CONSTANT ENERGY LIMITED

TIRAWLEY WIND FARM

CO. MAYO

CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN (CEMP)

April 2026

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DOCUMENT APPROVAL

PROJECT	Tirawley Wind Farm	
CLIENT / JOB NO	Constant Energy Limited	6289
DOCUMENT TITLE	Construction Environmental Management Plan	

	Prepared by	**Reviewed /Approved by**
Document Final	Name Darren Timlin Padraig O' Dowd	Name David Kiely
Date April 2026	Signature 	Signature 

TIRAWLEY WIND FARM, CO. MAYO

CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN

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MANAGEMENT PLANS

1 INTRODUCTION

1.1 BACKGROUND TO REPORT

Jennings O'Donovan & Partners Limited, on behalf of Constant Energy Limited, has prepared this Construction Environmental Management Plan (CEMP) for the construction of the Proposed Development of 16 no. wind turbines, 1 no. meteorological mast, a Permanent Operations Compound, an Onsite Substation, Battery Energy Storage System (BESS), 17 no. Spoil Deposition Areas and all ancillary works, works along the Turbine Delivery Route (TDR) and the construction of a 13.55 km underground Grid Connection between the Wind Farm substation to Tawnaghmore 110 kV substation, Killala Business Park, Co. Mayo.

The Proposed Development has been designed to ensure that any environmental impacts which may arise can be appropriately mitigated such that there will be no likely significant environmental effects.

This document has been prepared on the basis, that this document will be further developed and expanded following the appointment of the Contractors for the main construction works. Some items of this CEMP can only be finalised with appropriate input from the Contractors who will actually carry out the main construction works. This CEMP identifies, for the incoming Contractors, the key planning, environmental and contract document constraints that must be adhered to in order to deliver optimum environmental reassurance for the Site.

The preparation of this document, and its continued development, is considered to be an appropriate mechanism to ensure the appropriate management of construction activities in accordance with the relevant environmental requirements.

This document should be read in conjunction with the Natura Impact Statement, Environmental Impact Assessment Report (EIAR), Planning Report, Planning Drawings.

1.2 CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN (CEMP): AIMS & OBJECTIVES

This CEMP has been developed in accordance with the Institute of Environmental Management and Assessment Practitioner "*Environmental Management Plans*", Best Practice Series, Volume 12, December 2008.

The principal objective of this CEMP is to avoid, minimise and control adverse environmental impacts associated with the development of the wind farm. As such, the Contractors commit to safeguarding the environment through the identification, avoidance and mitigation of the potential negative environmental impact associated with the Proposed Development.

This CEMP defines good practice as well as specific actions required to implement mitigation requirements as identified in the EIS, the planning process and/or other licensing or consenting processes.

The CEMP will also be developed further, and/or amended where necessary, to take account of any additional information which may be made available from the detailed design process or pre-construction confirmatory surveys within the parameters prescribed in this CEMP and in consultation with the planning authority.

In the event planning permission is granted for the Proposed Development, the CEMP will be updated prior to the commencement of the development, to address the requirements of any relevant planning conditions, including any additional mitigation measures which are conditioned and will be submitted to the Planning Authority for written approval. The contractors will be contractually obliged to comply with all measures identified in the CEMP, as above. The CEMP will form part of the main Civil Balance of Plant (CBoP) Construction works Contract as well as the Electrical Balance of Plant (EBoP) Construction works contract. The Developer will take account of the structure, content, methods and requirements contained within the various sections of this CEMP when further developing the CEMP and Management Plans as required by their Contract.

An Environmental Manager and an Ecological Clerk of Works (ECoW) with appropriate experience such as working on large scale renewable projects and with relevant qualifications e.g. BSc in ecology or environmental management and accreditation such as CIEEM will be appointed for the duration of the construction phase so that the CEMP is effectively implemented.

While this version of the CEMP provides a benchmark for good practice, where avoidance or further minimisation of risks to the environment can be demonstrated through use of alternative methods or improvements to current practices, the Contractors will implement these wherever possible, subject to approval from environmental monitoring personnel.

1.3 CEMP DEVELOPMENT & IMPLEMENTATION

The CEMP has been prepared as part of the planning application for Tirawley Wind Farm. It is a live document onsite and will be developed further by the Contractors with site specific method statements and plans as required prior to each phase of the works, as set out above. It is also effectively a document management system for recording information and data relating to environmental checks, reports, surveys, monitoring data and auditing. Upon

completion of the construction works, the Contractors will submit a complete electronic copy of the final CEMP to the client for their records. This final CEMP will include electronic scans of all hard copy reports, data, field records and correspondence which are gathered over the course of the construction works.

While version numbers will remain fixed depending on the stage of the Proposed Development, it is acknowledged that the CEMP is a continually evolving document which can be updated in part or whole, at any stage of the project. Hence, revision and document distribution records are included at the front of each CEMP document to enable individual documents to be updated at any time. A summary of the CEMP development process and the required input from the main parties involved in the post planning and construction of the wind farm are indicated in **Figure 1.1**. The Contractors will be responsible for further development of the CEMP in line with other relevant licenses and consents. This may involve liaising with statutory bodies where appropriate. The CEMP will only be updated in line with the parameters in this version of the CEMP or to incorporate any planning conditions.

