APPENDIX 4-4

CONSTRUCTION AND ENVIRONMENTAL MANAGEMENT PLAN

Planning and Environmental Consultants

Construction and Environmental Management Plan

Lyrenacarriga Wind Farm, Co. Waterford & Co. Cork

DOCUMENT DETAILS

Client:	**Curns Energy Ltd.**
Project Title:	**Lyrenacarriga Wind Farm, Co. Waterford & Co. Cork**
Project Number:	**170749**
Document Title:	**Construction and Environmental Management Plan**
Document File Name:	**CEMP F– 2021.01.04 – 170749**
Prepared By:	**MKO** **Tuam Road** **Galway** **Ireland** **H91 VW84**

Planning and Environmental Consultants

Rev	Status	Date	Author(s)	Approved By
01	Draft	05/11/2020	SC	OC
02	Draft	05/11/2020	SC	OC
03	Draft	11/12/2020	SC	OC
04	Final	04/01/2021	SC	OC

Table of Contents

TABLE OF TABLES

TABLE OF PLATES

TABLE OF FIGURES

1. INTRODUCTION

This Construction and Environmental Management Plan (CEMP) has been developed by MKO on behalf of Curns Energy Ltd., who intend to apply to An Bord Pleanála for planning permission to construct a wind energy development and all associated infrastructure. This CEMP has been prepared in conjunction with the Environmental Impact Assessment Report (EIAR) which will accompany the planning application for the Proposed Development to be submitted to the competent authority .

Should the project secure planning permission, the CEMP will be updated, in line with all conditions and obligations which apply to any grant of permission. The CEMP should be read in conjunction with the EIAR 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 wind farm development.

Triggers for amendments to the CEMP will include:

- When there is a perceived need to improve performance in an area of environmental impact;
- As a result of changes in environmental legislation applicable and relevant to the project;
- Where the outcomes from auditing establish a need for change;
- Where Work Method Statements identify changes to a construction methodology to address high environmental risk; and
- As a result of an incident or complaint occurring that necessitates an amendment.

This report provides the environmental management framework to be adhered to during the pre-commencement, construction and operational 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 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 Background

The CEMP has been prepared with reference to the following reports, which have been produced in support of the planning application:

- MKO (December 2020). *Lyrenacarriga Wind Farm, Co. Waterford/Cork. Environmental Impact Assessment Report.* Doc. File Name: EIAR - 2021.01.04 - 170749
- MKO (December 2020) *Lyrenacarriga Wind Farm, Co. Waterford/Cork. Natura Impact Statement.* Doc. File Name: NIS - 2021.01.04 - 170749
- Fehily Timoney and Company (December 2020) *Lyrenacarriga Wind Farm, Co. Waterford/Cork Geotechnical Assessment Report.* Doc. File Name: Appendix 4-2 - Geotechnical Assessment Report - Final - 2020.12.21

The reports listed above should be consulted for detailed information as required.

1.2 Scope of Construction and Environmental Management Plan

This report is presented as a guidance document for the construction and operational phases of the proposed Lyrenacarriga Wind Farm. Where the term 'site' is used in the CEMP it refers to all works associated with the Proposed Development enabling works. The CEMP the mitigation measures and monitoring proposals that are required to be adhered to in order to construct the wind farm in an appropriate manner. The report is divided into ten sections, as outlined below.

Section 1 provides a brief introduction as to the scope of the report and details the targets and objectives of this plan.

Section 2 outlines the site and project details and provides an overview of the baseline conditions at the proposed site.

Section 3 sets out an overview of the construction methodologies for all elements of the development

Section 4 sets out details of the environmental controls on site which looks at noise and dust controls. Site drainage measures, soil management, invasive species management, traffic management and a waste management plan are also included in this section.

Section 5 sets out a fully detailed implementation plan for the environmental management of the project outlining the roles and responsibilities of the project team.

Section 6 outlines the Emergency Response Plan to be adopted in the event of an emergency in terms of site health and safety and environmental protection.

Section 7 consists of a summary table of all mitigation proposals to be adhered to during the implementation of the project, categorised into three separate headings, 1) pre-commencement measures; 2) construction-phase measures and 3) operational-phase measures.

Section 8 consists of a summary table of all monitoring requirements and proposals to be adhered to during the implementation of the project, categorised into three separate headings, 1) pre-commencement measures; 2) construction-phase measures and 3) operational-phase measures.

Section 9 sets out an anticipated programme for the timing of the works.

Section 10 outlines the proposals for reviewing compliance with the provisions of this report.

1.3 Target and Objectives

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, Appropriate Assessment Screening Report (AASR), Natura Impact Statement (NIS) and all associated planning documentation;
- Ensure construction works and activities are completed in accordance with all planning conditions for the development and that the CEMP is updated as required;

- Ensure construction works and activities have minimal impact/disturbance to local landowners and the local community;
- Ensure construction works and activities have no adverse effect on the integrity of any European Site;
- 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, clay and soil 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 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; and,
- 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;
- Ensure a properly designed, constructed and maintained drainage system appropriate to the requirements of the site is kept in place at all times.

2. SITE AND PROJECT DETAILS

2.1 Site Location and Description

The Proposed Development site is located approximately 5 kilometres southeast of Tallow, Co. Waterford and approximately 15 kilometres northwest of Youghal, Co. Cork. The site is accessed via local roads from the R634 Regional Road, which travels in a northwest-southeast direction between Tallow and Youghal and the R627 Regional Road, which travels in northeast-southwest direction between Tallow and Midleton.

Table 2-1 sets out the townlands where all elements of the wind farm, grid connection route and ancillary works are located.

Table 2-1 Townlands within which the Development is located

Development Works	County	Townland
Wind turbines and access roads, Grid Connection and collector cabling, Substation including battery storage, Construction Compound & Borrow pits	Cork	Lyremountain, Knockanarrig, Ballyanthony, Rearour North, Breeda
	Waterford	Lyrenacarriga, Dunmoon South, Coolbeggan West, Propoge, Ballynatray Commons, Ballycondon Commons
Accommodation works on turbine delivery route	Cork	Breeda and Rearour South (one works location, at boundary of these townlands)
	Waterford	Killea and Newtown (one works location, at boundary of these townlands)

The Proposed Development will comprise the construction of 17 No. wind turbines. The proposed turbines will have a maximum blade tip height of up to 150 metres. The proposed turbines will have a maximum blade tip height of up to 150 metres. The turbine model has not been chosen. The exact make and model of the chosen turbine will be dictated by the energy production efficiencies of various turbines on the market at the time of turbine procurement but will not exceed the maximum size envelope as set out within the development description The development will also include associated foundations and hardstanding areas, upgrading of existing associated access roads, associated drainage, 1 no. permitted onsite electrical substation, provision of any new site access roads; the provision of underground electrical and communications cabling connecting the turbines to the proposed onsite substation and all associated site development works. All onsite wind farm cabling will be laid underground. The proposed site layout is shown in Figure 2-1 as well as the detailed site layout drawings of the Proposed Development which are included in Appendix 4-1 of the EIAR.

Current land-use on the subject site comprises coniferous forestry and agriculture. Land-use in the wider landscape comprises a mix of agriculture, low density residential and commercial forestry.

There are 51 dwellings located within one kilometre of the proposed turbine locations (plus one application for a dwelling, currently at Planning stage). The closest occupied dwelling is located approximately 700 metres from the nearest proposed turbine location.

Turbines will be delivered to the site of the Proposed Development from Waterford Harbour via the N25 through Youghal and the R634 Regional Route. Turbine delivery access to the eastern cluster will be via an access junction on the R634 Regional Road. Turbine delivery access to the western cluster will be via an access junction on the local road to the west of the site. An Outline Traffic Management Plan is located in Section 4 of this CEMP. A detailed assessment of the proposed turbine delivery route has been completed as part of Chapter 15 of the EIAR

2.2 Geological Conditions

The published soils map (www.epa.ie) for the area shows that the majority of the soils within the Proposed Development site are formed from tills (subsoils) derived from Devonian sandstone).

Deep, well-drained, mainly acidic mineral soil (AminDW) is the dominant soil type at the western cluster of the Proposed Development site with some localised areas of poorly drained mineral soils (AminPD) on the lower eastern section of the cluster.

At the eastern cluster, AminDW soils are mapped on the more elevated north-eastern and south-western sections of the cluster with AminPD mapped in the lower-lying north-western and south-eastern sections of the cluster. Alluvium is mapped along the watercourses particularly along the lower-lying central and south-eastern sections of the eastern cluster.

A map of the local subsoil cover is presented as Figure 9-1 of the EIAR (www.gsi.ie). This shows the mapped distribution of subsoil deposits around the proposed development site. The majority (>90%) of both cluster areas are overlain by tills derived from Devonian sandstone with localised areas of rock sub-crop or outcrop on the most elevated parts. A localised area of cutover bog is mapped on the southwestern corner of the eastern cluster. The mapped cutover bog does not intercept any of the Proposed Development footprint. Site mapping, observations of exposed soils and trial pits (described below) confirm these mapped conditions.

Further detail on soils and subsoils is available in Chapter 9 of the EIAR.

2.3 Hydrological Conditions

Regionally the Proposed Development site is located in the River Blackwater surface water catchment within Hydrometric Area 18 of the South Western International River Basin District (SWIRBD).

In terms of local hydrology, the northern half of the western cluster and the north-eastern tip of the eastern cluster are located (~20% of the overall site) are located in the River Bride surface water sub-catchment (Bride(Waterford)_SC0_30). The River Bride flows in an easterly direction approximately 4km to the north of the western cluster and is a major tributary to the River Blackwater. In terms of Proposed Development farm infrastructure, there is 1 no. turbine (T12) and 1 no. borrow pit from the western cluster located in the River Bride sub-catchment. The western cluster drains to the River Bride via the Glenaboy River catchment (Glenaboy_010) and Kilbeg Stream with all the aforementioned proposed infrastructure being located in the Glenaboy River catchment. There is no Proposed Development in the Kilbeg Stream catchment.

There is no proposed infrastructure from the eastern cluster located in the River Bride catchment.

The remainder of western and eastern cluster are located in the Tourig River and Glendine River surface water sub-catchments respectively (collectively these catchments are referred to as the Tourig_SC_010).

2.3.1 Flood Risk Identification

To identify those areas as being at risk of flooding in the Republic of Ireland, OPW's indicative river and coastal flood map (www.floodmaps.ie), CFRAM Preliminary Flood Risk Assessment (PFRA) maps (www.cfram.ie), Department of Environment, Community and Local Government on-line planning mapping (www.myplan.ie) and historical mapping (i.e. 6" and 25" base maps) were consulted.
No recurring flood incidents within the Proposed Development site boundary or immediately downstream were identified from OPW's flood hazard mapping. The closest mapped recurring flood events are located on the Bride River at Tallow Bridge and on the Glendine River just upstream of where it merges with the Blackwater River.

There is no text on local available historical 6" or 25" mapping for the proposed site that identify areas that are "prone to flooding" or benefitting lands (lands benefiting from the OPW Arterial Drainage Scheme).

Where complete the CFRAM Study OPW Flood Risk Assessment Maps are now the primary reference for flood risk planning in Ireland and supersede the PFRAM maps. There is no CFRAM mapping available for the area of the Proposed Development site and therefore the PFRA mapping has been reviewed. The PFRA mapping is shown in the attached FRA report.

The PFRA mapped 100-year fluvial flood zones within the Proposed Development site are typically constrained by topography and confined to land in close proximity of mapped watercourses. The proposed turbine locations, compounds, substation or borrow pits are not within any PFRA mapped fluvial flood zone as these infrastructure elements are located at least 75m from a watercourse.

Proposed infrastructure located within a mapped fluvial flood zone is limited to 2 no. existing watercourse crossing locations in the eastern cluster (these existing crossings will be upgraded as part of the development).

Small localised areas of pluvial flooding are mapped within the site within areas of low relief and/or relatively poorly draining soils/subsoils. The mapped pluvial flood zones do not affect any of the

It is a key mitigation of the Proposed Development to ensure all surface water runoff is treated (water quality control) and attenuated (water quantity control) prior to diffuse discharge at pre-existing Greenfield rates. As such the mechanism by which downstream flooding is prevented and controlled is through avoidance by design. These proposed drainage attenuation measures are described in the impact assessment section below.

2.4 Ecological Conditions

The majority of the study area is dominated by plantation forestry, comprising mainly of Sitka spruce (Picea sitchenis) and Lodgepole pine (Pinus contorta) as well as large plantations of Eucalyptus (Eucalyptus sp.). The site is accessible via a network of existing forestry access tracks and forestry rides. The remainder of the wind farm infrastructure site is dominated by Improved agricultural grassland (GA1) and Arable crops (BC1). The grid connection route is also predominantly located within Improved agricultural grassland (GA1) and existing roads.

A detailed account of each of the habitats recorded within the site is provided in Chapter 7 of the EIAR.

2.5 Archaeological Conditions

There are three recorded archaeological monuments located within the study area boundary for the wind farm site.

There is a total of one hundred and seventy (170) monuments located within 5km of the nearest turbine and are included here for purposes of establishing the archaeological context of the surrounding environs of the Proposed Development site. The details are included in Appendix 14-3 of the EIAR

An assessment of the potential impact of the turbines and associated infrastructure and substation including proposed underground grid connection based on desktop research and a comprehensive field survey concluded that while the archaeological potential of the area is high no new sites were noted within the areas proposed for development, nor are any recorded archaeological or architectural assets located therein. Direct impacts to recorded archaeological and architectural assets as a result of the turbines, substation and associated infrastructure have not been identified.

Where potential impacts are possible appropriate mitigation measures have been recommended in order to minimise any such impacts as set out in Section 8 below.

An archaeological assessment will be completed in areas prior to the commence of works. The details of the required assessment are summarised in Section 3 below.

3. CONSTRUCTION MANAGEMENT

3.1 Introduction

An experienced main contractor will be appointed for the civil works for the construction phase. The appointed contractor for the works will be required to comply with this CEMP and any revisions made to this document.

The Proposed Development will comprise of the following:

i. *Construction of up to 17 No. wind turbines with a maximum overall blade tip height of up to 150 metres;*
ii. *1 no. Meteorological Mast with a maximum height of up to 112 metres;*
iii. *Construction of 1 no. staff welfare and storage facility including waste water holding tank;*
iv. *1 no. permanent 110 kV electrical substation with 2 no. control buildings with welfare facilities, 10 no. battery containers, battery switchgear building, all associated electrical plant and equipment, security fencing, all associated underground cabling, waste water holding tank and all ancillary works;*
v. *Underground cabling connecting the turbines to the proposed substation and connection from the proposed substation to the national grid via a 110 kV loop in connection.*
vi. *Upgrade of existing tracks, roads and provision of new site access roads and hardstand areas;*
vii. *Construction of an access track in the townlands of Breeda and Rearour South to facilitate turbine delivery;*
viii. *Junction improvement works in the townland of Killea to facilitate turbine delivery;*
ix. *3 no. borrow pits;*
x. *2 no. temporary construction compounds;*
xi. *Site Drainage;*
xii. *Forestry Felling;*
xiii. *Signage; and*
xiv. *All associated site development works.*

It is proposed that the Lyrenacarriga Wind Farm will connect to the national grid via a 110 kV loop-in connection to the existing 110kV network which runs through the site.

Should the project secure planning permission, the developer and/or contractor for the main construction works will liaise directly with Cork and Waterford County Councils and An Garda Síochána in relation to securing any necessary permits to allow the works to take place including for example:

- Commencement notice
- Special Permits in relation to oversized vehicles on public roads
- Temporary Road Closures (if required)
- Road Opening Licence (if required)

Complaints will be documented in the site complaints log and the Site Manager will arrange to meet with those affected. The situation will be acted upon immediately and reviewed by the Project Manager.

An overview of the proposed anticipated Construction Methodologies is provided below.

3.2 Overview of Proposed Construction Methodology

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

- Temporary Construction Compound;
- Tree Felling
- Borrow Pits
- Site Drainage System;
- Proposed new Site Access and Roads and upgrade of existing roads;
- Watercourse Crossings
- Hard Standing Areas;
- Turbine and Anemometry Mast Foundations;
- Electricity Substation and Control Building;
- Spoil Management;
- Cable Trenching and Grid Connection and
- Turbine Delivery Route Accommodation Works.

3.2.1 Temporary Construction Compound

Two temporary construction compounds are proposed as part of the Proposed Development. Temporary Construction Compound (TCC) no. 1 is located approximately 601 metres southeast of Turbine 1 and TCC no. 2 is located 150 metres northeast of Turbine 13. Each compound measures 80 metres by 50 metres, with a footprint of 4,000 m^2 in area. The location of the proposed construction compounds is shown on the site layout drawing in Figure 2-1 (& Appendix 4-1 of the EIAR). The permitted compound area incorporates temporary site offices, staff facilities and car-parking areas.

The compound will typically be constructed as follows:

- The area to be used as the compound will be marked out at the corners using ranging rods or timber posts. Drainage runs and associated settlement ponds will be installed around the perimeter;
- The compound will likely be established using a similar technique as the floating road construction methodology as discussed below;
- A layer of geogrid will be installed 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 bunded containment area will be provided within the compound for the storage of lubricants, oils and site generators etc.;
- If necessary, the compound will be fenced and secured with locked gates, although fencing would only be utilised where significant risk of danger to third parties or vandalism/theft is envisaged; and,
- Upon completion of the project the compound will be decommissioned by backfilling the area with the material arising during excavation, landscaping with topsoil as required.
- During the construction phase, a self-contained port-a-loo with an integrated waste holding tank will be used on site for toilet facilities. This will be maintained by the service contractor on a regular basis and will be removed from the site on completion of the construction phase.

3.2.2 Tree Felling

Portions of the Proposed Development site are 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, access roads, the underground cable and the other ancillary infrastructure. Turbulence felling may also be required in the vicinity of turbine locations, the purpose of which is to avoid turbulence that can be created by the forest canopy and which can affect the performance and efficiency of the turbines.

A total of 45.6 hectares of forestry will have to be permanently felled within and around the footprint of the Proposed Development. An additional 5.4 hectares of trees will be required to be temporarily felled around all turbines in order to achieve the requirements of the bat mitigation proposal.

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 and the Forestry Regulations 2017 (SI 191/2017) and as per the Forest Service's policy on granting felling licenses for wind farm developments. The policy requires that a copy of the planning permission for the 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.

Details of the appropriate mitigation and drainage measures are included in Section 4.3 below.

3.2.3 Borrow Pits

It is proposed to develop three on-site borrow pits. Borrow pit No. 1 will be located approximately 50 metres to the southeast of Turbine No. 10, Borrow pit No. 2 will be located approximately 350 metres to the west of Turbine No. 12 and Borrow pit No. 3 will be located approximately 100 metres to the southwest of Turbine No. 14 as shown in Figure 2-1. The borrow pits will typically be excavated and backfilled as follows:

- The area to be used for both borrow pits will be marked out at the corners using ranging rods or timber posts. Drainage runs, and associated settlement ponds will be installed around the perimeter;
- The initial borrow pit excavation will involve removal of peat/organic topsoil (if present) and mineral soil to the top of bedrock. These materials will be stored temporarily or placed around the borrow pit to form berms to prevent surface water inflow to the borrow pit excavation;
- Interceptor drainage ditches will be excavated on all sides of the borrow pit to catch surface water runoff, and direct it to downstream re-distribution locations;
- The bedrock material will be extracted from the borrow pit using a rock breaking or blasting methodology and stockpiled or used as required;
- The use of material won from the borrow pit will be sequential with new road construction or turbine base formations;
- Temporary stockpiling of aggregates will be required to accommodate the cut and fill operations within the borrow pit, and the progression of access roads and turbine excavations;
- As the borrow pit excavation progress and become deeper, surface water and groundwater ingress will be removed via pumping to settlement ponds, and re-distribution locally across natural vegetated areas. Where required, additional specialist water treatment measures will be employed to ensure no deterioration in downstream water quality occurs;
- When extraction ceases within the borrow pit, the uphill face of the rock will be stepped, and deposits of soil will be placed which will assist in the re-vegetation of the rock face; and,

- The borrow pit will be reinstated using spoil material as summarised in Section 3.2.10 below,
- The extraction area of the borrow pit will have to be permanently secured and a stock-proof fence will be erected around the borrow pit to prevent access to these areas as well as the installation of appropriate health and safety signage.

3.2.4 Site Drainage System

The early establishment of temporary drainage facilities will manage the risk of impacts on watercourses on and adjacent to the site during construction. In addition, construction operations will adopt best working practices. The development of the site will need to 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 therefore need to 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 settlement ponds constructed to eliminate any material level of suspended solids within surface water running off the site. Surface water management and drainage design summarised within Section 4.2 below and Section 4.6 of the EIAR.

3.2.5 Proposed Site Access Roads

The Proposed Development requires construction of new roads in areas where existing roads are not already present as well as upgrade to existing roads to utilise the existing road network at the site as much as possible.

3.2.5.1 New Site Access Roads

New roadway will be required in areas where existing roads are not already present, or where existing sections are too steep or otherwise unsuitable for the required purpose in the case of the Proposed Development. Maximum use has been made of the existing machine tracks and fire breaks within areas of forestry to ensure that the felling area required to make way for proposed new site roads is kept to a minimum. There are approximately 4.1km of new access roads to be installed at the site. The new access roads will be constructed as follows using an excavated site road methodology which is summarised below.

- Establish alignment of the new site roads from the construction drawings and mark out the centrelines with ranging rods or timber posts;
- The road layout has been designed to avoid crossings of natural watercourses where possible;
- Where existing culverts are to be upgraded or extended, the works will be carried out to follow a method statement to be prepared in consultation with Inland Fisheries Ireland.
- The access tracks will be of single-track design with an overall width of 6m. There will be some local widening on the bends, junctions and around turbine bases for the safe passage of large vehicles;
- Any excavated road section's will, where it is considered beneficial have turf stripped over the area of the excavation and stored growing side up for reuse. This area will be oversized to facilitate the excavated subsoil material. The subsoil material will subsequently be capped with topsoil to form an earth bund around the excavated material;
- Where the Geotechnical Engineer confirms it is more suitable, a non-excavated ground bearing road will be employed. In this case a reinforced sub-base will be placed directly on the existing ground using geotextile separation layer and layers of geogrid reinforcing

as designed by the Geotechnical Engineer to achieve the bearing capacity required for the road running surface.

- All soil excavated will be used as part of the borrow pit restoration or in reinstatement areas. Topsoil will be temporarily stockpiled locally for reuse for landscaping the backfill placed above the foundations.
- The subsoil will be excavated down to a suitable formation layer of either firm clay or bedrock;
- For both excavated, the road will be constructed using well-graded granular fill, spread and compacted in layers typically of 200mm and a suitable capping layer to provide a homogeneous running surface. The thickness of layers and amount of compaction required will be subject to detailed design by Project Engineer in consultation with the Construction Manager based on the characteristics of the material and the compaction plant to be used;
- All new roadways will be constructed with a camber to aid drainage of surface water;
- For excavations in overburden and soil side slopes shall not generally be greater than 1(V): 2 or 3(H), respectively. Slacker slopes may be required if localised areas of weaker soil are encountered Design slopes will be informed by the Geotechnical Engineer;
- At bends or steep inclines from the roads, reflective snow poles will be erected to warn traffic on dark mornings and evenings that there is a turn in the road or a sharp incline beyond the site road.
- The granular fill use to complete the final running surface of the roads on site will be tested to BS812-111:1990 “Ten percent fines value”.

3.2.5.2 Upgrading of Existing Site Access Roads

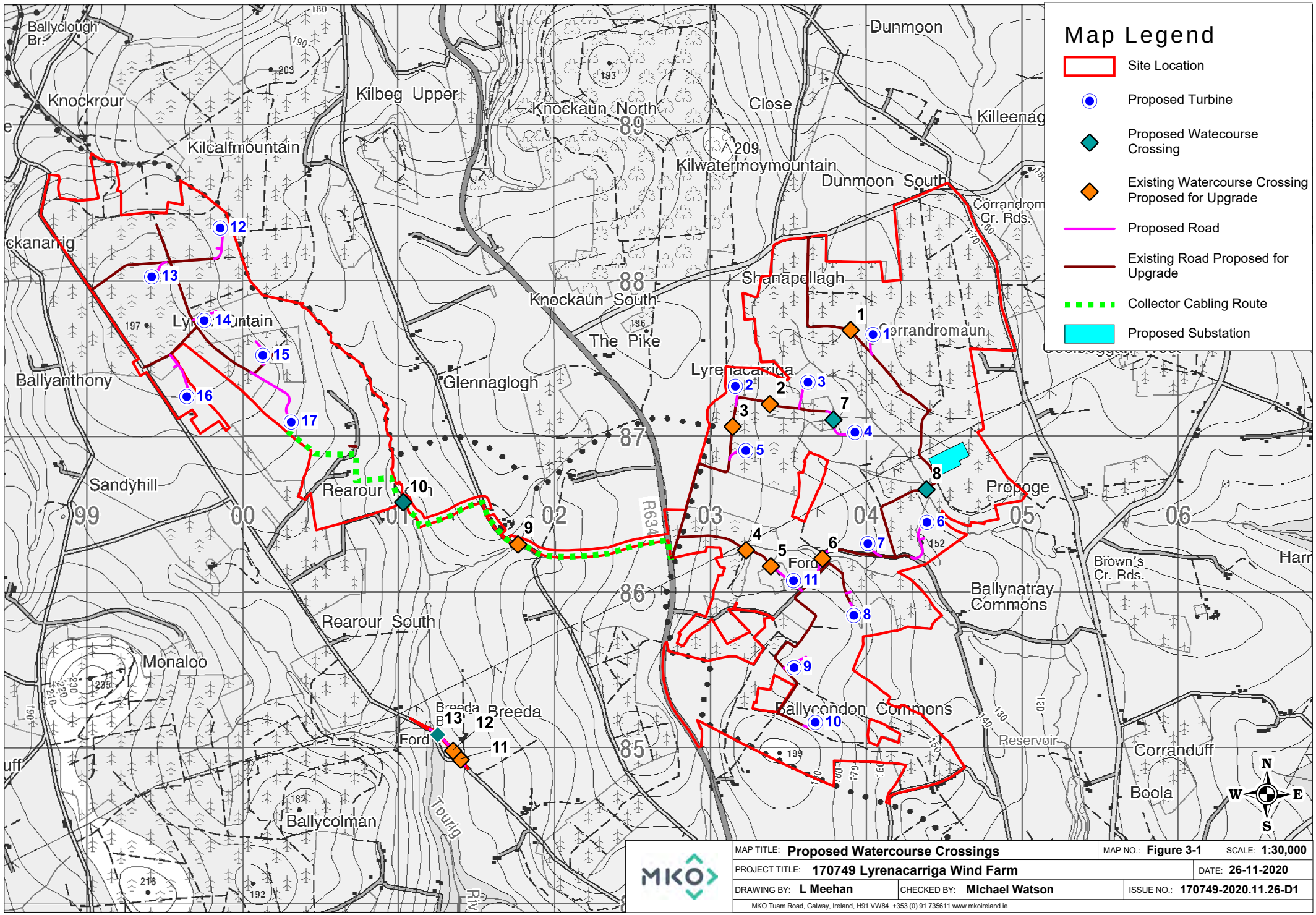
It is proposed to utilise the existing road network at the site as much as possible (approximately 10.7km will be used). These roads will require upgrading which will comprise widening of the roadway to a total running width of approximately six metres, with wider sections at corners and on the approaches to turbine locations and the laying of a new surface dressing on the existing section of roadway where necessary. The road widening will be undertaken as follows:

- If it is considered that the current road formation level is adequate to support required bearing, then no upgrade or widening works will be completed;
- Otherwise, where required, the subsoil in the existing road verge will be excavated down to a suitable formation layer and the spoil used for the restoration of borrow pits or in reinstatement areas;
- Well-graded imported granular fill will be spread and compacted in layers up to 200mm to provide a homogeneous running surface. The thickness of layers and amount of compaction required will be decided by the Construction Manager based on the characteristics of the material and the compaction plant to be used. These layers of granular fill will be brought to the same level as the top of the existing road surface;
- A layer of geogrid will be installed directly onto the top of the granular fill layer and the existing road surface where required; and,
- A layer of finer well graded stone for the running surface will be laid on the geogrid and compacted.
- Prior to any works commencing on the upgrade of existing roads, the requirement for additional roadside drainage will be considered by the Project Hydrologist in line with the proposals outlined in Section 4.2 below and Section 4.6 of the EIAR.

