechanical plant will be fitted with effective exhaust silencers and maintained in good working order for the duration of the contract. › Compressors will be attenuated models fitted with properly lined and sealed acoustic covers which will be kept closed whenever the machines are in use and all ancillary pneumatic tools shall be fitted with suitable silencers. › Machinery that is used intermittently will be shut down during periods when not in use. › Any plant, such as generators or pumps, which is required to operate close to NSL's outside of general construction hours will be surrounded by an acoustic enclosure or portable screen. › During the course of the construction programme, supervision of the works will include ensuring compliance with the limits detailed in Section 11.3.2 using methods outlined in British Standard BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Noise. › 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 Saturday. However, to ensure that optimal use is made of good weather periods or at critical periods within the programme (i.e. concrete pours, rotor/tower deliveries) it will be necessary on occasion to work outside of these hours. Where rock breaking is employed, the following are examples of measures that will be employed, 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. › 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 In respect of the Grid Connection construction, a solid hoarding will be employed at rock breaking plant where there are Noise Sensitive Locations (NSLs) are within 25m of the activity. Such a measure will be expected to reduce rock breaking noise at the NSL by 10 decibels.		
MM37	Vibration Control	CEMP Section 3	Specific to blasting the following mitigation measures will be employed to control the impact during blasts: › Trial blasts may be undertaken to obtain scaled distance analysis; › Ensuring appropriate burden to avoid over or under confinement of the charge; › Accurate setting out and drilling; › Appropriate charging; › Appropriate stemming with appropriate material such as sized gravel or stone chipping; › Delay detonation to ensure small maximum instantaneous charges; › Decked charges and in-hole delays; › Blast monitoring to enable adjustment of subsequent charges; › Good blast design to maximise efficiency and reduce vibration; › Avoid using exposed detonating cord on the surface.		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
MM38	Invasive Species	CEMP Section 3 EIAR Section 6	› A Toolbox Talk will be given by the Environmental Clerk of Works or Ecological Clerk of Works in relation to the management of invasive species within construction areas. › The infested area will be demarcated and works in the vicinity of the infestation will only be carried out under supervision by a suitably qualified Ecological Clerk of Works or Environmental Clerk of Works. › In advance of construction of the road upgrade works in the vicinity of the infested area, it will be necessary to completely remove the infestation outside of the flowering period (May to July) and dig the roots completely out. The effectiveness of this technique is increased by removing all viable roots. To avoid regrowth, stumps will be turned upside down and soil will be brushed off roots. The roots are relatively shallow, seldom being deeper than 45cm.9 › Once the supervising ecologist confirms that the material is dried out and non-viable, it will be chipped and composted on-site. › It is envisaged that no contaminated soil is to be removed from the Proposed Development Site but is to be reinstated within the site, thus negating the need for transport off-site, further risk of spread, and licencing requirements. Should potentially contaminated spoil be required to be removed from the site, it will be transported to a suitably licenced waste facility and will require a licence from the NPWS prior to its transportation. In order to avoid the potential for spread of invasive species into the Proposed Development Site: › Any construction material imported into the Proposed Development Site will come from a source confirmed to be free of invasive species. › All plant and machinery will be thoroughly cleaned before entering and exiting the Proposed Development Site.		
Chapter 5: Human Beings					
Pre-Commencement Phase					
MM39	Human Health	EIAR Section 5	Prior to commencement of any works, the occupants of dwellings in the vicinity of the proposed works will be contacted and the scheduling of works will be identified in line with the Engagement plan. Local access to properties will also be maintained throughout any construction works and local residents will also be supplied with the number of the works supervisor in order to ensure that disruption will be kept to a minimum.		
Construction Phase					
MM40	Human Health	EIAR Section 5	The Proposed Development 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) Regulations 2007 (S.I. No. 299 of 2007), as amended; › Safety, Health and Welfare at Work (Construction) Regulations 2013 (S.I. 291 of 2013), as amended; and › Safety, Health and Welfare at Work (Work at Height) Regulations 2006 (S.I. No. 318 of 2006). A Health and Safety Plan covering all aspects of the construction process will address the Health and Safety requirements in detail and is summarised below. 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. All construction, delivery and security staff will hold Safepass registration cards.. Construction operatives will hold a valid Construction Skills Certificate Scheme card. The developer will be 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. Safety Notice signs will be posted, directing all visitors to the site manager. Appropriate warning measures including 'goalposts' will be used as appropriate to prevent contact with any overhead lines that traverse the Wind Farm Site and Grid Connection. One 38kV overhead line crosses the Wind Farm Site in a southeast to northwest direction, from Limerick City to Tulla. One 400kV overhead line intersects the northwestern boundary of the Wind Farm Site, travelling from Moneypoint in the direction of Dublin. Owing to the scale and scope of the Proposed Development a Project Supervisor Design Process (PSDP) and Project Supervisor Construction Stage (PSCS) will 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 2006*'.		

[9] *TII (2020) - The Management of Invasive Alien Plant Species on National Roads – Technical Guidance GE-ENV-01105*

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			The PSDP appointed for the construction stage will 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 will 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.		
MM41	Human Health	EIAR Section 5	Signage indicating the designated pedestrian route along the hiking trails will be in place during the construction phase of the development. Likewise, appropriate construction site warning signage and health and safety signage will be in place along the hiking trails and on the approach to the construction site at all times during the construction phase to ensure that any potential impacts pertaining to existing amenity access is mitigated against. Furthermore, all health and safety procedures as detailed in Section 5.9.2.3 will be strictly adhered to ensure not only the safety of construction staff but any users of the hiking trails during the construction phase.		
MM42	Human Health	EIAR Section 5	A **Traffic Management Plan (TMP)**, incorporating all the mitigation measures set out in the CEMP, is included in Chapter 15 of the EIAR. The TMP 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 the Proposed Development. The detailed TMP includes the following: › **Traffic Management Coordinator** – a competent Traffic Management Co-ordinator will be appointed for the duration of the 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 the relevant County Councils (Clare and Limerick) in advance of deliveries of turbine components to site. Liaison with the Local Authorities and Transport Infrastructure Ireland (TII) will be carried out where required regarding requirements such as delivery timetabling. The programme will ensure that deliveries are scheduled in order to minimise the demand on the local network and minimise the pressure on the access to the site. › **Temporary traffic management measures during construction of Wind Farm Site at access junctions during construction** – Temporary measures including signage at access Junctions B at Sallybank, C and D at Snaty. › **Temporary traffic management measures during construction of Grid Connection** – Including signage and implementation of temporary traffic diversions. › **Temporary traffic signs and traffic management measures for the construction phase of the proposed temporary transition compound on the N69** – As part of the traffic management measures temporary traffic signs will be put in place at the access points for the transition zone located on the N69. 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). Construction staff (flagman) will be present at key junctions during peak delivery times. This will include a request to TII / LC&CC for a temporary speed reduction for the 85 day construction period.		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			› **Information to locals** – Locals in the area will be informed of any upcoming traffic related matters e.g. temporary lane/road closures (where required) or delivery of turbine components at night, via letter drops and posters in public places. Information will include the contact details of the 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** – Where required by the Local Authorities, a pre-condition survey of roads associated with the Proposed Development will be carried out immediately prior to construction commencement to record an accurate condition of the road at the time. A post construction survey will be carried out after works are completed to ensure that any remediation works are carried out to a satisfactory standard. The timing of these surveys will be agreed with the local authority. All road surfaces and boundaries will be re-instated to pre-development condition, as agreed with the Local Authority Engineers. › **Liaison with the relevant local authority** - Liaison with the County Councils and An Garda Síochána will be carried out during the delivery phase of the large turbine vehicles, when an escort for all convoys will be required. Once the surveys have been carried out and "prior to commencement" status of the relevant roads established, (in compliance with the provisions of the CEMP), the relevant Roads Sections will be informed of the names and contact numbers for the Project Developer/Contractor Site Manager as well as the Site Environmental Manager. › **Implementation of temporary alterations to road network at critical locations** – at locations highlighted in section 15.1.8. In addition, in order to minimise the impact on the existing environment during turbine component deliveries the option of blade adaptor trailers will also be used where deemed practicable. › **Identification of delivery routes** – These routes will be agreed with the County Councils and adhered to by all contractors. › **Delivery times of large turbine components** - The management plan will include the option to deliver the large wind turbine plant components at night in order to minimise disruption to general traffic during the construction stage. › **Travel plan for construction workers** – While the assessment above has assumed the worst case in that construction workers will drive to the site, the construction company will be required to provide a travel plan for construction staff, which will include the identification of routes to / from the site. › **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. › **Re-instatement works** - All road surfaces and boundaries will be re-instated to pre-development condition, as agreed with the local authority engineers. Prior to commencement of any works, the occupants of dwellings in the vicinity of the proposed works will be contacted and the scheduling of works will be made clear. Local access to properties will also be maintained throughout any construction works and local residents will also be supplied with the number of the works supervisor in order to ensure that disruption will be kept to a minimum. Deliveries of concrete and aggregate materials that cannot be source from the onsite borrow pits will. will be sourced from local quarries which will reduce the distance of these deliveries, thereby reducing the effect to traffic and transport in the wider area.		
MM43	Human Health	EIAR Section 5	The majority of aggregate material for the construction of roads and turbine bases will be sourced from the proposed borrow pit located within the main site of the proposed wind farm development, therefore limiting the distance needed to transport this material to the site. Truck wheels will be washed to remove mud and dirt before leaving the site. All plant and materials vehicles will be stored in the compound area or other dedicated areas. Areas of excavation will be kept to a minimum, and stockpiling will be minimised by coordinating excavation, spreading and compaction. Construction traffic will be restricted to defined routes and a speed limit will be implemented. 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 the site's drainage system, and will be pumped into a bowser or water spreader to dampen down haul roads and the temporary site compound 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. The active construction area along the intended grid connection route options will be small, ranging from 150-300m in length at any one time. Should separate crews be used during the construction phase they will generally be separated by 1-2km. All construction machinery will be maintained in good operational order while on-site, minimising any emissions that are likely to arise. Aggregate materials for the construction of the cabling route will be sourced locally to reduce the amount of emissions associated with vehicle movements.		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
Chapter 6: Biodiversity					
Pre-Commencement Phase					
MM44	Invasive Species Management	EIAR Section 6 CEMP Section 3	A pre-commencement survey for invasive species within the footprint of the Proposed Wind Farm Site will be carried out by a suitably qualified ecologist to ensure there is no new growth of Third Schedule invasive species in these areas.		
MM45	Fauna - Otter	EIAR Section 6	Prior to the commencement of construction works associated with the installation of new watercourse crossings or water crossing works over the Blackwater River, the following measures will be undertaken for the avoidance of disturbance/displacement and direct mortality and to ensure that no otter holts/breeding sites have been established since the original surveys undertaken (TII, 2007): › From a precautionary basis, a pre-commencement otter survey will be undertaken in accordance with standard best practice guidance prior to the commencement of site works. In the unlikely event that an otter holt is identified within or immediately adjacent to the Proposed Development footprint, construction works which are likely to disturb otter will not proceed until a derogation licence is obtained. › All conditions of a derogation licence will be implemented in full › No works will be undertaken within 150m of any holts at which breeding females or cubs are present › No wheeled or tracked vehicles (of any kind) will be used within 20m of active, but non-breeding, otter holts. Light work, such as digging by hand or scrub clearance will also not take place within 15m of such holts, except under licence (NRA, 200610). › All of the above works will be undertaken or supervised by an appropriately qualified ecologist.		
MM46	Fauna - Bats	EIAR Section 6	As described above, no roosts were identified within the footprint of the Proposed Development. However, a number of trees within the proposed transition compound were identified as having potential roost suitability. Therefore, the following mitigation is proposed: › A pre-commencement survey will be carried out by a suitably qualified ecologist prior to the felling of trees with potential roost features associated with the transition compound. The requirement for a pre-commencement survey does not represent a lacuna in the survey assessment but is fully in line with industry best practice. The function of this survey will be to assess any changes in baseline environment since the time of undertaking the surveys › If a roost is identified during pre-commencement surveys, felling works of the trees in question will not be undertaken until a derogation is obtained. The need for a derogation licence has not been identified at this stage; however, should evidence of roosting bats be identified during the pre-commencement survey, a derogation will be required at that stage. › Any trees identified as containing Potential Roost Features throughout the rest of the Proposed Development will be avoided and retained. The following construction best practice will be employed to minimise general noise and disturbance potential. 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). Where lighting is required, directional lighting will be used to prevent overspill on to forestry edges. Exterior lighting during construction, shall be designed to minimize light spillage, thus reducing the effect on areas outside the Proposed Development, and consequently on bats i.e. Lighting will be directed away from mature trees/treelines around the periphery of the 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.		