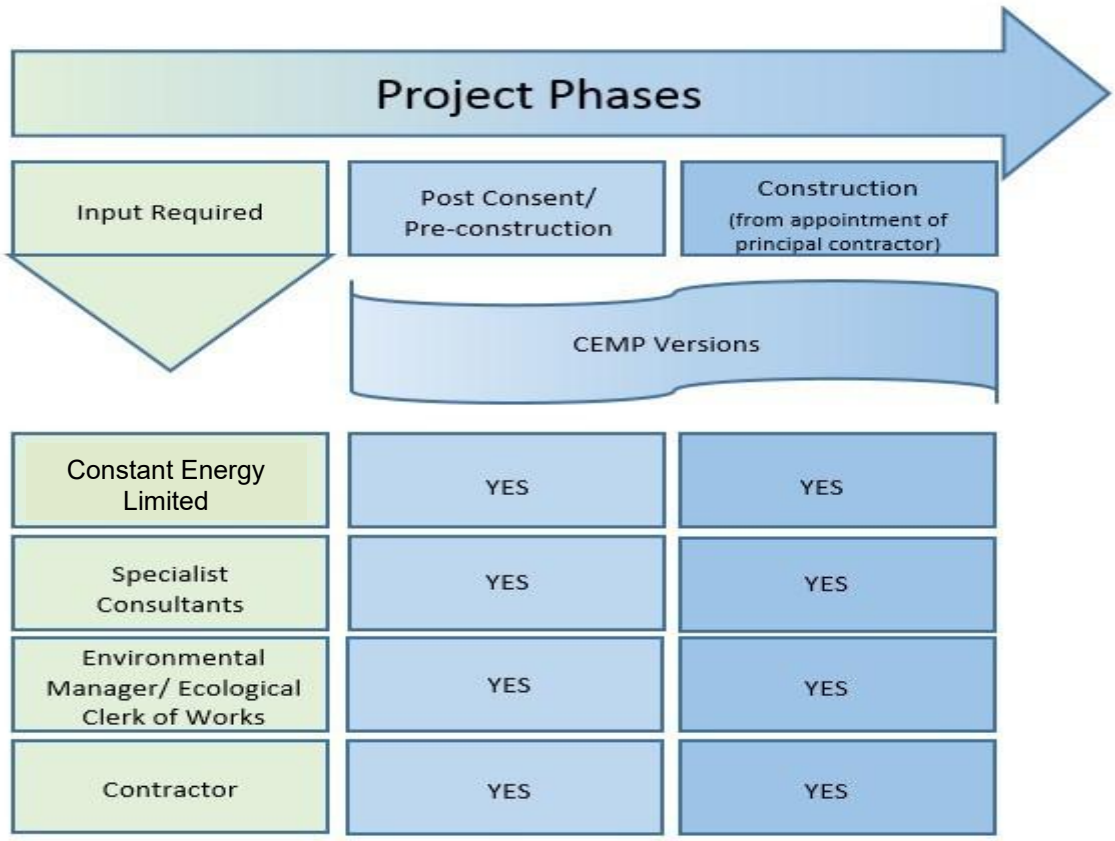

Figure 1.1 Summary of CEMP Development Process

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1.4 CEMP ROLES & RESPONSIBILITIES

Prior to commencement of construction works, the Developer will identify a core Environmental Management Group, comprising of specific project personnel (Environmental Manager) and the Ecological Clerk of Works. The Environmental Management Group will meet monthly to discuss the monthly environmental report and will advise site personnel on areas where improvements may be made onsite. The group will draw on technical expertise from relevant specialists where required, including the Resident Engineer and will liaise with other relevant external bodies as required.

The Developer will appoint an Ecological Clerk of Works who will be responsible for coordination, compliance monitoring and continued development of the CEMP and any other surveys, reports or method statements required. The Ecological Clerk of Works will also review the Contractors' method statements and environmental plans as required by the CEMP, carry out compliance auditing during the construction phase and coordinate the Environmental Management Group and required liaisons between Constant Energy Limited, the Contractors, the Planning Authority and other statutory authorities.

1.5 CEMP STRUCTURE

The CEMP is divided into discrete Sections which are designed to be filed as separate documents / folders if required. A copy of the CEMP documents / folder(s) will be kept in the Site offices for the duration of the site works and will be made available for review at any time. The Ecological Clerk of Works/Environmental Manager will be responsible for the CEMP and will keep all sections updated throughout the construction phase.

Where a Contractor has standard documents within his own company / corporate Environmental Management Plans which cover a particular requirement of this CEMP, these will either be inserted or cross referenced within the relevant Section of this CEMP.
The CEMP Sections are listed in **Table 1.1** as follows:

Table 1.1: CEMP – Document Structure

Section	Title & Brief Description	Contractors Development Required
1	**Introduction**	No (Information purposes only)
2	**Project Information** Provides details on site location, scheme description and a summary of the environmental sensitivities at the Site (as derived from the	No (Information purposes only)

Section	Title & Brief Description	Contractors Development Required
	Appropriate Assessment Screenings and other information where available).	
3	**Environmental Controls** Provides details on relevant Planning Consent Conditions and mitigation measures outlined in the EIAR and NIS. Any documents prepared by Constant Energy Limited in response to Planning Consent Conditions will be recorded in **Table 4.10, Table 4.11** contains a record of all Scheme Amendments and **Table 4.12** a Register of Variations.	**Yes** Any documents prepared by the Contractors in response to Consent Conditions will be recorded by the Contractors in **Table 4.10** and inserted in the CEMP where necessary. Any Scheme Amendments and / or Variations to the CEMP required during the works will be recorded by the Contractors in **Tables 4.11** and **4.12**.
3	**Environmental Communications Plan** Contains details on specific requirements relating to: • Contact details for Constant Energy Limited, personnel, technical specialists, Contractors personnel, regulators, landowners, other stakeholders etc.; • Meetings, reports and consultations; • Roles and responsibilities; and • General reporting procedures and tasks.	**Yes** The Contractors will: i) Insert contact information for regulatory authorities and other stakeholders (where not already provided) into **Table 5.1** ii) Refer to **Table 5.2** for details on requirements for meetings, reports and consultations iii) Insert information on Contractors appointments and responsibilities relating to environmental management and implementation of this CEMP into **Table 5.3**. iv) Refer to **Figure 5.1** for a summary of the main communication lines.
5	**Correspondence, Records, Reports** This Section relates to document control and retention of records. The information at the start of Section 5 provides: • A list of all documents to be retained / filed within the CEMP. **Table 6.1** provides a record of all Environmental Consents, Licenses and Permits issued for the project.	**Yes** The Contractors will complete **Table 6.1**. Throughout the duration of the Contract, the Contractors will insert / file all communication records, data, field records and reports associated with Environmental Management and implementation of this CEMP into this **Section 5**. This Section may be sub-divided into sub-folders for specific

Section	Title & Brief Description	Contractors Development Required
		information relating to discrete areas of Environmental Management (such as waste management, pollution prevention, water quality monitoring, ecology etc). Alternatively, this information may be filed within the individual Management Plans in **Section 6**. The filing method selected by the Contractors will be made explicit at the start of **Section 6**.
6	**Management Plans & Available Information** Management Plans include the following: • MP1 Environmental Response Plan (ERP) • MP2 Water Quality Monitoring Plan (WQMP) • MP3 Surface Water Management Plan • MP4 Water Crossing Plan • MP4 Peat and Spoil Management Plan • MP5 Waste and Resource Management Plan • MP6 Decommissioning Plan • MP7 Traffic Management Plan (TMP)	**Yes** The Contractors is required to develop the Management Plans and/or include additional information or method statements as appropriate and where required by the Contract. The development of the Management Plans will generate more site-specific documents which address particular environmental management procedures applicable for works in specified areas of the Site. These Management Plans will inform the Contractors' Environmental Plans (for example, Spoil Management Plan). **Table 7.1** lists all Management Plans and provides information on Contractor's responsibilities.