3.2.6 Watercourse Crossing

It is proposed that 2 no. new stream crossings and 6 no. existing stream crossing upgrades will be required as part of access road construction and upgrades on the site. In addition, a total of 3 no. existing crossings will be upgraded and 2 no. new crossings constructed on the proposed collector cabling route between the two turbine clusters and at the proposed new link road near Breeda Bridge

The locations of the crossings are shown on Figure 3-1 and in the layout drawings in Appendix 4-1 of the EIAR. Table 3-1 below summaries the watercourse crossings proposed as part of the development.



MAP TITLE: **Proposed Watercourse Crossings**		MAP NO.: **Figure 3-1**	SCALE: **1:30,000**
PROJECT TITLE: **170749 Lyrenacarriga Wind Farm**			DATE: **26-11-2020**
DRAWING BY: **L Meehan**	CHECKED BY: **Michael Watson**		ISSUE NO.: **170749-2020.11.26-D1**

MKO Tuam Road, Galway, Ireland, H91 VW84. +353 (0) 91 735611 www.mkoireland.ie

Table 3-1 Proposed New Watercourse Crossings and Existing Crossings for Upgrade

No.	Description	ITM Coordinates (m)	
		Easting	Northing
Wind Farm Access Roads			
1	Existing crossing proposed for upgrade	603,848	587,745
2	Existing crossing proposed for upgrade	603,329	587,270
3	Existing crossing proposed for upgrade	603,092	587,126
4	Existing crossing proposed for upgrade	603,177	586,333
5	Existing crossing proposed for upgrade	603,336	586,231
6	Existing crossing proposed for upgrade	603,667	586,280
7	Proposed new crossing	603,738	587,170
8	Proposed new crossing	604,334	586,722
Collector Cabling Route Between Clusters			
9	Existing crossing proposed for upgrade	601,715	586,371
10	Proposed new crossing	600,979	586,641
Access Road on Turbine Delivery Route			
11	Existing crossing proposed for upgrade	601,347	584,990
12	Existing crossing proposed for upgrade	601,298	585,047
13	Proposed new crossing	601,200	585,150

Proposed new stream crossings will be bottomless or clear span pre-cast bridges and the existing banks will remain undisturbed. No in-stream excavation works are proposed and therefore there will be no direct impact on the watercourse at the proposed crossing locations. Where the proposed underground onsite cabling route follows an existing road or road proposed for upgrade, the cable will pass over or below the culvert within the access road.

The design of the proposed crossings follows Inland Fisheries Ireland's *'Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters'* (2016). During 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 within 50 metres of the crossing construction areas.

The watercourse crossings will be constructed to the specifications of the OPW bridge design guidelines *'Construction, Replacement or Alteration of Bridges and Culverts - A Guide to Applying for Consent under Section 50 of the Arterial Drainage Act, 1945'*, and in consultation with Inland Fisheries Ireland. New watercourse crossings will require a Section 50 application (Arterial Drainage Act, 1945), which will be obtained prior to works. The river/stream crossings will be designed in accordance with OPW guidelines/requirements on applying for a Section 50 consent.

The typical construction methodology for the installation of a pre-cast concrete bottomless box culvert crossing is as follows:

- The access road on the approach either side of the watercourse will be completed to a formation level which is suitable for the passing of plant and equipment required for the installation of the watercourse crossing.
- All drainage measures along the proposed road will be installed in advance of the works.
- A foundation base will be excavated to rock or competent ground with a mechanical excavator with the foundation formed in-situ using a semi-dry concrete lean mix. The base will be excavated along the stream bank with no instream works required.

- Access to the opposite side of the watercourse for excavation and foundation installation will require the installation of pre-cast concrete slab across the watercourse to provide temporary access for the excavator. Plant and equipment will not be permitted to track across the watercourse.
- Once the foundation base has been completed, the pre-cast concrete box culvert will be installed using a crane which will be set up on the bank of the watercourse and will be lifted into place from the bank with no contact with the watercourse.
- Where the box culvert is installed in sections, the joints will be sealed to prevent granular material entering the watercourse,
- Once the crossing is in position stone backfill will be placed and compacted against the structure up to the required level above the foundations.

When the pre-cast concrete box culvert is cured as per the manufacturer's specification, the filling and compaction of the road will be completed. The road finish level will be decided by the Project Engineer.

The typical construction methodology for the installation of a pre-cast concrete clear-span bridge crossing is as follows:

- The access road on the approach either side of the watercourse will be completed to a formation level which is suitable for the passing of plant and equipment required for the installation of the watercourse crossing.
- All drainage measures along the proposed road will be installed in advance of the works.
- A concrete abutment will be installed which will consist of pre-cast concrete panels installed on a concrete lean mix foundation to provide a suitable base. The base will be excavated to rock or competent ground with a mechanical excavator with the foundation formed in-situ using a semi-dry concrete lean mix. The base will be excavated along the stream bank with no instream works required.
- Access to the opposite side of the watercourse for excavation and foundation installation may require the installation of pre-cast concrete slab across the watercourse to provide temporary access for the excavator. Plant and equipment will not be permitted to track across the watercourse.
- All pre-cast concrete panels and slabs/beams will be installed using a crane which will be set up on the bank of the watercourse and will be lifted into place from the bank with no contact with the watercourse.
- A concrete deck will be poured over the beams/slabs which span across the river. This will be shuttered, sealed and water tested before concrete pouring can commence.
- Once the crossing is in position stone backfill will be placed and compacted against the structure up to the required level above the foundations.

When the pre-cast concrete beams are cured, the filling and compaction of the road will be completed. The road finish level will be decided by the Project Engineer.

The proposed upgrade of existing crossings will be completed as follows:

- The access road on the approach watercourse will be completed to a formation level which is suitable for the passing of plant and equipment required for the installation of the watercourse crossing.
- The installation of the culvert will take place in low flow conditions.
- Where a flow exists, the water running through the watercourse channel will be pumped around the water crossing location and back into the watercourse channel downstream of the works area.
- Where over pumping is required, measures will be taken to ensure that the pumped water discharge does not disturb the channel bed with the force of water from the discharge. A steel plate to reduce the force of the flow will be used where appropriate.

- The project engineer will determine the required gradient of the culvert. The culvert must be laid at a gradient that will ensure water is contained within the culvert at all times. Where necessary a rock armour dam will be installed within the channel to reduce flow and ensure an acceptable depth of water remains within the culvert. Where a gradient of 1 – 1.5% is identified, the use of a baffle has been recommended.
- The bed of the watercourse channel will be excavated, if necessary, to achieve the correct line and to allow the culvert to be embedded 300mm into the base of the existing drain.
- The embedded section will be allowed to fill naturally with existing material within the base of the drain or with suitable drainage material such as gravel or round shingle where deemed applicable.
- The culvert will be lowered into place using an excavator with a lifting mechanism.
- Large stone boulders (approx. 400mm), sourced from the on-site borrow pits, will be placed over the culvert to create a headwall for the culvert and a suitable sub-base for road construction.
- Smaller 50mm stone sourced on site will be placed upon the sub-base to construct the road over the water crossing.

The works will be undertaken in line with NRA *Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes.*

Proposed Mitigation Measures for watercourse crossings are detailed below as detailed in Section 10.5 of the EIAR and are summarised as follows:

- 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;
- All guidance / mitigation measures proposed by the OPW or the Inland Fisheries Ireland is incorporated into the design of the proposed crossings;
- As a further precaution, near stream construction work, will only be carried out during the period permitted by Inland Fisheries Ireland for in-stream works according to the Eastern Regional Fisheries Board (2004) guidance document “Requirements for the Protection of Fisheries Habitat during Construction and Development Works at River Sites”, i.e., May to September inclusive. This time period coincides with the period of lowest expected rainfall, and therefore minimum runoff rates. This will minimise the risk of entrainment of suspended sediment in surface water runoff, and transport via this pathway to surface watercourses (any deviation from this will be done in discussion with the IFI);
- During the near stream construction work double row silt fences will be emplaced immediately down-gradient of the construction area for the duration of the construction phase. There will be no batching or storage of cement allowed in the vicinity of the crossing construction areas; and,
- All new river/stream crossings will require a Section 50 application (Arterial Drainage Act, 1945). The river/stream crossings will be designed in accordance with OPW guidelines/requirements on applying for a Section 50 consent.

All of the above works will be supervised by the Environmental Clerk of Works and where deemed necessary by the Project Hydrologist.

3.2.7 Hard Standing Area

Hard standing areas consisting of levelled and compacted hardcore are required around each turbine base to facilitate access, turbine assembly and turbine erection. The hard standing areas are typically

used to accommodate cranes used in the assembly and erection of the turbine, offloading and storage of turbine components, and generally provide a safe, level working area around each turbine position. The hard stand will be designed taking account of the loadings provided by the turbine manufacturer and will consist of a compacted stone structure. The hardstands will be constructed in a similar manner to the site access roads and will conform 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 proposed turbine position.

The crane hardstands will be constructed by one of the following methodologies:

- Typical excavation method.
- Piled/Floated hardstand method.

3.2.7.1 *Typical Excavation Method*

The typical excavation method can be summarised as follows:

- Establish alignment of the hardstands from the construction drawings and mark out the corners with ranging rods or timber posts.
- The excavated material will be stored adjacent to the hardstand.
- Topsoil and subsoil stockpiles will be formed and the side compacted to prevent silt run off during heavy rain or airborne dust during dry periods.
- Drainage runs and associated settlement ponds will be installed.
- The soil will be excavated down to a suitable formation layer of either firm clay or rock.
- Suitable granular fill will be spread and compacted in layers to provide a homogeneous running surface.

Batters to have a slope of between 1:1 and 1:5 (depending on depth and type of material) and will be left as cut to re-vegetate naturally with local plant species.

3.2.7.2 Piled/Floated Hardstand Method

Floating/Piled construction methods will be adopted where the site investigation has revealed the depth of unsuitable sub-formation is such that it is not suitable to be excavated. Piling will mitigate against the excavation of soft material thereby avoiding the excavation of excessive volumes of unusable material.

This system involves:

- Installing a layer of geogrid directly onto the existing ground;
- Placement of a layer of well graded course stone to level the platform;
- Application of further layers of geo grid (if required); and
- Laying the final layer of a finer well graded stone for the running surface.

Piles will be positioned to align with the pads of the proposed turbine crane and as per the requirements of the turbine supplier. Geotechnical analysis of the site investigation information will dictate the type of pile to be used. There are several methods however the most likely will either be pre-cast driven piles and auger bored piles. A reinforced concrete pad will be constructed on top of the piles. Shuttering will be used lined with polythene and an antibleeding admixture used to prevent any concrete leachate.

3.2.8 Turbine and Anemometry Mast Foundations

Each of the turbines and the anemometry mast to be erected on site will have a reinforced concrete base. If there is a requirement for piling at any of the turbine bases, this will be established by detailed

post-consent geotechnical investigations. The exact dimensions and types of foundations will be determined by pre-construction structural design calculations incorporating appropriate factors of safety.

If there is a requirement for piling at any of the turbine bases, this will be established by detailed post-consent geotechnical investigations, a description of the piling process is described below.

Those shown on drawings included in the EIAR are circular, but the final foundation could also be square or hexagonal depending on the requirements of the final turbine supplier. 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 5 metre safe working area and slope batter;
- 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 and treated in settlement ponds, and/or specialist treatment systems, prior to discharge from the works area;
- Soil excavation shall be observed by a qualified archaeologist in accordance with a scheme of archaeological monitoring, in order to identify any significant remains as they come to light; and
- Where a piled foundation is required, the piles will most likely be constructed by coring and inserting a steel sleeve which will be filled with reinforced concrete prior to sleeve removal as summarised below.

Standard reinforced concrete bases will be completed as follows:

- Overburden will be stripped off the foundation area to a suitable formation using a 360° excavator, and will be placed across the site as close to the excavation as practical;
- An embankment approximately 600 mm high will be constructed around the perimeter of each turbine base where required and a fence or berm will be erected to prevent construction traffic from driving into the demarcated working area. All necessary health and safety signage will be erected to warn of works etc.;
- A 250mm formation layer of clause 804 hardcore material and a 100mm concrete blinding layer will be laid approximately directly on top of the newly exposed formation, tamped and finished with a screed board to leave a flat level surface. The concrete should be protected from rainfall during curing and all surface water runoff from the curing concrete should be prevented from entering surface water drainage directly;
- 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 when in the forms using vibrating pokers to the levels and profile indicated on the drawings. Upon completion of the concreting works the foundation base will be covered and allowed to cure;
- 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. A gravel access will be formed from the access track to the turbine door and around the turbine for maintenance.

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 storage areas will be stripped of vegetation prior to stockpiling in line with best working practices;
- A piling platform for the piling rig will be constructed. This can be done in two ways depending on the bearing capacity of the underlying soil;
    - The first method is to lay geo-textile on the existing surface and a stone layer will then be placed on top of the geo-textile by an excavator and compacted in order to give the platform sufficient bearing capacity for the piling rig.
    - The second method is to excavate the soils to a suitable intermediate mineral subsoil and backfill to the formation level.

- The piling rig, fitted with an auger, will then bore through the soft material with a sleeve fitted around the auger to prevent the sidewalls of the soil 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; and
- Reinforcing steel on the top of the pile will tie to the foundation base steel.

The procedure for standard reinforced concrete bases as outlined above can be applied from here.

In addition, A proposed welfare and storage one-storey building measuring approximately 54 square metres and 4.3 metres in height will be located adjacent to the met mast, as shown in Appendix 4-1 of the EIAR. This building will comprise space for parts storage, and welfare facilities for use by maintenance staff. A 2.4-metre palisade fence will encompass the met mast and storage building.

3.2.9 Electricity Substation and Control Buildings

It is proposed to construct an electricity substation and associated control building to the east of the site as shown in Figure 2-1 (& Appendix 4-1 of the EIAR). The control building will be located within the compound of the substation.

The substation will be constructed by the following methodology:

- The area of the substation will be marked out using ranging rods or wooden posts and the soil stripped and removed to the nearby storage area for later use in landscaping. No material will be removed from site and storage areas will be stripped of vegetation prior to stockpiling in line with best working practises;
- The dimensions of the substation area will be set to meet the requirements of the ESB and the necessary equipment to safely and efficiently operate the wind farm;
- Wind farm control buildings will also be built within the substation compound;
- The foundations will likely be piled. The piles will most likely be constructed by coring and inserting a steel sleeve which will be filled with reinforced concrete prior to sleeve removal;
- Excavated material will remain on site at all times for reuse;
- 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 concrete roof slabs will be lifted into position using an adequately sized mobile crane;
- The construction and components of the substation will be to ESB or EIRGRID specifications; and
- 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 substation compound will be completed to formation level with an approved stone with all necessary concrete plinths installed by way of in-situ reinforced concrete or pre-cast concrete.

3.2.9.1 Battery Storage

A Battery storage compound is proposed to be located adjacent to the substation. This compound is proposed to include 10 No. battery modules contained within steel units with dimensions of approximately 12.2 m x 2.4 m x 2.8 m high. The enclosures will be similar in appearance to standard shipping containers and shall be placed on concrete foundations or plinths.

The system proposed includes lithium-ion batteries, connected to inverters that convert direct current (DC) to alternating current (AC), which are in turn connected to step up/down MV/LV (medium voltage/low voltage) unit transformers feeding a common busbar located in the Independent Power Producer's (IPP) control building within the substation. Depending on the size and type of the transformers they may be bunded with drainage via an oil interceptor unit.

3.2.10 Spoil Management

The quantity of spoil, requiring management on the site of the Proposed Development has been calculated 198,080m^3. These quantities were calculated as part of the Geotechnical Assessment Report in Appendix 4-2 of the EIAR. This includes a factor of 20% (bulking factor of 15% and contingency factor of 5%) which has been applied and is included to the excavated spoil volumes above to allow for expected increase in volume upon excavation and to allow for a variation in ground conditions across the site.

3.2.10.1 Spoil Usage in Restoration of Borrow Pits

Once the required volume of rock has been extracted from the borrow pit areas, it is intended to reinstate these areas with overburden excavated from the works areas of the Proposed Development.

The general construction methodology for the construction of the borrow pits, as presented in the Geotechnical Assessment Report in Appendix 4-2 of the EIAR, is summarised below.

As rock is being extracted from the borrow pit, upstands of rock will be left in place, depending on the type of rock, to act as intermediate retaining buttresses. Where this is not achievable, stone buttresses will be constructed within the borrow pit. The upstands or buttresses will form individual restoration areas within the borrow pit which will be filled once the required volume of rock has been extracted from each individual area. The buttresses will be wide enough to allow construction traffic access for the tipping of spoil into the individual cells.

- As rock is being extracted from the borrow pit, upstands of rock will be left in place, depending on the type of rock, to act as intermediate retaining buttresses. Where it is not possible to leave upstands/segments of intact rock in place it may be necessary to construct rock buttresses founded on in-situ rock within the borrow pits. The rock

buttresses will be constructed of rock fill from the borrow pit excavation. The founding stratum for each rock buttress will be inspected and approved by a competent person.

- It may be necessary to construct the rock buttress within the borrow pit in stages as infilling of spoil behind the buttresses progresses. 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 spoil, as necessary.
- Infilling of the spoil will commence at the back edge of the borrow pit and progress towards the borrow pit entrance. The contractor excavating the rock will be required to develop the borrow pits in a way which will allow the excavated spoil to be placed safely.
- The height of the rock buttresses constructed will be greater than the height of the placed spoil to prevent any surface spoil run-off.
- The use of temporary access ramps and long reach excavators during the placement of the excavated spoil is likely to be required.
- Where possible, the surface of the placed spoil will be shaped to allow efficient run-off of surface water from borrow pit areas.
- An interceptor drain will also 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 on the re-instated borrow pit area.
- Control of groundwater within the borrow pits may be required during construction, including a temporary pump and suitable outfall locations. Outfall controls are shown on the Drainage Design drawings which are included in the planning application drawings and presented in Appendix 4-6 of the EIAR.
- Stilling ponds may be required at the lower side/outfall location of the borrow pit. Further details on stilling ponds are provided in Section 4.6.4.7 of the EIAR.
- Supervision by a geotechnical engineer or appropriately competent person will be carried out during works.

3.2.10.1.1 *Placement of Spoil alongside Access Roads*

In some areas of the site of the Proposed Development excavated materials will be placed temporarily alongside the access roads before movement to the borrow pit. The following best practice guidelines for the placement of spoil alongside the access road will be adhered to during the construction of the Proposed Development:

- The potential spoil placement locations are alongside the existing excavated and proposed new access tracks with cross slopes of less than 10 degrees.
- As a general guide, the spoil placed adjacent to the existing and proposed excavated access tracks will be restricted to a maximum height of 1.0m over a 3m wide corridor on both sides of the access tracks. It should be noted that the site engineer will define/confirm the maximum restricted height for the placed spoil.
- The placement of excavated spoil will be avoided without first establishing the adequacy of the ground to support the load
- Where there is any doubt as to the stability of the ground then no material will be placed on to the surface.
- Where practical, it will be ensured that the surface of the placed spoil is shaped to allow efficient run-off of surface water. Where possible, shaping of the surface of the spoil will be carried out as placement of spoil within the area progresses. This will reduce the likelihood of debris run-off and ensure stability of the placed spoil.
- Finished/shaped side slopes in the placed spoil will be not greater than 1 (v): 2 or 3 (h).
- Supervision by a geotechnical engineer or appropriately competent person will be carried out during this work.
- An interceptor drain will be installed upslope of the designated spoil placement areas to divert any surface water away from these areas. This will help ensure stability of the placed spoil and reduce the likelihood of debris run-off.
- All the above-mentioned general guidelines and requirements will be confirmed by the site engineer prior to construction.

The management of excavated overburden and the methods of placement and/or reinstatement are described in detail in the Geotechnical Assessment Report in Appendix 4-2 of the EIAR.

3.2.11 Cable Trenching and Grid Connection

The transformer in each turbine is connected to the substation through a network of buried electrical cables. Fibre-optic cables will also connect each wind turbine to the wind farm control building in the substation compound. The ground is trenched typically using a mechanical excavator. 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, generally 1.2m below ground level depending on the ground conditions that are encountered. 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 cables will generally follow the access tracks to each turbine location.

It is proposed to connect the two sections of the site via underground cabling located within existing agricultural land and within the public road corridor. The cabling route measures approximately 3.3 km.

It is proposed to construct a 110 kV substation within the site and to connect from here via a 110 kV loop-in connection to the existing 110kV network which runs through the site. The exact route under consideration is outlined in Figure 2-1 (& Appendix 4-1 of the EIAR).

3.2.11.1 Overhead Line Grid Connection

The proposed design for the 110kV Looped line from the existing overhead line will require two new angle masts which will be constructed under the existing Knockraha - Woodhouse 110kV Overhead Line (OHL). The existing OHL conductor will be terminated at these two angle masts in order to facilitate an OHL loop into Lyrenacarriga 110kV Substation via terminal towers and onto gantry dropper's arrangement. The existing conductor will be removed between the angle masts with the new connection looped through to the new Lyrenacarriga 110kV Substation.

The angle mast locations have been selected based on ground surveys, ground profiles, allowable angles and ruling span checks.

The following section outlines the methodology to be followed during construction works of the proposed new angle masts which will be constructed adjacent to the existing 110 kV overhead line;

- The existing 110 kV overhead line will be modified to allow the line to turn into the new 110 kV substation in a loop-in – loop-out configuration. This will involve the removal of one number double pole set and the installation of two number turning angle masts (13 metre height) and two number end masts within the substation area.
- Temporary access roads will be required from the substation road to the angle mast location to enable the delivery of stone and concrete required for the angle mast foundations.
- An outage of the existing overhead line will be sought and will be programmed by Eirgrid on their annual grid outage programme.
- The angle and end mast foundations will then be excavated, blinded, stoned up, prior to concrete shuttering, steel fixing and pouring of base and each angle mast leg.
- After completion of concrete pouring the ground surrounding the mast will be reinstated and landscaped.
- After a sufficient concrete curing period the angle and end masts will be fully assembled on the ground before being lifted into place using a mobile crane.
- Crews will fix and bolt the masts in place and attach the lightning rod.

- Dead man stays will be installed to support the existing pole sets prior to the breaking overhead line at the location of the new angle masts.
- The installation of 3 no conductors and 2 no shield wires will then tie the existing overhead line into the new station at two points or bays.
- Bird diverters, dampers and vibration monitors are also proposed to be installed on the new conductor. It is also common for a fibre-optic cable which may wrapped around one of the conductors to be terminated into the new substation.

Stringing of Conductors

Stringing of overhead lines from the substation onto the existing supporting lattice structures will be kept clear of all obstacles along the straight by applying sufficient tension. This method requires the pulling of a light pilot line (nylon rope) which is normally carried by hand into the stringing wheels. This in turn is used to pull a heavier pilot line (Steel rope) which is subsequently used to pull the conductors from the drum stands using specifically designed "puller – tensioner" machines. The main advantages with this method are:

- The line is protected from surface damage
- Major obstacles can be completed without any significant disruption.

Once the conductors have been pulled into position, one end of the straight is terminated on the appropriate tension fittings and insulator assemblies. The free end of the straight is then placed in temporary clamps which take the conductor tension. The conductor is then cut from the puller-tensioner and the conductor is sagged using a chain hoist. Bird flight diverters or warning spheres can be added following the sagging procedure if required.

3.2.11.2 Collector Cabling Construction Methodology

The underground collector cabling including the connection route between the western and eastern clusters of the windfarm measures approximately 3.3km will be installed using the following methodology:

- The area where excavations are planned will be surveyed, prior to the commencement of works, with a cable avoiding tool and all existing underground services will be identified.
- Two teams consisting of two tracked excavators, two dumpers and a tractor and stone cart with side-shoot will dig the trench and lay approximately 300m of the underground cable ducting per day.
- Both teams will start approximately 150m apart with the team behind finishing at the starting point of the team ahead.
- The excavators will open a trench at the edge of the road surface, the trench will be a maximum of 600mm wide and 1,250mm deep. An image of a typical cable trench is shown on Plate 3-1.
- Clay plugs will be installed at 50 metre intervals to prevent the trench becoming a conduit for surface water runoff.
- Cable joint pits will be located at approximately 500m intervals or as otherwise required by ESB requirements along the proposed cable route, each joint pit will be approximately 2.6 x 8m in size and contain a communications chamber, an earth link box and a cable joint bay, all of which will be located in the road edge and accessible for cable pulling and future maintenance.
- The excavated material will be loaded into the dumpers to be transported to a designated temporary stockpiling area to be reused as backfilling material where appropriate.
- Once the trench has been excavated, a base layer of blinding will be installed by the tractor and stone cart and compacted by the excavators.

- The ducting along with marker strips will then be placed in the trench as per relevant specifications.
- Blinding will be installed to 75mm above the cable ducting and compacted.
- The remainder of the trench will be backfilled with granular material and compacted.
- The trench will be surfaced as per the road surface specifications of the national or local public road.

Plate 3-1 Cable Trench View

3.2.11.3 Existing Underground Services

Any underground services encountered along the route will be surveyed for levels and the ducting will pass over the service provided adequate cover is available. A minimum clearance of 300mm 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 layer and yellow top level 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 where appropriate. All excavations will be kept within the roadway boundaries, i.e. in road or grass margin.

3.2.11.4 Joint Bays

Joint bays are pre-cast concrete chambers where lengths of cable ducting will be connected. They will be located at various points along the ducting route approximately every 500 meters or as otherwise required by ESB requirements along the proposed cable route. 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 will be incorporated into the traffic management system. Once they have been constructed, they will be backfilled temporarily until cables are being installed.

3.2.11.5 Watercourse Crossings on Collector Route

There are a total of 2 no. watercourse crossings along the proposed collector cable route; 1 no. existing culvert crossing and 1 no. open channel stream/watercourse crossing. The locations of these crossings are shown above in Figure 3-1.

The watercourse crossing methodologies for the provision of the grid connection at these locations is set out below with the most appropriated option being selected for each crossing. Instream works are not required at any watercourse crossing along the proposed collector route.

3.2.11.5.1 *Crossing Using Standard Trefoil Formation – Option 1*

Watercourses will not be directly impacted upon since no instream works or bridge/culvert alterations are proposed. Where adequate cover exists above an bridge/culvert or where a new bottomless box culvert or clear-span structure has been installed (as outlined in Section 3.2.6 above), the standard ESB approved trefoil arrangement will be used where the cable ducts pass over a culvert without any contact with the existing culvert or water course. The cable trench will pass over the culvert in a standard trench as outlined in Figure 3-2.