[10] *4 NRA, 2006. Guidelines for the Treatment of Otters prior to the Construction of National Road Schemes. Dublin: Transport Infrastructure Ireland. Available at: www.tii.ie/tii-library/environment/construction-guidelines/Guidelines-for-the-Treatment-ofOtters-prior-to-the-Construction-of-National-Road-Schemes.pdf*

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			The proposed lighting around the site shall 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 construction (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, › When using white light, use sources with a "warm" colour temperature (less than 3000K).		
MM47	Fauna - Badger	EIAR Section 6	Prior to the commencement of construction works, the following measures will be undertaken for the avoidance of disturbance and to ensure no additional setts have been established since the original surveys undertaken. The following measures are in line with Guidelines For The Treatment Of Badgers Prior To The Construction Of National Road Schemes (TII 2009). › From a precautionary basis, a pre-commencement badger survey will be undertaken by a qualified ecologist in accordance with standard best practice guidance prior to the commencement of site works to ensure that no additional setts in close proximity to proposed infrastructure have been built. In the event that a badger sett is identified within or immediately adjacent to the Proposed Development footprint, mitigations as per the above referenced TII document will be implemented for the new sett. › If any new setts are found within the vicinity of proposed infrastructure, mitigations as per the above mentioned TII document will be implemented to prevent disturbance of the sett.		
MM48	Fauna – Red Squirrel and Pine Martin	EIAR Section 6	Prior to the commencement of construction works, the following measures will be undertaken for the avoidance of disturbance and to ensure no dreys or dens have been established since the original surveys undertaken. The following measures are in line with Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes (NRA 2009). › From a precautionary basis, a pre-commencement survey will be undertaken by a qualified ecologist in accordance with standard best practice guidance prior to the commencement of site works to ensure that no red squirrel dreys or pine marten dens are present within or in close proximity to the infrastructure footprint. › In the event that a red squirrel drey or pine marten den is identified within the Proposed Development footprint during pre-commencement surveys, further surveys will be undertaken to ascertain whether the drey/den is in use. Consultation will be carried out with NPWS and a Species Protection Plan as agreed by the project ecologist and NPWS will be put in place in advance of felling works.		
Construction Phase					
MM49	Hedgerows and Treelines	EIAR Section 6 Appendix 6-5	The Biodiversity Management Plan (Appendix 6-5) provides for the replanting of 1170m of native hedgerow within the lands to the southeast of the site in the vicinity of the proposed wind farm access road. This includes the replanting of hedgerows along the proposed new road. Additionally, the loss of treelines for the temporary transition compound located to the south of the Shannon Estuary will be mitigated post-construction through replanting of trees lost during restoration of the compound site. It is proposed to replant the trees being lost in their original locations. Advanced nursery stock will be planted in order to reduce the amount of time required to reach the age class of the trees being removed. The species to be planted will comprise poplar, willow, or hawthorn, or another native species that is found locally and which is suited to local soil conditions and to be being planted as advanced stock. The above measures are fully described in the Biodiversity Management Plan in Appendix 6-5.		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
MM50	Wet Heath and Upland Blanket Bog	EIAR Section 6 Appendix 6-5	The loss of 0.9ha of wet heath for the Proposed Development will be offset through the Biodiversity Management Plan which includes for the restoration of peatland habitats which are currently forested within the EIAR Site Boundary. This will involve felling an area measuring approx. 52.98ha and a bespoke management and monitoring plan for restoration of peatland within these areas. In addition, the selected areas will provide linkages and join up previously fragmented areas of peatlands in the vicinity of the EIAR Site Boundary which will support the objective of Article 10 of the Habitats Directive to maintain landscape connectivity for flora and fauna. The Biodiversity Management Plan (BMP) is provided as Appendix 6-5 to this EIAR. On completion of successful peatland restoration to peatland habitats, this will result in an additional area of approx. 52.98ha of peatland habitat as a result of the Proposed Development. The mitigation/restoration measures will be monitored over the lifetime of the Proposed Development as part of the BMP to determine their effectiveness and to allow for alteration in approaches where necessary.		
MM51	Oak, Ash and Hazel Woodland	EIAR Section 6 Appendix 6-5	The Biodiversity Management Plan includes for the replanting of approx. 0.9ha of oak-ash-hazel woodland around the proposed southeastern access road after completion of turbine blade delivery. This will be a linear woodland and will therefore be of a similar nature to that being lost. Details of this woodland replanting are provided in the Biodiversity Management Plan (Appendix 6-5).		
MM52	Flora and Fauna	EIAR Section 6	The operation of the Proposed Development will not result in any additional land take or loss of habitats and as such there is no potential for any significant effects in this regard. However, the Proposed Development has the potential to result in enhancement of the surrounding areas through habitat rehabilitation management (as described in the Biodiversity Management Plan) that will be implemented during the construction phase of the Proposed Development, and maintained during the operational phase. Details of the management that will be undertaken are provided in the Biodiversity Management Plan in Appendix 6-5.		
Chapter 7 Birds					
Pre-Commencement Phase					
Construction Phase					
MM53	Birds	EIAR Section 7	The following measures are proposed for the construction phase: › Construction will not commence until the forestry which hosted the 2023 hen harrier nest is no longer suitable for nesting hen harrier (please see Appendix 7-5, Figure 7.5.7). This is predicted to occur when the canopy closes. This measure to delay the onset of construction works, ensures the area remains undisturbed while the habitat is still suitable for nesting. This forestry was planted in 2018. It is considered that pre-thicket forestry is suitable for breeding hen harrier within the first ten years of planting, it is therefore considered that without intervention, this forestry block will become unsuitable for hen harrier in c. 2028. Before construction works can begin, habitat surveys must be undertaken to demonstrate that the forestry is no longer suitable for breeding hen harrier. The forestry must be confirmed to be unsuitable closed canopy forestry. These surveys will be conducted after the breeding season has ended (September/October) by a suitably qualified ornithologist, at the location of the 2023 hen harrier nest site, from 2026 onward, until it can be demonstrated that the forestry is no longer suitable for breeding hen harrier. The proposed development has been specifically designed to ensure other areas of suitable unaffected nesting habitat remain that could be utilised by the 2023 pair following canopy closure. This unaffected nesting habitat as previously outlined has been utilised for nesting previously and has been, by design, avoided and is buffered by 750m from the nearest turbine. Please see Appendix 7-5, Figure 7.5.28 for location details. › A Construction and Environmental Management Plan (CEMP) has been prepared. The CEMP will be in effect prior to the start of the construction phase. Best practice measures which form part of the design of the project are included in Chapter 4 of the EIAR. The CEMP is included as an Appendix to Chapter 4. › Construction works will begin outside the bird nesting season as defined by the Wildlife Act 1976 as amended (1st of March to the 31st of August). › All removal of woody vegetation will be undertaken in accordance with Section 40 of the Wildlife Act 1976 as amended. › 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. › Plant machinery will be turned off when not in use. › All plant and equipment for use will comply with the European Communities (Noise Emission by Equipment For Use Outdoors) Regulations, 2001 (S.I. No. 632/2001) and other relevant legislation. › An Ecological Clerk of Works (ECoW) will be appointed. Duties will include:		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			› Oversee a pre-construction transect/walkover bird survey, to avoid significant effects on breeding birds will be avoided. Further details are provided in Section 7-9 below. › Inform and educate on-site personnel of the ornithological and ecological sensitivities within the Proposed Development. ○ 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.		
MM54	Birds – Hen Harrier Enhancement Measures	EIAR Section 7	Permanent Forestry Removal and Restoration › The identified area of existing forestry will be permanently removed. The timber, brash and stumps will be collected and removed off-site. The area will be allowed to revert to peatland habitat. This process will be aided by drain blocking as discussed below. This will create suitable foraging habitat for hen harrier and its associated prey species. Pre-mature felling of forestry will be undertaken before the first breeding season of the construction phase of the project programme. This would allow time (i.e. min. three growing seasons) for the clear-felled site to revegetate in advance of the operational phase. Thereby ensuring replacement habitat would be available should the predicted displacement effect occur. › A hydrology/hydrogeology study will be undertaken to map the movement of ground and surface water to inform the requirement for drain blocking. Forestry drainage channels will be blocked where necessary, using peat dams or plastic dams, as appropriate. In flat areas drain blocks should be placed every 15 metres and more frequently when accounting for a slope. When drains are blocked this reinstates the waterlogged conditions which are crucial for the survival of peatland plants. These works will be subject to a separate planning application if required. › Self-seeding conifers originating as windblown seedlings from adjacent and nearby commercial conifer plantations, are a threat to the viability of the compensation and enhancement area. They gradually take hold, and if unmanaged, would eventually make the area unsuitable for nesting/foraging hen harrier. Habitat maintenance of the area will involve the eradication of self-seeding conifers, and removal off-site. It is envisaged that the compensation areas will require maintenance twice during the life of the wind farm, once after approximately 10 and 20 years. The monitoring outlined in Section 5 below will monitor the level of encroachment by self-seeding conifers and will bring the scheduled removal forward as required. › No invasive species were recorded onsite during the February 2020 site visit. A confirmatory pre-commencement survey for invasive species will be undertaken as part of preparatory work. In the event of any invasive species being recorded within the area identified for enhancement measures, an invasive species management plan will be put in place to eradicate any stands of such species. › Herbicides will not be used for the eradication of self-seeding trees and will not be relied upon for the clearance of invasive species. › Enhancement and maintenance works will be undertaken outside of the nesting season as per the Wildlife Acts 1976 – 2023 as amended. A suitably qualified ornithologist will be present at the removal of all woody vegetation, to ensure that identified breeding bird sites are avoided. If breeding activity of birds of high conservation concern is identified, no works shall be undertaken within a species-specific buffer (as per Goodship and Furness, 2022) in line with best practice, until it can be demonstrated that the nest is no longer occupied. › The felling license for these lands will be applied for in tandem with the felling license application that will be required to facilitate the construction of the wind farm within the proposed development area. The felling license will include management prescriptions for the felling of the forestry. Following felling, these compensation lands will be managed for the benefit of hen harrier and peatland restoration. › If at any point, hen harrier are identified to be nesting on any part of the compensation or enhancement lands, the wind farm development company in cooperation with the individual landowner will provide for the protection of the nest site. › The use of poisons or stupefying baits is not permitted within compensation or enhancement lands. Hen harriers and other birds of prey can fall victim to secondary and direct poisoning. › Native vegetation around the perimeter of the northern plot, as well as a row of conifers along the southeastern boundary, will be retained as shown in Figure 3-2. The existing linear features as depicted will be gapped up using native tree and hedgerow species that are representative of the species present in the local area. Scrub and Hedgerows › Habitat management prescriptions for scrub and hedgerows are outlined below: › Retain existing areas of scrub and hedgerows; › Where there is evidence of scrub or hedgerow removal (since 2016), these habitats will be reinstated as part of individual farm plans; › Hedgerow/liner strips of scrub that occur along the road that intersects the management area will be widened to 3-4 metres by parallel planting of native hedgerow species; › In open areas or where the extent of scrub and hedgerows is limited, create new areas of habitat; › In open areas or where the extent of scrub and hedgerows is limited, allow expansion of native hardwood scrub;		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			› Trim established areas of gorse or willow scrub as the only means of preventing further encroachment onto grassland