2 PROJECT INFORMATION

2.1 SITE LOCATION AND SCHEME DESCRIPTION

The Proposed Development, as shown in **Figure 2.1**, is located ~14.5 km northwest of Ballina Town, ~5.2 km northwest of the village of Killala and ~4 km east of Ballycastle village in north Co. Mayo. The Wind Farm Site has a total area of ~108.06 ha. The Wind Farm Site is located within the townland of Ballymurphy, Ballynaleck, Barnhill Lower, Barnhill Upper, Barroe, Billoos, Carn, Carrickanass, Carrowmore, Castlelackan Demesne, Castletown, Conaghra, Glebe, Lackanhill, Lecarrowntemple, Lissadrone East and Lissadrone West.

The Grid Connection Route (GCR) to the Tawnaghmore 110 kV Substation located in Killala Business Park transects the townlands of Barroe, Carrad More, Tawnaghmore Upper, Rathbaun, Carrickanass, Cloonavarry, Doonamona, Rathcash, Castlereagh, Rathowen West, Rathowen East, Magherabrack, Cloonawillin, Killala, Mullafarry, Lisglennon, Tawnaghmore Lower, Ballinteean and Carrowreagh.

Temporary works will be required to accommodate the delivery of the turbine components. The temporary works included as part of this application and assessed as part of this EIAR are located in the townlands of Annagh Beg, Creevagh More, Garranard and Billoos. The EIAR provides a description of the proposed temporary works required along the Turbine Delivery Route (TDR) which are outside the Redline Boundary (such as the temporary removal of road signage during the transportation if turbine blades).

The EIAR has considered three possible Turbine Delivery Routes (TDR) with a particular focus on the final leg of the TDR between the Wind Farm Site and the Northern part of Ballina town Co. Mayo.

Option 1: Turbine components will be transported from Killybegs Port (Donegal) to the Wind Farm Site via the R263, N56, N15, N4, N59, L-1141, R294, L-1119, N59, L-1108, R315, L-51722, L-51732.

Option 2: Turbine components will be transported from Galway Port (Galway) to the Wind Farm Site via the R339, R336, N83, N17, N5, L-1331, N5, N58, N26, N59, L-1108, R315, L-51722, L-51732.

Option 3: Turbine components will be transported from Foynes Port (Limerick) to the Wind Farm Site via the N67, N69, N18, M18, M17, N17, N5, L-1331, N5, N58, N26, R294, N59, L-1108, R315, L-51722, L-51732.

The Wind Farm Site is located in a rural setting and housing density in the area is low. There are 266 houses within 2 km of the proposed turbines. The closest inhabited dwelling to a turbine not associated with the Proposed Development (H3) is located 554 m from the nearest turbine (AT08). The V117 turbine with a 135 m blade tip height (4 x 135 m = 540 m) maintains 540 m housing buffer.

There is 1 no. disused vacant dwelling (H1) located c. 265 m southwest of AT12. This dwelling is under the control of the Developer and as part of the planning application, permission is sought for it to be converted and used as an operations building for the lifespan of the Proposed Development (**EIAR Chapter 2: Development Description**, **Section 2.7.8**).

There is 1 no. dwelling (H2) located c. 321 m southwest from AT01. This property is under the control of the Developer and the owner is a financial beneficiary of the Proposed Development. The owner has confirmed that this property will remain unoccupied for the operational lifespan of the Proposed Development.

Figure 2.1: Site Layout Map

Planning Permission is being sought by the Developer for the construction of 16 No. Wind Turbines with an anticipated output of 68.8 MW, 1 no. meteorological mast, a Permanent Operations Compound, an Onsite Substation, Battery Energy Storage System (BESS), 17 no. Spoil Deposition Areas and all ancillary works, works along the Turbine Delivery Route (TDR) and the construction of an underground Grid Connection to Tawnaghmore 110 kV substation, Killala Business Park, Co. Mayo.

The Proposed Development will consist of the following:

- Construction of 16 no. Vestas V117 (4.3 MW) IEC IIA – T wind turbines. This specific model with a blade tip height of 135 m, was selected as the candidate turbine and its associated parameters were used to determine the significant environmental effects associated with the Proposed Development. No flexibility in terms of turbines dimensions is sought as part of the application for Planning Permission.
- Construction of permanent Turbine Hardstands and Turbine Foundations.
- Change the use of a residential site and vacant dwelling to a Permanent Operations Compound consisting of an operations office, storage area and staff parking.
- Construction of two Temporary Construction Compounds with associated temporary site offices, parking areas and security fencing.
- Installation of 1 no. (35-year life cycle) meteorological mast with a height of up to 80 m and a 4 m lightning pole on top.
- Development of 17 no. permanent onsite spoil deposition areas.
- Construct 5 no. new permanent site entrances as described in the EIAR **Chapter 17: Traffic and Transport** and **Figure 2.1**.
- Upgrade 9 no. existing site entrances as described in the EIAR **Chapter 17**: **Traffic and Transport** and **Figure 2.1**.
- Works for new and upgraded entrances include clearing visibility splays of vegetation, widening the entrances to allow HGVs turn onto local public roads and the R314, excavation to solid formation level, installation roadside drainage features, placing entrance sub-base with rockfill materials, placing capping level and providing surface dressing where necessary.
- Road construction works within the Wind Farm Site consisting of the construction of approximately 9.64 km of new Site Access Tracks through the Wind Farm Site. The upgrading of 1.76 km of private Access Tracks and 1.58 km of public roads within the Wind Farm Site, road verge widening, hedge trimming and all associated infrastructure and drainage works as described in EIAR **Chapter 17: Traffic and Transport** and the **Turbine Delivery Route Report Appendix 17.1.**