3.2.11.5.2 *Flatbed Formation over Bridges/Culverts – Option 2*

Where cable ducts are to be installed over an existing bridge/culvert crossing where sufficient cover cannot be achieved by installing the ducts in a trefoil arrangement, the ducts will be laid in a much shallower trench the depth of which will be determined by the location of the top of the culvert or the depth of excavatable material over a bridge. The ducts will be laid in this trench in a flatbed formation over the existing culvert and will be incased in 6mm thick steel galvanized plate with a 35N concrete surround as per ESB Networks specification. This method of duct installation is further detailed in Figure 3-3.

Where a bridge or culvert has insufficient cover depth to fully accommodate the required trench, the ducts can be laid in a flatbed formation partially within the existing road surface. Where this option is to be employed, the ducts will also be encased in steel with a concrete surround as per EirGrid and/or ESB Networks specifications. In order to achieve cover over these ducts and restore the carriageway of the road, it may be necessary to raise the pavement level locally to fully cover the ducts. The increase road level will be achieved by overlaying the existing pavement with a new wearing course as required. Any addition of a new pavement will be tied back into the existing road pavement at grade. After the crossing over the culvert has been achieved, the ducts will resume to the trefoil arrangement within a standard trench. This method of duct installation is further detailed in Figure 3-4.

3.2.11.5.3 *Directional Drilling – Option 3*

In the event that none of the above methods are appropriate, directional drilling will be utilised. The directional drilling method of duct installation which will be carried out using Vermeer D36 x 50 Directional Drill (approximately 22 tonnes), or similar plant, will be utilised for the horizontal directional drilling at watercourse/culvert crossings listed above. The launch and reception pits will be approximately 0.55m wide, 2.5m long and 1.5m deep. The pits will be excavated with a suitably sized excavator. The drilling rig will be securely anchored to the ground by means of anchor pins which will be attached to the front of the machine. The drill head will then be secured to the first drill rod and the operator shall commence to drill into the launch pit to a suitable angle which will enable him to obtain the depths and pitch required to the line and level of the required profile. Drilling of the pilot bore shall continue with the addition of 3 metres long drill rods, mechanically loaded and connected into position.

During the drilling process, a mixture of a natural, inert and fully biodegradable drilling fluid such as *Clear Bore*™ and water is pumped through the centre of the drill rods to the reamer head and is forced into the void, to enable the annulus which has been created to support the surrounding sub soil and

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

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

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

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

The directional drilling methodology is further detailed in Figure 3-5.

3.2.11.5.4 General Construction Measures

Prior to any works commencing a dilapidation survey will be conducted of the entire route, photographing and noting any existing damage or defects to structure or road surfaces. A copy of this survey will be submitted to Cork and Waterford County Councils prior to works commencing.

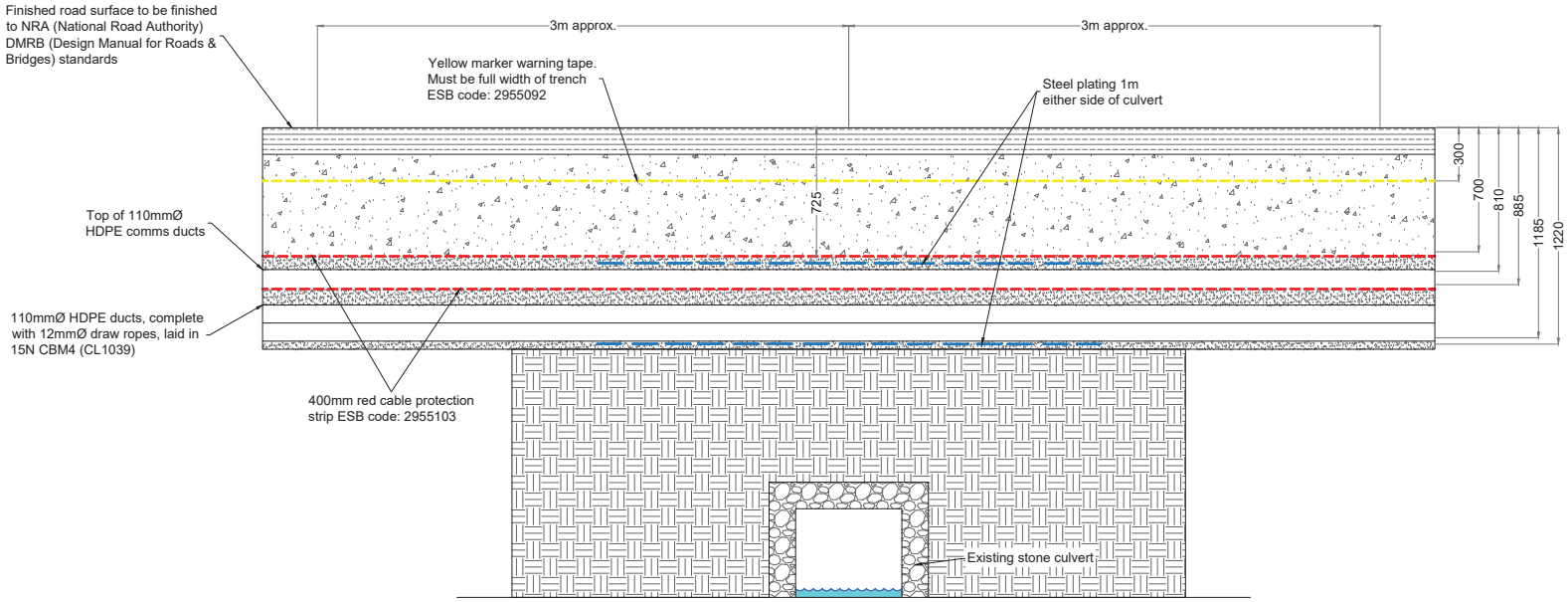
Communication with the public, local residences and businesses along the route will be an important responsibility of the project supervisor. One to two weeks before any work commencing reasonable efforts will be made to inform all affected parties of the oncoming works.

Signage will be erected in the weeks prior to any works commencing along and on adjacent roads to the proposed route notifying the public of the forthcoming construction. Contact details for the contractor and details of the road opening license will also be posted along the proposed cable route during construction.

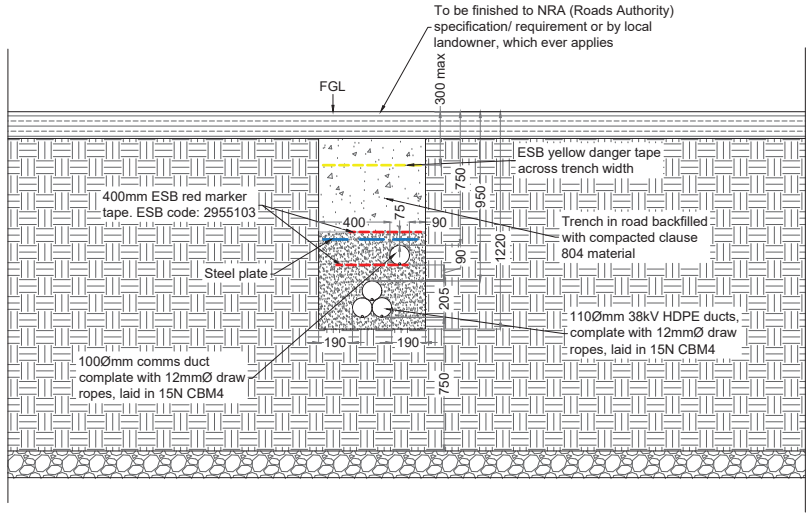
Every effort will be made to minimise the impact of the above works on local residences and traffic. Consideration will also be given to the agricultural community and works will be organised and sequenced so as not to inconvenience any such activities.

- All personnel will be inducted and made familiar with the method statements, risk assessments and traffic management plans involved.
- All site-specific safety rules will be adhered to.
- All plant operators will have appropriate Construction Skills Certificate Scheme (CSCS) training.
- All personnel will have SOLAS Safe Pass training
- Fire extinguishers and first aid supplies will be available in the work area.

- The road way will be maintained in clean condition at all times.
- Helmets, high visibility clothing and safety footwear will be worn at all times.
- A competent foreman will be on site at all times.
- Excavations will be backfilled at the end of each working day.
- The trench will not be over crowded with operatives.
- Unauthorised access will be monitored and prevented.
- Pipe work will be lifted into position manually.
- Hand dig will be used to expose any services detected during the survey.



Longitudal section at watercourse crossing



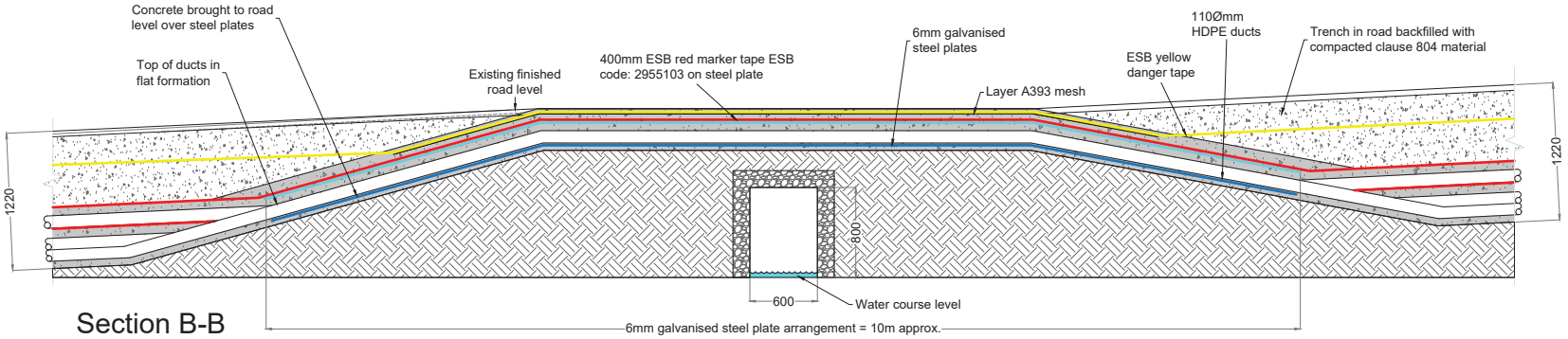
Cross section at watercourse crossing

DRAWING TITLE:
Typical Cable Trench Over Culvert

PROJECT TITLE:
Lyrenacarriga Wind Farm

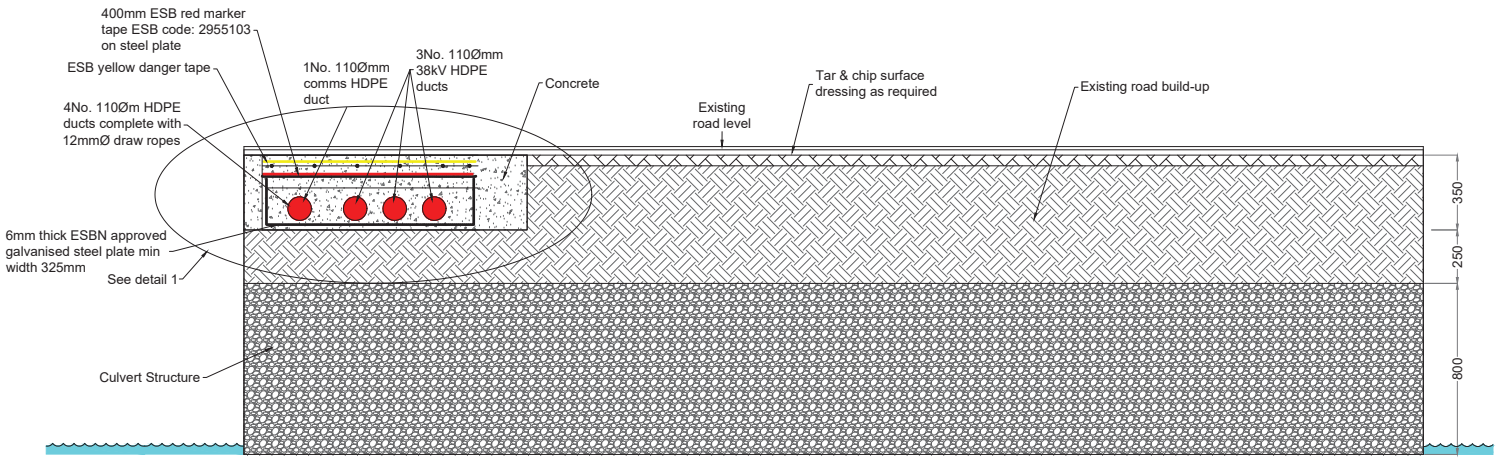
DRAWING BY:	CHECKED BY:
Joseph O Brien	Michael Watson
PROJECT No.: 170749	DRAWING No.: Figure 3-2
SCALE: 1:30 @ A3	DATE: 28.08.2019

MKO
Planning and Environmental Consultants
Tuam Road, Galway
Ireland, H91 VW84
+353 (0) 91 735611
email: info@www.mkoireland.ie
Website: www.mkoireland.ie



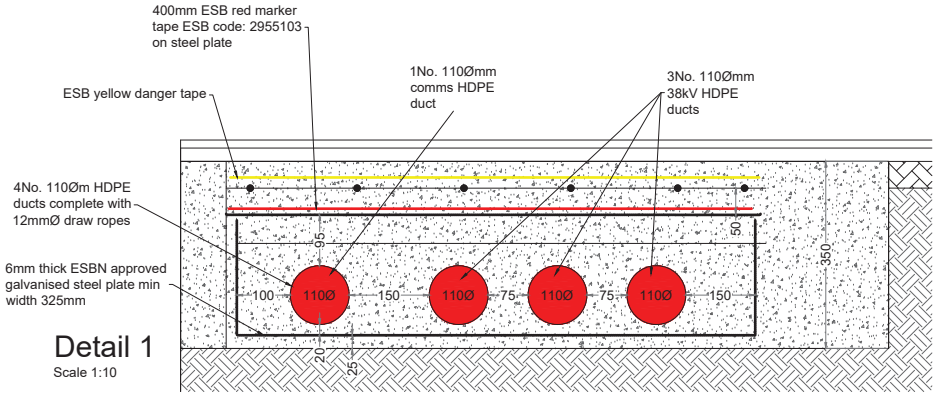
Section B-B

Scale 1:45



Section A-A

Scale 1:25



Detail 1

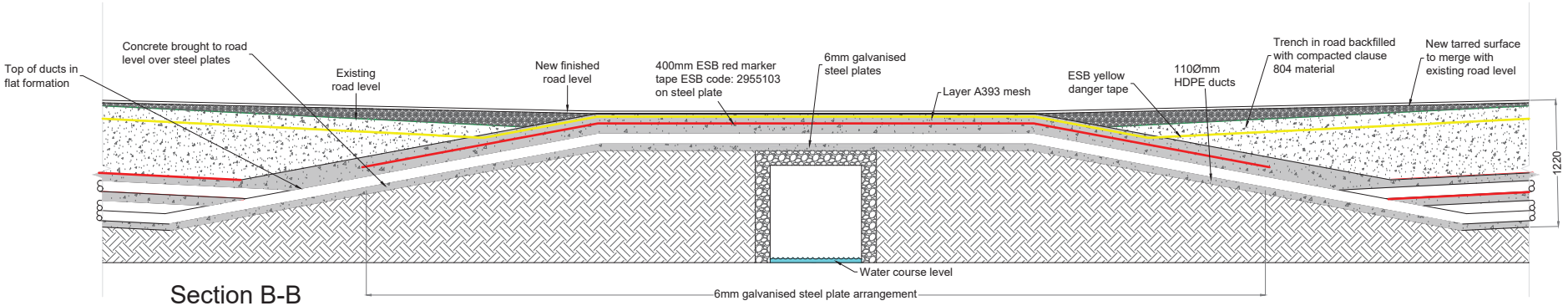
Scale 1:10

Typical Cable Trench Flatbed Formation Over Culvert

PROJECT TITLE: Lyrenacarriga Wind Farm

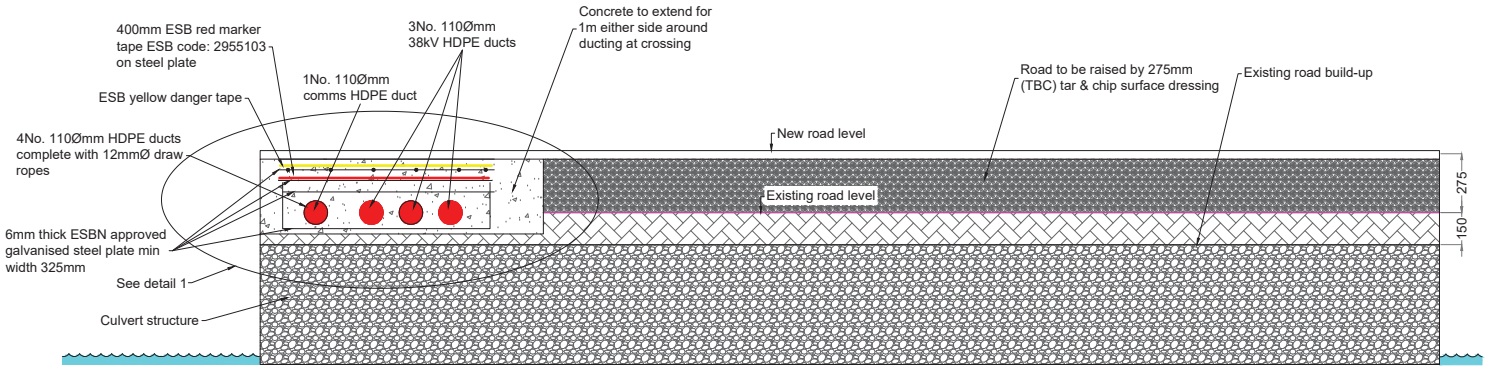
DRAWING BY:	CHECKED BY:
Joseph O Brien	Michael Watson
PROJECT No.: 170749	DRAWING No.: Figure 3-3
SCALE: As Shown @ A3	DATE: 28.08.2019

MKO
Planning and Environmental Consultants
Tuam Road, Galway
Ireland, H91 VW84
+353 (0) 91 735611
email: info@www.mkoireland.ie
Website: www.mkoireland.ie



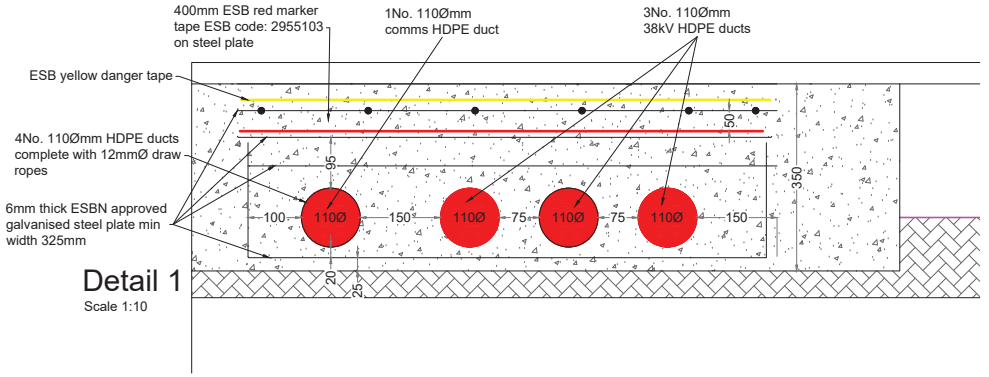
Section B-B

Scale 1:45



Section A-A

Scale 1:25



Detail 1

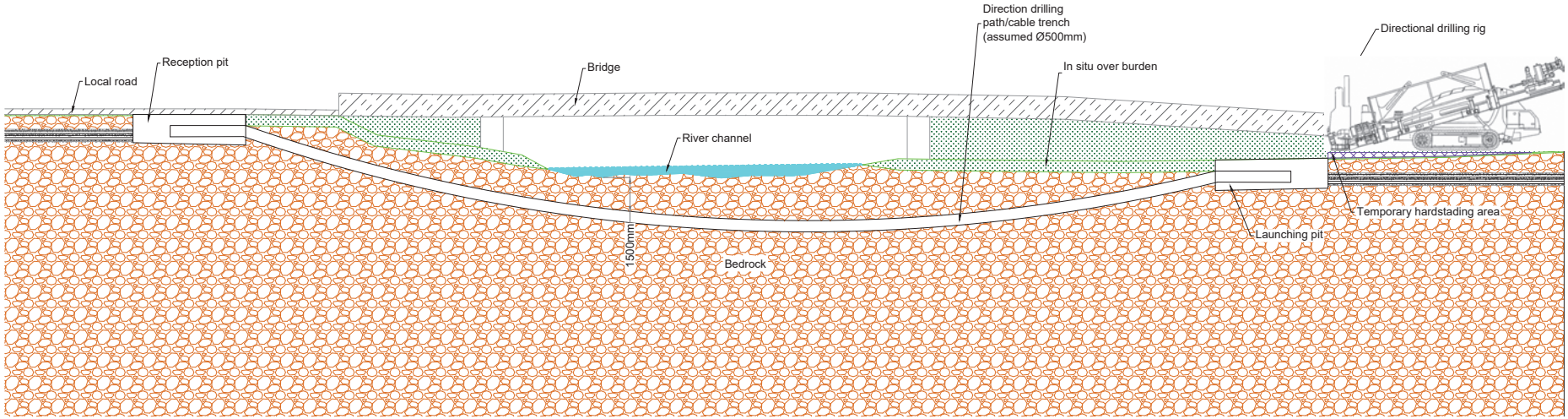
Scale 1:10

DRAWING TITLE:
Cable Trench Flatbed at Road Surface Level - Option 3

PROJECT TITLE: Lyrenacarriga Wind Farm

DRAWING BY: Joseph O Brien	CHECKED BY: Michael Watson
PROJECT No.: 170749	DRAWING No.: Figure 3-4
SCALE: As Shown @ A3	DATE: 28.08.2019

MKO
Planning and Environmental Consultants
Tuam Road, Galway
Ireland, H91 VW84
+353 (0) 91 735611
email: info@www.mkoireland.ie
Website: www.mkoireland.ie



Typical Directional Drilling Rig

Typical Drilling Rig & Launch Pit

DRAWING TITLE:
Typical Directional Drilling

PROJECT TITLE:
Lyrenacarriga Wind Farm

DRAWING BY:	CHECKED BY:
Joseph O Brien	Michael Watson
PROJECT No.: 170749	DRAWING No.: Figure 3-5
SCALE: 1:200 @ A3	DATE: 28.08.2019

MKO
Planning and Environmental Consultants
Tuam Road, Galway
Ireland, H91 VW84
+353 (0) 91 735611
email: info@www.mkoireland.ie
Website: www.mkoireland.ie

3.2.12 Turbine Delivery Route Accommodation Works.

The proposed turbine transport route from the N25 National Primary Road to the proposed development site is shown on Figure 3-6. Works such as road widening are sometimes required along proposed turbine transport routes to accommodate the large vehicles used to transport turbine components to wind farm sites. The proposed transport route for the proposed development has been the subject of a route assessment to determine if any widening works are required along its length; see Section 15.1.8 of the EIAR.

Works are proposed at two locations on the turbine delivery route as part of the proposed development. The locations of these works are shown on Figure 3-7 and are described below. Other works on the route will be minor only, for example the temporary removal of some street signs or furniture, or the temporary levelling of the centre island of some roundabouts. Lombard's Cross Roads

Minor road widening is proposed on the southeast corner of Lombard's Cross Roads, as shown in Figure 3-7. This widening will comprise an area of hard-surfacing to be temporarily installed, measuring approximately 70 square metres.

The proposed area for surfacing is currently occupied by road verge and agricultural land. The works will require clearing back the existing road verge and field vegetation at the junction, and excavation of material to allow the placing of stone/hard surfacing within the proposed area. A series of removable bollards will be placed along the existing road edge in order to preserve the structure of the junction outside of those periods when deliveries of turbine components are underway. Once deliveries are completed the area and boundaries will be reinstated restoring the junction to its existing configuration.

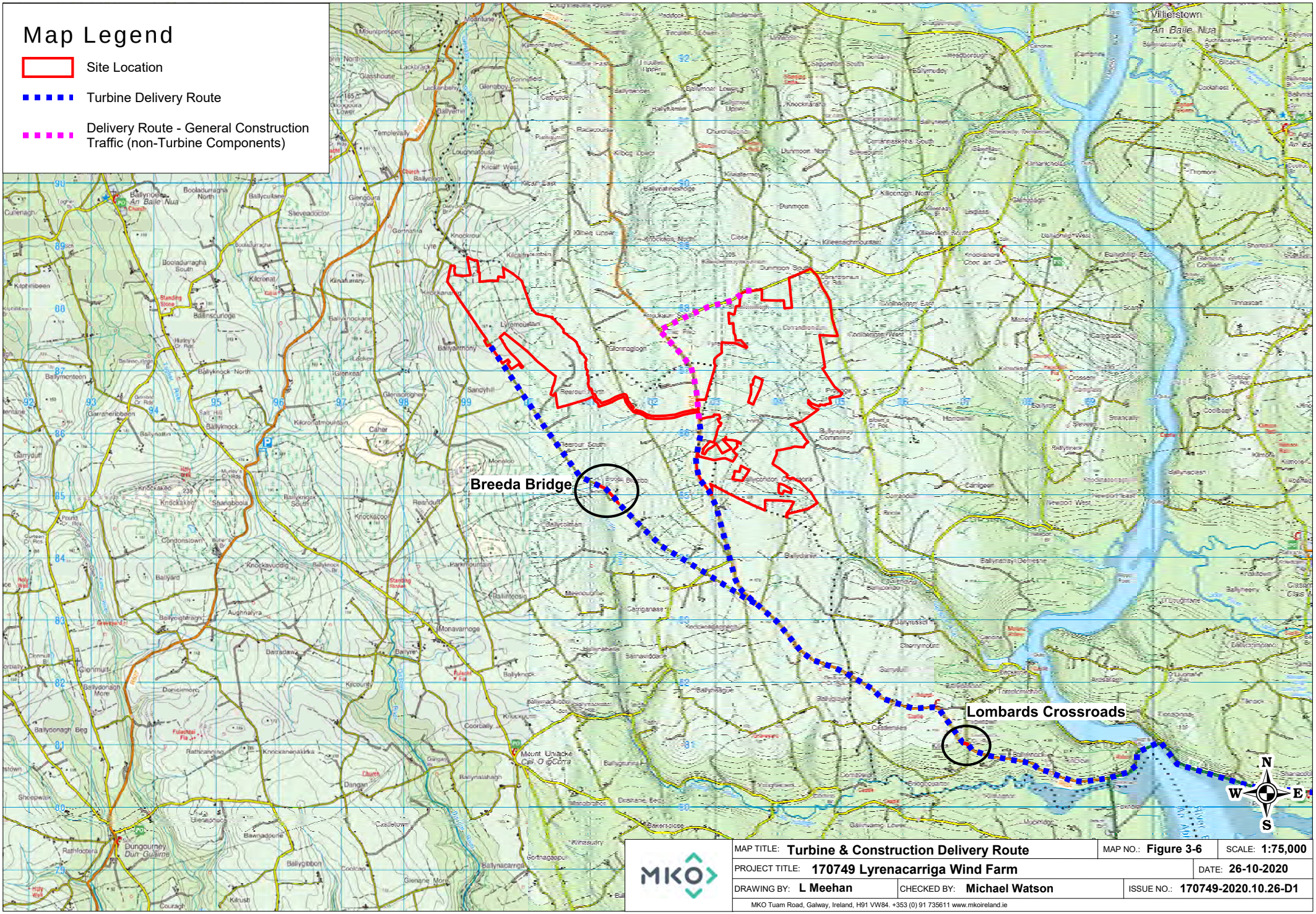
3.2.12.1 Breeda Bridge

A section of access road measuring approximately 300 metres in length is proposed off the local road L7806, in order to allow the turbine delivery vehicles to avoid a bend in the public road and to avoid the removal of mature roadside trees at this location. The proposed road will be constructed on agricultural land.