or access paths and tracks. Repeat annually as necessary; › Prevent any removal, burning or herbicide use on areas of established scrub; › If deemed necessary for road safety reasons, cut roadside hedgerows outside of the bird nesting season (March 1st – August 31st); › If deemed necessary for the protection of overhead electricity lines, cut hedgerows outside of the bird nesting season (March 1st – August 31st); › Hedgerow maintenance is permitted to prevent the hedge "escaping". In such cases, hedgerow trees should be left uncut, and the remainder of the hedgerow cut into an "A" shape, i.e. wider at the base than at the top; › Encroachment of scrub onto grassland can be controlled by cutting on annual basis if required. Cutting in this case should not come closer than 1 metre from the base of the hedge; › Herbicides and pesticides will not be used within 5 metres of an existing hedgerow; and › Hedge cuttings will be piled into heaps and left to decay naturally. Wet Grassland and Peatland › In general, maintain stocking levels of no greater than 0.15 livestock units (LU) per forage hectare; › In the specific case of blanket bog maintain stocking levels of up to 0.10 LU/ha; › No new forestry planting on the bog and heath areas within the enhancement area will be permitted; › Self-seeded conifers invading open areas of bog and heath will be removed; › Heath and bog habitats will be surveyed at least once every two years to ensure that new seedlings are removed; › Participating landowners will remove any self-seeding conifers as they appear or as they are noticed and can also be removed by the windfarm development company as provided for in the farm plan agreements. › On areas of wet grassland, the application of chemical or organic fertiliser will be prohibited; › All rhododendron or other invasive species must be removed in Year 1 of the plan. Ongoing control will be required in each subsequent year. Acceptable control methods are cutting/pulling; › Consideration will be given to the creation of shallow pools 30- 50 cm deep to provide spawning sites for amphibians; and › In cases where the land is wet, concentrate grazing during the summer months. Rush Management › In general, rushes will be cut on a 2-year cycle unless there are specific reasons for a longer cycle, e.g. weak rush growth. › In most cases, active rush management will commence in year 1 of the plan and should only be delayed until year 2 or 3 where improved grassland is in reversion, where rush growth is very weak or where the rushes were cut or treated with herbicide in the year prior to joining the scheme. › On farms with a large area of rushy wet grassland (> 10 hectares), active rush management can be delayed on a portion of the area until Year 2 of the farm plan. The area where active rush management is to be delayed for this reason should not normally exceed 50% of the wet grassland component of the farm. › The planned rush management will be reviewed on an annual basis to determine if it is having the desired effect. If it is found during an annual inspection that rush recovery has been stronger or weaker than had been originally anticipated, the farm plan will be changed to adjust the cutting sequence for future years and provisions for these amendments will be included in the Farm plan management agreements. These details have been consented to by the consenting landowners.		
EIAR Chapter 8 Land Soils & Geology					
Construction Phase					
MM55	Earthworks	EIAR Section 8	› Placement of turbines and associated infrastructure in areas with shallower peat; › The peat and subsoil which will be removed during the construction phase will be localised to the wind farm infrastructure turbine location, substation and temporary compounds and access roads; › The Proposed Development has been designed to avoid sensitive habitats within the application area; › A minimal volume of peat, subsoil and rock will be excavated and removed to allow for infrastructure works to take place in comparison to the total volume of these materials present on the site due to optimisation of the Proposed Development design; › In general, excavated peat and spoil will be moved short distances from the point of excavation and will be used for landscaping or stored in the onsite borrow pits; and, › Construction of settlement ponds will be volume neutral, and all excess material will be used locally to form pond bunds and surrounding landscaping.		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
MM56	Peat and Spoil Management	EIAR Section 8	› Excavation works will be undertaken and supervised by an experienced contractor and suitably qualified personnel; › Rock will be removed by either breaking or blasting and will be determined by confirmatory ground investigations comprising of rotary core drilling; › Borrow pits will be developed with stable ground inclinations; › Exposed slopes will be left with irregular faces to promote re-vegetation; › The stability of the rock faces will be inspected by the Project Geotechnical Engineer upon excavation to ensure stability; › Rock buttresses will be constructed within the borrow pits to help retain placed peat and spoil. The founding stratum for each buttress will be inspected and approved by the Project Geotechnical Engineer; › Infilling of peat and spoil should commence at the back of the borrow pit and progress towards the pit entrance.		
MM57	Contamination of Soil	EIAR Section 8	› On-site re-fuelling will be undertaken using a double skinned bowser 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 (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; › An emergency response plan for the construction phase to deal with accidental spillages will be contained within the Construction Environmental Management Plan.		
MM58	Erosion of Exposed Subsoils and Peat during Construction	EIAR Section 8	› Peat removed from the development locations and access roads will be reinstated within the Proposed Development site; › The upper vegetative layer (where still present) 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 peat within the peat storage areas; › Re-seeding and spreading/planting will also be carried out in these areas; › Brash/bog mats will be put in place to support vehicles on soft ground, reducing peat and mineral soils erosion and avoiding the formation of rutted areas, in which surface water ponding can occur; and, › A full Peat and Spoil Management Plan for the development is shown as Appendix 4-2 of the EIAR and details control measures for the removal, storage and general management of the materials to be excavated during construction.		
MM59	Erosion of Exposed Subsoils and Peat during Tree Felling	EIAR Section 8	All proposed felling works will be completed in accordance with the best practice Forest Service regulation, policies and strategic guidance documents as well as Coillte and DAFM guidance documents to ensure that felling results in minimal potential negative effects on the local peat, soil and subsoil environment. In addition, the following mitigation measures will be implemented during felling operations: › Before any works are completed silt fences will be installed to limit the movement of entrained sediment in surface water runoff; › The harvester and the forwarder are designed specifically for the forest environment and are low ground pressure machines; › All machinery will be operated by suitably qualified personnel; › These machines will traverse the Wind Farm Site along specified off-road routes (referred to as racks); › Brash mats will be placed on the racks to support the vehicles on soft ground, reducing peat and mineral soil disturbance and erosion and avoiding the formation of rutted areas, in which surface water ponding can occur; › As felling progresses, the harvester will collect brash produced by the felling and place it in front of the machine before it advances forward along the rack; › The condition of the racks will be continually monitored and fresh brash will be applied when the brash mat becomes heavily used and worm, ensuring that the mat remains effective throughout the operational phase; and, › The location of racks will be chosen to avoid wet and potentially sensitive areas.		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
MM60	Bog Restoration Works	EIAR Section 8	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 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.		
MM61	Peat Instability	EIAR Section 8	The following control measures incorporated into the construction phase of the project will ensure the management of the risks for this site: › Appointment of experienced and competent contractors; › The site will be supervised by experienced and qualified personnel; › Allocate sufficient time for the project (be aware that decreasing the construction time has the potential to increase the risk of initiating a localised peat movement); › Prevent undercutting of slopes and unsupported excavations; › Maintain a managed robust drainage system; › Prevent placement of loads/overburden on marginal ground; › Set up, maintain and report findings from monitoring systems (as outlined in the Geotechnical and Peat Stability Assessment); › Ensure construction method statements are developed and agreed before commencement of construction and are followed by the contractor. The method statements will be in compliance with all guidance and control measures prescribed in the Geotechnical and Peat Stability Risk Assessment. This will ensure that best practice guidance regarding the management of peat stability will be inherent in the construction phase; › Revise and amend the Construction Risk Register as construction progresses to ensure that risks are managed and controlled for the duration of construction. › Maintain hydrology of area by maintaining existing drains to prevent the build-up of water pressures in the peat, leading to the peat becoming “buoyant”; › Use of experienced geotechnical staff for confirmatory site investigations; and, › Use of experienced contractors and trained operators to carry out the work.		
EIAR Chapter 9 Hydrology					
Pre-Commencement Phase					
MM62	Clear-felling of Coniferous Plantation	EIAR Section 9	**Mitigation by Avoidance:** 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. Minimum buffer zone widths recommended in the Forest Service (2000) guidance document “Forestry and Water Quality Guidelines”. With moderate slopes existing across much of the Wind Farm Site, a 10m setback for felling will be established along all aquatic zones. Buffer zone widths will be increased at vulnerable hydrological features where deemed necessary. This will ensure water quality is protected during the felling operations. However, most of the Proposed Development infrastructure is located outside of the 50m hydrological buffer zone, thereby limiting the felling which will occur in close proximity to natural watercourses. The setback distance from sensitive hydrological features means that adequate room is maintained for the proposed mitigation measures (discussed below) to be properly installed and operate effectively. The buffer/setback zone will: › Avoid physical damage (river/stream banks and river/stream beds) to watercourses and the associated release of sediment; › Avoid peat/soil disturbance and compaction within close proximity to surface watercourses; › Avoid the entry of suspended sediment from works into watercourses; and, › Avoid the entry of suspended sediment from the 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. **Mitigation by Design:** Mitigation measures which will reduce the risk of entrainment of suspended solids and nutrient release in surface watercourses comprise best practice methods which are set out as follows:		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			› 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 vehicles 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 peat and mineral soil disturbance and erosion and avoiding the formation of rutted areas, in which surface water ponding can occur. Brash mat renewal will take place when they become heavily used and worn. Provision will 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. An ECoW will monitor forecasts and determine when works should be suspended; › 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 peat disposal 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. Straw bales and check dams to 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 (refer to Pre-Emptive Site Drainage Management below); › 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. **Pre-emptive Site Drainage Management:** The works programme for the felling operations will also take account of weather forecasts and predicted rainfall in particular. Operations 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. The following forecasting systems are available and will be used on a daily/weekly basis and reviewed by an EcoW, as required, to allow site staff to direct proposed and planned construction activities: › General Forecasts: Available on a national, regional and county level from the Met Éireann website (www.met.ie/forecasts). These provide general information on weather patterns including rainfall, wind speed and direction but do not provide any quantitative rainfall estimates; › MeteoAlarm: Alerts to the possible occurrence of severe weather for the next 2 days. Less useful than general forecasts as only available on a provincial scale; › 3-hour Rainfall Maps: Forecast quantitative rainfall amounts for the next 3 hours but does not account for possible heavy localised events; › Rainfall Radar Images: Images covering the entire country are freely available from the Met Éireann website (www.met.ie/latest/rainfall_radar.asp). The images are a composite of radar data from Shannon and Dublin airports and give a picture of current rainfall extent and intensity. Images show a quantitative measure of recent rainfall. A 3-hour record is given and is updated every 15 minutes. Radar images are not predictive; and, › Consultancy Service: Met Éireann provide a 24-hour telephone consultancy service. The forecaster will provide an interpretation of weather data and give the best available forecast for the area of interest.		