- Forestry felling of approximately 31.86 ha of coniferous forest will be required to facilitate the construction of the Proposed Development. For the purposes of this Proposed Development, the Developer commits that the location of any replanting (alternative afforestation) associated with the Proposed Development will be greater than 10 km from the Wind Farm Site and also outside any potential hydrological pathways of connectivity i.e. outside the catchment within which the Proposed Development is located. The extent of felling required to be licensed for the purpose of giving effect to the Proposed Development can only be determined once planning permission for the Proposed Development has been granted. It will be a condition of the felling licence that an equivalent area of land required to be felled shall be replanted. The felling will be subject to a separate planning application which, in practical terms, can only be made once planning permission for the Proposed Development has been granted.
- All associated site development works including berms, landscaping, and soil excavation.
- Development of an internal site drainage network and sediment control systems.
- Construction of 1 no. 110 kV electrical substation including 2 no. control buildings with welfare facilities, all associated electrical plant and equipment, security fencing and gates, all associated underground cabling, wastewater holding tank, and all ancillary structures and works (the 'Wind Farm substation').
- Installation of battery arrays located within container units (20 no. units) and associated electrical plant for grid stabilisation adjacent to the Onsite Substation building (with up to 150 MW storage capacity) with surrounding palisade fence 2.65 m in height.
- All associated underground electrical and communications cabling connecting the wind turbines to the Wind Farm substation.
- All works associated with the permanent connection of the Wind Farm to the national electricity grid comprising of a 110 kV underground cable system in permanent cable ducts from the proposed, Wind Farm substation, in the townland of Barroe to the existing Tawnaghmore substation at the Killala Business Park.

A 10-year planning permission and 35-year operational life from the date of commissioning of the entire Wind Farm (apart from the substation) is being sought. However, part of the substation and all of the grid connection will be handed over to EirGrid networks to own and operate. As part of the national grid infrastructure, their life can extend beyond the life of the wind farm. Accordingly, permission is sought for the grid connection and substation in perpetuity.

LEGEND	Client Representative	Client	Drg. By	DT	Job No.	6289
Met Mast Location Point Turbine Location Points Tawnaghmore 110kV Substation Proposed 110kV Grid Route BESS Proposed 110kV Substation Proposed Development Redline	JENNINGS O'DONOVAN an RSK company JENNINGS O'DONOVAN AND PARTNERS LIMITED FINISKLIN SLIGO IRELAND Tel (+353) 719 161 416 Email. Info@jodireland.com www.jodireland.com @JOD_Sligo Jennings O'Donovan & Partners Jennings O'Donovan CYAL50512615 © Tailte Éireann – Surveying.	CONSTANT ENERGY LIMITED. Project TIRAWLEY WIND FARM, CO. MAYO Title PROPOSED GRID CONNECTION ROUTE	Checked By	MG	Figure	2.2
			Approved	DT	Rev	0
			Scale	1:30,000 (A3)		
			Stage	Planning		
			Date	10/03/2026		

Figure 2.2: Proposed Grid Connection Route**.**

3 ENVIRONMENTAL CONTROLS

This CEMP sets out the key environmental considerations to be taken into account by the contractor during construction of the Project. This CEMP details the mitigation measures to be implemented in order to comply with the environmental commitments outlined in the EIAR, NIS and associated documents, and the applicable guidance documents and best practice measures as listed below. The contractor will be contractually obliged to comply with all measures outlined in this CEMP. In the event planning permission is granted for the Project, the CEMP will be updated prior to the commencement of the Proposed Development, to address the requirements of any relevant planning conditions, including any additional mitigation measures which are conditioned and will be submitted to the Planning Authority for written approval. This CEMP will be adhered to and further developed by the Contactor and will be overseen by the Project representative/foreman.

Guidance Documents

The guidance documents listed below must be complied with by the appointed Contractor.

- BPGCS005, Oil Storage Guidelines.
- CIRIA (2006) Guidance on 'Control of Water Pollution from Linear Construction Projects' (CIRIA Report No. C648, 2006).
- CIRIA (2015) SuDS Manual, (CIRIA Report C753, 2015)
- CIRIA, (2005). C650 Construction Industry Research and Information Association (CIRIA) Environmental Good Practice on Site.
- CIRIA, (2007). C697 The SUDS Manual.
- COFORD (2004) Forest Road Manual – Guidelines for the Design, Construction and Management of Forest Roads.
- Coillte (2009): Forest Operations & Water Protection Guidelines.
- Construction Industry Research and Information Association (CIRIA), (2001). C532 Control of Water Pollution from Construction Sites, Guidance for Consultants and Contractors.
- Department of Agriculture, Food and the Marine (2018) DRAFT Plan for Forests & Freshwater Pearl Mussel in Ireland – Consultation Document.
- EPA Best practice guidelines for the preparation of resource & waste management plans for construction & demolition projects.
- EU Construction and Demolition Waste Management Protocol - BIBM.
- Fisheries Protection during Development Works (Foyle and Carlingford areas) Environmental Guidelines Series – No. 1. Loughs Agency.
- Forest Service (2000) Forestry and Water Quality Guidelines. Forest Service,

- Forest Services (2006) Draft Plan for Forestry and Freshwater Pearl Mussel Requirements – Site Assessment and Mitigation Measures.
- Forestry Commission (2004) Forests and Water Guidelines, Fourth Edition. Publ. Forestry Commission, Edinburgh.
- GPP 22 (2018) Dealing with Spills, NetRegs
- GPP 5 (2018) Works and Maintenance In or Near Water, NetRegs.
- GPP1 (2020) Understanding your Environmental Responsibilities – Good environmental Practices, NetRegs.
- GPP21 (2021) Pollution Incident Response Planning, NetRegs.
- IEMA's latest Impact Assessment Guidance, 'A New Perspective on Land and Soil in Environmental Impact Assessment' (Feb 2022)
- IFI (2016) Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters

3.1 HUMAN BEINGS AND COMMUNITY

The assessment set out in **Chapter 5: Population & Human Health** has not identified any likely significant effects from the Proposed Development on population or human health.

The main mitigation measure is by design or avoidance. A suitable separation distance from turbines and other key infrastructure to properties has been embedded in the EIA Development design. Additional mitigation to protect site personnel and the public will also be implemented in the event of damage to a turbine and subsequent likely turbine or turbine component failure.

These are:

- Turbines will be procured from a reliable manufacturer and will have undergone vigorous safety checks during design, construction, commissioning and operation.
- Physical and visual warnings such as signs will be erected at access points and close to turbines for the protection of site personnel and the public.
- Facility for remote turbine deactivation will be provided.
- The Developer will appoint a Project Supervisor for the Design Process (PSDP) and a Project Supervisor for the Construction Stage (PSCS). The PSDP will compile a Preliminary Safety and Health Plan (PSHP), which details general information about the project and envisaged health and safety risks. The PSHP will be made available to the PSCS. The PSCS will develop a Construction Stage Health and Safety Plan (CSHSP) which incorporates the information contained in the PSHP and details how safety and health will be managed during the construction of the Proposed Development.