The access road will have a running width of 5 metres and will be constructed in the same manner as the proposed wind farm site roads, as described in Section 3.2.5 above. The proposed new access road will be used by turbine delivery vehicles only, with the exit and re-entry points onto the L7806 to be subject to traffic management measures, as presented in Chapter 15 of the EIAR.

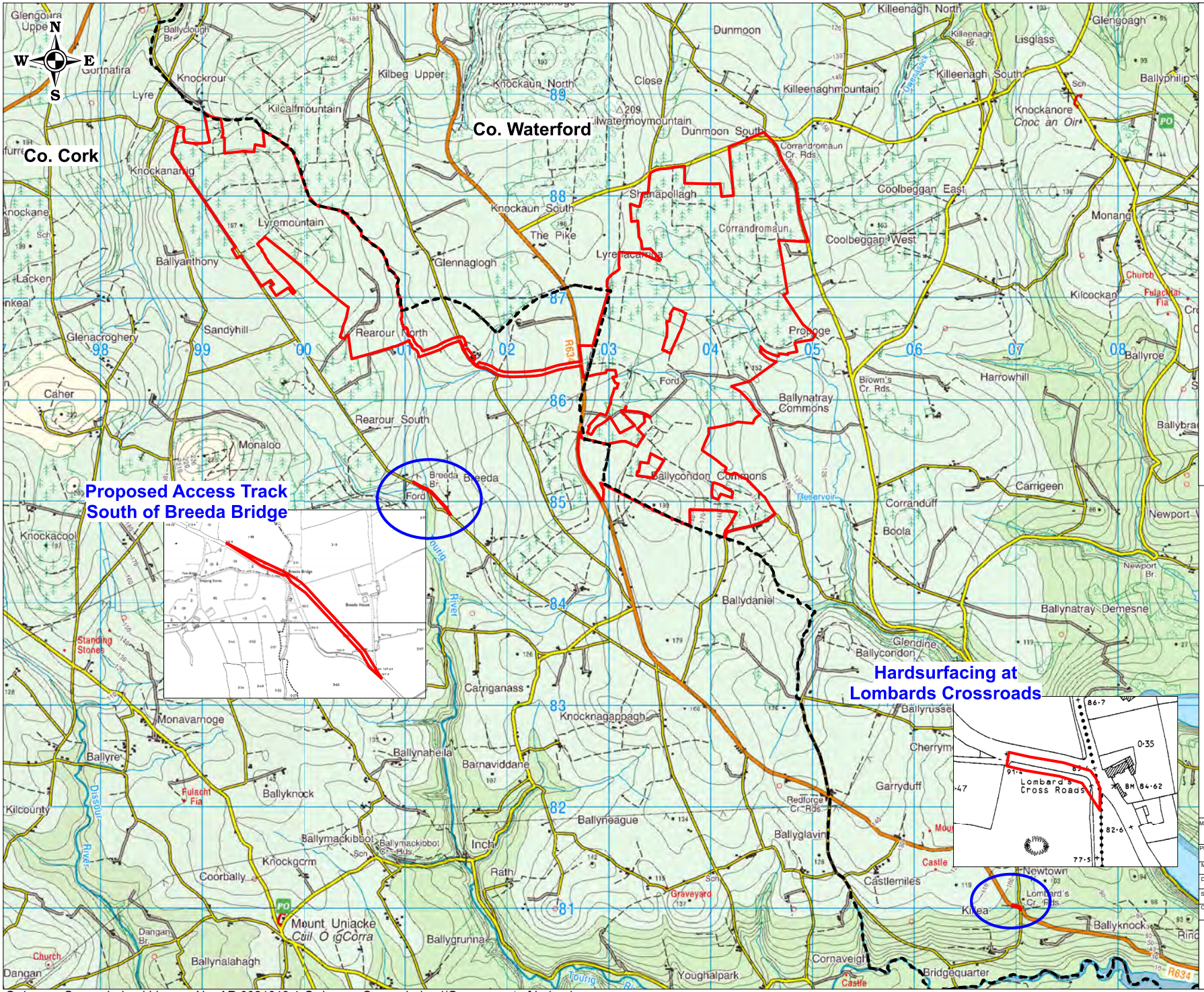
The proposed link road will be constructed using the same methodology as per the wind farm site roads. The construction methodology for the proposed access road is summarised as follows:

- Overburden within the required areas for the accommodation works will be excavated and temporarily stockpiled adjacent to the works area, where possible, until a competent stratum is reached.
- A layer of geogrid/geotextile may be required at the surface of the competent stratum to provide further structural formation.
- The competent stratum will be overlain with granular fill.
- A final surface running layer will be placed over the granular fill to provide a suitable surface to accommodate the turbine delivery/abnormal load vehicles.
- The accommodation works when not in use during the construction phase will be cordoned off from the public road, using bollards/fencing.
- Upon completion of the turbine delivery phase of the proposed wind farm the proposed access road will be removed and the grass re-seeded.
- Gates or a berm will be installed post construction to prevent access from the public road.



MAP TITLE: **Turbine & Construction Delivery Route**		MAP NO.: **Figure 3-6**	SCALE: **1:75,000**
PROJECT TITLE: **170749 Lyrenacarriga Wind Farm**			DATE: **26-10-2020**
DRAWING BY: **L Meehan**	CHECKED BY: **Michael Watson**		ISSUE NO.: **170749-2020.10.26-D1**

MKO Tuam Road, Galway, Ireland, H91 VW84. +353 (0) 91 735611 www.mkoireland.ie



MAP TITLE: **Delivery Route Works**

PROJECT TITLE: **Lyrenacarriga Wind Farm**

MAP NO.: **Figure 3-7**

DRAWING BY: **L Meehan** | CHECKED BY: **M Watson**

SCALE: **1:75,000** | DATE: **31-08-2020**

OS SHEET NO.: **2008**

MKO
Planning & Environmental Consultants
Tuam Road, Galway, Ireland, H91 VW84.
+353 (0) 91 735611
www.mkoireland.ie

4. ENVIRONMENTAL MANAGEMENT

4.1 Introduction

This CEMP includes all best practice measures required to construct the Proposed Development. It sets out the drainage proposals that 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 proposals, tree felling, refuelling, dust and noise control measures. An outline of the management of invasive species, waste materials, archaeological features, traffic, site reinstatement and decommissioning is also provided.

4.2 Protecting Water Quality

4.2.1 Introduction

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 been prepared specifically with the intention of having no negative impact on the water quality of the site and discharges from the site and its associated rivers and lakes, and consequently no impact on downstream catchments and ecological ecosystems.

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

4.2.2 Site Drainage Principles

The site drainage features have been outlined in Section 4.6 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 development and turbine locations and associated new roadways were originally selected to avoid natural watercourses. There will be no direct discharges to any natural watercourses, with all drainage waters being dispersed as overland flows. All discharges from the works areas will be made via settlement ponds, and over vegetation filters at a significant distance from streams and lakes respectively.

Existing artificial drains in the vicinity of existing site roads will be maintained in their present location where possible. If it is expected that these artificial drains will receive drainage water from works areas, check dams will be added (as specified below) to control flows and sediment loads in these existing

artificial drains. If road widening or improvement works are necessary along the existing roads, where possible, the works will take place on the opposite side of the road to the drain.

4.2.3 Existing Drainage Features

The northern half of the western cluster is largely coniferous forestry while the southern half is agricultural grassland. Ground elevation ranges from approximately 203m OD at the topographic peak of Kilcalfmountain at the north of the western cluster to ~130 m OD near the south of the western cluster, with the overall slope (gentle to moderate) to the south – southeast.

The eastern cluster comprises mainly coniferous forestry with areas of grassland in the central and south-eastern parts of the eastern cluster. The eastern cluster has a ground elevation range between 200 m OD at the south of the cluster, and 120 m OD along the eastern boundary with the overall ground slope (gentle to moderate) to the east.
Within both cluster landholding areas there are numerous manmade drains that are in place predominately to drain the forestry plantations. The current internal forestry drainage pattern is influenced by the topography, soil type, layout of the forest plantation and by the existing road network. The forest plantations are generally drained by a network of mound drains which typically run perpendicular to the topographic contours of the site and feed into collector drains, which discharge to interceptor drains down-gradient of the plantation. The eastern cluster mainly drains into the Glendine and Tourig Rivers and the western cluster generally drains into the Glenboy River, Tourig River and Kilbeg Stream.

4.2.4 Drainage Design Principles

Drainage water from any works areas of the 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.

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. Discoloured run-off from any construction area will be isolated from natural clean run-off.

A schematic line drawing of the drainage design is presented in Figure 4-1 below.

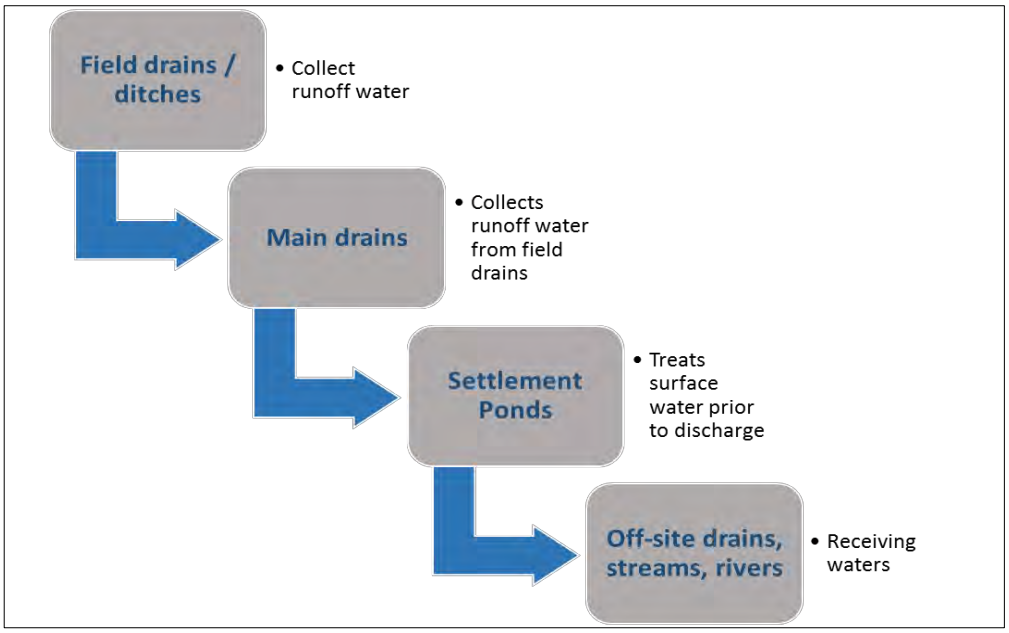


Figure 4-1 Schematic Drawing of Drainage Design

The drainage design has been prepared based on experience of the project team of other wind farm sites, based on various Irish Legislation and a number of best practice guidance documents.

4.2.5 Legislation and Best Practice Guidance

There is no one guidance document that deals with drainage management and water quality controls for wind farm and other renewable energy developments. However, a selection of good practice approaches have been adopted in preparation of this CEMP, and these are taken from the various best practice guidance documents listed below.

- 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).

4.2.6 Site Drainage Design and Management

The proposed site drainage design measures for this site are outlined in Chapter 4, Section 4.6 of the EIAR. Site drainage is assessed in detail in Chapter 10 of this EIAR including detailed proposals for design and mitigation. As this CEMP is a working document and is presented as an Appendix to the EIAR, the detailed drainage measures are not included in this document. When the final CEMP report is prepared, and presented as a standalone document, all drainage measures will be included in that document. The drainage proposals will be developed further prior to the commencement of construction. The following sections give an outline of drainage management arrangements in terms of pre-construction, construction and operational phases of the Proposed Development.

4.2.6.1 Pre-Construction Drainage

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

4.2.6.2 Construction Phase Drainage

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

Best practice and practical experience on other similar projects suggests that in addition to the drainage plans that are included in the EIAR, there are additional site based decisions and plans that can only be made in the field through interaction between the Site Construction Manager, the Project Hydrologist and the Project Geotechnical Engineers. The mechanisms for interaction between these are outlined within Section 5 of this CEMP.

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

4.2.6.3 Operational Phase Drainage

The project hydrologist will inspect and review the drainage system after construction has been completed to provide guidance on the requirements of an operational phase drainage system. This

operational phase drainage system will have been installed during the construction phase in conjunction with the road and hardstanding construction work as described below:

- Interceptor drains will be maintained up-gradient of all proposed infrastructure to collect clean surface runoff, in order to minimise the amount of runoff reaching areas where suspended sediment could become entrained. It will then be directed to areas where it can be re-distributed over the ground by means of a level spreader.
- Swales/road side drains will be maintained to intercept and collect runoff from access roads and hardstanding areas of the site, likely to have entrained suspended sediment, and channel it to stilling ponds for sediment settling;
- Check dams will be maintained at regular intervals along interceptor drains and swales/roadside drains in order to reduce flow velocities and therefore minimise erosion within the system during storm rainfall events; and,
- Stilling ponds/settlement ponds, emplaced downstream of swales and roadside drains, will buffer volumes of runoff discharging from the drainage system during periods of high rainfall, by retaining water until the storm hydrograph has receded, thus reducing the hydraulic loading to watercourses. 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. Inspection and maintenance of all settlement ponds will be ongoing through the construction period.

4.2.6.4 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, clean stone, terram, straw bales 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.

4.2.6.5 Pre-emptive Site Drainage Management

The works programme for the groundworks part of the construction phase of the project will also take account of weather forecasts and predicted rainfall. Large excavations and movements of overburden or large-scale overburden or soil stripping will be suspended or scaled back if heavy rain is forecast. The extent to which works will be scaled back or suspended will relate directly to the amount of rainfall forecast.

4.2.6.6 Reactive Site Drainage Management

The final drainage design prepared for the site has provided for adaptive management of drainage measures. The effectiveness of drainage measures designed to minimise runoff entering works areas and capture and treat silt-laden water from the works areas, will be monitored continuously by the Environmental Clerk of Works (ECoW) 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 in so far as is possible. This may require the installation of additional check dams, interceptor drains or swales as deemed necessary on-site. The drainage design may have to be modified on the ground as necessary, and the modifications will draw on the various features outlined above in whatever combinations are deemed to be most appropriate to situation on the ground at a particular time.

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

4.2.7 Cable Trench Drainage

Cable trenches are typically developed in short sections, thereby minimising the amount of ground disturbed at any one time and minimising the potential for drainage runoff to pick up silt or suspended solids. Each short section of trench is excavated, ducting installed and bedded, and backfilled with the appropriate materials, before work on the next section commences.

To efficiently control drainage runoff from cable trench works areas, excavated material is stored on the upgradient side of the trench. Should rainfall generate runoff from the excavated material, the material is contained in the downgradient cable trench. Excess subsoil will be removed from the cable trench works area immediately upon excavation and used for landscaping and reinstatements of other areas elsewhere on site.

On steeper slopes, silt fences, as detailed in Section 4.6 of the EIAR 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.

4.2.8 Drainage Maintenance

An inspection and maintenance plan for the drainage system onsite will be prepared in advance of commencement of any works. Regular inspections of all installed drainage features will be necessary, especially after heavy rainfall, to check for blockages, and ensure there is no build-up of standing water at parts of the systems where it is not intended. The inspection of the drainage system will be the responsibility of the Environmental Clerk of Works 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 insure 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 weekly during the construction phase of the project and 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.

Collector drains will be regularly inspected for evidence of erosion along the length of the drain. 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.

An adequate amount of clean stone, Terra Stop (or similar silt fencing material), stakes, straw bales (rectangular bales, to be used in emergency only), etc. will be kept on site at all times to ensure the drainage system can be fully maintained throughout the construction phase of the wind farm and ensure that personnel are fully equipped to provide an emergency facility to control the discharge from settlement ponds and react to any accidental silt discharges.

Silt traps will be inspected weekly during the construction phase of the project and following rainfall events with sediment build-up removed as required. 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 project. Weekly inspections during the construction phase will be reduced to monthly, bi-monthly and eventually quarterly inspections during the operational phase. 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.

4.3 Tree Felling

The implementation of appropriate mitigation during felling will reduce the risk of entrainment of suspended solids and nutrient release in surface watercourses. These measures are derived from best practice guidance documents as outlined in Section 10.5.2.1 of the EIAR. The water protection measures to be adopted during felling operations 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;
- 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;
- Ditches which drain from the proposed area to be felled towards existing surface watercourses will be blocked, and temporary silt traps will be constructed. No direct discharge of such ditches to watercourses will occur. Drains and sediment traps will be installed during ground preparation. Collector drains will be excavated at an acute angle to the contour (~0.3%-3% gradient), to minimise flow velocities. Main drains to take the discharge from collector drains will include water drops and rock armour, as required, where there are steep gradients, and should avoid being placed at right angles to the contour;
- 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 will be carefully disposed away from all aquatic zones. Where possible, all new silt traps will be constructed on even ground and not on sloping ground;
- In areas particularly sensitive to erosion or where felling inside the 75 metre buffer is required, it will be necessary to install double or triple sediment traps;
- All drainage channels will taper out before entering the 75m buffer zone. This ensures that discharged water gently fans out over the buffer zone before entering the aquatic zone, with sediment filtered out from the flow by ground vegetation within the zone. On erodible soils, silt traps will be installed at the end of the drainage channels, to the outside of the buffer zone;
- 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. Correct drain alignment, spacing and depth will ensure that erosion and sediment build-up are minimized and controlled;
- Brash mats will be used to support vehicles on soft ground, reducing organic topsoil and mineral soils erosion and avoiding the formation of rutted areas, in which surface water ponding can occur. Brash mat renewal should take place when they become heavily used and worn. Provision should be made for brash mats along all off-road routes, to protect the soil from compaction and rutting. Where there is risk of severe erosion occurring, extraction should be suspended during periods of high rainfall;
- Timber will be stacked in dry areas, and outside a local 75 metre watercourse buffer. 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 run-off;
- Checking and maintenance of roads and culverts will be on-going through the felling operation;
- Refuelling or maintenance of machinery will not occur within 100m of a watercourse. Mobile bowser, drip kits, spill kits, qualified personnel will be used where refuelling is required;
- A permit to refuel system will be adopted:

- 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;
- Crossing of streams will not be permitted;
- Trees will be cut manually from along streams and using machinery to extract whole tree; and
- Travel only perpendicular to and away from stream.

Table 4-1 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	25m

4.4 Cement Based Products Control Measures

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

- No batching of wet-cement products will occur on site;
- The arrangements for concrete deliveries to the site will be discussed with suppliers before work starts, agreeing routes, prohibiting on-site washout of trucks and discussing emergency procedures.
- Ready-mixed supply of wet concrete products and where possible, emplacement of pre-cast elements, will take place. Where possible pre-cast elements for culverts and concrete works will be used;
- No washing out of any plant used in concrete transport or concreting operations will be allowed on-site;
- Where concrete is delivered on site, only chute cleaning will be permitted, 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.
- Use weather forecasting to plan dry days for pouring concrete;
- Ensure pour site is free of standing water and plastic covers will be ready in case of sudden rainfall event;
- The small volume of water that will be generated from washing of the concrete lorry's chute will be directed into a concrete washout area, typically built using straw bales and lined with an impermeable membrane. below. The areas are generally covered when not in use to prevent rainwater collecting. In periods of dry weather, the areas can be uncovered to allow much of the water to be lost to evaporation. At the end of the concrete pours, any of the remaining liquid contents is tankered off-site. Any solid contents that will have been cleaned down from the chute will have solidified and can be broken up and disposed of along with other construction waste.

The 50 m wide river buffer zone and 20 m existing artificial drainage buffer will be in place for the duration of the construction phase. No construction activity will occur within the buffer zone with the exception of bridge and culvert construction. The buffer zone will:

- Prevent any cement-based products accidentally entrained in the construction phase drainage system entering directly into watercourses, achieved in part by ending drain

discharge outside the 50 m buffer zone and allowing percolation across the vegetation of the buffer zone;
- Provide a buffer against accidental direct pollution of surface waters by any pollutants, or by pollutants entrained in surface water run-off.

The complete washing out of concrete trucks will not be permitted at the site. Suppliers will be directed back to their own facility to complete the washout process. However, a washout area for chute cleaning will be provided at various locations in close proximity to the concrete pour locations. The concrete washout area will be constructed as follows:

- Topsoil and subsoil will be excavated to create a basin which will form the washout area. The size will be determined by the number of chute washings that it will need to accommodate on a given day and the volume of water required to complete each washing. This will be determined by the Construction Manager.
- Once the excavation of the washout area has been complete, the washout area will be lined with an impermeable membrane which will be installed directly on to the topsoil or subsoil within the excavated basin.
- An apron will be installed at ground level around the excavated washout area which will act as stop ramp to prevent vehicles reversing into the washout area. This apron will also be used to secure the impermeable membrane at ground level. Two examples are shown in Plates 4-1 and 4-2 below.
- The concrete wash water will be extracted and disposed of by a waste contractor at an appropriately licensed facility, an agreement for which will be in place prior to any concrete pour commencing.

Plate 4-1 Concrete washout area

Plate 4-2 Concrete washout area

4.5 Refuelling, Fuel and Hazardous Materials Storage

Mitigation measures proposed to avoid release of hydrocarbons at the site are as follows:

- Minimal refuelling or maintenance of construction vehicles or plant will take place on site.
- On-site refuelling will take place using a mobile double skinned fuel bowser. The fuel bowser, a double-axel custom-built refuelling trailer will be re-filled off site where possible and will be towed around the site by a 4x4 jeep to where machinery is located. It is not practical for all vehicles to travel back to a single refuelling point, given the size of the cranes, excavators, etc. that will be used during the construction of the wind farm. 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. 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.

- Fuels volumes stored on site should be minimised. Any fuel storage areas 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 electrical control building should be bunded appropriately to the volume of oils likely to be stored, and to prevent leakage of any associated chemicals and to groundwater or surface water. The bunded area will be fitted with a storm drainage system and an appropriate oil interceptor;
- The plant used should be regularly inspected for leaks and fitness for purpose; and,
- An emergency plan for the construction phase to deal with accidental spillages will be contained within Emergency Response Plan (Section 6). Spill kits will be available to deal with an accidental spillage.

4.6 Dust and Noise

It is not intended to do scientific noise and dust monitoring during the construction phase. The Environmental Clerk of Works will be responsible for the daily monitoring and checks on dust and noise levels emanating from the site as well as the implementation of the mitigation measures set out below. The developer will undertake monitoring to evaluate the effectiveness of the proposed mitigation measures if requested by the council

4.6.1 Dust/Debris Control & Air Quality

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

Measures to control dust include:

- Any site roads with the potential to give rise to dust will be regularly watered, as appropriate, during dry and/or windy conditions;
- The designated public roads outside the site and along the main transport routes to the site will be regularly inspected by the Site Environmental Clerk of Works for cleanliness, and cleaned as necessary;
- Material handling systems and material storage areas will be designed and laid out to minimise exposure to wind;
- Water misting or sprays will be used as required if particularly dusty activities are necessary during dry or windy periods;
- Water misting or bowsers will operate on-site as required to mitigate dust in dry weather conditions;
- The transport of soils or other material, which has significant potential to generate dust, will be undertaken in tarpaulin-covered vehicles where necessary;
- All construction related traffic will have speed restrictions on un-surfaced roads to 15 kph;
- Daily inspection of construction sites to examine dust measures and their effectiveness.
- When necessary, sections of the haul route will be swept using a truck mounted vacuum sweeper; and,
- All vehicles leaving the construction areas of the site will pass through a wheel cleansing area prior to entering the local road network.

Wheels or vehicle underbodies are often washed before leaving sites to prevent the build-up of mud on public (and site) roads. A wheel wash facility can be provided where required. These wheel washing systems will either be mobile units or will be constructed on the ground using the same methodology as the concrete washout area within a much shallower excavation. Both wheel wash options will retain the water used in the process as part of a closed loop system. The wash water will be replaced regularly and will be disposed similarly to the concrete washout area at an appropriately licensed facility.

4.6.2 Noise & Vibration 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 wind farm. Measures 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 or throttled back to a minimum during periods when not in use.
- Any plant, such as generators or pumps, which is required to operate before 07:00hrs or after 19:00hrs 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 Table 4-2 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 period or at critical periods within the programme it could occasionally be necessary to work out with these hours. Any such out of hours working would be agreed in advance with the local planning authority.

Where rock breaking is employed, the plant and equipment will be sensitively located, taking account of local topography and natural screening.

The following are examples of measures that will be considered as necessary in order 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 line 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.

Table 4-2 Example Threshold of Potential Significant Effect at Dwellings

Assessment category and threshold value period (L_{Aeq},T)	Threshold value, in decibels (dB)		
	Category A Note A	Category B Note B	Category C Note C
Night-time (23:00 to 07:00hrs)	45	50	55
Evenings and weekends Note D	55	60	65
Daytime (07:00 – 19:00hrs) and Saturdays (07:00 – 13:00hrs)	65	70	75

- Note A Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are less than these values.
- Note B Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are the same as category A values.
- Note C Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are higher than category A values.
- Note D 19:00 – 23:00 weekdays, 13:00 – 23:00 Saturdays and 07:00 – 23:00 Sundays.

4.7 Invasive Species Management

Due to the legislative requirements to control the spread of noxious weeds and non-native invasive plant species, it is important that any activities associated with the planning, construction and operation of wind farm developments comply with the requirements of the Wildlife Acts, 1976-2012. Regulations 49 and 50 of the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. 477 of 2015) include legislative measures to deal with the dispersal and introduction of Invasive Alien Species (IAS), which are listed in the Third Schedule of the regulations.

Regulation 49 deals with the Prohibition on introduction and dispersal of certain species while Regulation 50 relates to Prohibition on dealing in and keeping certain species (Regulation 50 has not yet been commenced). Invasive species are listed under the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. 477 of 2015).

The introduction and/or spread of invasive species such as Himalayan Balsam, Giant Rhubarb or Rhododendron for example, could result in the establishment of invasive alien species and this may have negative effects on the surrounding environs. Appropriate spread prevention measures have been incorporated into the design of the project.

A baseline invasive species survey will be 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. 477 of 2015) by a suitably qualified ecologist. If the presence of such species is found at or adjacent to the site, particularly in areas where its excavation may be required, an invasive species management plan will be prepared for the site to prevent the introduction or spread of any invasive species within the footprint of the works. An invasive species management plan, if required, will set out best practice control methods as summarised in the following sections.

4.7.1 General Best Practice Control Methods

The following general best practice guidelines in the treatment and control of invasive species during construction works are outlined below having regard to relevant guidance documents particularly those issued by the National Roads Authority (2010) and The Best Practice Management Guidelines produced by Invasive Species Ireland (Maguire et al, 2008). The bio security requirements in relation to all plant and equipment as set out in the Inland Fisheries Ireland (IFI) Bio-Security Protocol which will be implemented as required.