MM63	Earthworks	EIAR Section 9	**Mitigation by Avoidance:** 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;		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			› 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. **Mitigation by Design:** Key mitigation by design measures that will be implemented comprise source controls, in-line controls and treatment systems, as follows: › 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 stockpiles, weathering off stockpiles, cessation of works in certain areas or other similar/equivalent or appropriate measures. › 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 Wind Farm Site that an extensive network of forestry and roadside 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 forestry drainage network and the proposed wind farm network is relatively simple. The key elements being the upgrading and improvements to 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; › Runoff from individual turbine hardstanding areas will not be 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.		
MM64	Works within Hydrological Buffer Zones	EIAR Section 9	**Mitigation Measures by Avoidance:** The above mitigation measures will be implemented at these work locations. The following additional mitigation measures will also be implemented: › Double silt fences will be placed downgradient of all work locations within the hydrological buffer zones. › All works will be completed during the summer months and works will be postponed in the event of heavy rainfall.		
MM65	Dewatering	EIAR Section 9	Management of groundwater seepages 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, following periods of heavy rainfall, 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;		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			› 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 Siltbuster unit; › The borrow pit settlement ponds have been designed to allow a 24hr retention time as per EPA guidance (2006) which is highest level of protection recommended by the EPA with regard to retention time; › There will be no direct discharge to surface watercourses, and therefore no risk of hydraulic loading or contamination will occur; › 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; and, › A mobile 'Siltbuster' or similar equivalent specialist treatment system will be available on-site 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.		
MM66	Hydrocarbons and Cement Based Products	EIAR Section 9	Mitigation measures to be implemented to avoid release of hydrocarbons at the Proposed Development site are as follows: › All plant will be inspected and certified to ensure that they are leak free and in good working order prior to use at the Proposed Development site. › On site re-fuelling of machinery will be carried, as required, out using a mobile double skinned fuel bowser: ○ The fuel bowser, a double-axel custom-built refuelling trailer will be re-filled off site, and will be towed around the site by a 4x4 jeep to where machinery is located. ○ The 4x4 jeep will also carry fuel absorbent material and pads in the event of any accidental spillages. ○ The fuel bowser will be parked on a level area in the construction compound when not in use and 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 all refuelling operations; › Onsite 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. › No batching of wet-cement products will occur on the Wind Farm Site. Ready-mixed supply of wet concrete products and/or emplacement of pre-cast elements will take place; › Pre-cast elements for culverts and concrete works will be used; › No washing out of any plant used in concrete transport or concreting operations will be allowed on-site; › Where concrete is delivered on the Wind Farm Site, only the chute will be cleaned, using the smallest volume of water possible. 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 is to be isolated in temporary lined wash-out pits located near proposed wind farm site compound. These temporary lined wash-out pits will be removed from the wind farm site at the end of the construction phase; › The contractor will use weather forecasting to plan dry days for pouring concrete; and, › The contractor will ensure pour site is free of standing water and plastic covers will be ready in case of sudden rainfall event.		
MM67	Wastewater Disposal	EIAR Section 9	› During the construction phase, a self-contained port-a-loo with an integrated waste holding tank will be used at each of the site compounds, maintained by the providing contractor, and removed from site on completion of the construction works; › Water supply for the site office and other sanitation will be brought to site and removed after use from the Wind Farm Site to be discharged at a suitable off-site treatment location; and, › No water or wastewater will be sourced on the site, nor discharged to the site.		
MM68	Stream Crossings	EIAR Section 9	The Proposed Development design has been optimised to utilise the existing infrastructure (i.e. existing site roads) where practicable. 1 no. crossings is proposed along existing site tracks with a total of 5 no. new crossings proposed. This design prevents the unnecessary disturbance of the existing site drainage network prevents the requirement for widespread instream works across the Wind Farm Site.		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			Mitigation measures to be implemented for the upgrade of the existing crossings and the new proposed crossing are detailed below: › All proposed new stream crossings will be bottomless or clear span culverts 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 underground cabling route follows an existing road or road proposed for upgrade, the cable will pass over or below the culvert within the access road; › 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", that is, 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; › 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 on-site; and, › All new road 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. Prior to the commencement of cable trenching or crossing works the following key temporary drainage measures will be installed: › All existing roadside drains 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 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. The following mitigation measures are proposed for the Grid Connection crossing works: › No stockpiling of construction materials will take place along the grid route; › No refuelling of machinery or overnight parking of machinery is permitted in this area (within 50m of the watercourse crossings); › No concrete truck chute cleaning is permitted in this area (within 50m of the watercourse crossing); › 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.		
MM69	Surface Water Effects during Directional Drilling along the Grid Connection	EIAR Section 9	**Proposed Mitigation Measures**: › Although no in-stream works are proposed, the drilling works will only be done over a dry period between July and September (as required by IFI for in-stream works) to avoid the salmon spawning season and to have more favourable (dryer) ground conditions; › The crossing works area will be clearly marked out with fencing or flagging tape to avoid unnecessary disturbance; › There will be no storage of material / equipment or overnight parking of machinery inside the 15m buffer zone; › Before any ground works are undertaken, double silt fencing will be placed upslope of the watercourse channel along the 15m buffer zone boundary; › Additional silt fencing or straw bales (pinned down firmly with stakes) will be placed across any natural surface depressions / channels that slope towards the watercourse; › Silt fencing will be embedded into the local soils to ensure all site water is captured and filtered; › The area around the bentonite batching, pumping and recycling plant will be bunded using terram (as it will clog) and sandbags in order to contain any spillages;		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			› Drilling fluid returns will be contained within a sealed tank / sump to prevent migration from the works area; › Spills of drilling fluid will be cleaned up immediately and stored in an adequately sized skip before been taken off-site; › If rainfall events occur during the works, there will be a requirement to collect and treat small volumes of surface water from areas of disturbed ground (i.e. soil and subsoil exposures created during site preparation works); › This will be completed using a shallow swale and sump down slope of the disturbed ground; and water will be pumped to a proposed percolation area at least 50m from the watercourse; › The discharge of water onto vegetated ground at the percolation area will be via a silt bag which will filter any remaining sediment from the pumped water. The entire percolation area will be enclosed by a perimeter of double silt fencing; › Any sediment laden water from the works area will not be discharged directly to a watercourse or drain; › Works shall not take place during periods of heavy rainfall and will be scaled back or suspended if heavy rain is forecasted; › Daily monitoring of the compound works area, the water treatment and pumping system and the percolation area will be completed by a suitably qualified person during the construction phase. All necessary preventative measures will be implemented to ensure no entrained sediment, or deleterious matter is discharged to the watercourse; › If high levels of silt or other contamination is noted in the pumped water or the treatment systems, all construction works will be stopped. No works will recommence until the issue is resolved and the cause of the elevated source is remedied; › On completion of the works, the ground surface disturbed during the site preparation works and at the entry and exit pits will be carefully reinstated and re-seeded at the soonest opportunity to prevent soil erosion; › The silt fencing upslope of the river will be left in place and maintained until the disturbed ground has re-vegetated; › There will be no batching or storage of cement allowed at the watercourse crossing; › There will be no refuelling allowed within 50m of the watercourse crossing; and, › All plant will be checked for purpose of use prior to mobilisation at the watercourse crossing.		
Chapter 10 Air Quality					
Construction Phase					
MM70	Exhaust Emissions	EIAR Section 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 at an appropriate offsite location, thereby minimising any emissions that arise. › Turbines components will be transported to the Wind Farm Site on specified routes only (see Chapter 15 Material Assets), unless otherwise agreed with the Planning Authority. › All machinery and vehicles will be switched off when not in use and not left idling. › The majority of aggregate materials for the construction of the Proposed Development will be obtained from the borrow pits on site. This will significantly reduce the number of delivery vehicles accessing the Wind Farm Site, thereby reducing the amount of emissions associated with vehicle movements. › Deliveries of aggregate materials that cannot be source from the onsite borrow pits will be sourced from local quarries which will reduce the distance of these deliveries, thereby reducing the effect to traffic and transport in the wider area. › The Materials Recovery Facility (MRF) f will be as close as possible to the Wind Farm Site and Grid Connection to reduce the amount of emissions associated with vehicle movements.		
MM71	Dust Emissions	EIAR Section 10 CEMP Section 3	› 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 will be carried out along haul roads to ensure dust does not cause a nuisance. Water bowser movements will be carefully monitored to avoid, , increased runoff. › All plant and materials vehicles for the Proposed Development will be stored in dedicated areas within the 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 Wind Farm Site on specified haul routes only. › Grid Connection infrastructure will be transported to the Grid Connection 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 Wind Farm Site will be checked weekly by the Site Manager for cleanliness and cleaned as necessary. › The roads adjacent to the Wind Farm Site entrances will be checked weekly for damage/potholes and repaired as necessary. › The transportation of materials from the borrow pits around the Wind Farm Site will be covered by tarpaulin or similar covered vehicles.		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			› 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 . › In periods of extended dry weather, 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 an appropriately licensed waste contractor. The MRF facility will be local to the Proposed Development to reduce the amount of emissions associated with vehicle movements		
EIAR Chapter 11 Climate					
Construction Phase					
MM72	Greenhouse Gas Emissions	EIAR Section 11	› All construction vehicles and plant will be maintained in good operational order while onsite. If a vehicle requires repairs, this work will be carried out, thereby minimising any emissions that arise. › When stationary, delivery and on-site vehicles will be required to turn off engines. › 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. › Turbines and construction materials will be transported to the Site on specified routes only unless otherwise agreed with the Planning Authority. › The majority of aggregate materials for the construction of the Proposed Development will be obtained from on-site borrow pits. This will significantly reduce the amount of emissions associated with vehicle movements. › The Materials Recovery Facility (MRF) will be local to the Proposed Development site to reduce the amount of emissions associated with vehicle movements. The nearest licensed waste facility to the site is Clare Waste & Recycling Company Limited, Raheen Rd, Raheen, Tuamgraney, Co. Clare which is located approximately 21km to the east of the site. › Waste associated with the construction of the Grid Connection underground electrical cabling route will be disposed of at the closest MRF to where waste is generated along the underground electrical cabling route. › Where applicable, low carbon intensive construction materials will be sourced and utilised onsite.		
EIAR Chapter 12 Noise and Vibration					
Construction Phase					