- The PSCS may also develop the following documents during the pre-construction stage of the Proposed Development, for implementation during the construction stage:
    - Construction and Environmental Management Plan (CEMP)
    - Emergency Response Plan
    - Detailed Traffic Management Plan
- The PSDP will see that the General Principles of Prevention, outlined under the safety design advice provided by the Health and Safety Authority (HSA), are taken into account for all designs relating to the Proposed Development
- The construction, operation and decommissioning of the Proposed Development shall be managed in accordance with the Safety, Health and Welfare at Work Act 2005 (as amended), the Safety, Health and Welfare at Work (General Application) Regulations 2007 (as amended), and the Safety Health and Welfare at Work (Construction) Regulations 2013 (as amended).
- All machinery and relevant equipment shall be in compliance with The Machinery Directive (2006/42/EC).

3.2 BIODIVERSITY

A suitable Ecological Clerk of Works (ECoW) with experience in overseeing wind farm construction projects will be appointed by the Contractor for the duration of the construction phase to ensure that the CEMP is effectively implemented and that all planning conditions relating to biodiversity are complied with. An Environmental Manager will be appointed by the Developer to oversee the environmental management of the project, advise on the environmental issues and ensure compliance by the Contractor.

The appointed ECoW will deliver a toolbox talk to all contractors, including sub-contractors, prior to construction starting on ecologically sensitive features within or in close proximity to the works area. The duties of the ECoW will be to monitor the efficacy of mitigation measures implemented by the contractors and to report on the application and success of these measures. In the event of pollution occurring or the potential to occur, the ECoW will have a ‘Stop Works’ authority to ensure measures to stop a pollution event are implemented immediately.

An Ecological Clerk of Works (ECoW) will be employed by the Contractor for the duration of the construction phase and will ensure that all mitigation measures relating to ecology described in this report and contained within the planning permission are implemented.

All mitigation measures have been developed in the context of national and international legislative guidance for the protection and management of flora, habitats of conservation importance, fauna and aquatic ecological interest.

Guidelines to be adhered to in the delivery of the CEMP and method statements are as follows:

- EPA Guidelines on the Information to be contained in Environmental Impact Assessment Reports (2022).
- European Commission (2017) Environmental Impact Assessment of Projects. Guidance on the preparation of the Environmental Impact Assessment Report. (Directive 2011/92/EU as amended).
- NRA (2009). Guidelines for Assessment of Ecological Impacts of National Road Schemes.
- CIEEM (2024). Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine. Chartered Institute of Ecology and Environmental Management, Winchester.
- Fossitt (2000). A Guide to Habitats in Ireland. Heritage Council, Kilkenny.
- Smith et al. (2011). Best Practice Guidance for Habitat Survey and Mapping in Ireland.
- Bats and onshore wind turbines: Survey, Assessment and Mitigations. Scottish Natural Heritage January, 2019.
- Bats and onshore wind turbines - Survey, Assessment and Mitigation. Scottish Natural Heritage. August 2021
- Bat Conservation Ireland Guidelines for consideration of bats in wind farm projects - Revision 2014
- BTHK (2018). Bat Roosts in Trees – A Guide to Identification and Assessment for Tree-Care and Ecology Professionals. Pelagic Publishing, Exeter UK.
- CIEEM (2021). Bat Mitigation Guidelines. A guide to impact assessment, mitigation and compensation for developments affecting bats. Beta version 1.0.
- Collins, J. (Editor) (2023) Bat Surveys for Professional Ecologists: Good Practice Guidelines (4th edition). Bat Conservation Trust, London
- Kelleher, C. & Marnell, F. (2006) Bat Mitigation Guidelines for Ireland. Irish Wildlife Manuals, No. 25. National Parks and Wildlife Service, Department of Environment, Heritage and Local Government, Dublin, Ireland.
- Marnell, F., Kelleher, C. & Mullen, E. (2022) Bat mitigation guidelines for Ireland v2. Irish Wildlife Manuals, No. 134. National Parks and Wildlife Service, Department of Housing, Local Government and Heritage, Ireland.

3.2.1 Designated Sites

The present report has identified likely pathways between the area of the Proposed Development and three European sites, namely:

- Lackan Saltmarsh and Kilcummin Head SAC (code 00516)
- Killala Bay/Moy Estuary SAC (code 000364)
- Killala Bay/Moy Estuary SPA (code 002041)

In the absence of mitigation, there is a risk that contaminants generated by the Proposed Development during the construction, operation and decommissioning phases could enter local watercourses and ultimately flow to the designated sites where there could be resultant adverse effects on water quality and aquatic life and relevant qualifying interests within the sites. Mitigation is therefore required to minimise this risk.

The implementation of mitigation through avoidance principles, pollution control measures, surface water drainage measures and other preventative measures have been incorporated into the project design in order to minimise potential significant adverse effects on water quality at the Wind Farm Site.

Within the Wind Farm Site all turbine locations and associated infrastructure have a buffer zone of at least 50 m from natural streams, with a 10 m buffer to significant drains. No works will take place within these buffer zones except for the watercourse crossings on the access track network. Implementation of such buffer zones will result in the avoidance of sensitive hydrological features. Direct discharges to surface waters of dewatered loads will not be permitted under any circumstances. This in turn will avoid or reduce the potential for adverse effects on downstream designated sites.

The CEMP provides a contractual commitment to mitigation and monitoring, and reduces the risk of pollution whilst improving the sustainable management of resources. The environmental commitments of the Proposed Development will be managed through the CEMP and will be secured in contract documentation and arrangements for construction and later phases, such that there will be a robust mechanism in place for their implementation. The CEMP addresses the construction phase, and will be continued through to the commissioning, operation and final decommissioning phases.

3.2.2 Mitigation for Habitats

3.2.2.1 Habitat Loss

The Proposed Development will result in the loss of a limited amount of habitat of significant ecological importance, namely an area of blanket bog at wind turbine AT13 location (0.68 ha) and various hedgerows throughout the project area.

As the loss of blanket bog cannot be mitigated, this loss shall be offset through a Biodiversity Enhancement and Management Plan (BEMP). The BEMP is outlined in full in Appendix 6.4 of the EIAR. Briefly, the BEMP area comprises the abandoned quarry at Castlelackan Demesne (other than the part of quarry required to facilitate turbine AT16). The quarry had been built in an area of blanket bog and the property still supports approximately 3.9 ha of relatively intact bog. This bog shall be preserved, and where feasible enhanced, for the lifetime of the Proposed Development.