4.7.2 Good Practice on Site Management

Careful preparation of the site and planning of the works is crucial to successful treatment of invasive species. The following list of guidelines, which is not exhaustive, shall be followed by all on-site personnel. Only those who have been inducted into biosecurity measures on-site may enter the contaminated zones within the works areas. Should any risk of contaminated material escaping be observed by the site supervisor, the management plan for the site must be amended by an appropriately qualified person to mitigate against the risk.

4.7.3 Establishing Good Site Hygiene

To establish good site hygiene, the following s recommended:

- A risk assessment and method statement must be provided by the Contractor prior to commencing works.
- A series of test pits will be dug within the footprint of the proposed cable route in order to confirm presence or absence of parent plant rhizomes. This will be completed under the supervision of a suitably qualified ecologist.
- Fences will be erected around areas of infestation, as confirmed by test pits, and warning signs shall be erected.
- A designated wash-down area will be created, where power-washed material from machinery can be contained, collected and disposed of with other contaminated material. This area will contain a washable membrane or hard surface.
- Stockpile areas will be chosen to minimise movement of contaminated soil.
- Stockpiles will be marked and isolated.
- Contaminated areas which will not be excavated will be protected by a root barrier membrane if they are likely to be disturbed by machinery. Root barrier membranes will be protected by a layer of sand above and below and topped with a layer of hardcore.
- The use of vehicles with caterpillar tracks within contaminated areas will be avoided to minimise the risk of spreading contaminated material.
- An environmental Clerk of Works/suitably qualified ecologist will be on site to monitor and oversee the implementation of invasive species management plans.

Decontamination of Vehicles

- Personnel may only clean down if they are familiar with the plant and rhizome material and can readily identify it.
- Decontamination will only occur within designated wash-down areas.
- Vehicles will be cleaned using stiff-haired brush and pressure washers, paying special attention to any areas that might retain rhizomes e.g. wheel treads and arches.
- All run-off will be isolated and treated as contaminated material. This will be disposed of in already contaminated areas.

4.8 Waste Management Plan

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

This WMP has a number of key objectives as outlined below:

- To set out management prescriptions that adhere to a waste management hierarchy
- To outline the roles and responsibilities of the Waste Manager
- Prevention and minimisation of waste at the construction stage of the development.

4.8.1 Legislation

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

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

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

4.8.2 Preliminary Plan

The Department of the Environment guidelines state that, at the design stage of the project, only a preliminary WMP is required,

> *"Formal production and presentation of the Plan may be at a later stage but a clear 'waste management philosophy' needs to be adopted...at the initial conceptual stage of the Project..."*

This preliminary WMP has a number of key objectives as outlined below:

- To set out management prescriptions that adhere to a waste management hierarchy
- To outline the roles and responsibilities of the Waste Manager
- Prevention and minimisation of waste at the construction stage of the development.

4.8.3 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.

4.8.4 Construction Phase Waste Management

4.8.4.1 Description of the Works

The construction of the development will involve the construction of 17 no. turbines, new site access tracks & upgrade of existing tracks, internal cabling and grid connection, substation & control buildings and junction upgrade along the turbine haul route.

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 the proposed 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 the proposed borrow pits.

The waste types arising from the construction phase of the development are outlined in Table 4-3 below.

Table 4-3 Expected waste types arising during the Construction Phase

Material Type	Example	EWC 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

Material Type	Example	EWC Code
Mixed municipal waste	Daily canteen waste from construction workers, miscellaneous	20 03 01
Plastic	PVC frames, electrical fittings	17 02 03
Plastic packaging	Packaging with new materials	15 01 02
Tiles and ceramics	Slates and tiles	17 01 03
Wooden packaging	Boxes, pallets	15 01 03

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 that contamination does not occur.

4.8.4.2 Waste Arisings and Proposals for Minimisation, Reuse 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 should be taken to ensure excess waste is not generated during construction, including;

- Ordering of materials should 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.

4.8.4.3 Waste Arising from Construction Activities

All waste generated on site that will be contained in waste skips at a waste storage area on site. This waste storage area will be kept tidy with a waste skip 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 road as only the quantity of stone necessary will be sourced from the proposed borrow pits and will be extracted from the borrow pit areas on an 'as needed' basis.

Site personnel will be instructed at induction that no 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.

4.8.4.4 Waste Arising from Decommissioning

The design life of the wind farm is 30 years after which time a decision will be made to determine whether or not the turbines will be replaced by new turbines or if decommissioning will occur. The lengthy time frame between the completion of the construction phase and decommissioning will result in the only materials remaining on site at that time will be infrastructural material such as the turbine foundations, turbines and the granular material used to construct roads. If the site is decommissioned, cranes will disassemble each turbine tower and all equipment. The associated components will be removed from site for re-use, recycling or waste disposal. Any structural elements that are suitable for recycling will be disposed of in an appropriate manner. All lubrication fluids will be drained down and put aside for appropriate collection, storage, transport and disposal. Any materials which cannot be re-used or recycled will be disposed of by an appropriately licenced contractor.

The waste types arising from the decommissioning of the development are outlined in Table 4-4 below.

Table 4-4 Expected waste types arising during the Decommissioning Phase

Material Type	Example	EWC Code
Cables	Electrical wiring	17 04 11
Metals	Copper, aluminium, lead, iron and rebar	17 04 07
Inert materials	Crushed stone, concrete	17 01 07

4.8.4.5 Reuse

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

- Concrete can be reused as aggregate for roads cable trench backfilling material.
- Plastic packaging etc. can be used to cover materials on site or reused for the delivery of other materials.
- Excavated soil can be reused for reinstatement of the areas around turbine foundations and adjacent to site roads.

4.8.4.6 Recycling

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

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

4.8.4.7 Implementation

4.8.4.7.1 *Roles and Responsibilities for Waste Management*

Prior to the commencement of the development, a Construction Waste manager will be appointed by the project team. 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.

4.8.4.7.2 *Training*

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

- Distinguish reusable materials from those suitable for recycling;
- Ensure maximum segregation at source;
- Co-operate with site manager on the best locations for stockpiling reusable materials;
- Separate materials for recovery; and
- Identify and liaise with waste contractors and waste facility operators.

4.8.4.7.3 *Record Keeping*

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

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

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

4.8.4.8 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 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.

4.9 Outline Archaeological Management Plan

Archaeological monuments are safeguarded through national and international policy, which is designed to secure the protection of the cultural heritage resource.

A field inspection of the study area of the development carried out by Tobar Archaeological Services found an existing track leading to a 19th century house (now overgrown). The western portion of the line of the track will require removal as part of the road construction for approximately 150m before it reaches the settlement where it turns in a southerly direction towards the turbine. The house will be avoided by the proposed road and the turbine base.

Three recorded monuments subject to statutory protection as defined in the Record of Monuments and Places or Sites and Monument Record are located within or on the EIAR site boundary for the Proposed Development. Descriptions of these monuments are outlined in Section 14.3.2.2 of the EIAR.

Due to the presence of archaeological monuments within the site boundary, the following mitigation proposed for the protection and preservation of potentially new and previously undiscovered sites:

- A pre-construction walkover survey / inspection of areas proposed for excavation will be undertaken to re-assess the Proposed Development for new sites that may be exposed.
- If present, the sites shall be archaeologically excavated under licence prior to construction. The archaeologist will liaise with the Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs regarding the methods being proposed for excavation.
- Pre-construction archaeological testing of turbine bases and hardstands proposed for excavation will be carried out. A report setting out the findings will be submitted to the relevant authorities where required.
- Archaeological monitoring of ground works and metal detection of spoil during construction. A report on the results of the monitoring shall be compiled and submitted to the relevant authorities where required on completion of the project.

In the event of the discovery of archaeological finds or remains, the National Monuments Service and the National Museum of Ireland shall be notified immediately. If features are revealed, the archaeological finds or remains will need to be investigated, and no further development will take place in that area until the site is fully identified, recorded and excavated or alternatively avoided to the satisfaction of the statutory authorities.

4.10 Outline Construction Traffic Management Plan

4.10.1 Introduction

The purpose of this Outline Construction Traffic Management Plan is to set details of the traffic requirements for the Proposed Development and outline the information that will be included in a detailed Traffic Management Plan which will be prepared by the appointed contractor prior to the commencement of construction.

The Construction Traffic Management Plan can only be finalised when a contractor has been appointed to carry out and schedule the works. It is also appropriate that the Project Supervisor Construction Stage when appointed, along with the turbine supplier shall have an input in the preparation and review of the Traffic Management Plan.

4.10.2 Construction Phase

The construction phase of the development will run for between 12 - 18 months. Due to the size of the site, its general layout and the total number of turbines proposed, it is unlikely that the construction phase will require phasing. Therefore, the following sequence of construction activities are proposed:

- Site set up and erection of signage
- Construction of main road access and site entrances.
- Initial installation of on-site tracks and drainage.
- Installation of new access tracks and upgrade of existing.
- Development of the construction compound and any other temporary works.
- Construction of substation and control building.
- Preparation of crane hard standings.
- Construction of turbine foundations.
- Installation of internal site cabling within wind farm
- Installation of the grid connection cabling
- Wind Turbine erection
- Land reinstatement.

4.10.2.1 Site Access Tracks

The internal access tracks will provide the required access to all turbine and associated infrastructure. The new and upgraded access tracks have been designed to provide a minimum 5m running width along the straight sections of track with wider sections up to 6m at bends where required. Passing bays will be installed to allow a mechanism for two-way traffic. Appropriate signage at the location of these passing bays as well as instruction on priority vehicles will be installed throughout the site. The running surface on the existing and new access tracks will facilitate the delivery of large and abnormal loads on oversized trucks.

Where upgrade of existing public road junctions are to be completed as outlined in Section 3.2.12 above, the traffic management on the public road at these locations will be provided by the appointed contractor with the approval of Cork and Waterford County Council.

4.10.2.2 Access to Site from National Roads

Three entrances are proposed for the construction stage of the Proposed Development in order to transport turbine components, materials and equipment to the site.

- Access A on the R634 regional road, into eastern cluster of turbines
- Access B on the L7806 local road, into western cluster of turbines, and
- Access C located on the L2003 local road into eastern cluster (non-turbine traffic).

Access junction A is on the east side of the R634 and is at the location of an existing forestry access. It is proposed that this junction will provide access and egress to the eastern site for the abnormal loads only. All of these movements will be made with the assistance of escort vehicles and traffic management staff. This junction will be closed at all other times. Following the construction phase of the Proposed Development, the upgraded area of this entrance will be closed by erecting fencing, however this may be reopened during the lifetime of the development should replacement blades or other abnormal loads be required to access the site.

Access junction B located on the L7806 will be the sole access to the western site and will provide for the delivery of abnormal loads, the delivery of general construction traffic, and all construction traffic during the construction of the Proposed Development. It will also provide access for maintenance staff to the western cluster once the wind farm is operational.

Access junction C located on the L2003 is also an existing forestry access and will provide for all general construction traffic, including construction staff. It will also provide for maintenance staff to the eastern cluster when operational.

Where required by the local authority a condition survey of the public roads on the turbine haul route can be undertaken prior to the commencement of any works at the development site. Where required this can include a structural integrity survey of bridges and culverts which will be traversed by the grid connection cabling.

4.10.2.3 Construction Material Delivery

The delivery of construction materials to the site will be via the proposed haul routes shown on Figure 3-6 above. This general construction traffic will use the Regional roads in the area surrounding the site. The number of construction vehicles that will be generated during the construction phase of the Proposed Development are described as part of the Traffic and Transport Assessment in Section 15.1 of the EIAR.

4.10.2.4 Turbine Component Delivery

The deliveries of turbine components to the site will be made in escorted convoys of approximately three vehicles at a time, and mostly at night when roads are quietest as is standard practice for turbine delivery. Convoys will be accompanied by escorts at the front and rear operating a “stop and go” system. Although the turbine delivery vehicles are large, they will not prevent other road users or emergency vehicles passing, should the need arise. The delivery escort vehicles will ensure the turbine transport is carried out in a safe and efficient manner with minimal delay or inconvenience for other road users.

The method for deliveries of abnormally large is outlined in the Construction Traffic Management Plan and is summarised below:

The delivery of the abnormally large loads will take place at night under Garda escort, all vehicles will approach the Proposed Development from the south-east on the N25, followed by the R634. Turbine deliveries will enter the site via Junctions A and B

Prior to the Traffic Management Plan being finalised, 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 final traffic management plan. All turbine deliveries will be provided for in a transport management plan which will have to be prepared in advance of the construction stage, when the exact transport arrangements are known, delivery dates confirmed and escort proposals in place. Such a transport management plan is typically 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. The turbine delivery route is shown in Figure 3-7 above.

The delivery of the turbine components will be carried by a specialist haulage company who will be responsible for completing a trial run to ensure the haul route can accommodate the turbine delivery. The haulage company in conjunction with the turbine supplier will advise on any additional works that are required after the completion of the trial run. It will be the responsibility of the appointed haulage company to liaise with the relevant local authorities and An Garda Siochána to secure the necessary

permits. A system of public notification will also be required to provide residents with the intended delivery schedule of these abnormal load. This information will be passed on by a leaflet drop, local engagement and/or the provision of a website with updated notifications if deemed necessary at the time.

4.10.2.5 Grid Connection Consents

The proposed grid connection route will require a Road Opening Licence (ROL) prior to the commencement of any grid connection works on the public road. The ROL will require a detailed traffic management plan for the grid connection cabling works which will set out any proposed road closures, diversions, signage etc. The final details of such a traffic management proposals cannot be determined without the input of the appointed contractor.

4.10.3 Detailed Traffic Management Plan

A detailed Traffic Management Plan (TMP), incorporating all the mitigation measures set out in the Outline TMP will be prepared by the appointed contractor which will details in respect of traffic management agreed with the roads authority and An Garda Síochána prior to construction works commencing on site. The detailed TMP will include 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 Cork and Waterford County Councils in advance of deliveries of turbine components to site.

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

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

Liaison with the relevant local authority - Liaison with the relevant local authority including the roads sections of local authorities that the delivery routes traverse and An Garda Siochána, during the delivery phase of the large turbine vehicles, when an escort for all convoys will be required.

Implementation of temporary alterations to road network at critical junctions – At locations highlighted in section 15.1.8.

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

Travel plan for construction workers – While the assessment above has assumed the worst case 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 a routes to / from the site and identification of an area for parking.

Temporary traffic signs – As part of the traffic management measures temporary traffic signs/warning signs will be put in place at all key junctions, including all new junctions providing access to the site. All measures will be in accordance with the "Traffic Signs Manual, Section 8 – Temporary Traffic Measures

and Signs for Road Works" (Department of Transport, Tourism and Sport (DoTT&S)) and "Guidance for the Control and Management of Traffic at Roadworks" (DoTT&S). A member of construction staff (flagman) will be present at key junctions during peak delivery times.

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.

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.

Road Opening Licence – Roads works associated with the grid connection cabling will be undertaken in line with the requirements of a road opening licence as agreed with Cork and Waterford County Councils.

Diversions and road closures – reasonable access to residences, farms and businesses will be maintained at all times during any road closures associated with the cable works. The details of this will be agreed with the roads authority in advance of works taking place. The network of local roads in the area will be used for traffic diversions for local traffic in order to expedite the works and limit the duration of the impact owing to the cabling works.

Trench Reinstatement - Trenches on public roads, once backfilled, will be temporarily reinstated to the satisfaction of the roads authority. Following temporary reinstatement of trenches sections of public roads along which the cable route travels will receive a surface overlay subject to agreement with the roads authority.

4.11 Outline Site Reinstatement Plan

4.11.1 Post Construction

Upon the completion of the major infrastructural elements of the project such as site roads, turbine bases and the substation, the initial site restoration will commence. This will involve the removal of machinery from the site which will have come to its end of use such as excavators, haulage vehicles and storage containers. As this equipment is removed, particularly from stoned areas such as the temporary construction compound, these areas will then be restored to their original state to promote revegetation. The restoration procedure for the site areas adjacent to infrastructure for which the original site conditions have been altered for the purpose of the construction of the wind farm are outlined in the following sections.

4.11.1.1 Site Roads and Turbine Foundations

Where the upgrade of existing roads and the construction of new roads has been completed, the restoration of either side of these roads will be carried out immediately after construction of this element of the works. The restoration along these road edges will mainly involve backfilling and landscaping with the material which will be removed during excavation and set aside for this purpose. The turbine foundations when complete will also be backfilled with this material. The replacing of this material will restore the areas adjacent to the construction to its original state and will enhance revegetation opportunities.

4.11.1.2 Temporary Construction Compound

The site compound will be constructed using a similar methodology to that of the new site roads. This compound will be removed after the commissioning of the turbines. The stoned area will be excavated and all stone transported off site by a licensed haulier for reuse or recovery at an appropriately permitted site. The overburden excavated prior to the installation of the site compound will be transported back to this original location and levelled with the area being restored to the original ground level.

Where restoration takes places in areas which have been previously used for agricultural purposes then the area will be reseeded for agricultural grassland. All restoration procedures will be carried out under the supervision and guidance of the supervising project ecologist.

4.11.1.3 Drainage Features

The supervising project hydrologist will provide supervision throughout the construction phase of the project. On completion of the construction phase, any drainage features which have been installed prior to or during the construction phase and are deemed to be unnecessary for the operational phase by the hydrologist will be removed. Each area which has a drainage feature removed will be restored to its original condition. This will again be carried out under the supervision of the supervising project hydrologist.

4.12 Outline Decommissioning Plan

The design life of the wind farm is 30 years and ongoing research shows that this is likely to increase with improvements in turbine technology, site design and maintenance measures. Therefore, a decision will be made to determine whether or not the turbines will be replaced by new turbines which would be the subject of a new planning application or if full decommissioning will occur. If the site is decommissioned, cranes will disassemble each turbine tower and all equipment.

All infrastructure including turbine components will be separated and removed off-site for re-use, recycling and waste disposal. The procedure for the management of this waste material is outlined in the Waste Management Plan Section 4.8 above.

It is proposed that turbine foundations and hardstanding areas will be left in place and covered with soil/topsoil. It is proposed to leave the access roads in situ at the decommissioning stage. It is considered that leaving the turbine foundations, access tracks and hardstanding areas in situ will have considerably less of an environmental impact than removing and recycling these materials. However, if removal is deemed to be required all infrastructure will be removed with mitigation measures in line those during construction being employed.

After decommissioning, the areas around the turbine bases and other disturbed areas will be encouraged to revegetate naturally and will be backfilled with spoil similar to that removed during excavation so as to allow natural recolonisation. An ecologist will be required to supervise the site reinstatement after decommissioning. If the wind farm is decommissioned, the site will be reinstated within approximately six months.

This outline decommissioning plan will be developed further and agreed with Cork and Waterford County Council prior to any decommissioning operations.

5. ENVIRONMENTAL MANAGEMENT IMPLEMENTATION

5.1 Roles and Responsibilities

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

In general, the Environmental Clerk of Works will maintain responsibility for monitoring the works and Contractors/Sub-contractors from an environmental perspective. The Environmental Clerk of Works will act as the regulatory interface on environmental matters by reporting to and liaising with Cork and Waterford County Councils and other statutory bodies as required.

The Environmental Clerk of Works will report directly to the Site Supervisor/Wind Farm Construction Manager. An Environmental Clerk of Works or Project Ecologist, Project Hydrologist, Project Archaeologist and 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:

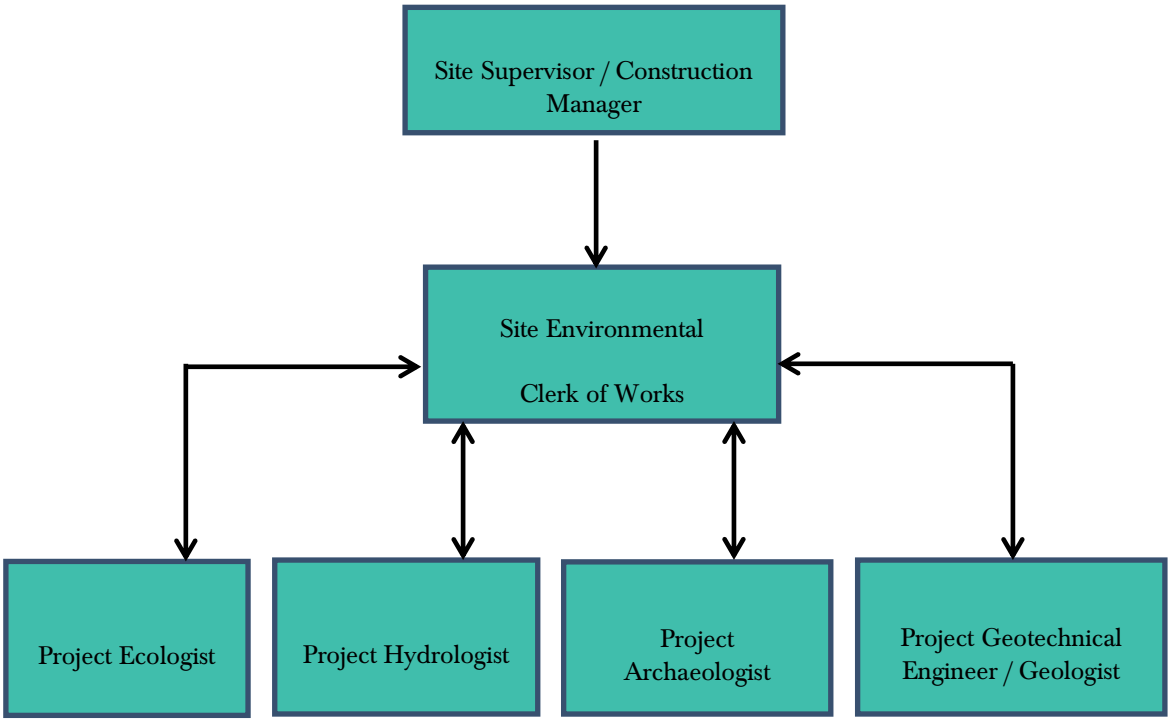


Figure 5-1 Site Management Chain of Command

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

5.1.1 Wind Farm Construction Manager/Site Supervisor

The Site Supervisor/Construction Manager 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 Project 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.

5.1.2 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, 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 Environmental Clerk of Works will report to the Site Supervisor/Construction Manager. The responsibilities and duties of the Environmental Clerk of Works will include the following:

- Preparation of the CEMP 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 proper mitigation measures are initiated and adhered to during the construction phase;
- Liaise with Project Ecologist, Project Hydrologist and Project Geotechnical Engineer 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.

- Fulfil the role of Waste Manager and implement the objectives of the Waste Management Plan as set out in Section 4.8 above

The level, detail and frequency of reporting expected from the Environmental Clerk of Works 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.

5.1.3 Project Ecologist

The Project Ecologist will report to the Environmental Clerk of Works and is responsible for the protection of sensitive habitats and species encountered during the construction phase of the wind farm. 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.

5.1.4 Project Hydrologist

The Project Hydrologist will report to the Environmental Clerk of Works and is responsible for inspection and review of drainage and water quality aspects associated with construction of the wind farm. 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.

5.1.5 Project Archaeologist

The Project Archaeologist will report to the Environmental Clerk of Works and is responsible for archaeological monitoring of the site during the construction phase. This will include monitoring of site

investigations and excavation works as well as the monitoring and metal detection of spoil during construction

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

5.1.6 Project Geotechnical Engineer / Geologist

The Geotechnical Engineer or Project Geologist will report to the Environmental Clerk of Works and is responsible for inspection and review of geotechnical aspects associated with construction of the wind farm. 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 Geotechnical Risk Register and that these are subject to ongoing monitoring; and,
- Ongoing inspection and monitoring of the development, particularly in areas of soil repository areas, 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.

5.2 Water Quality and Monitoring

5.2.1 Pre-Construction Baseline Monitoring

Baseline water quality field testing and laboratory analysis will be undertaken where required prior to commencement of felling and construction at the site. The baseline monitoring programme will be subject to agreement with Cork and Waterford County Councils.

Analysis will be for a range of parameters with relevant regulatory limits along with Environmental Quality Standards (EQSs) and sampling will be undertaken for each stream that drains from the construction site.

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

5.2.2 Construction Phase Monitoring

5.2.2.1 Daily Visual Inspections

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. Should the suspended solids levels measured during construction be higher than the existing levels, the source will be identified and additional mitigation measures implemented.

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

The following periodic inspection regime will be implemented:

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

5.2.2.2 Continuous Turbidity Monitoring

Turbidity monitors or sondes will be installed at locations surrounding the wind farm site. The monitoring locations will be selected as part of the final drainage design before construction commences in consultation with the Project Hydrologist. The Project Hydrologist will advise on the optimum locations for continuous water monitoring. The sondes will provide continuous readings for turbidity levels in the watercourse. This equipment will be supplemented by daily visual monitoring (during the construction phase) at their locations as outlined in the sections below.

5.2.2.3 Monthly Laboratory Analysis

Baseline laboratory analysis of a range of parameters with relevant regulatory limits and EQSs will be undertaken for each watercourse outlined in Figure 10-2 of the EIAR . This will not be restricted to these locations and further sampling points will be added as deemed necessary by the Environmental Clerk of Works in consultation with the Project Hydrologist and Site Manager.

5.2.2.4 Field Monitoring

Field chemistry measurements of unstable parameters, (pH, conductivity, temperature) will be taken at but not limited to the surface water monitoring locations outlined in Figure 10-2 of the EIAR and at all

installed sonde locations. These analyses will be carried out by either the Environmental Clerk of Works or the Project Hydrologist. In-situ field monitoring will be completed on a weekly basis. In-situ field monitoring will also be completed after major rainfall events, i.e. after events of >25mm rainfall in any 24-hour period. The supervising hydrologist will monitor and advise on the readings collected by in-situ field monitoring.

5.2.2.5 Monitoring Parameters

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

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

5.2.3 Construction Phase Drainage Inspections & Maintenance

Drainage performance will form part of the civil works contract requirements. During the construction phase the effectiveness of drainage measures designed to minimise runoff entering works areas and capture and treatment of potentially silt-laden water from the works areas will be monitored periodically (daily, weekly, and event-based monitoring, i.e. after heavy rainfall events) by the Environmental Clerk of Works and/or the Project Hydrologist. The Environmental Clerk of Works will respond to changing weather and drainage conditions on the ground as the project proceeds, to ensure the effectiveness of the drainage design is maintained.

Prior to the commencement of construction an inspection and maintenance plan for the on-site drainage system which will be prepared by the Environmental Clerk of Works in consultation with the Project Hydrologist. Regular inspections of all installed drainage systems will be undertaken, especially after heavy rainfall, to check for blockages, and ensure there is no build-up of standing water in parts of the systems where it is not intended.

Regular inspections of all existing and installed drainage systems will be undertaken, especially after heavy rainfall, to check for blockages, and ensure there is no build-up of standing water within the system. Any excess build-up of silt levels at check dams, the settlement ponds, or any other drainage features that may decrease the effectiveness of the drainage feature, will be removed.