MM73	Construction Noise	EIAR Section 12	Regarding construction activities, reference will be made to BS 5228-1:2009+A1:2014 *Code of practice for noise and vibration control on construction and open sites – Noise*, which offers detailed guidance on the control of noise & vibration from demolition and construction activities. The following measures will be adopted during construction: › Managing the hours according to the CEMP [Appendix 4-3] 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. Furthermore, a variety of practicable noise control measures will be employed. These include: › Selection of plant with low inherent potential for generation of noise and/ or vibration; › Placing of noisy / vibratory plant as far away from sensitive properties as permitted by site constraints, and; › Regular maintenance and servicing of plant items. The following list of measures will be implemented on site, to ensure compliance with the relevant construction noise criteria: › No plant used on site will be permitted to cause an on-going public nuisance due to noise. › The best means practicable, including proper maintenance of plant, will be employed to minimise the noise produced by on site operations.		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			› All vehicles and mechanical plant will be fitted with effective exhaust silencers and maintained in good working order for the duration of the contract. › Compressors will be attenuated models fitted with properly lined and sealed acoustic covers which will be kept closed whenever the machines are in use and all ancillary pneumatic tools shall be fitted with suitable silencers. › Machinery that is used intermittently will be shut down during periods when not in use. › Any plant, such as generators or pumps, which is required to operate close to NSL's outside of general construction hours will be surrounded by an acoustic enclosure or portable screen. › During the course of the construction programme, supervision of the works will include ensuring compliance with the limits detailed in Section 11.3.2 using methods outlined in British Standard BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Noise. › 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 Saturday. However, to ensure that optimal use is made of good weather periods or at critical periods within the programme (i.e. concrete pours, rotor/tower deliveries) it will be necessary on occasion to work outside of these hours. Where rock breaking is employed, the following are examples of measures that will be employed, 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. › 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. 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. In respect of the grid connection construction, a temporary solid hoarding will be employed where there are NSLs less than 40m to the activity. This can be expected to reduce noise at the NSL by 5 - 10 dB. With this mitigation measure in place, the resulting noise effect is negative, not significant and brief to temporary. Additional or alternative mitigation measures include: › 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, and; › Placing of noisy / vibratory plant as far away from sensitive properties as permitted by site constraints.		
MM74	Vibration	EIAR Section 12	Specific to blasting the following mitigation measures will be employed to control the impact during blasts: › Trial blasts may be undertaken to obtain scaled distance analysis; › Ensuring appropriate burden to avoid over or under confinement of the charge; › Accurate setting out and drilling; › Appropriate charging; › Appropriate stemming with appropriate material such as sized gravel or stone chipping; › Delay detonation to ensure small maximum instantaneous charges; › Decked charges and in-hole delays; › Blast monitoring to enable adjustment of subsequent charges; › Good blast design to maximise efficiency and reduce vibration;		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			› Avoid using exposed detonating cord on the surface.		
EIAR Chapter 13 Cultural Heritage					
Construction Phase					
MM75	Recorded Monuments at the Wind Farm Site	EIAR Section 13	One recorded monument is located within the proposed Wind Farm Site. It comprises a megalithic tomb – wedge tomb (CL044-068—) situated c. 22m east of an existing forestry track. The tomb is situated c. 347m SE of T4, c. 428m SW of T6 and c. 355m NW of T7. The nearest proposed infrastructure comprises the proposed new road to T7 which is located c. 77m to the east. While no direct effects to the monument are identified some mitigation is proposed in order to avoid accidental damage to the tomb during the construction stage of the Proposed Development. **Mitigation measures:** › A buffer zone measuring 30m will be established around megalithic tomb CL044-068— prior to the commencement of construction works. The buffer will comprise durable temporary fencing with 'keep out' signage. The requirement for the buffer zone and associated signage will be included in the CEMP. › No ground works or storage of materials or tracking of machinery will take place within the buffer zone.		
MM76	Recorded Monuments along the Grid Connection	EIAR Section 13	Five recorded monuments are located within 100m of the proposed Grid Connection route. No direct effects to the monuments themselves are identified. The proposed Grid Connection route extends through the Zone of Notification for three of the recorded monuments and therefore mitigation measures will be implemented during construction works in order to avoid any potential negative effects arising during such works. **Mitigation Measures:** › The proposed Grid Connection will extend along and within the east side of the public road where it extends past church and graveyard CL053-032001- and 002- in order to avoid potential direct effects to any sub-surface archaeological features which may exist in this area. › Archaeological monitoring will be carried out along the relevant sections of the underground electrical cabling route where the latter extends through the ZoN for monuments CL053-032001- and 002- Church and graveyard and CL053-031— Enclosure. › A report on the monitoring will be compiled on completion of the work and submitted to the NMS and the Planning Authority. › Further mitigation including preservation in situ (avoidance), preservation by record (excavation) may be required depending on the results of the monitoring.		
MM77	Works along the Turbine Delivery Route	EIAR Section 13	The proposed overrun area at Aharinaghbeg townland is located within the Zone of Notification for recorded monument CL053-007— Enclosure. At its closest point the works will measure c. 13m from the outer extent of the enclosure. No works to the monument itself will take place. Given the proximity to the monument, however, and the location of the works within the Zone of Notification for same mitigation measures are recommended in order to avoid any accidental damage to the monument. **Mitigation Measures:** › A buffer zone of 10m will be established around recorded monument CL053-007— Enclosure prior to the commencement of any works. The buffer will comprise durable temporary fencing with 'keep out' signage. The requirement for the buffer zone and associated signage will be included in the CEMP. › Archaeological monitoring of any ground works associated with the works along the TDR within the ZoN for recorded monument CL053-007— Enclosure. › A report on the monitoring will be compiled on completion of the work and submitted to the NMS and the Planning Authority. › Further mitigation including preservation in situ (avoidance), preservation by record (excavation) may be required depending on the results of the monitoring.		
MM78	Sub Surface Archaeological Potential	EIAR Section 13	› Pre-development archaeological testing of proposed infrastructure will be carried out under licence from the National Monuments Service. Given that the Site is largely under coniferous forestry plantations it is proposed that the archaeological testing will be carried out after the necessary clear-felling of forestry has taken place. This will ensure adequate machine access to all areas of proposed infrastructure in order to facilitate the programme of archaeological testing. › A report on the testing will be compiled on completion of the work and submitted to the NMS and the Planning Authority. › Further mitigation including preservation in situ (avoidance), preservation by record (excavation), buffer zones may be required depending on the results of the testing.		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			› Archaeological monitoring of all groundworks during the construction stage of the Proposed Development by a licensed archaeologist. › A report on the monitoring will be compiled on completion of the work and submitted to the NMS and the Planning Authority. › Further mitigation including preservation in situ (avoidance), preservation by record (excavation), buffer zones may be required depending on the results of the monitoring. › Pre-development archaeological testing of the proposed overrun areas at Kilmore townland and at the proposed temporary transition compound will be carried out under licence from the National Monuments Service. › 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), buffer zones may be required depending on the results of the testing.		
MM79	Newly Recorded Monuments	EIAR Section 13	› A walk-over survey of the proposed Wind Farm following clear-felling of dense forestry will be carried out by a suitably qualified archaeologist. › A report on the walk-over survey will be compiled on completion of same and will detail the nature and location of any potential archaeological sites/monuments identified. › Further mitigation such as preservation in situ (avoidance), preservation by record (excavation) or buffer zones may be required depending on the results of the walk-over survey.		
MM80	Features of Local Cultural Heritage Merit	EIAR Section 13	› A buffer zone of 20m will be established around ruinous stone structure CH1 prior to the commencement of any works. The buffer will comprise durable temporary fencing with 'keep out' signage. The requirement for the buffer zone and associated signage will be included in the CEMP. › No ground works or storage of materials or tracking of machinery will take place within the buffer zone. › A photographic and descriptive record of a sample of field boundaries impacted by construction works associated with the development will be carried out by the monitoring archaeologist and included in the monitoring report.		
Chapter 15 Material Assets					
Construction Phase					
MM81	Services	EIAR Chapter 15	The mitigation measures include the following: › 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.		
MM82	Waste Generation	EIAR Chapter 15	The following mitigation measures will be implemented: › 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 Proposed Development 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 closest, authorised municipal waste facility is located approximately 9.2km south of the Proposed Development site, at Limerick City, Co. Limerick. › Extensive waste categorisation will be in place to ensure the highest possible quality of recycling of the respective categories and to prevent an accumulation of pollutants in the material cycle – it is anticipated that the following waste types, at a minimum, will be segregated: ○ Electrical Waste ○ Plastics; ○ Oils; ○ Metals; ○ Glass; and ○ Timber.		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			› To minimise the generation of waste and waste disposed to landfill, wastes will be managed in accordance with the waste hierarchy and relevant regulatory controls. › Waste will be clearly labelled and segregated on site. Measures will be taken to ensure that wastes cannot blow away. › Housekeeping measures will be followed for the storage of materials to ensure that materials are protected as much as possible. › All waste materials will be stored in skips or other suitable receptacles in designated areas of the site. › Any hazardous wastes generated (such as chemicals, fuels and oils) will also be segregated and will be stored in appropriate receptacles (in suitably bunded areas, where required). › A waste manager will be appointed by the main contractor(s) to ensure effective management of waste during the construction works. › All staff will be provided with training regarding the waste management procedures; › All waste leaving site will be reused, recycled or recovered where possible to avoid material designated for disposal. › All waste leaving the site will be transported by suitable permitted contractors and taken to suitably registered, permitted or licenced facilities; and › All waste leaving the site will be recorded and copies of relevant documentation maintained. As a minimum, the following waste management data will be provided: ○ Quantity of materials and waste removed from site by type in volume and weight. ○ Outcome of the materials and waste on and off site. ○ Waste transfer notes. ○ Hazardous waste consignment notes.		
Chapter 15 – Traffic					
Construction Phase					
MM83	Traffic	EIAR Section 15	**Mitigation by Design:** Mitigation by design measures include the following; › Selection of the most appropriate delivery route to transport the wind turbine components, requiring the minimum remedial works to accommodate the vehicles as set out in Section 15.1.8 of the EIAR. › Implementation of temporary alterations to the highway network at locations identified in Section 15.1.8 of the EIAR. **Mitigation Measures During the Construction Stage:** The construction of this development will require significant coordination and the following comprehensive set of mitigation measures will be put in place before and during the construction stage of the project in order to minimise the effects of the additional traffic generated by the proposed Wind Farm and Grid Connection. **Delivery of abnormal sized loads** The following are the main points to note for these deliveries. These will take place after peak evening traffic: › The delivery of turbine components is a specialist transport operation with the transportation of components carried out at night when traffic is at its lightest and the impact minimised. › The deliveries will be made in consultation with the Local Authority and An Garda Síochána. › It is estimated that 72 abnormal sized loads will be delivered to the site, comprising 15 convoys of 5, undertaken over 15 separate nights. › These nights will be spread out over an approximate period of 3 weeks and will be agreed in advance with the relevant authorities › In order to manage each of the travelling convoys, for each convoy there will be two police escort vehicles that will stop traffic at the front and rear of the convoy of 5 vehicles. › There will also be two escort vehicles provided by the haulage company for each convoy.		