The BEMP shall also provide mitigation for the overall effects on biodiversity as a result of the Proposed Development, with preservation and enhancement of areas of willow scrub, grassland, rock surfaces (bare to sparsely vegetated) and ponds.

The permanent loss of hedgerows and trees will be offset through a planting scheme. The planting will follow best practice, including guidance from the Department of Agriculture, Food and the Marine ACRES scheme.

The estimated permanent losses are as follows:

New entrances from public roads	800 m
Internal breaches of hedgerows by infrastructure	355 m
Losses for bat buffer mitigation at turbines (inc. forest edge)	449 m
Total estimated linear loss	**1,604 m**

Taking into account the value of local hedgerows and that the new plantings will take up to 10 years to equal in structure and diversity the hedges removed, a greater area will be replanted than is removed. A figure of 50% above the loss is considered appropriate, which results in a length of **2,406 m** to be replanted.

A strip of 3 m width will be allowed for staggered planting (see below) and fencing as required. The area required for the replacement planting of permanent hedging is therefore **7,218 m^2** or **0.72 ha**.

The Turbine Delivery Route will require the removal of **2,504 m** of hedging from along roads to facilitate road widening. While this will be replanted along the extended road edge when works are complete, the temporary loss is significant as there will be an interval of up to ten years before the replanted hedging attains similar value to what will be removed. Due to the ecological value of hedgerows, additional mitigation is required for this temporary loss and it is considered appropriate that 50% of this figure, *i.e.* **1,252 m**, is replanted elsewhere as permanent hedging to offset this temporary adverse effect. Using a 3 m planting strip width, this amounts to **3,756 m^2** or **0.376 ha.**

From above, the amount of new planting required to offset the permanent and temporary loss of hedgerows is **3,658 m** or **10,974 m^2 (1.097 ha).**

Additional losses of scrub, mostly willow and gorse, will be lost to create bat buffers at wind turbines AT09 and AT13, which is estimated at **0.29 ha**.

In summary, the total area of hedging, trees and scrub required to be planted to offset the losses is as follows:

	Length (m)	Area (ha)
Permanent hedgerow loss	2,406 m	0.72 ha
Temporary hedgerow loss	1,252 m	0.376 ha
Scrub at bat buffers	-	0.29 ha
Total	**3,658 m**	**1.39 ha**

To reflect the losses across the Wind Farm Site, the total area to be replanted will be distributed at three locations (see **Figure 3.1 – 3.3**), as follows:

AT01/substation:	1.11 ha available
AT06 location:	0.67 ha available
AT14 location:	1.01 ha available
Total land available for planting	**2.79 ha**

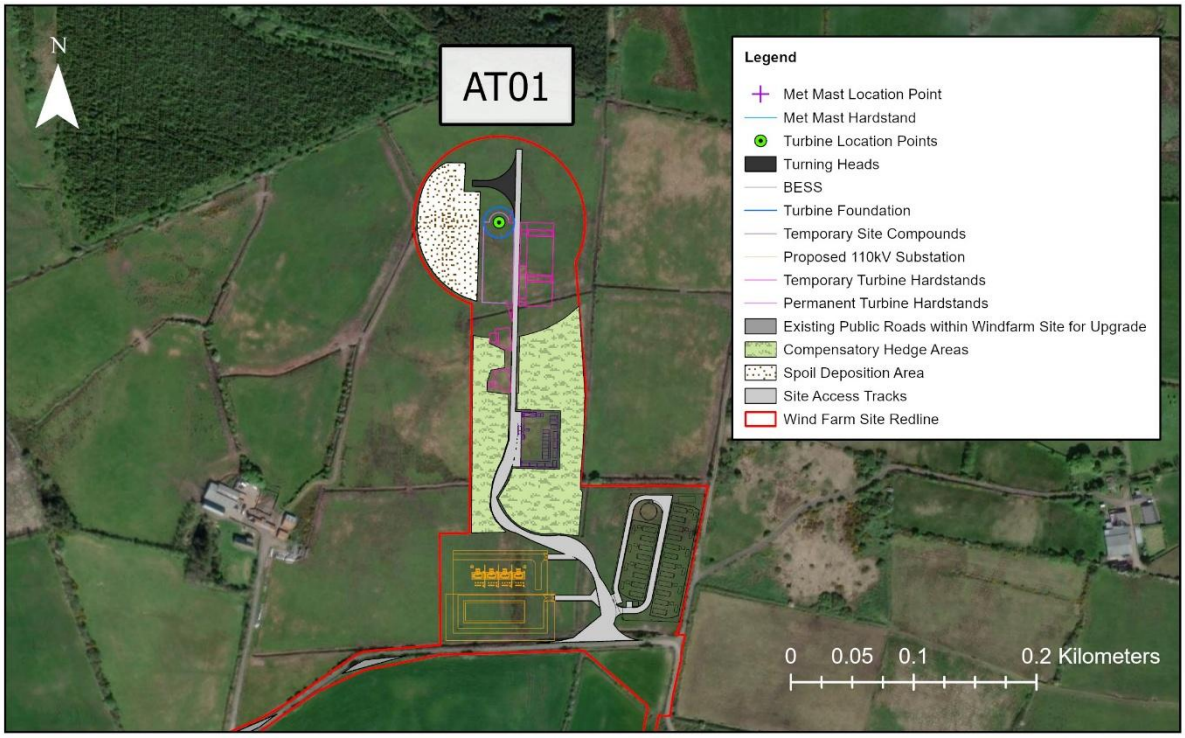

Figure 3.1: Detail of native woodland planting at AT01 location.

Figure 3.2: Detail of native woodland planting at AT01 location.