The following periodic inspection regime is likely to be proposed:

- Daily general visual inspections by Environmental Clerk of Works;

- Weekly (existing & new drains) inspections by the Environmental Clerk of Works and/or the site Construction Manager;
- Inspection to include all elements of drainage systems and all monitoring. Inspections required to ensure that drainage systems are operating correctly and to identify any maintenance that is required. Any changes, such as discolouration, odour, oily sheen or litter should be noted and corrective action should be implemented. High risk locations such as settlement ponds will be inspected daily. Daily inspections checks will be completed on plant and equipment, and whether materials such as silt fencing or oil absorbent materials need replacement;
- Event based inspections by the Environmental Clerk of Works as follows:
- >10 mm/hr (i.e. high intensity localised rainfall event);
- >25 mm in a 24-hour period (heavy frontal rainfall lasting most of the day); or,
- Rainfall depth greater than monthly average in 7 days (prolonged heavy rainfall over a week).
- Monthly site inspections by the Project Hydrologist during construction phase; and,
- Quarterly site inspections by the Project Hydrologist after construction for a period of one year following the construction phase.
- A written record will be maintained or available on-site of all construction phase monitoring undertaken.

5.2.4 Surface Water Monitoring Reporting

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

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

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

5.2.5 Post Construction Monitoring

5.2.5.1 Monthly Laboratory Analysis Sampling

Monthly sampling for laboratory analysis for a range of parameters adopted during pre-commencement and construction phases will continue for six months after completion of the heavy civils work undertaken as part of the construction phase. The supervising hydrologist will monitor and advise on the readings being received from the testing laboratory.

5.3 Environmental Awareness and Training

5.3.1 Environmental Induction

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

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

5.3.2 Toolbox Talks

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

- Ecological Sensitivities on site
- Buffers to be upheld – watercourses, archaeology, ecology
- Sediment and Erosion Control
- Good site practice
- On-site Traffic Routes and Rules
- Keeping to tracks – vehicle rules
- Strictly adhering to the development footprint
- Fuel Storage
- Materials and waste procedures

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

6. EMERGENCY RESPONSE PLAN

An Emergency Response Plan (ERP) has been prepared to provide details of procedures to be adopted in the event of an emergency in terms of site health and safety and environmental protection during the construction and operational phases of the Lyrenacarriga Wind Farm. The construction phase of the development will have the highest volume of works activity and site personnel resulting in this phase being the most likely to engage this ERP should a situation require it. The operational phase is a much less intensive phase of the development. The physical site presence during operation is significantly reduced with every element of the site monitored remotely. This ERP may be superseded by a plan prepared by the operation controller of the wind farm after final commissioning. A copy of this will be provided to Cork and Waterford County Councils once prepared.

The decommissioning phase will adopt this ERP during that phase in the event of an incident during the works associated with decommissioning and site restoration

6.1 Emergency Response

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

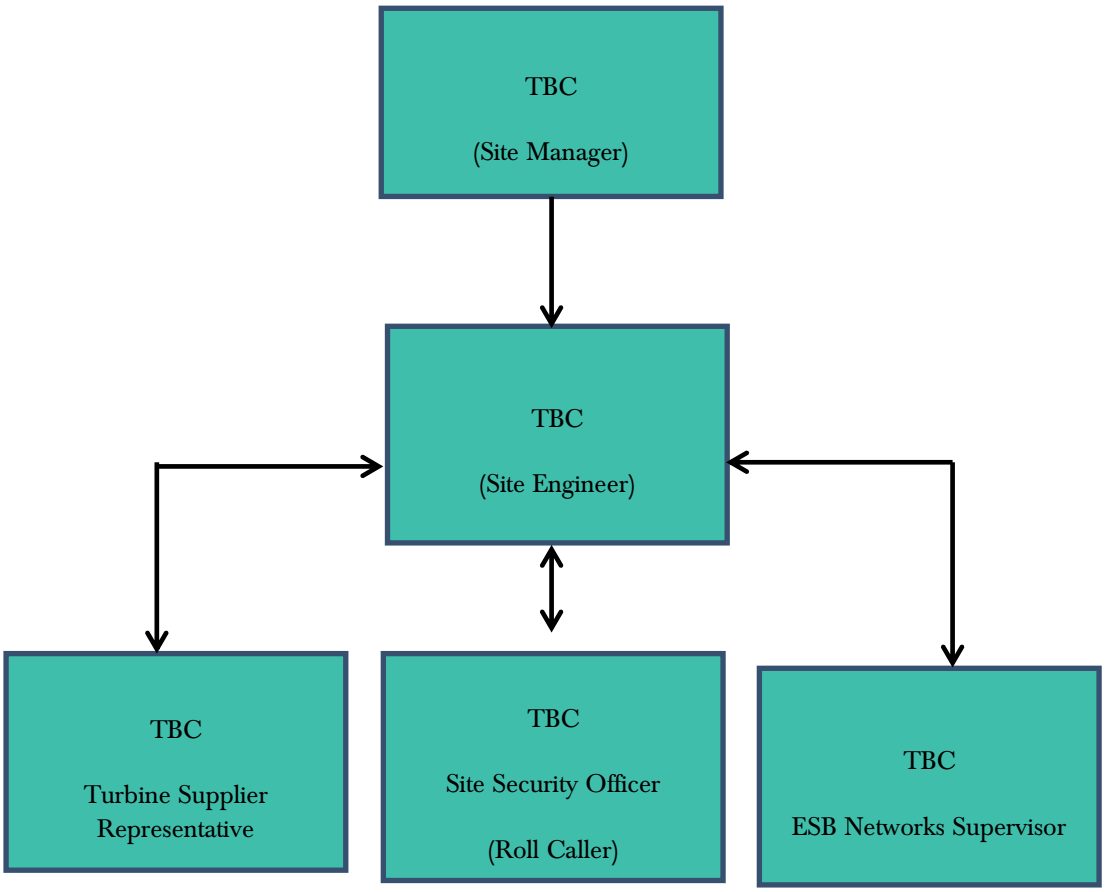


Figure 6-1 Emergency Response Procedure Chain of Command

6.1.1 Initial Steps

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

Table 6-1 Hazards associated with potential emergency situations

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

In the event of an emergency situation associated with, but not restricted to, the hazards outlined in Table 6-1 the Site 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 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 Manager will be required to use his or her own discretion at that point. In the case of fire, the emergency evacuation of the site should proceed, without exception. The site evacuation procedure is outlined in Section 6.1.2.
- 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 he is unable to do so. If delegating the task, ensure that they follow the procedures for contacting the emergency services as set out in Section 6.3.
- 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 the relevant emergency contact, appropriate regulatory body or service provider as required e.g. ESB Networks the numbers for which as provided in Section 6.3.2.

- Contact the next of kin of any injured personnel where appropriate. The procedure for this is outlined in Section 6.3.3.

6.1.2 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 Manager when all personnel have been accounted for. At this time the Site Manager will decide the next course of action which be determined by the situation that exists at that time. The Site Manager will advise all personnel accordingly.

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

6.2 Environmental Emergency Response Procedure

6.2.1 Spill Control Measures

Every effort will be made to prevent an environmental incident during the construction and operational 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 Environmental Clerk of Works immediately giving information on the location, type and extent of the spill so that they can take appropriate action.
- The Environmental Clerk of Works 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 Environmental Clerk of Works will notify the appropriate regulatory body such as Cork and Waterford County Councils, and the Environmental Protection Agency (EPA), if deemed necessary.

Environmental incidents are not limited to just fuel spillages. Therefore, any environmental incident must be investigated in accordance with the following steps.

- The Environmental Clerk of Works must be immediately notified.
- If necessary, the Environmental Clerk of Works 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 Environmental Clerk of Works will liaise with the Project Ecologist.
- If the incident has impacted on a sensitive receptor such as an archaeological feature the Environmental Clerk of Works will liaise with the Project Archaeologist.
- A record of all environmental incidents will be kept on file by the Environmental Clerk of Works and the Main Contractor. These records will be made available to the relevant authorities such as Cork and Waterford County Councils, EPA if required.

The Environmental Clerk of Works will be responsible for any corrective actions required as a result of the incident e.g. an investigative report, formulation of alternative construction methods or environmental sampling, and will advise the Main Contractor as appropriate.

6.3 Contact the Emergency Services

6.3.1 Emergency Communications Procedure

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

Stay calm. It's important to take a deep breath and not get excited. Any situation that requires 999/112 is, by definition, is 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 don't 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's 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 don't understand.

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

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

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

6.3.2 Contact Details

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

Table 6.2 Emergency Contacts

Contact	Telephone no.
Emergency Services – Ambulance, Fire, Gardaí	999/112
Doctor – The Health Centre Tallow	058-56441
Hospital – Cork University Hospital	021-4922000
ESB Emergency Services	1850 372 999
Gas Networks Ireland Emergency	1850 20 50 50
Gardaí – Tallow Garda Station	05856222
Health and Safety Co-ordinator: TBC	TBC
Health and Safety Authority	1890 289 389
Inland Fisheries Ireland (IFI)	1890 347 424
Project Supervisor Construction Stage (PSCS): TBC	TBC
Project Supervisor Design Stage (PSDS): TBC	TBC
Client – Curns Energy Ltd.	056-771 5782

6.3.3 Procedure for Personnel Tracking

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.

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

6.4 Induction Checklist

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

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

ERP Items to be included in Site Induction	Status
All personnel will be made aware of the evacuation procedure during site induction	
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 should form part of the site induction to make new personnel and sub-contractors aware of any such arrangement or requirement if applicable.	
All operatives on site without any exception will have undergo a site induction where they will be required to provide personal contact details which will include contact information for the next of kin.	

7. MITIGATION PROPOSALS

All mitigation measures relating to the pre-commencement, construction and operational phases of the development were set out in the relevant chapters of the EIAR submitted as part of the planning permission application.

This section of the CEMP groups together the mitigation measures presented in the EIAR. It is intended that the CEMP would be updated where required prior to the commencement of the development, to include all mitigations measures, conditions and or alterations to the EIAR and application documents should they emerge during the course of the planning process and would be submitted to the Planning Authority for written approval.

All mitigation measures which will be implemented during the pre-commencement, construction and operational phases of the project are outlined in Table 8-1. The mitigation measures have been grouped together according to their environmental field/topic and are presented under the following headings:

- Construction Management
- Drainage Design and Management
- Felling
- Subsoils and bedrock
- Flora and Fauna
- Noise
- Air Quality/Dust
- Landscape and Visual
- Traffic

By presenting the mitigation proposals in the below format, it provides 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 Mitigation Measures

Reference No:	Reference Heading	Location	Mitigation Measure	Audit Result	Action Required
Pre-Commencement Phase					
Pre- Commencement Construction Management					
MM1	Environmental Management	EIAR Chapter 4	Before the commencement of any felling works, the Environmental Clerk of works ECoW will › oversee the keyhole and extraction works. › 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 construction works, the ECoW will › 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). During Construction works the ECoW will › Be responsible for preparing and delivering the Environmental Toolbox 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.* › Take representative photographs showing the progress of operation onsite, and the integrity and effectiveness of the water protection measures.		

Reference No:	Reference Heading	Location	Mitigation Measure	Audit Result	Action Required
			› Collect water samples for analysis by a 3rd party accredited laboratory, adhering to the following requirements: o Surface water samples shall be collected upstream and downstream of the keyhole felling site at suitable sampling locations. o Sampling shall be taken from the stream / riverbank, with no in-stream access permitted. o 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.		
MM2	Site Drainage Plan	EIAR Chapter 4 and Chapter 10	› The Project Hydrologist/Design Engineer will assist in preparing a site drainage plan before construction commences.		
Biodiversity					
MM3	Effects on Rivers/Streams and Sensitive Aquatic Faunal Species	EIAR Chapter 7, Chapter 10, and CEMP Section 5	› A detailed drainage maintenance plan for the Proposed Development is provided in Chapter 4, Section 4.6.8 of this EIAR with additional drainage details described in Section 4.6 generally. This plan provides		

Reference No:	Reference Heading	Location	Mitigation Measure	Audit Result	Action Required
			details of how water quality will be protected during the construction of the Proposed Development. › Prior to the commencement of construction works on site, the extent of the proposed infrastructure at this location will be marked out by the Project Engineer and Project Ecologist. The area will be clearly fenced off and appropriate fencing erected. This will further minimise any potential for unnecessary habitat loss. If required, limb removal of individual branches will be undertaken, under the provisions of the Wildlife Act, as a preference to the loss of the entire tree. Such measures would allow for regrowth following turbine delivery.		
MM4	Effects on Fauna and Marsh Fritillary	EIAR Chapter 7, CEMP Section 5	› On a precautionary basis, a pre-commencement badger survey will be undertaken in accordance with standard best practice guidance (TII, 2005) prior to the commencement of site works to confirm the conditions predicted in this EIAR. If a badger sett is identified within or immediately adjacent to the proposed development footprint, a badger sett disturbance licence will be sought from the National Parks and Wildlife Service. › Exclusion zone fencing/berm and appropriate signage will be put in place along the section of haul road, where an existing cul-de-sac forestry spur road could provide vehicular access closer to the identified badger sett. This existing forestry access track will therefore be closed to any vehicular traffic/parking during the construction phase to avoid any unnecessary storage of vehicles etc . › On 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, consultation will be undertaken with the		

Reference No:	Reference Heading	Location	Mitigation Measure	Audit Result	Action Required
			National Parks and Wildlife Service and a derogation licence applied for. › 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 (TII, 2006[1]). › Area of suitable marsh fritillary habitat and associated colony will be fenced off or clearly marked prior to the commencement of any site works under the guidance and supervision of a suitably qualified Project Ecologist who will fulfil the role of Ecological Clerk of Works All of the above works will be undertaken or supervised by an appropriately qualified ecologist		
Construction Phase					
Construction Management					
MM5	Health and Safety	EIAR Chapter 5	During construction of the Proposed Development, all staff will be made aware of and adhere to: › 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;		

[1] *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-of-Otters-prior-to-the-Construction-of-National-Road-Schemes.pdf*

Reference No:	Reference Heading	Location	Mitigation Measure	Audit Result	Action Required
			› 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). This will encompass the use of all necessary Personal Protective Equipment and adherence to the site Health and Safety Plan which will include measures to exclude members of the public from certain areas of the site during construction.		
MM6	Health and Safety	EIAR Chapter 4	Stock-proof fencing (where required) will be erected around the borrow pit (s) and peat and spoil repositories if deemed necessary to prevent uncontrolled access to this area. Appropriate health and safety signage will also be erected on this fencing and at locations around the site		
MM7	Refuelling	EIAR Chapters 4, 5 7,10	› Minimal refuelling or maintenance of construction vehicles or plant will take place on site. › On-site refuelling will be carried out using a mobile double skinned, bunded 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. It is not practical for all vehicles to travel back to a single refuelling point, given the size of the cranes, excavators, etc. that will be used during the construction of the proposed wind farm development. 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 when not in use. Refuelling operations will be carried out only by designated trained and competent operatives under a Permit		

Reference No:	Reference Heading	Location	Mitigation Measure	Audit Result	Action Required
			to Refuel process. Mobile anti-pollution measures such as drip trays and fuel absorbent mats will be used during all refuelling operations › Fuels volumes stored on site will be minimised. Any fuel storage areas 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 electrical control building will be bunded appropriately to the volume of oils likely to be stored, and to prevent leakage of any associated chemicals and to groundwater or surface water. The bunded area will be fitted with a storm drainage system and an appropriate oil interceptor; › The plant used will be regularly inspected for leaks and fitness for purpose; and, › An emergency plan for the construction phase to deal with accidental spillages will be contained within Emergency Response Plan (Section 6 of CEMP). Spill kits will be available to deal with an accidental spillage		
MM8	Reinstatement	EIAR Chapter 4	A portion of excavated overburden material will be stored temporarily adjacent to the works areas for reinstatement when the main construction activities are completed. Soil will be backfilled outside the drainage channels along track-sides and vegetated sods replaced over the surface, bedded-in, regraded, etc., to re-constitute a stable and settled ground surface on which the natural vegetation can recover and will be resistant to erosion.		
Drainage Design and Management					
MM9	Clear Felling of Coniferous Plantation	EIAR Chapter 4, Chapter 10	The following Guidance will be adhered to › Forestry Commission (2004): Forests and Water Guidelines, Fourth Edition. Publ. Forestry Commission, Edinburgh; › Coillte (2009): Forest Operations and Water Protection Guidelines;		

Reference No:	Reference Heading	Location	Mitigation Measure	Audit Result	Action Required
			› Coillte (2009): Methodology for Clear Felling Harvesting Operations; › Forest Service (Draft): Forestry and Freshwater Pearl Mussel Requirements – Site Assessment and Mitigation Measures; and, › Forest Service (2000): Forestry and Water Quality Guidelines. Forest Service, DAF, Johnstown Castle Estate, Co. Wexford A self-imposed conservative buffer zone of 75 metres will be maintained for all streams where possible; with the exception of existing road/crossing upgrades and proposed stream crossings, the proposed tree felling areas are generally located outside of imposed buffer zones. The large distance between the majority of the proposed felling areas and sensitive aquatic zones means that potential poor-quality runoff from felling areas can be adequately managed and attenuated prior to even reaching the aquatic buffer zone and primary drainage routes. Where tree felling is required in the vicinity of streams, the following additional mitigation measures will be employed. › Machine combinations (i.e. handheld or mechanical) will be chosen which are most suitable for ground conditions and which will minimise soils disturbance; › 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; › Removing clay, soil, silts from roads during wet periods and dust suppression during dry spells; › Ditches which drain from the proposed area to be felled towards existing surface watercourses will be blocked, and temporary silt traps will be constructed. No direct discharge of such ditches to		

Reference No:	Reference Heading	Location	Mitigation Measure	Audit Result	Action Required
			watercourses will occur. Drains and sediment traps will be installed during ground preparation. Collector drains will be excavated at an acute angle to the contour (~0.3%-3% gradient), to minimise flow velocities. Main drains to take the discharge from collector drains will include water drops and rock armour, as required, where there are steep gradients, and will avoid being placed at right angles to the contour; › 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 will be carefully disposed of in the 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 or where felling inside the 75-metre buffer is required, it will be necessary to install double or triple sediment traps; › All drainage channels will taper out before entering the 75m buffer zone. This ensures that discharged water gently fans out over the buffer zone before entering the aquatic zone, with sediment filtered out from the flow by ground vegetation within the zone. On erodible soils, silt traps will be installed at the end of the drainage channels, to the outside of the buffer zone; › 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. Correct drain alignment, spacing and depth will ensure that erosion and sediment build-up are minimized and controlled; › Brash mats will be used to support vehicles on soft ground, reducing 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		

Reference No:	Reference Heading	Location	Mitigation Measure	Audit Result	Action Required
			compaction and rutting. Where there is risk of severe erosion occurring, extraction will be suspended during periods of high rainfall; › Timber will be stacked in dry areas, and outside a local 75 metre watercourse buffer. 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 run-off; › Checking and maintenance of roads and culverts will be on-going through the felling operation; › Refuelling or maintenance of machinery will not occur within 100m of a watercourse. Mobile bowser, spill kits, qualified personnel will be used where refuelling is required; › A permit to refuel system will be adopted: › 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; › Crossing of streams will not be permitted; › Trees will be cut manually from along streams and using machinery to extract whole tree; and Travel only perpendicular to and away from stream.		
MM10	Silt Traps	EIAR Chapter 4, Chapter 10	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.		

Reference No:	Reference Heading	Location	Mitigation Measure	Audit Result	Action Required
MM11	Drain Inspection and Maintenance	EIAR Chapter 4, Chapter 10	The following items shall be carried out during pre-felling inspections: › Communication with tree felling operatives in advance to determine whether any areas have been reported to experience 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 shall be identified. Ideally the pre-felling inspection shall be carried out during rainfall; › Following tree felling all main drains shall 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.		
MM12	Surface Water Quality Monitoring	EIAR Chapter 4, Chapter 10	› Appropriate interceptor drainage, to prevent up-slope surface runoff from entering excavations will be put in place; › If required, pumping of excavation inflows will prevent build-up of water in the excavation; › The interceptor drainage will be discharged to the site constructed drainage system or onto natural vegetated surfaces and not directly to surface waters;		

Reference No:	Reference Heading	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; › 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 a final line of defence if needed		
MM13	Earthworks (Removal of Vegetation Cover, Excavations and Stock Piling)	EIAR Chapter 4, Chapter 10	› Drainage and seepage water resulting from infrastructure excavation; › Stockpiled excavated material providing a point source of exposed sediment; › Construction of the collector cable trench resulting in entrainment of sediment from the excavations during construction; and, › Erosion of sediment from emplaced site drainage channels. › 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		

Reference No:	Reference Heading	Location	Mitigation Measure	Audit Result	Action Required
			any increased risk of downstream flooding or sediment transport/erosion; › Silt traps will be placed in the existing drains upstream of any streams where construction works / tree felling is taking place, and these will be diverted into proposed interceptor drains, or culverted under/across the works area; › Runoff from individual turbine hardstanding areas will be not discharged into the existing drain network but discharged locally at each turbine location through stilling 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 reducing and silt control measures such as check dams, sandbags, 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.		
MM14	Settlement ponds	EIAR Chapter 4, Chapter 10	› Settlement ponds, placed either singly or a pair in series, will buffer volumes of run-off discharging from the drainage system during periods of high rainfall, by retaining water until the storm hydrograph has receded, thus reducing the hydraulic loading to water courses as per the drainage design.		
MM15	Water Treatment Train	EIAR Chapter 4, Chapter 10	› A water treatment train such as a “Siltbuster” if required. If the discharge water from construction areas fails to be of a high quality		

Reference No:	Reference Heading	Location	Mitigation Measure	Audit Result	Action Required
			during the daily inspections then a filtration treatment system (such as a 'Siltbuster' or similar equivalent treatment train (sequence of water treatment processes) will be used to filter and treat all surface discharge water collected in the dirty water drainage system. This will apply for all of the construction phase.		
MM16	Silt Bags	EIAR Chapter 4, Chapter 10	› Silt bags will be used where small to medium volumes of water need to be pumped from excavations. As water is pumped through the bag, the majority of the sediment is retained by the geotextile fabric allowing filtered water to pass through. Silt bags will be used with natural vegetation filters or sedimats, Sediment entrapment mats, consisting of coir or jute matting, will be placed at the silt bag location to provide further treatment of the water outfall from the silt bag. Sedimats will be secured to the ground surface using stakes/pegs. The sedimat will extend to the full width of the outfall to ensure all water passes through this additional treatment measure. A water treatment train such as a "Siltbuster" if required. If the discharge		

Reference No:	Reference Heading	Location	Mitigation Measure	Audit Result	Action Required
MM17	Potential Release of Hydrocarbons	EIAR Chapter 4, Chapter 10	› On site re-fuelling of machinery will be carried 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 within the CEMP (Appendix 4-4 of this EIAR). Spill kits will be available to deal with and accidental spillage in and outside the re-fuelling area.		
MM18	Release of Cement-Based Products	EIAR Chapter 4, Chapter 10	› No batching of wet-cement products will occur on site. Ready-mixed supply of wet concrete products and where possible, emplacement of pre-cast elements, will take place. › Where possible pre-cast elements for culverts and concrete works will be used.		

Reference No:	Reference Heading	Location	Mitigation Measure	Audit Result	Action Required
			› Where concrete is delivered on site, only the chute will be cleaned, using the smallest volume of water practicable. No discharge of cement contaminated waters to the construction phase drainage system or directly to any artificial drain or watercourse will be allowed. Chute cleaning water will be undertaken at lined cement washout ponds. › The pour site will be kept free of standing water and plastic covers will be ready in case of sudden rainfall event.		
MM19	Morphological Changes to Surface Water Courses & Drainage Patterns	EIAR Chapter 4, Chapter 10	› 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; › All guidance / mitigation measures proposed by the OPW or the Inland Fisheries Ireland is incorporated into the design of the proposed crossings; › As a further precaution, near stream construction work, will only be carried out during the period permitted by Inland Fisheries Ireland for in-stream works according to the Eastern Regional Fisheries Board (2004) guidance document "Requirements for the Protection of Fisheries Habitat during Construction and Development Works at River Sites", i.e., May to September inclusive. This time period coincides with the period of lowest expected rainfall, and therefore minimum runoff rates. This will minimise the risk of entrainment of suspended sediment in surface water runoff, and transport via this pathway to surface watercourses (any deviation from this will be done in discussion with the IFI);		

Reference No:	Reference Heading	Location	Mitigation Measure	Audit Result	Action Required
			› During the near stream construction work double row silt fences will be emplaced immediately down-gradient of the construction area for the duration of the construction phase. There will be no batching or storage of cement allowed in the vicinity of the crossing construction areas; and, › All new river/stream crossings will require a Section 50 application (Arterial Drainage Act, 1945). The river/stream crossings will be designed in accordance with OPW guidelines/requirements on applying for a Section 50 consent.		
MM20	Hydrological Impacts on Downstream Designated Sites	EIAR Chapter 4, Chapter 10	› 75m buffer zones and drainage control measures (i.e. interceptor drains, swales, stilling ponds), will ensure that the quality of runoff from proposed development areas will be very high.		
MM21	Surface Water Quality Impacts on the Youghal Public Water Supply Abstractions	EIAR Chapter 4, Chapter 10, CEMP Section 5	The design includes for measures such as 75m buffer from watercourses and in control measures (silt busters, check dams etc) to prevent any potential impact on the Youghal Public Water Supply. The implementation of the below will also be incorporated: › Detailed Drainage Management Design 10.5.2 and 10.5.3 of the EIAR? › Daily inspections will be undertaken to assess the effectiveness of the water treatment trains		
MM22	Turbine Delivery Route Works	EIAR Chapter 10	› Silt traps will be temporarily be placed in all drains intercepted by the works prior to works commencing › Silt fence perimeters will be placed downslope of the works before excavations begin › At the Breeda Bridge proposed access road temporary drains (interceptor and collector drains) and settlement ponds will be put in place to deal with surface water runoff.		

Reference No:	Reference Heading	Location	Mitigation Measure	Audit Result	Action Required
Construction Management					
MM23	Plant and equipment inspections	EIAR Chapter 4	› Site plant will be regularly inspected for leaks and fitness for purpose; and an emergency plan for the construction phase to deal with accidental spillages will be contained within the Construction Environmental Management Plan. Spill kits will be available to deal with accidental spillages.		
MM24	Wastewater Disposal	EIAR Chapter 4	› Temporary port-a-loo toilets located within a staff portacabin will be used during the construction phase. Wastewater from staff toilets will be directed to a sealed storage tank, with all wastewater being tankered off site by an appropriately consented waste collector to wastewater treatment plants.		
MM25	Concrete Deliveries and Management	EIAR Chapter 4	› No batching of wet-cement products will occur on site. Ready-mixed supply of wet concrete products will be used and where possible, pre-cast elements for culverts and concrete works will be used.		
MM26	Concrete Deliveries and Management	EIAR Chapter 4	› No washing out of any plant used in concrete transport or concreting operations will be allowed on-site, save for chute cleaning as described below		
MM27	Concrete Deliveries and Management	EIAR Chapter 4	› Where concrete is delivered on site, only the chute need 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 directed into a dedicated lined washout area. This lined area will be removed from site once the construction phase is complete.		