Ref. No.	Reference Heading	Reference Location	Mitigation Measure	Audit Result	Action Required
			Other Traffic Management Measures A **Traffic Management Plan (TMP)** is provided specifying details relating to traffic management and is included as Appendix 15-2 the EIAR. Prior to the commencement of the construction phase of the Proposed Development a detailed Traffic Management Plan will be prepared by the Contractor for agreement with the relevant local authorities and An Garda Síochána. In the event An Bord Pleanála decides to grant consent for the Proposed Development, the final TMP will address the requirements of any relevant planning conditions, including any additional mitigation measures which are conditioned by the Board. The TMP prescribes the following: › **Traffic Management Coordinator** – a competent Traffic Management Co-ordinator will be appointed for the duration of the 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 the relevant County Councils (Clare and Limerick) in advance of deliveries of turbine components to site. Liaison with the Local Authorities and Transport Infrastructure Ireland (TII) will be carried out where required regarding requirements such as delivery timetabling. The programme will ensure that deliveries are scheduled in order to minimise the demand on the local network and minimise the pressure on the access to the site. › **Temporary traffic management** measures during construction of Wind Farm Site at access junctions during construction – Temporary measures including signage at access Junctions B at Sallybank, C and D at Snaty. › **Temporary traffic management** measures during construction of Grid Connection – Including signage and implementation of temporary traffic diversions. › **Temporary traffic signs** and traffic management measures for the construction phase of the proposed temporary transition compound on the N69 – As part of the traffic management measures temporary traffic signs will be put in place at the access points for the transition zone located on the N69. 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). Construction staff (flagman) will be present at key junctions during peak delivery times. This will include a request to TII / LC&CC for a temporary speed reduction for the 85 day construction period. › **Information to locals** – Locals in the area will be informed of any upcoming traffic related matters e.g. temporary lane/road closures (where required) or delivery of turbine components at night, via letter drops and posters in public places. Information will include the contact details of the 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** – Where required by the Local Authorities, a pre-condition survey of roads associated with the Proposed Development will be carried out immediately prior to construction commencement to record an accurate condition of the road at the time. A post construction survey will be carried out after works are completed to ensure that any remediation works are carried out to a satisfactory standard. The timing of these surveys will be agreed with the local authority. All road surfaces and boundaries will be re-instated to pre-development condition, as agreed with the Local Authority Engineers. › **Liaison with the relevant local authority** - Liaison with the County Councils and An Garda Síochána will be carried out during the delivery phase of the large turbine vehicles, when an escort for all convoys will be required. Once the surveys have been carried out and "prior to commencement" status of the relevant roads established, (in compliance with the provisions of the CEMP), the relevant Roads Sections will be informed of the names and contact numbers for the Project Developer/Contractor Site Manager as well as the Site Environmental Manager. › **Implementation of temporary alterations to road network at critical locations** – at locations highlighted in section 15.1.8. In addition, in order to minimise the impact on the existing environment during turbine component deliveries the option of blade adaptor trailers will also be used where deemed practicable. › **Identification of delivery routes** – These routes will be agreed with the County Councils and adhered to by all contractors. › **Delivery times of large turbine components** - The management plan will include the option to deliver the large wind turbine plant components at night in order to minimise disruption to general traffic during the construction stage. › **Travel plan for construction workers** – While the assessment above has assumed the worst case in that construction workers will drive to the site, the construction company will be required to provide a travel plan for construction staff, which will include the identification of routes to / from the site. › **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. › **Re-instatement works** - All road surfaces and boundaries will be re-instated to pre-development condition, as agreed with the local authority engineers.		