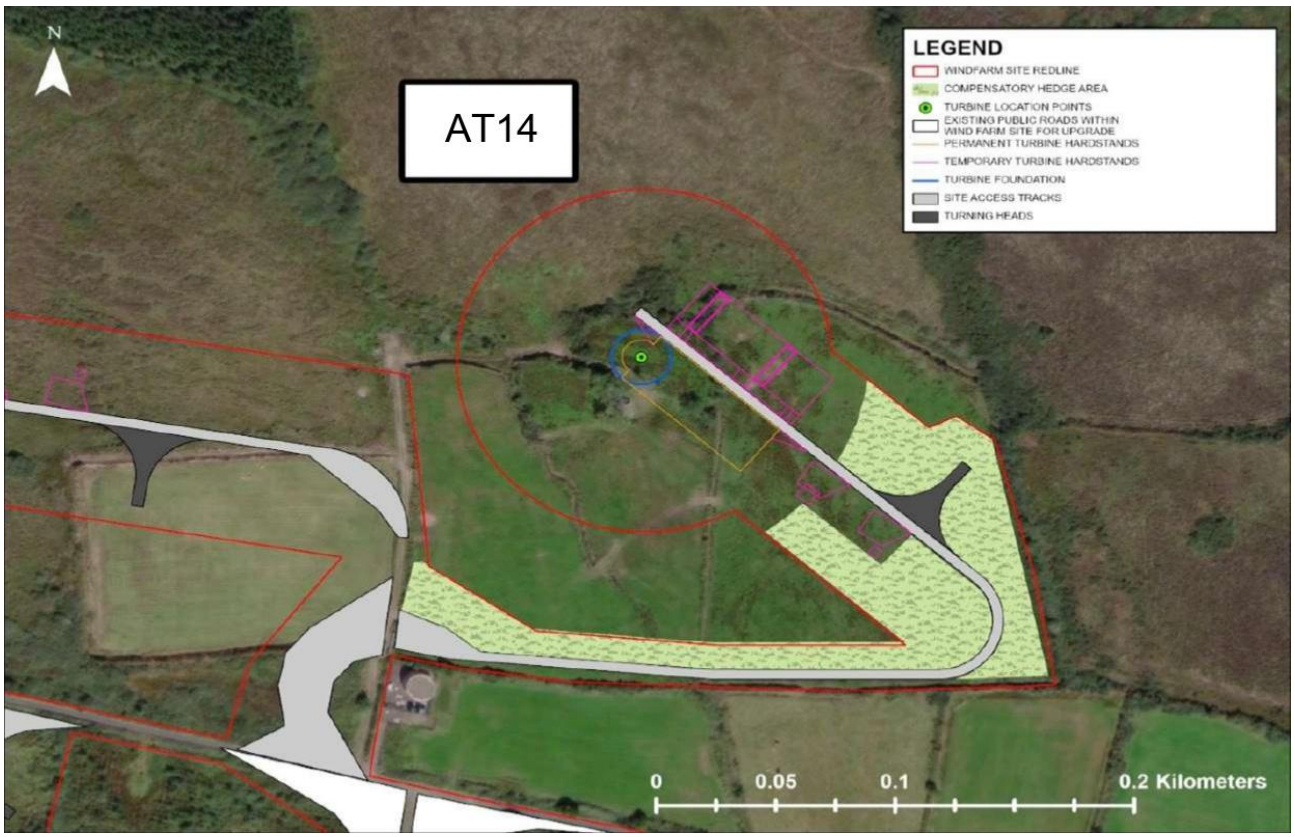

Figure 3.3: Detail of native woodland planting at AT14 location.

An ecologist will advise on the exact design and details for the new plantings. To maximise the biodiversity potential, the plantings will connect with ecological features such as existing hedgerows and treelines. The plantings will comprise both linear strips and broader stands of woodland.

The following guidance will be adhered to for hedge planting:

- As soon as a date is agreed for the commencement of construction, the first step in the schedule will be the planting of the new hedgerows/woodland strips within the appropriate season. The earlier planting is carried out the better, as this will allow time for these features to establish prior to the loss of existing features.
- Plantings will consist of native Irish species from Irish genetic stock (certified Irish). Hedgerow species which have a fairly widespread presence in the area, and which are useful biodiversity species, include hawthorn, blackthorn, grey willow (*Salix cinerea* subsp. *oleifolia*), hazel, holly, rowan (*Sorbus aucuparia*), alder (*Alnus glutinosa*), guelder rose (*Virburnum opulus*) and spindle (*Euonymous europaeus*). Formerly ash would be used as a principal tree standard but is not being planted due to ash dieback disease. Instead, sessile oak (*Quercus petraea*) is a suitable species.

- Hedgerows will be planted in a double staggered row within strips of 3 m width. Spacing will be 20-30 cm apart using 60-90 cm high 'whips'. The dominant species will be hawthorn, blackthorn, grey willow and hazel (20-50% each), with holly, rowan, alder, spindle and guelder rose as supporting species (less than 10% each). Alder and willow would be particularly useful if along watercourses.
- Tall trees will be planted at approximately 30 m intervals and will consist mainly of sessile oak, though species such as alder can be allowed to grow tall.
- The planted strip will be fenced off from livestock (where required). Trees planted as standards will be individually fenced to protect from deer.
- Fertiliser application will not be permitted.
- The control of competing vegetation is critical for the establishment and growth of young trees. Inadequate vegetation management will result in mortality, loss of growth and vigour and the need for further inputs during the establishment process.
- Any plants that fail will be replaced on an annual basis for the first five years since start of planting programme.

3.2.2.2 Mitigation to minimise disturbance of bog and promote re-vegetation

The construction works will cause disturbance to adjoining bog habitat around the AT13 turbine site, as an area will be needed by the Contractor to facilitate the works. To minimise disturbance to the bog and to ensure good recovery, as well as to minimise areas of bare peat which would be prone to erosion, the following programme will be adhered to during the construction phase.

Restricted access to bog

At the commencement of works, the required work footprint on the bog shall be identified and the area shall be marked by a rope fence (using wooden poles) and with appropriate signage. No construction activities shall be allowed outside of the agreed work area for the duration of the construction period. The ECoW shall inspect the site regularly whilst works are on-going. Excavated peat and subsoil shall be removed to the approved deposition area, with no storage of peat or any other materials on the adjoining bog area. The rope fences shall remain in place until the works at this location are fully complete.

Re-vegetation of bare surfaces at work area

An ecological objective is to minimise the area of exposed peat surface and to encourage rapid re-vegetation of the disturbed bog surface at wind turbine AT13 location. This shall be achieved by the removal of the vegetated bog surface within the work footprint, the storage of this material, and subsequent re-use around the turbine and hardstand margins.

First, a suitable local area shall be identified where the removed material can be stored for the duration of the works – it is noted that such areas will not be on other vegetated bog surfaces but rather grassland habitat. Also, it is important that the selected storage areas shall not be prone to disturbance for the duration of the required storage period.