Reference No:	Reference Heading	Location	Mitigation Measure	Audit Result	Action Required
MM28	Concrete Deliveries and Management	EIAR Chapter 4	› Weather forecasting will be used to plan dry days for pouring concrete. Ensure pour site is free of standing water and plastic covers will be ready in case of sudden rainfall event		
MM29	Concrete Deliveries and Management	EIAR Chapter 4	› The use of pre-cast elements for culverts and concrete works will be prioritised.		
Peat, Subsoils and Bedrock					
MM30	Soil, Subsoil and Bedrock Excavation	EIAR Chapter 9	› Use of the existing forestry road network as much as possible to reduce soil/subsoil excavation and borrow pit volumes; › The soil and subsoil which will be removed during the construction phase will be localised to the Proposed Development infrastructure locations; › No turbines or related infrastructure will be constructed near or on any designated sites such as NHAs or SACs; › A minimal volume of soil and subsoil will be removed to allow for infrastructural work to take place in comparison to the total volume present on the site due to optimisation of the layout by mitigation by design.		
MM31	Ground/Slope Instability and Failure	EIAR Chapter 9	› Based on the Geotechnical Assessment Report there is no evidence of past failures nor were there any signs of instability noted on the proposed development site. However, the Geotechnical Assessment Report (Appendix 4-2) provides recommendations which will be implemented regarding wind farm infrastructure construction, borrow pit construction and spoil placement/storage.		

Reference No:	Reference Heading	Location	Mitigation Measure	Audit Result	Action Required
MM32	Contamination of Soil by Leakages and Spillages and Alteration of Peat/Soil Geochemistry	EIAR Chapter 9	› On site re-fuelling will be undertaken by suitably trained personnel only; › Fuels stored on site will be minimised. Storage areas where 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 electrical substation will be bunded appropriately to the volume of oils likely to be stored, and to prevent leakage of any associated chemicals and 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; › All waste tar material arising from the chipping and resurfacing of the temporary construction access road will be removed off-site and taken to licenced waste facility; and, › An emergency plan for the construction phase to deal with accidental spillages is contained within the Construction and Environmental Management Plan (Appendix 4-4 of this EIAR). Spill kits will be available to deal with accidental spillage in and outside the re-fuelling area.		
MM33	Erosion of Exposed Subsoils and Soil During Tree Felling, Access Road and Turbine Base Construction Work	EIAR Chapter 9, CEMP Section 5	› All excavated material will be managed in accordance with the measures presented in the Geotechnical Assessment Report – see Appendix 4-2. Material will be moved over the least possible distance. › Any excess spoil will be moved to storage areas or will be temporarily surrounded by earthen berms to prevent erosion. This will prevent erosion of soil. Silt fences will be installed around temporary stockpiles to limit movement of entrained sediment in surface water runoff. The		

Reference No:	Reference Heading	Location	Mitigation Measure	Audit Result	Action Required
			use of earthen berms and silt fencing around earthworks and spoil mounds will prevent egress of water from the works. › In order to minimise erosion of mineral subsoils, stripping of topsoil will not take place during extremely wet periods[2] (to prevent increased silt rich runoff). Temporary drainage systems (Please see Drainage Management Plan) will be required to limit runoff impacts during the construction phase. › During tree felling, brash mats will be used to support vehicles on soft ground, reducing soil and mineral subsoil 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.		
Biodiversity					
MM34	Environmental Management- Invasive Species	EIAR Chapter 6	The control of invasive alien species will follow guidelines issued by the National Roads Authority - *The Management of Noxious Weeds and Non-native Invasive Plant Species on National Roads* (NRA 2010[3]). Best practice measures in relation to invasive species are described below:		

[2] >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.

[3] *NRA, 2010, National Roads Authority* - The Management of Noxious Weeds and Non-native Invasive Plant Species on National Roads, Online, Available at: https://www.tii.ie/tii-library/environment/construction-guidelines/Management-of-Noxious-Weeds-and-Non-Native-Invasive-Plant-Species-on-National-Road-Schemes.pdf, Accessed 09.12.2020

Reference No:	Reference Heading	Location	Mitigation Measure	Audit Result	Action Required
			› Where works cannot avoid areas of Rhododendron, the proposed method of removal is by means of cutting and digging. This will be carried out by a suitably qualified individual familiar with Rhododendron and the potential risks associated with the plant. Firstly, all overgrowth will be removed by means of cutting. This will take place outside of the optimal seed dispersal period (Feb-May) (Edwards, 2006). › Any stumps and roots which require removal during the cable installation/windfarm development will be removed either manually or by using a digger. › To avoid regrowth, Rhododendron material removed will be mulched and spread within the site. If stumps cannot be mulched these will be buried upside down at a depth of 2m in a designated location within the site. › All Rhododendron material will be stockpiled in a clearly defined fenced off area within the site. All fencing will be monitored and maintained for the duration of the works. › On completion of the proposed development, the site will be monitored for Rhododendron encroachment. Any encroachment will be sprayed and/or removed via the above treatment methods. Any spraying will be carried out with a suitable herbicide following the manufactures instructions. › Good construction site hygiene will be employed to prevent the spread of these species with vehicles thoroughly cleaned down prior to leaving any site with the potential to have supported invasive species. All plant and equipment employed on the construction site (e.g. excavator, footwear, etc.) will be thoroughly cleaned down on site to prevent the spread of invasive plant. All clean down must be		

Reference No:	Reference Heading	Location	Mitigation Measure	Audit Result	Action Required
			undertaken in areas with no potential to result in the spread of invasive species. Any material that is imported onto any site will be verified by a suitably qualified ecologist to be free from any invasive species listed on the 'Third Schedule' of Regulations 49 & 50 of Regulations 49 and 50 of the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. 477 of 2011). This will be carried out by searching for rhizomes and plant material.		
MM35	Habitat maintenance	EIAR Chapter 7	› Prior to the commencement of construction works on site, the extent of the proposed infrastructure at this location will be marked out by the Project Engineer and Project Ecologist. The area will be clearly fenced of and appropriate fencing erected. This will further minimise any potential for unnecessary habitat loss. If required, limb removal of individual branches will be undertaken, under the provisions of the Wildlife Act, as a preference to the loss of the entire tree. Such measures would allow for regrowth following turbine delivery › In order to offset for the loss of hedgerow and treeline habitat to the proposed development (predominantly associated with bat mitigation measures), it is also proposed to plant 236 linear metres of new hedgerow within large areas of agricultural/arable lands to increase connectivity locally. The locations in which the proposed planting will be located will be subject to final landowner agreement. However, indicative areas for planting are proposed in Figure 7-13. The species composition will be similar to that in the surrounding landscape i.e. hawthorn, blackthorn and semi-mature native tree species. There will therefore be no net loss in hedgerow or treeline habitat. In addition,		

Reference No:	Reference Heading	Location	Mitigation Measure	Audit Result	Action Required
			connectivity to the wider landscape will be maintained around turbines where hedgerows and treelines are retained.		
MM36	Impact on Fauna and Marsh Fritillary	EIAR Chapter 7, CEMP Section 5	› 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 (TII, 2006). › In order to avoid any potential for indirect effects on otter and Sensitive Aquatic Faunal Species, via deterioration in water quality, a detailed drainage maintenance plan for the Proposed Development is provided › Area of suitable marsh fritillary habitat and associated colony will be fenced off or clearly marked prior to the commencement of any site works under the guidance and supervision of a suitably qualified Project Ecologist who will fulfil the role of Ecological Clerk of Works		
Ornithology					
MM37	Breeding Bird Disturbance	EIAR Chapter 4, Chapter 8, NIS.	› 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. › The removal of woody vegetation will be undertaken outside the bird breeding season which runs from the 1st of March to the 31st of August inclusive. Where sections of woody vegetation are removed for the purposes of the junction and road upgrades, these will be replaced with suitable hedge/tree species which are common in the local context. › Plant machinery will be turned off when not in use.		

Reference No:	Reference Heading	Location	Mitigation Measure	Audit Result	Action Required
			› All plant and equipment for use will comply with best practise Construction Plant and Equipment Permissible Noise Levels Regulations and other relevant legislation. › A Project Ecologist who will fulfil the role of Ecological Clerk of Works will be appointed. Duties will include: o Undertake a pre-construction transect/walkover bird survey to ensure that significant effects on breeding birds will be avoided. o Inform and educate on-site personnel of the ornithological and ecological sensitivities within the Proposed Development site. o Oversee management of ornithological and ecological issues during the construction period and advise on ornithological issues as they arise. o Provide guidance to contractors to ensure legal compliance with respect to protected species onsite. o Liaise with officers of consenting authorities and other relevant bodies with regular updates in relation to construction progress.		
MM38	Impact on Wetland and Waterbirds	EIAR Chapter 8 and NIS	Mitigation measures have been incorporated into the proposed development for the prevention of water pollution. The proposed development includes a detailed drainage plan that is included in full in Section 4.7, Chapter 4 of the EIAR (Appendix 3 to this NIS). › Drains will be excavated and stilling ponds constructed to eliminate any suspended solids within surface water running off the site. The following best practice drainage measures have been incorporated into the proposed development for the protection of water quality, as fully described in Section 3.2.4.2 of the CEMP, see Appendix 4-4, Appendix 3 of this NIS:		

Reference No:	Reference Heading	Location	Mitigation Measure	Audit Result	Action Required
			› Interceptor drains will be maintained up-gradient of all proposed infrastructure to collect clean surface runoff, in order to minimise the amount of runoff reaching areas where suspended sediment could become entrained. It will then be directed to areas where it can be re-distributed over the ground by means of a level spreader. › Swales/roadside drains will be maintained to intercept and collect runoff from access roads and hardstanding areas of the site, likely to have entrained suspended sediment, and channel it to stilling ponds for sediment settling; › Check dams will be maintained at regular intervals along interceptor drains and swales/roadside drains in order to reduce flow velocities and therefore minimise erosion within the system during storm rainfall events; and, › Stilling ponds/settlement ponds, emplaced downstream of swales and roadside drains, will buffer volumes of runoff discharging from the drainage system during periods of high rainfall, by retaining water until the storm hydrograph has receded, thus reducing the hydraulic loading to watercourses. 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. Inspection and maintenance of all settlement ponds will be ongoing through the construction period.		
Noise & Vibration					
MM39	Plant, machinery and vehicular noise emissions *BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on*	EIAR Chapter 4, Chapter 5 and Chapter 13.	› 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.		

Reference No:	Reference Heading	Location	Mitigation Measure	Audit Result	Action Required
	construction and open sites – Vibration		› 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 or throttled back to a minimum during periods when not in use. › Any plant, such as generators or pumps, which is required to operate before 07:00hrs or after 19:00hrs 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 Table 4-2 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 period or at critical periods within the programme it could occasionally be necessary to work out with these hours. Any such out of hours working would be agreed in advance with the local planning authority.		
MM40	Rock Breaking *BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on*	EIAR Chapter 5 and Chapter 13	Specific to blasting (if undertaken) the following mitigation measures will be employed to control the impact during blasts: › 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).		

Reference No:	Reference Heading	Location	Mitigation Measure	Audit Result	Action Required
	construction and open sites – Vibration		› The firing of blasts at similar times to reduce the 'startle' effect. › The implementation of an onsite documented complaints procedure. › The use of independent monitoring by external parties for verification of results. › Trial blasts in less sensitive areas to assist in blast designs and identify potential zones of influence. › 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 line 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. › 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. › 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.		
MM41	*BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on*	EIAR Chapter 5 and Chapter 13	Where rock breaking is employed in relation to the proposed borrow pit location, the following are examples of measures that will be employed, where necessary, to mitigate noise emissions from these activities:		

Reference No:	Reference Heading	Location	Mitigation Measure	Audit Result	Action Required
	construction and open sites – Noise; Vibration		› 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.		
Air Quality/Dust					
MM42	Dust	EIAR Chapter 4, Chapter 5 and Chapter11	› In periods of extended dry weather, dust suppression may be necessary along haul roads, site roads, around borrow pit areas and other infrastructure to ensure dust does not cause a nuisance. If necessary, water will be taken from stilling ponds in the site's drainage system and pumped into a bowser or water spreader to dampen down haul roads, borrow pit and site compounds to prevent the generation of dust where required. Water bowser movements will be carefully monitored to avoid, insofar as reasonably possible, increased runoff. › All plant and materials vehicles shall be stored in dedicated areas (on site). › Areas of excavation will be kept to a minimum, and stockpiling will be minimised by coordinating excavation, spreading and compaction. › Turbines and construction materials will be transported to site on specified haul routes only. › The agreed haul route roads adjacent to the site will be regularly inspected for cleanliness and cleaned as necessary. Any clay, soil or silty material deposited by site traffic will be removed from the roads		

Reference No:	Reference Heading	Location	Mitigation Measure	Audit Result	Action Required
			to maintain the stoned running surface. This removal of spoil material can have a substantial reduction effect of dust production in dry spells. Removed spoil material will be transported to the borrow pit or other suitable storage location for containment and storage. › The transport of construction materials to the site that have significant potential to cause dust, will be undertaken in tarpaulin or similar covered vehicles where necessary. › The transport of spoil that has the significant potential to generate dust, to the on-site borrow pits will be minimised. If necessary, excavated spoil will be dampened prior to transport to the borrow pits. › A Construction and Environmental Management Plan (CEMP) will be in place throughout the construction phase (see Appendix 4-4). The CEMP includes dust suppression measures. › The designated public roads outside the site and along the main transport routes to the site will be regularly inspected by the Site Environmental Clerk of Works for cleanliness, and cleaned as necessary; › Material handling systems and material storage areas will be designed and laid out to minimise exposure to wind; › Water misting or sprays will be used as required if particularly dusty activities are necessary during dry or windy periods; › Water misting or bowsers will operate on-site as required to mitigate dust in dry weather conditions; › The transport of soils or other material, which has significant potential to generate dust, will be undertaken in tarpaulin-covered vehicles where necessary; › All construction related traffic will have speed restrictions on un-surfaced roads to 15 kph;		

Reference No:	Reference Heading	Location	Mitigation Measure	Audit Result	Action Required
			› Daily inspection of construction sites to examine dust measures and their effectiveness. › When necessary, sections of the haul route will be swept using a truck mounted vacuum sweeper; and, › All vehicles leaving the construction areas of the site will pass through a wheel cleansing area prior to entering the local road network		
MM43	Exhaust Emissions	EIAR Chapter 4, Chapter 5 and Chapter 11	› 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. › The majority of aggregate materials for the construction of the Proposed Development will be obtained from borrow pits on the site of the Proposed Development. This will significantly reduce the number of delivery vehicles accessing the site, thereby reducing the amount of emissions associated with vehicle movements.		
MM44	Greenhouse Gas Emissions	EIAR Chapter 11	› All construction vehicles and plant will be maintained in good operational order while onsite, thereby minimising any emissions that arise. › 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 wind farm will be obtained from the three proposed borrow pits on the site of the Proposed Development. This will significantly reduce the number of delivery vehicles accessing the site, thereby reducing the amount of emissions associated with vehicle movements.		

Reference No:	Reference Heading	Location	Mitigation Measure	Audit Result	Action Required
Traffic					
MM45	Liaison with the relevant local authority	EIAR Chapter 5 and Chapter 15	› Liaison with the relevant local authority including the roads section of local authorities that the delivery routes traverse and An Garda Siochána, during the delivery phase.		
MM46	Travel Plans for Construction Workers	EIAR Chapter 5 and Chapter 15	› The construction company will be required to provide a travel plan for construction staff, which will include the identification of a routes to / from the site and identification of an area for parking.		
MM47	Temporary traffic signs	EIAR Chapter 5 and Chapter 15, CEMP Section 4	› As part of the traffic management measures temporary traffic signs will be put in place at all key junctions, including the access junction on the N15. All measures will be in accordance with the "Traffic Signs Manual, Chapter 8 – Temporary Traffic Measures and Signs for Road Works" (DoT now DoTT&S) and "Guidance for the Control and Management of Traffic at Roadworks" (DoTT&S). A member of construction staff (flagman) will be present at key junctions during peak delivery times.		
MM48	Delivery of abnormally sized loads	EIAR Chapter 5 and Chapter 15, CEMP Section 4	The following are the main points to note for these deliveries which 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 153 abnormally sized loads will be delivered to the site, comprising 31 convoys of 5, undertaken over 31 separate nights.		

Reference No:	Reference Heading	Location	Mitigation Measure	Audit Result	Action Required
			› These nights will be spread out over an approximate period of 9 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 Garda 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 › Implementation of temporary alterations to road network at critical junctions – 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.		
Cultural Heritage					
MM49	Felling Licence	EIAR Chapter 4	› Felling will be carried out under the terms of a licence application to the Forest Service, as per the Forest Service's policy on granting felling licenses for wind farm developments		
MM50	Clear felling of Coniferous Plantation	EIAR Chapter 4	› Works will be overseen by an ECoW. › The extent of all necessary tree felling will be identified and demarcated with markings on the ground in advance of any felling commencing. › All roads and culverts will be inspected prior to any machinery being brought on site to commence the felling operation. No tracking of vehicles through watercourses will occur. Vehicles will only use existing road infrastructure and established watercourse crossings. › Existing drains that drain an area to be felled towards surface watercourses will be blocked, and temporary silt traps will be constructed to ensure collection of all silt within felling areas. These		

Reference No:	Reference Heading	Location	Mitigation Measure	Audit Result	Action Required
			temporary silt traps will be cleaned out and backfilled once felling works are complete. This ensures there is no residual collected silt remaining in blocked drains after felling works are completed. No direct discharge of such drains to watercourses will occur from within felling areas. › New collector drains and sediment traps will be installed during ground preparation to intercept water upgradient of felling areas and divert it away. Collector drains will be excavated at an acute angle to the contour (0.3%-3% gradient), to minimise flow velocities. › All silt traps will be sited outside of buffer zones and have no direct outflow into the aquatic zone. Machine access will be maintained to enable the accumulated sediment to be excavated. Sediment will be carefully disposed of away from all aquatic zones. › All new collector drains will taper out before entering the aquatic buffer zone to ensures the discharging water gently fans out over the buffer zone before entering the aquatic zone. › Machine combinations will be chosen which are most suitable for ground conditions at the time of felling, and which will minimise soils disturbance; › Mechanised operations will be suspended during and immediately after heavy rainfall. › Where brash is required to form brash mats, it is to be laid out at harvesting stage to prevent soil disturbance by machine movement. › Unused Brash may be moved within the site to facilitate the creation of mats in more demanding locations. › Felling of trees will be pointed directionally away from watercourses. › Felling will be planned to minimise the number of machine passes in any one area. › Extraction routes, and hence brash mats, will be aligned parallel to the ground contours where possible.		

Reference No:	Reference Heading	Location	Mitigation Measure	Audit Result	Action Required
			› Harvested timber will be stacked in dry areas, and outside any 50-metre watercourse buffer zone. Straw bales and check dams to be emplaced on the down gradient side of timber storage sites. › Branches, logs or debris will not be allowed to build up in aquatic zones. All such material will be removed when harvesting operations have been completed but removing of natural debris deflectors will be avoided		
Operational Phase					
Population & Human Health					
MM51	Health & Safety	EIAR Chapter 5	› Access to the turbines is through a door at the base of the structure, which will be locked at all times outside maintenance visits. › Signs will be erected at suitable locations such as, amenity access points and carparks, setting out the conditions of public access under the relevant legislation and providing normal hours (and out of hours) contact details. Staff associated with the project will conduct frequent visits, which will include inspections to establish whether any signs have been defaced, removed or are becoming hidden by vegetation or foliage, with prompt action taken as necessary. › Signs will also be erected at suitable locations across the site as required for the ease and safety of operation of the wind farm. These signs include: o Buried cable route markers at 50m intervals and change of cable route direction; o Directions to relevant turbines at junctions; o "No access to Unauthorised Personnel" at appropriate locations;		

Reference No:	Reference Heading	Location	Mitigation Measure	Audit Result	Action Required
			○ Speed limits signs at site entrance and junctions; ○ "Warning these Premises are alarmed" at appropriate locations; ○ "Danger HV" at appropriate locations; ○ "Warning – Keep clear of structures during electrical storms, high winds or ice conditions" at site entrance; ○ "No unauthorised vehicles beyond this point" at specific site entrances; and ○ Other operational signage required as per site-specific hazards.		
MM52	Health & Safety	EIAR Chapter 5	› An operational phase Health and Safety Plan will be developed to fully address identified Health and Safety issues associated with the operation of the site and providing for access for emergency services at all times. › The components of a wind turbine are designed to last up to 30 years (or longer with regular maintenance) and are equipped with a number of safety devices to ensure safe operation during their lifetime. During the operation of the wind farm regular maintenance of the turbines will be carried out by the turbine manufacturer or appointed service company. A project or task specific Health and Safety Plan will be developed for these works in accordance with the site's health and safety requirements.		
Shadow Flicker					
MM53	Shadow Flicker monitoring & Screening	EIAR Chapter 6	In the event that shadow flicker limit exceedances are experienced at buildings, a site visit will be undertaken firstly to determine the level of occurrence, existing screening and window orientation. The shadow flicker prediction data will be used to select dates on which a shadow flicker event could be observed at one or multiple affected properties and the following process will be adhered:		

Reference No:	Reference Heading	Location	Mitigation Measure	Audit Result	Action Required
			› Recording the weather conditions at the time of the site visit, including wind speeds and direction (i.e. blue sky, intermittent clouds, overcast, moderate breeze, light breeze, still etc.). › Recording the house number, time and duration of site visit and the observation point GPS coordinates. › Recording the nature of the sensitive receptor, its orientation, windows, landscaping in the vicinity, any elements of the built environment in the vicinity, vegetation. › In the event of shadow flicker being noted as occurring the details of the duration (times) of the occurrence will be recorded. › Screening Measures: In the event of an occurrence of shadow flicker exceeding guideline threshold values of 30 hours per annum or 30 minutes per day at residential receptor locations, mitigation options will be discussed with the affected homeowner, including: o Installation of appropriate window blinds in the affected rooms of the residence; o Planting of screening vegetation; o Other site-specific measures which might be agreeable to the affected party and may lead to the desired mitigation.		
MM54	Turbine Control Measures		If it is not possible to mitigate identified shadow flicker limit exceedances locally using the measures detailed in MM53, the following turbine shut-down/curtailment procedure shall be incorporated as a mitigation measure within the operating system of the permitted wind farm: › The SCADA (Supervisory Control and Data Acquisition) wind turbine control system for the permitted development will be programmed to cease operation of the relevant wind turbine(s) where shadow flicker		

Reference No:	Reference Heading	Location	Mitigation Measure	Audit Result	Action Required
			exceeds the allowed 30 minutes per day/30 hours annual limit at any identified sensitive receptor. The turbine technology includes a photocell which records light levels and whether they are strong enough to cast a shadow and as such turbines can be programmed to shut down in the event of the specified threshold values – 30 hours per annum or 30 minutes per day) being reached. This action would be taken when the particular weather conditions relating to a potential Shadow Flicker exceedance limits event occurs, i.e. a particular wind speed, direction and direct sunlight present. › Within 12 months of commissioning of the wind farm, field investigation/monitoring will be carried out by the wind farm operator at potentially affected properties in order to confirm the effectiveness of the mitigation measures. › Notwithstanding the approach set out above should shadow flicker associated with the permitted development be perceived to cause a nuisance at any home, the affected homeowner will be invited to engage with the Wind Farm Developer. › The homeowner will be asked to log the date, time and duration of shadow flicker events occurring on at least five different days. This methodology has been used effectively at other sites. The provided log will be compared with the predicted occurrence of shadow flicker at the residence, and if necessary, a field investigation will be carried out. A report on the effectiveness of the shadow flicker mitigation measures will be compiled and submitted to the local authority in line with the current best practice.		
Biodiversity					
MM55	Bats	EIAR Chapter 7	› In order to reduce the value of the habitat for bat species in the areas surrounding the turbines, a buffer of at least 50m between the tip of the		

Reference No:	Reference Heading	Location	Mitigation Measure	Audit Result	Action Required
			blade and any trees or other tall vegetation that could provide high quality foraging habitat for bat species, will be implemented. › Ongoing monitoring of bat activity will be undertaken for at least 3 years' post construction of the wind farm. This will provide data and information on the actual recorded impact of the wind turbines on the local bat populations. Full details of the proposed monitoring programme are provided in Appendix 7.2, and includes measurement of bat activity, weather conditions and any correlation between the two. The monitoring will also include corpse searching in the areas surrounding the turbines to gather data on any actual collisions. › If, following monitoring, there are significant effects recorded, a range of measures are proposed to ensure that any such effects are fully mitigated. These measures include blade feathering, curtailment of turbines during certain conditions and increase of buffers surrounding the turbines. Any or all of the above measures may be employed following actual monitoring of the impact of the operating turbines on bats to ensure that no potential for significant effects on bat species remains		
Traffic Management					
MM56	Roads	EIAR Chapter 15	› **Post Construction Condition Survey** – Where required by the local authority, 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. Where required 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		
MM57	Telecommunications	EIAR Chapter 15	› In the event of interference occurring to telecommunications, the Department of the Environment, Heritage and Local Government		

Reference No:	Reference Heading	Location	Mitigation Measure	Audit Result	Action Required
			'Wind Farm Planning Guidelines' (2006) acknowledge that 'electromagnetic interference can be overcome' by the use of divertor relay links out of line with the wind farm.		
MM58	Telecommunication-Aviation	EIAR Chapter 15	› The Irish Aviation Authority (IAA) requested the following which will be agreed with and implemented during the operational period of the wind farm. › Agree an aeronautical obstacle warning light scheme for the wind farm development. › Provide as-constructed coordinates in WGS84 format together with ground and tip height elevations at each wind turbine location. › Notify the Authority of intention to commence crane operations with a minimum of 30 days prior notification of their erection		
Ornithology					
MM59	Bird monitoring programmes	EIAR Chapter 8	In line with best practise measures, a detailed post-construction Bird Monitoring Programme has been prepared for the operational phase of the Proposed Development, please refer to Appendix 8-7 for further details. The programme of works will monitor parameters associated with collision, displacement/barrier effects and habituation during the lifetime of the project. Surveys are proposed to be scheduled to coincide with Years 1, 2, 3, 5, 10 & 15 of the lifetime of the wind farm. Monitoring measures are based on guidelines issued by the Scottish Natural Heritage (SNH, 2009). The following individual components are proposed: › Flight activity surveys: vantage point surveys › Targeted bird collision surveys (corpse searches) will be undertaken with trained dogs. The surveys will include detection and scavenger		

Reference No:	Reference Heading	Location	Mitigation Measure	Audit Result	Action Required
			trials, to correct for these two biases and ensure the resulting data is robust.		
Peat, Subsoils and Bedrock					
MM60	Site Road Maintenance and Vehicle Use	EIAR Chapter 9	› Use of aggregate from authorised quarries for use in road and hardstand maintenance. › Vehicles used during the operational phase will be refuelled off site before entering the site; › No fuels will be stored on-site during the operational phase; and › Spill kits will be available in all site vehicles to deal with an accidental spillage and breakdowns; and, › An emergency plan for the operational phase to deal with accidental spillages and breakdowns will be contained in the Environmental Management Plan for the wind farm operational phase. The plan will include access to spill kits, containment bins and absorbent material.		
MM61	Use of Oils in Turbine Transformers During Operational Stage	EIAR Chapter 9	› All transformers and substation areas will be bunded to 110% of the volume of oil used in each transformer/substation;		

Reference No:	Reference Heading	Location	Mitigation Measure	Audit Result	Action Required
			› An emergency plan for the operational phase to deal with accidental spillages will be contained in the Environmental Management Plan for the wind farm operational phase. The plan will include access to spill kits, containment bins and absorbent material.		
Drainage Management Plan					
MM62	Progressive Replacement of Natural Surface with Lower Permeability Surfaces	EIAR Chapter 10 CEMP Section 5	› Interceptor drains will be installed up-gradient of all proposed infrastructure to collect clean surface runoff, in order to minimise the amount of runoff reaching areas where suspended sediment could become entrained. It will then be directed to areas where it can be re-distributed over the ground by means of a level spreader; › Swales/collector road side (dirty water) drains will be used to collect runoff from access roads and turbine hardstanding areas of the site, likely to have entrained suspended sediment, and channel it to settlement ponds for sediment settling; › On steep sections of access road transverse drains ('grips') will be constructed in the surface layer of the road to divert any runoff off the road into swales/road side drains; › Check dams will be used along sections of access road drains to intercept silts at source. Check dams will be constructed from a 4/40mm non-friable crushed rock; › Settlement ponds, emplaced downstream of road swale sections and at turbine locations, will buffer volumes of runoff discharging from the drainage system during periods of high rainfall, by retaining water until the storm hydrograph has receded, thus reducing the hydraulic loading to watercourses; and, › Settlement ponds will be designed in consideration of the greenfield runoff rate.		