7. MONITORING PROPOSALS

All monitoring proposals relating to the pre-commencement and construction phase of the Proposed Development were set out in various sections of the EIAR, NIS and Biodiversity Enhancement Plan prepared as part of the planning permission application to An Board Pleanála.

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.

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 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 Monitoring Measures

Ref. No.	Reference Heading	Reference Location	Monitoring Measure	Frequency	Reporting Period	Responsibility
Pre-Construction Phase						
MX1	Forestry Felling Drainage Management	EIAR Section 4	Before the commencement of any felling works, an Environmental Clerk of Works (ECoW) will be appointed to oversee the keyhole 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 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 Section 3.4 (Monitoring and Recording) and Appendix 3 (Site Monitoring Form (Visual Inspections)) of the Forestry & Freshwater Pearl Mussel Requirements (DAFM, 2008). › 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.	As Required	Weekly	ECoW
MX2	Drainage Maintenance and Inspection	EIAR Section 9	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 by the ECoW, 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.	As Required	Weekly	ECoW
MX3	Invasive Species	EIAR Section 6 CEMP Section 3	A pre-commencement survey for invasive species within the footprint of the Proposed Wind Farm Site will be carried out by a suitably qualified ecologist to ensure there is no new growth of Third Schedule invasive species in these areas. If additional invasive species are recorded within the construction areas, an Invasive Species Management Plan will be prepared in advance of construction which will incorporate the measures necessary to prevent spread additional to the measures laid out below.	Once	As required	Project Ecologist
MX4	Flora and Fauna - Otter	EIAR Section 6	A pre-commencement confirmatory otter survey will be undertaken in accordance with standard best practice guidance prior to the commencement of site works.	Once	As required	Project Ecologist

Ref. No.	Reference Heading	Reference Location	Monitoring Measure	Frequency	Reporting Period	Responsibility
MX5	Flora and Fauna - Badger	EIAR Section 6	From a precautionary basis, a pre-commencement badger survey will be undertaken by a qualified ecologist in accordance with standard best practice guidance prior to the commencement of site works to ensure that no additional setts in close proximity to proposed infrastructure have been built. In the event that a badger sett is identified within or immediately adjacent to the Proposed Development footprint, mitigations as per the above referenced TII document will be implemented for the new sett.	Once	As Required	Project Ecologist
Construction Phase						
MX6	Drainage Maintenance and Inspections	CEMP Section 3 CEMP Section 4	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 impacts, 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. 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. Regular inspections (weekly and monthly) of all installed drainage features will be undertaken. Additional event based inspections will also be completed, i.e. after heavy rainfall in order to check for blockages and to ensure there is no build-up of standing water at parts of the drainage systems where it is not intended. The inspection of the drainage system will be the responsibility of the ECoW or the supervising hydrologist.	Daily/Weekly	As Required	ECoW
MX7	Roles and Responsibilities	CEMP Section 4	In general, the ECoW will maintain responsibility for monitoring the works and Contractors/Sub-contractors from an environmental perspective. The ECoW will act as the regulatory interface on environmental matters by reporting to and liaising with Clare County Council and other statutory bodies as required. The main contractor 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), and to monitor all site works and to ensure that methodologies and mitigation are followed throughout construction to avoid negatively impacting on the receiving environment.	As Required	Weekly	ECoW
MX8	Project Hydrologist	CEMP Section 4	Complete ongoing inspection and monitoring of the development, particularly in areas of drainage control, through all phases of construction (including pre, during and post construction) and ensure construction is carried out as specified in the EIAR, and in relevant planning conditions.	As Required	Weekly	ECoW
MX9	Project Geotechnical Engineer	CEMP Section 4	› 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 Site Supervisor/Construction Manager; › Ensuring that identified hazards are listed in the Construction Risk Register and that these are subject to ongoing monitoring; and, › Ongoing inspection and monitoring of the development, particularly in areas of peatland and the 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.	Monthly	Monthly	Project Geotechnical Engineer
MX10	Birds	EIAR Section 7	Pre-commencement surveys will be undertaken prior to the initiation of any site clearance or enabling works at the Wind Farm Site, with particular attention focused on previously identified hen harrier nest/roost locations. The phasing and programming of construction work will be reviewed by the contractor in consultation with the developer and their ecological advisors in light of the results of the pre-commencement bird surveys. If an	As required	As required	Project Ornithologist

Ref. No.	Reference Heading	Reference Location	Monitoring Measure	Frequency	Reporting Period	Responsibility
			active nest / roost location of a protected Annex 1 species are discovered, no works shall be undertaken within a species-specific buffer (Forestry Commission Scotland, 2006; Goodship and Furness 2022; Ruddock and Whitfield, 2007) in line with best practice. The Ecological Clerk of Works (ECoW) will liaise with and seek advice on suitable buffer distances with an ornithologist. The ECoW will be responsible for demarcating and monitoring observance of the exclusion zones as well as communicating the location of the exclusion zones to site staff on an ongoing basis. The ECoW should carry out at a minimum daily checks of exclusion zones to ensure there is no incursion into these areas. During the construction phase focused breeding season monthly surveys (March to August inclusive) of historical hen harrier nest sites and all suitable habitat within 750 m of the development footprint and/or all works areas will be carried out. The survey methods will follow that outlined in NatureScot (2019) guidance on raptor searches. Vantage point watches will be carried out over areas of suitable hen harrier breeding habitat to locate any active nests by an Ornithologist. The ornithologist will be required to submit written records of survey work completed and findings to the client / client's representative on a monthly basis. Findings that require immediate action will be conveyed to the client / client's representative and the contractor as soon as the issue arises by phone followed thereafter by written advice. 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 clearly marked off to alert all personnel on site to the suspension of works within that area. The ornithological monitoring programme may require amendment or adaptation from time to time during the construction phase in response to changes in the baseline environment where species, particularly hen harrier, are discovered to be using areas of the site or adjacent to the site that were previously not used. Any changes to the monitoring programme will be notified and agreed with the client / client representative and will be clearly documented by the ECoW, specialist ornithologist, contractor and client / client's representative.			
MX11	Plant and Equipment Inspections	EIAR Section 9 CEMP Section 4	The plant used during construction will be regularly inspected for leaks and fitness for purpose	As Required	Monthly	ECoW
MX12	Excavation Dewatering	EIAR Section 9	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	Daily	Daily	EcoW/Suitably qualified person
MX13	Dust	EIAR Section 5	In periods of extended dry weather, dust suppression will be implemented along haul roads to ensure dust does not cause a nuisance. 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 by the environmental clerk of works, as the application of too much water may lead to increased runoff.	As required	As required	ECoW
MX14	Surface Water Quality during Directional Drilling	EIAR Section 9	Daily monitoring of the compound works area, the water treatment and pumping system and the percolation area will be completed by a suitably qualified person during the construction phase. All necessary preventative measures will be implemented to ensure no entrained sediment, or deleterious matter is discharged to the watercourse.	Daily	Daily	EcoW/Suitably qualified person
MX15	Clear Felling of Coniferous Plantation	EIAR Section 8	**Surface Water Quality Monitoring** Sampling will be completed by the ECoW 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; › It is advantageous if the upstream location is outside/above the forest in order to evaluate the impact of land-uses other than forestry;	As required	As required	ECoW

Ref. No.	Reference Heading	Reference Location	Monitoring Measure	Frequency	Reporting Period	Responsibility
			› 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. Also, daily surface water monitoring forms will also be utilised at every works site near any watercourse. These will be taken daily and kept on site for record and inspection.			
MX16	Underground Cabling	EIAR Section 12	In respect of the Grid Connection construction, a temporary solid hoarding will be employed where there are NSLs less than 40m to the activity. This can be expected to reduce noise at the NSL by 5 - 10 dB. With this mitigation measure in place, the resulting noise effect is negative, not significant and brief to temporary. Additional or alternative mitigation measures include: › 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, and; › Placing of noisy / vibratory plant as far away from sensitive properties as permitted by site constraints.	As required	As required	Acoustician
MX17	Proposed Grid Connection Archaeological Monitoring	EIAR Section 13 CEMP Section 2.4	› The proposed Grid Connection will extend along and within the east side of the public road where it extends past church and graveyard CL053-032001- and 002- in order to avoid potential direct effects to any sub-surface archaeological features which may exist in this area. › Archaeological monitoring will be carried out along the relevant sections of the underground electrical cabling route where the latter extends through the ZoN for monuments CL053-032001- and 002- Church and graveyard and CL053-031— Enclosure. › A report on the monitoring will be compiled on completion of the work and submitted to the NMS and the Planning Authority. › Further mitigation including preservation in situ (avoidance), preservation by record (excavation) may be required depending on the results of the monitoring.	As required	As required	Project Archaeologist
MX18	Proposed Turbine Delivery Route Archaeological Monitoring	EIAR Section 13 CEMP Section 2.4	› Archaeological monitoring of any ground works associated with the works along the Turbine Delivery Route within the ZoN for recorded monument CL053-007— Enclosure. › A report on the monitoring will be compiled on completion of the work and submitted to the NMS and the Planning Authority. › Further mitigation including preservation in situ (avoidance), preservation by record (excavation) may be required depending on the results of the monitoring.	As required	As required	Project Archaeologist
MX19	Archaeological Monitoring at Proposed Wind Farm	EIAR Section 13 CEMP Section 2.4	› Archaeological monitoring of all groundworks during the construction stage of the Proposed Development by a licensed archaeologist. › A report on the monitoring will be compiled on completion of the work and submitted to the NMS and the Planning Authority. › Further mitigation including preservation in situ (avoidance), preservation by record (excavation), buffer zones may be required depending on the results of the monitoring.	As required	As required	Project Archaeologist
MX20	Archaeological Monitoring of Features of Local Cultural Heritage Merit	CEMP Section 2.4 EIAR Section 13	› A photographic and descriptive record of a sample of field boundaries impacted by construction works associated with the development will be carried out by the monitoring archaeologist and included in the monitoring report.	As required	As required	Project Archaeologist