Reference No:	Reference Heading	Location	Mitigation Measure	Audit Result	Action Required
MM63	Runoff Resulting in Suspended Solids Entrainment in Surface Waters	EIAR Chapter 10 CEMP Section 5	› Please see MM10 and MM20		
MM64	Control of hydrocarbons during maintenance	EIAR Chapter 10 CEMP Section 5	› Please see MM18		
Noise & Vibration					
MM65	Greenhouse Gas Emissions	EIAR Chapter 11	› All construction vehicles and plant will be maintained in good operational order while onsite, thereby minimising any emissions that arise. › 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 wind farm will be obtained from the three proposed borrow pits on the site of the Proposed Development. This will significantly reduce the number of delivery vehicles accessing the site, thereby reducing the amount of emissions associated with vehicle movements.		
Air Quality/Dust					
MM66	Exhaust Emissions	EIAR Chapter 11	› Any vehicles or plant brought onsite during the operational phase will be maintained in good operational order that comply with the Road Traffic Acts 1961 as amended, thereby minimising any emissions that arise.		

Reference No:	Reference Heading	Location	Mitigation Measure	Audit Result	Action Required
Decommissioning Phase					
Ornithology					
MM67	Disturbance/Displacement	EIAR Chapter 8	› Mitigation measures outlined for the Construction phase remain the same for the decommissioning phase.		
Biodiversity					
MM68	Impact on Flora, Fauna and Aquatic Species	EIAR Chapter 7	› The same mitigation to prevent significant impacts on water quality and associated aquatic fauna and other terrestrial fauna during construction will be applicable to the decommissioning phase. A decommissioning plan is contained in the CEMP, Appendix 4-4 of this EIAR.		
Air Quality/dust					
MM69	Exhaust, Dust and Greenhouse Gas Emissions	EIAR Chapter 11	› The mitigation measures prescribed for the construction phase of the proposed development will be implemented during the decommissioning phase thereby minimising any potential impacts.		
Noise & Vibration					
MM70	Noise & Vibration	EIAR Chapter 13	› Mitigation measures considered in relation to any decommissioning of the site are the same as those proposed for the construction phase of the development.		

Reference No:	Reference Heading	Location	Mitigation Measure	Audit Result	Action Required
Traffic & Transport					
MM71	Traffic & Transport	EIAR Chapter 15	› A decommissioning plan, including material recycling / disposal and traffic management plan will be prepared for agreement with the local authority. This plan will contain similar mitigation measures to those implemented during the construction phase.		

8. MONITORING PROPOSALS

All monitoring measures relating to the pre-commencement, construction and operational phases of the development were set out in the relevant chapters of the EIAR submitted as part of the planning permission application.

This section of the CEMP groups together the monitoring measures presented in the EIAR. It is intended that the CEMP would be updated where required prior to the commencement of the development, to include all monitoring measures, conditions and or alterations to the EIAR and application documents should they emerge during the course of the planning process and would be submitted to the Planning Authority for written approval.

The monitoring proposals are presented in terms of the monitoring requirement, frequency of monitoring and the mechanism for reporting results where applicable.

By presenting the monitoring proposals in the below format, it is intended to provide a monitoring schedule that can be reviewed and tracked during all phases of the project.to ensure all the required monitoring is completed as required.

Table 8-1 Monitoring Proposals

Ref. No.	Reference Heading	Reference Location	Monitoring Measure	Frequency	Reporting Period	Responsibility
Pre-Commencement Phase						
MX1	Environmental Management	EIAR Chapter 4 CEMP Section 4	› The Contractor will be responsible for implementing the monitoring measures specified throughout the EIAR and compiled in the Audit Report which is included in the CEMP. › The Contractor will also be responsible for ensuring that all construction staff understand the importance of implementing the monitoring measures. The implementation of the monitoring measures will be overseen by the Environmental Clerk of Works (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 monitoring measures are maintained for the duration of the construction phase, and into the operational phase where necessary.	Ongoing	Monthly	ECoW
MX2	Environmental Management	EIAR Chapter 4 CEMP Section 4	› The ECoW will oversee the site works and implementation of the Construction Environmental Management Plan (CEMP), and provide on-site advice on the mitigation measures necessary as necessary to ensure the project proceeds as intended. The level, detail and frequency of reporting expected from the Site ECoW for the Construction Manager, developer's project manager, and any Authorities or other Agencies, will be agreed by parties where required prior to commencement of construction, and may be further adjusted as required during the course of the project.	Ongoing	Monthly	ECoW
MX3	Drainage Maintenance		› An inspection and maintenance plan for the drainage system on site will be prepared in advance of commencement of any	Ongoing	Monthly	ECoW

Ref. No.	Reference Heading	Reference Location	Monitoring Measure	Frequency	Reporting Period	Responsibility
		EIAR Chapter 4, Chapter 10, CEMP Section 5	works. Regular inspections of all installed drainage systems will be necessary, especially after heavy rainfall, to check for blockages, and ensure there is no build-up of standing water at parts of the systems where it is not intended. The inspection of the drainage system will be the responsibility of the site ECoW or the supervising hydrologist.			
MX4	Environmental Management	EIAR Chapter 4 CEMP Section 4	Before the commencement of any felling works, the ECoW › will oversee the keyhole and extraction works. › 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 construction works, the ECoW will › 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). During Construction works the ECoW will › Be responsible for preparing and delivering the Environmental Toolbox 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.* › Take representative photographs showing the progress of operation onsite, and the integrity and effectiveness of the water protection measures.	Ongoing	Monthly	ECoW

Ref. No.	Reference Heading	Reference Location	Monitoring Measure	Frequency	Reporting Period	Responsibility
			› Collect water samples for analysis by a 3rd party accredited laboratory, adhering to the following requirements: o Surface water samples shall be collected upstream and downstream of the keyhole felling site at suitable sampling locations. o Sampling shall be taken from the stream / riverbank, with no in-stream access permitted. o 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.			
MX5	Adaptive Site Drainage Management	EIAR Chapter 4, Chapter 10, CEMP Section 5	› The final drainage design prepared for the Proposed Development prior to commencement of construction will provide for reactive/ adaptive management of drainage measures. › The effectiveness of drainage measures designed to minimise runoff entering works areas and capture and treat silt-laden water from the works areas, will be monitored continuously by the ECoW or supervising hydrologist on-site.	Ongoing	Monthly	Project Hydrologist
MX6	Site Drainage Plan	EIAR Chapter 4, Chapter 10,	› The Project Hydrologist/Design Engineer will assist in preparing a site drainage plan before construction commences.	As Required	As Required	Project Hydrologist /Design Engineer

Ref. No.	Reference Heading	Reference Location	Monitoring Measure	Frequency	Reporting Period	Responsibility
		CEMP Section 5				
MX7	Invasive Species	EIAR Chapter 7 CEMP Section 4	› A pre-commencement invasive species survey shall be completed for the site. › Rhododendron will be clearly marked using posts and tape prior to any machinery/personnel entering the site (this includes site investigation, clearance, fencing or set up works). All fencing will be monitored and maintained for the duration of the works. This will be supervised by the Project Ecologist	Once	On completion	Project Ecologist
MX8	Ornithology: Pre-Construction Monitoring	EIAR Chapter 8	› Pre-commencement surveys will be undertaken prior to the initiation of works at the wind farm. The verification survey will include a thorough walkover survey to a 500m radius of the development footprint and/or all works areas, where access allows. If winter roost sites or breeding activity of birds of high conservation concern is identified, the roost or nest site will be located, and earmarked for monitoring at the beginning of the first winter season or breeding season (respectively) of the construction phase. If it is found to be active during the construction phase no works shall be undertaken within a 500m buffer (Forestry Commission Scotland, 2006; Ruddock & Whitfield, 2007) in line with best practise. No works shall be permitted within the buffer until it can be demonstrated that the roost or nest is no longer occupied. › All site staff and subcontractors will be made aware of any restrictions to be imposed by means of a toolbox talk and a map of the 'no-work zone' will be made available to all construction staff. The restricted area will also be marked off using hazard-tape fencing to alert all personnel on site to the suspension of works within that area.	Once	On completion	Project Ecologist

Ref. No.	Reference Heading	Reference Location	Monitoring Measure	Frequency	Reporting Period	Responsibility
			› Where no roosting, nesting or breeding activity of species of high conservation concern is identified in works areas, construction activity can proceed, with ongoing monitoring in parallel to ensure adherence of protection protocols throughout the season.			
MX9	Archaeology and Cultural Heritage	Chapter 14	› Protective buffer zones will be implemented around the recorded monuments listed in Table 14-3 prior to the commencement of the construction phase. All onsite staff will receive toolbox talks on these buffer zones which will be maintained throughout the construction period. › Pre-development licensed archaeological testing of the following: o Proposed cable route in greenfield areas o Turbines/Hardstands for T3, T4, T6, T7, T14, T16 and T17 o New roads where they are proposed in green fields o Proposed new road along haul route › Archaeological monitoring (under licence from the National Monuments Service) of any further geotechnical / engineering trial pits or investigations and a report detailing the results of same. › A licensed metal detection survey of the watercourse prior to the cable route excavation in this location. This could be undertaken by the monitoring archaeologist on site in advance of the works as part of the overall monitoring programme. › A photographic and descriptive record of the boundary removal that is proposed at the Historic Settlement north of T16. This will be undertaken by the monitoring archaeologist in advance of groundworks associated with T16.	Ongoing	Monthly	Project Archaeologist
MX10	Traffic Management Plan, Delivery	EIAR Chapter 15,	A **Traffic Management Plan (TMP)** is provided specifying details relating to traffic management is included in the CEMP (Appendix	Once and updated as required	As Required	Site Manager

Ref. No.	Reference Heading	Reference Location	Monitoring Measure	Frequency	Reporting Period	Responsibility
	Programme, pre-commencement road works	CEMP Section 4	4-4). Prior to the commencement of the construction phase of the proposed development a final Traffic Management Plan, incorporating all the mitigation measures set out in the TMP will be prepared by the Contractor for agreement with the local authority and An Garda Síochána. The TMP includes recommendations for 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 County Councils in advance of deliveries of turbine components to site. Liaison with the relevant 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. › A Pre and Post Construction Condition Survey – Where required by the local authority, a pre-condition survey of roads associated with the proposed development can be carried out immediately prior to construction commencement to verify and record the 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. Where required 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			

Ref. No.	Reference Heading	Reference Location	Monitoring Measure	Frequency	Reporting Period	Responsibility
			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 Roads section will be informed of the relevant 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 junctions – 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, › 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. These are set out in the CEMP which is contained in Appendix 4.3.			

Ref. No.	Reference Heading	Reference Location	Monitoring Measure	Frequency	Reporting Period	Responsibility
			Re-instatement works - All road surfaces and boundaries will be re-instated to pre-development condition, as agreed with the local authority engineers.			
MX11	Information to Local Residents	EIAR Chapter 15	› 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 Site Manager, 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. The Site Community Liaison Officer (one has been in place since June 2018) will also be liaising with all local residents and near neighbours.	As Required	As Required	Site Manager & Community Liaison Officer
Construction Phase						
MX12	Health and Safety	EIAR Chapter 5	The PSCS appointed for the construction stage shall be required to perform his/her duties as prescribed in the Safety, Health and Welfare at Work (Construction) Regulations. These duties include (but are not limited to): › Development of the Safety and Health Plan for the construction stage with updating where required as work progresses. › Compile and develop safety file information › Reporting of accidents / incidents. › Weekly site meeting; › 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;	Ongoing	Monthly & As required	Site Manager / PSCS

Ref. No.	Reference Heading	Reference Location	Monitoring Measure	Frequency	Reporting Period	Responsibility
			› 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; › Notify the Authority and the client of non-compliance with any written directions issued.			
MX13	Plant and Equipment Inspections	EIAR Chapter 4, Chapter 8.	› A programme for the regular inspection of plant and equipment for leaks and fitness for purpose will be developed at the outset of the construction phase. › The plant used will be regularly inspected for fuel leaks, unnecessary noise generation and general fitness for purpose. › Local areas of the haul route will be condition monitored and maintained, if necessary.	Before Use	As Necessary	Drivers / ECoW
MX14	Flora and Fauna	EIAR Chapter 7	› Habitat condition monitoring will be undertaken during construction and in year 1 post construction to ensure that there are no negative effects on marsh fritillary habitat	As required	Monthly	Project Ecologist
MX15	Flora and Fauna	CEMP Section 5	› The Project Ecologist will carry out regular inspection and monitoring of the development, through all phases of construction/operation and provide ecological advice as required and carry out ecological monitoring and survey work as may be required by the planning authority	As required	Monthly	Project Ecologist
MX16		EIAR Chapter 8	› A Project Ecologist who will fulfil the role of Ecological Clerk of Works will be appointed. Duties will include:	As required	Monthly	Project Ecologist

Ref. No.	Reference Heading	Reference Location	Monitoring Measure	Frequency	Reporting Period	Responsibility
	Breeding Bird Disturbance		○ Undertake a pre-construction transect/walkover bird survey to ensure that significant effects on breeding birds will be avoided. ○ Inform and educate on-site personnel of the ornithological and ecological sensitivities within the Proposed Development site. ○ Oversee management of ornithological and ecological issues during the construction period and advise on ornithological issues as they arise. ○ Provide guidance to contractors to ensure legal compliance with respect to protected species onsite. Liaise with officers of consenting authorities and other relevant bodies with regular updates in relation to construction progress.			
MX17	Breeding Birds	EIAR Chapter 8	› In the interest of the protection of breeding birds, should the planned construction programme commencement coincide with the Breeding bird season (April to July inclusive), an early breeding season survey by a qualified ornithologist will be commissioned and, subject to confirmation of no nesting or breeding activity in any areas for works to be undertaken, works will proceed, with ongoing monitoring in parallel to ensure adherence of protection protocols throughout the season. Hedgerow cutting and disturbance of any other confirmed nesting habitat would be prohibited during the breeding season in line with legislation and best practice. The removal of woody vegetation will be undertaken in full compliance with Section 40 of the Wildlife Act 1976 – 2018. Any required removal of vegetation will be undertaken following inspection by a suitable qualify ornithologist to ensure no nesting birds are affected.	As required during the breeding season	Monthly	Project Ornithologist
MX18	Water Quality and Monitoring	EIAR Chapter 10	› The effectiveness of drainage measures designed to minimise runoff entering works areas and capture and treat silt-laden	As Required	As Necessary	ECoW / Project Hydrologist

Ref. No.	Reference Heading	Reference Location	Monitoring Measure	Frequency	Reporting Period	Responsibility
		CEMP Section 5	water from the works areas, will be monitored continuously by the Environmental Clerk of Works (ECoW) 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 in so far as is possible.			
MX19	Water Quality and Monitoring	EIAR Chapter 10 CEMP Section 5	› Daily surface water monitoring forms will be utilised at every works site near any watercourse. These will be taken daily and kept on site for record and inspection.	Daily	As Necessary	ECoW
MX20	Surface Water Quality	EIAR Chapter 4, CEMP Section 5	› Baseline laboratory analysis of a range of parameters with relevant regulatory limits and EQSs will be undertaken as per water monitoring programme for the overall windfarm development and each primary watercourse along the route. This will not be restricted to just these locations around the immediate wind farm site with further sampling points added as deemed necessary by the Environmental Clerk of Works in consultation with the Project Hydrologist and Site Manager. › In-situ field monitoring will be completed on a Monthly basis. › In-situ field monitoring will also be completed after major rainfall events, i.e. after events of >25mm rainfall in any 24-hour period. The supervising hydrologist will monitor and advise on the readings collected by in-situ field monitoring.	Monthly	As received	ECoW
MX21	Drain Inspection and Maintenance	EIAR Chapter 4Chapter 10	The following items shall be carried out during pre-felling inspections and after: › Communication with tree felling operatives in advance to determine whether any areas have been reported where there is unusual water logging or bogging of machines;	As Required	As Necessary	ECoW / Project Hydrologist

Ref. No.	Reference Heading	Reference Location	Monitoring Measure	Frequency	Reporting Period	Responsibility
			› 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 shall be identified. Ideally the pre-felling inspection shall be carried out during rainfall			
MX22	Surface Water Quality Monitoring	EIAR Chapter 4, EIAR Chapter 10	› Daily monitoring of excavations by a suitably qualified person will occur during the construction phase › Daily inspections will be undertaken to assess the effectiveness of the water treatment train	Daily	As Required	ECoW
MX23	Deterioration of Water Quality	EIAR Chapter 4, NIS.	› 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 be immediately be stopped, and a geotechnical assessment undertaken. › Turbidity monitors or sondes will be installed at locations surrounding the wind farm site. The monitoring locations will be selected as part of the final drainage design before construction commences in consultation with the Project Hydrologist. › The Project Hydrologist will advise on the optimum locations for continuous water monitoring. The sondes will provide continuous readings for turbidity levels in the watercourse. This equipment will be supplemented by daily visual monitoring (during the construction phase) at their locations. › All such measures will be overseen and implemented by a dedicated project Environmental Clerk of Works.	Daily	As Required	ECoW
MX24	Silt Fences		Silt fences will be emplaced within drains down-gradient of all construction areas. Silt fences are effective at removing heavy	Daily	As Required	ECoW

Ref. No.	Reference Heading	Reference Location	Monitoring Measure	Frequency	Reporting Period	Responsibility
		EIAR Chapter 4, Chapter 10	settleable solids such as those present in the subsoils/sandstone tills that overlie the site. This will act to prevent entry to water courses of sand and gravel sized sediment, released from excavation of mineral sub-soils of glacial and glacio-fluvial origin, and entrained in surface water runoff. Inspection and maintenance of these structures during the construction phase is critical to their functioning to stated purpose. They will remain in place throughout the entire construction phase. Double silt fences will be placed within drains down-gradient of all construction areas inside the hydrological buffer zones.			
MX25	Clear felling of Coniferous Plantation	EIAR Chapter 10 CEMP Section 4	› Works will be overseen by an ECoW. › The extent of all necessary tree felling will be identified and demarcated with markings on the ground in advance of any felling commencing. › All roads and culverts will be inspected prior to any machinery being brought on site to commence the felling operation. No tracking of vehicles through watercourses will occur. Vehicles will only use existing road infrastructure and established watercourse crossings	Daily	As Required	ECoW
MX26	Plant and Equipment Inspections	EIAR Chapter 10 CEMP Section 4	The plant used will be regularly inspected for fuel leaks, unnecessary noise generation and general fitness for purpose. Local areas of the haul route will be condition monitored and maintained, if necessary.	Daily	As Required	ECoW/Site Manager
MX27	Noise and Vibration	EIAR Chapter 13	Monitoring typical levels of noise and vibration during critical periods and at sensitive locations will be carried out.	Ongoing	As Required	ECoW/Site Manager
MX28	Cultural Heritage	EIAR Chapter 14	› Archaeological monitoring of ground works during construction (in areas of previously undisturbed ground). The National Monuments Service will be informed of such findings	Ongoing	As Required	Project Archaeologist

Ref. No.	Reference Heading	Reference Location	Monitoring Measure	Frequency	Reporting Period	Responsibility
			to discuss how best to proceed. If archaeological finds, features or deposits are uncovered during archaeological monitoring, the developer will be prepared to provide resources for the resolution of such features whether by preservation by record (excavation) or preservation in situ (avoidance).Once the project is completed, a report on the results of the monitoring will be compiled and submitted to the relevant authorities. › Archaeological monitoring (under licence from the National Monuments Service) of any further geotechnical / engineering trial pits or investigations and a report detailing the results of same. › Preservation of Townland boundaries: A photographic and descriptive record of any boundaries that are proposed to be removed during construction. This will be undertaken by the monitoring archaeologist. › Archaeological monitoring of topsoil/peat removal of all off-road sections of the proposed route during construction. A report on the results of the monitoring shall be compiled and submitted to the relevant authorities on completion of the project. › Archaeological Monitoring along the public road where it crosses the bridge at Breeda townland. A photographic and descriptive record of the bridge arches will be made (if exposed) and a report compiled on the findings.			
MX29	Traffic Management Co-Ordinator	EIAR Chapter 15 CEMP Section 4	› A competent Traffic Management Coordinator 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.	Ongoing	As Required	Site Manager

Ref. No.	Reference Heading	Reference Location	Monitoring Measure	Frequency	Reporting Period	Responsibility
Operational Phase						
MX30	Health & Safety	EIAR Chapter 5	› An operational phase Health and Safety Plan will be developed to fully address identified Health and Safety issues associated with the operation of the site and providing for access for emergency services at all times. › Turbines have a direct communications link with remote monitoring centres (both in Eirgrid and the Turbine Manufacturer). Faults signals from sensors are communicated to, and managed by, these monitoring centres and alerts can be raised to appointed Operation and Maintenance crews who can assess and address any issues in advance of or as they arise.	Ongoing	As Required	Site Manager
MX31	Flora and Fauna	EAIR Section 6	› Habitat condition monitoring will be undertaken during construction and in year 1 post construction to ensure that there are no negative effects on marsh fritillary habitat	Ongoing	As Required	Project Ecologist
MX32	Bird monitoring programmes	EIAR Chapter 8	In line with best practise measures, a detailed post-construction Bird Monitoring Programme has been prepared for the operational phase of the Proposed Development, please refer to Appendix 8-7 for further details. The programme of works will monitor parameters associated with collision, displacement/barrier effects and habituation during the lifetime of the project. Surveys are proposed to be scheduled to coincide with Years 1, 2, 3, 5, 10 & 15 of the lifetime of the wind farm. Monitoring measures are based on guidelines issued by the Scottish Natural Heritage (SNH, 2009). The following individual components are proposed: › Flight activity surveys: vantage point surveys › Targeted bird collision surveys (corpse searches) will be undertaken with trained dogs. The surveys will include	Ongoing	As Required	Project Ornithologist

Ref. No.	Reference Heading	Reference Location	Monitoring Measure	Frequency	Reporting Period	Responsibility
			detection and scavenger trials, to correct for these two biases and ensure the resulting data is robust.			
MX33	Noise Monitoring	EIAR Chapter 13	› One post commissioning noise monitoring survey is recommended to ensure compliance with any noise conditions applied to the development. In the unlikely instance that an exceedance of these noise criteria is identified, the assessment guidance outlined in the noise conditions, ESTU-R-97, IoA GPG and Supplementary Guidance Note 5: Post Completion Measurements (July 2014) will be followed and relevant corrective actions will be taken, if required. For example, implementation of noise operational modes resulting in curtailment of turbine operation can be implemented for specific turbines in specific wind conditions to ensure predicted noise levels are within the relevant planning conditions. › In the unlikely event that an issue with low frequency noise is associated with the Proposed Development, it is recommended that an appropriate investigation be undertaken. Due consideration will be given to guidance on conducting such an investigation which is outlined in Appendix VI of the EPA document entitled *Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities* (NG4) (EPA, 2016).	Once	On completion	Site Manager
MX34	Surface Water Quality	CEMP Section 4	› Monthly sampling for laboratory analysis for a range of parameters adopted during pre-commencement and construction phases will continue for six months during the operational phase. The supervising hydrologist will monitor and advise on the readings being received from the testing laboratory.	Ongoing	Monthly	ECoW

Ref. No.	Reference Heading	Reference Location	Monitoring Measure	Frequency	Reporting Period	Responsibility
MX35	Drainage Inspections	CEMP Section 5	› The drainage system will be monitored in the operational phase until such a time that all areas that have been reinstated become re-vegetated and the natural drainage regime has been restored.	Ongoing	Monthly	ECoW

9. PROGRAMME OF WORKS

9.1 Construction Schedule

It is estimated that the construction phase will take approximately between 18 – 24 months from starting on site to the commissioning of the electrical system. In the interest of the protection of breeding birds , should the planned construction programme commencement coincide with the Breeding bird season (April to July inclusive), an early breeding season survey by a qualified ornithologist will be commissioned and, subject to confirmation of no nesting or breeding activity in any areas for works to be undertaken, works will proceed, with ongoing monitoring in parallel to ensure adherence of protection protocols throughout the season. Hedgerow cutting and disturbance of any other confirmed nesting habitat would be prohibited during the breeding season in line with legislation and best practice. The removal of woody vegetation will be undertaken in full compliance with Section 40 of the Wildlife Act 1976 – 2018. Any required removal of vegetation will be undertaken following inspection by a suitable qualify ornithologist to ensure no nesting birds are affected

Works during the construction phase of the development, including delivery of construction materials will be limited to avoid unsociable hours as per Section 8.5 (d) of the code of practice for BS 5228: Part 1: 1997. Construction operations shall generally be restricted to between 07:00 hours and 19:00 hours Monday to Saturday. However, to ensure that optimal use is made of good weather period or at critical periods within the programme it could occasionally be necessary to work out with these hours. It may also be necessary to commence turbine base concrete pours earlier due to time constraints incurred by the concrete curing process. Any such out of hours working would be agreed in advance with the local planning authority.

Work on Sundays or public holidays will only be conducted in exceptional circumstances or in an emergency. Additional emergency works may also be required outside of normal working hours as quoted above. This work, if required, will be agreed through notification and consultation with the affected parties as deemed necessary.

Delivery of abnormal loads such as turbine tower sections and blades will take place at night outside of peak traffic hours. The anticipated phasing and scheduling main construction task items are outlined in Figure 9-1 below.

			Year 1				Year 2			
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								
3	Site Roads	Construction/upgrade of roads; install drainage measures & water protection measures								
4	Turbine Hardstands	Excavate bases, construct hardstanding areas								
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	Turbine Delivery and Erection									
9	Substation Commissioning									
10	Turbine Commisioning									

Figure 9-1 Indicative Construction Schedule

10. COMPLIANCE AND REVIEW

10.1 Site Inspections and Environmental Audits

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

Environmental inspections will ensure that the works are undertaken in compliance with this CEMP and any subsequent updates to this document. Environmental site inspections will be carried out by suitably trained staff.

10.2 Auditing

Environmental audits will be carried out during the construction phase of the project. In contrast to monitoring and inspection activities, audits are designed to shed light on the underlying causes of non-compliance, and not merely detect the non-compliance itself. In addition, audits are the main means by which system and performance improvement opportunities may be identified. Environmental audits will be carried out by 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.

10.3 Environmental Compliance

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

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

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

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

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

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

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

10.4 Corrective Action Procedure

A corrective action is implemented to rectify an environmental problem on-site. Corrective actions will be implemented by the 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 Construction Manager and the Site Environmental Clerk of Works will be conducted. This in turn will be passed down to the site staff involved. A Corrective Action Notice will be completed at a later date.

10.5 Construction Phase Plan 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.