Ref. No.	Reference Heading	Reference Location	Monitoring Measure	Frequency	Reporting Period	Responsibility
			Operational Phase Monitoring			
MX21	Birds	EIAR Section 7	These surveys will aim to monitor ongoing hen harrier activity within the wind farm. A comprehensive survey scope is proposed in this regard. Survey methods employed for operational monitoring will be in line with guidelines issued by the Scottish Natural Heritage (SNH, 2009). operational monitoring will be undertaken in Years 1, 2, 3, 5, 10 and 15 of the lifetime of the wind farm. Operational monitoring will include vantage point surveys, breeding bird surveys to monitor hen harrier activity and a programme of regular corpse searching of birds that may potentially collide with operating turbines during the operational phase of the wind farm project. The following individual components are proposed: › Monthly flight activity surveys: vantage point surveys. › Breeding Bird surveys: hen harrier monitoring. › 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 monitoring is comprehensive and considered entirely adequate in this regard. The results of this monitoring will be reported to the Planning Authority following each monitoring year and will include recommendations that may inform additional mitigation or adaptation if required. In addition to the outlined bird surveys, annual monitoring of the compensation and enhancement lands will be undertaken. Please refer to Appendix 6-5 for details.	Various	As required	Project Ornithologist
MX22	Birds	EIAR Section 7	During monitoring years, operational breeding bird surveys will be conducted to monitor hen harrier breeding activity at the Wind Farm Site. Survey methodology will be similar to methods employed for baseline EIAR surveys which will allow a comparison of data to be made for each monitoring year. The timing of visits will follow the recommendations of Hardey *et al.* (2013). Surveys will be conducted over areas of suitable breeding habitat for hen harrier to establish breeding territories present within the Wind Farm Site. A total of four site visits will be undertaken during the bird breeding season for each monitoring year and timed to coincide with the core breeding period April - July. The number of surveys days required per visit will be established based on requirements to establish hen harrier territories within the Wind Farm Site. Notes will be recorded on nesting and territorial behaviour and breeding signs using standard BTO codes. Non-breeding behaviour such as birds flying over the site will also be recorded.	As required	As required	Project Ornithologist
MX23	Birds	EIAR Section 7	The compensation and enhancement lands for hen harrier will be the subject of annual monitoring to assess the effectiveness of the measures proposed and employed and to contribute to advances in habitat management methods, which can be applied to future similar projects. The monitoring can also aid adaption and implementation of improved methods and measures as they emerge, or intensification of successful measures deployed from farm plan to farm plan. The monitoring measures will include as relevant: › The areas proposed for compensation and enhancement will be the subject of ongoing monitoring during the operational phase of the wind farm to ensure it is offering supporting habitat for breeding hen harrier. The ongoing monitoring will take place during the breeding bird season. The monitoring will seek to identify whether hen harrier are utilising the areas under active management for foraging and will be conducted by way of vantage point surveys (six hours in duration). These surveys will be undertaken once a month March to August inclusive, each year. › Passerine point counts will be undertaken monthly from April to September inclusive in each monitoring year at each of the compensation and enhancement areas. The monitoring aims to investigate to what extent enhancement measures e.g. seed crops, increase the availability of prey species for hen harrier. These surveys will be conducted each year. › Areas of favourable hen harrier foraging habitat (i.e. scrub, blanket bog, wet heath and heather banks) within the compensation and enhancement areas should be accurately mapped and should be monitored annually to check that the areas so covered have not altered in	As required	As required	Project Ornithologist

Ref. No.	Reference Heading	Reference Location	Monitoring Measure	Frequency	Reporting Period	Responsibility
			size and that the grazing regime that is in place is maintaining the current state of these habitats (i.e. neither poaching nor overgrowth of open areas is occurring). As well as mapping, this monitoring will be recorded by means of fixed-point photography. › Vegetation sampling: A number of fixed relevé sites (i.e. permanent quadrats) will be set up in the compensation and enhancement areas. Data will be recorded prior to the commencement of habitat enhancement activities. The character of each relevé will be recorded (e.g. species proportions present using Domin scale, vegetation structure) and photographs will be taken of each relevé from a fixed point. These relevés will then be re-examined yearly following commencement of the plan in place to establish the extent of habitat improvement resulting from management practices. Following commencement of the plan, the efficacy of the enhancement measures will be reviewed yearly. Analysis of the data collected will be the basis for a review of the measures and techniques employed. This analysis will be contained in an annual report. Should any adjustments to the plan be deemed necessary or advisable, these should be undertaken in consultation with the NPWS prior to any alterations to the plan. Reports detailing the monitoring works carried out, the results obtained and a review of their success, along with any suggestions for amendments to the plan will be prepared and submitted to the planning authority yearly following commencement of the plan. The farm plan agreements and enhancement area plan agreements will provide for such amendments.			
MX24	Bats	EIAR Section 6	As per NIEA and NatureScot Guidance, at least 3 years of post-construction monitoring is required to assess the effects of construction related habitat modification on bat activity i.e. the 50 metre separation between the proposed turbine blade tips and the nearest landscape feature. For example, it may be that the construction of wind turbines reduces bat activity patterns at the site relative to that recorded pre-construction, due to the implementation of the 50-metre buffer described above, and to a level at which there is no longer potential for significant effects on bats (NatureScot, 2021). Post-construction monitoring will include static detector surveys, walked survey transects and corpse searching to record any bat fatalities resulting from collision. At a minimum, monitoring will be conducted for 3 years post-construction. The results of post-construction monitoring shall be utilised to assess changes in bat activity patterns post-construction and to monitor the implementation of the mitigation strategy. 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 would be analysed to confirm the efficacy of the curtailment during different periods of bat activity. At the end of each year, the efficacy of the curtailment programme will be reviewed, and any identified efficiencies incorporated into the curtailment programme. This approach allows for an evidence-based review of the potential or bat fatalities at the site, post construction, to ensure that the necessary measures, based on a new baseline post-construction, are implemented for the protection of bat species locally.	As required	As required	Bat Ecologist

8. PROGRAMME OF WORKS

8.1 Construction Schedule

The construction phase will take approximately 18-24 months to complete from starting on site to the commissioning of the electrical system and export of electricity from site.

The EIAR stipulated that in the interest of breeding birds, construction would not commence during the breeding bird season, which runs from March to August. The EIAR also stipulated that the removal of conifers (forestry) by felling will take place between the 1st of September and the end of February, thus avoiding the period from the 1st of March to the 31st of August inclusive, as prescribed in the Wildlife Acts.

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 Friday and 7 a.m. to 2 p.m. on Saturdays, 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 of the main construction task items are outlined in Figure 8-1 below, where 1st January has been selected as an arbitrary start date for construction activities.

ID	Task Name	Task Description	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
1	Site Health and Safety									
2	Site Compounds	Site Compounds, site access, fencing, gates								
3	Site Roads	Construction/upgrade of roads; install drainage measures & water protection measures								
4	Turbine Hardstands	Excavate/pile for turbine bases where required								
5	Turbine Foundations	Fix reinforcing steel and anchorage system, erect shuttering, concrete pour								
6	Substation Construction and Electrical Works	Construct substation, underground cabling between turbines								
7	Backfilling and Landscaping									
8	Grid Connection									
9	Turbine Delivery and Erection									
10	Substation Commissioning									
11	Turbine Commisioning									

Figure 8-1 Indicative Construction Schedule

9. COMPLIANCE AND REVIEW

9.1 Site Inspections and Environmental Monitoring

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 impacts, 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.

9.2 Auditing

The Contractor will be responsible for implementing the mitigation and monitoring measures specified throughout the EIAR and compiled in Sections 6 and 7 of this CEMP. The Contractor will also be responsible for ensuring that all construction staff understand the importance of implementing the mitigation measures. The implementation of the mitigation measures will be overseen by the environmental clerk of works or supervising hydrogeologists, environmental scientists, ecologists or geotechnical engineers, depending on who is best placed to advise on the implementation.

Environmental audits will be carried out during the construction phase of the project. In contrast to monitoring and inspection activities, audits are designed to highlight 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 contractor staff or alternatively by external personnel acting on their behalf. It is important that an impartial and objective approach is adopted. 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 project management personnel.

9.3 Environmental Compliance

The following definitions will apply in relation to the classification of Environmental Occurrences during construction of the proposed renewable energy development:

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.

9.4 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 ECoW 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.

9.5 Construction Phase Review

This CEMP will be updated and reviewed prior to commencement of construction, and also every six months thereafter during the construction phase of the project.