The approach to 'save' the surface vegetated material shall be as follows: the surface shall be cut-out as sods or 'turves' to a depth of approximately 20-30 cm using a dumper/digger with a bucket. Care will be taken to keep the turves as intact as possible and the vegetated side upwards. The turves shall be loaded to a trailer and transported to the pre-identified storage area. The turves shall be off-loaded from the trailer and placed side by side and vegetation side upwards. They shall be placed in single layers, i.e. not piled on top of each other. Should storage of the above materials be for prolonged periods (months), the stored turves and peat piles will need to be watered during dry spells.

When ready for placement at the finished turbine/hardstand, the turves will be lifted with a dumper and bucket and taken to the destination. Here they will be off-loaded and placed side by side on the disturbed bog surface with vegetation side up. The turves will be bedded in with the bucket of a dumper so that they form a continuous layer without gaps between them. This approach will provide almost immediate cover of the bare surfaces.

All of the above processes will be monitored by the ECoW.

3.2.2.3 Otter

While there was no evidence of otter presence at any of the stream crossing points, downstream of the site the main rivers and the coastal strip provide suitable habitat to support otter populations. Such populations could be affected adversely by pollutants entering the watercourses as a result of activities associated with the Proposed Development.

The mitigation proposed to maintain water quality in the aquatic zones (as detailed in Section **3.3** and in **Section 3.5**) will ensure that the food supplies for otters within local watercourses are not affected by contaminants generated by the Proposed Development.

If three years lapse from between the planning-stage surveys (carried out in 2022-23) and commencement of construction works at water crossings, it will be necessary to carry out a survey for otter in areas of potential suitable habitat which will be disturbed by the works as the local distribution of otter may have changed in that period.

It is noted that should the pre-construction survey indicate a requirement for protection of the relevant species (in this case otter), appropriate measures will be taken to comply with all relevant legislation and best practice guidance in force at the time.

3.2.2.4 Badger

Whilst no signs of badger presence were found within a 100 m distance of the work areas during the baseline surveys, badger does occur in the wider area and distribution of local populations can change over time. As more than 36 months will have elapsed since the baseline surveys in 2022-23, a pre-construction confirmatory survey will be undertaken in accordance with NRA Guidance (2006). This will focus on the areas of the site where works will take place (to a distance of approximately 100 m).

Should an active sett be located within a 50 m distance of the works area, mitigation would be necessary to ensure that the sett is closed prior to the commencement of any works onsite. This procedure would be carried out in strict accordance with relevant legislation.

As several years will have lapsed from the time of the planning-stage surveys (carried out in 2023-24) and commencement of construction works, including tree-felling, it will be necessary to carry out a survey for badger in areas of potential suitable habitat which will be disturbed by the works as the local distribution of badger may have changed in that period. This will be carried out by an ecologist with experience of badger survey and within the recommended period (November – March).

It is noted that should the pre-construction survey indicate a requirement for protection of the relevant species (in this case badger), appropriate measures will be taken to comply with all relevant legislation and best practice guidance in force at the time.

3.2.2.5 Common frog and Smooth Newt

The common frog is widespread within the Wind Farm Site occurring in drains, fields which are permanently wet, bog and in the ponds within the abandoned quarry at Castlelackan Demesne. Areas where construction works are due to commence during the period February to August will be checked by the ECoW for the presence of frog spawn, tadpoles and adult frogs. If present, these will be removed under licence from NPWS and transferred to suitable ponds, drains or wetlands in the vicinity and away from the construction footprint.

The ponds within the abandoned quarry at Castlelackan Demesne have some potential to support the smooth newt though aquatic vegetation is notably sparse. Prior to the

commencement of construction works within the quarry, a survey for the smooth newt will take place within the ponds. Should newts be recorded in ponds that could be affected by the works, these shall be removed to one of the other ponds onsite, under licence.

The status of the common frog and smooth newt within the ponds within the abandoned quarry at Castlelackan Demesne will be determined prior to the commencement of any construction works, including those in relation to spoil deposition.

Should the pre-construction survey indicate a requirement for protection of the relevant species, appropriate measures will be taken to comply with all relevant legislation and best practice guidance in force at the time. This will include removal (under licence) of spawn, tadpoles and/or adults from the pond which will be lost to one of the other ponds onsite.

3.2.2.6 Bats

Buffer Zones

Bats typically use woodland edge habitats for commuting and feeding purposes. Areas of conifer plantation should be felled in order to discourage bat species from flying close to turbines. Various publications provide guidelines on buffer zones surrounding turbines to reduce the favourability of the site for bat activity. Eurobats 'Guidelines for consideration of bats in wind farm projects' (Rodrigues, et al., 2015) recommend buffer zones of 200 m from turbine base to high potential features whilst Natural England Bats (England, 2014) recommend 50 m buffers from blade tip to tree. NIEA (2021) recommends a minimum buffer of 100 m between the turbines at the edge of commercial forestry where wind farms are proposed to be key-holed.

For Tirawley turbine hub height will be 76.5 m, while blade length is 58.7 m. A separate calculation has been completed for turbines surrounded by hedgerows (feature height 13 m) and treelines (24 m). The following formula is used to calculate the distance required from the turbine base.

$$\mathbf{B} = \sqrt{(50 + \mathrm{Bl})^2 - (\mathrm{HH} - \mathrm{FH})^2}$$

Where: bl = blade length, hh = hub height, fh = feature height (all in metres).
Thus, turbines will have either a 88 m or 94 m buffer
Buffer 88 m = Turbines AT01, AT05, AT07, AT08, AT13
Buffer 94 m = Turbines AT02, AT03, AT04, AT06, AT09, AT10, AT11, AT12, AT14, AT15, and AT16

While the creation of buffers has been used as a mitigation measure extensively, Berthinussen (2021) shows that no detailed study has been conducted showing its effectiveness. Barré (2018) highlights habitat loss (potentially due to creation of buffers) impacts can be considerable in wind farm development and proposes no net loss of high biodiversity value landscape features. As an alternative to the loss of the trees and scrub adjacent to AT14 and AT16 it is proposed to strengthen curtailment at these locations (see below).

Retention of Trees and Replacement

Trees and treelines along approach roads and Site Access Tracks will be retained unless felling is unavoidable. Retained trees will be protected from root damage by an exclusion zone of at least 7 metres or equivalent to canopy height. Such protected trees will be fenced off by adequate temporary fencing prior to other works commencing

A replanting programme will mitigate for the loss of hedgerows, treelines and mature trees which serve as commuting corridors and possibly roosts for bats.

Measures Specific for Turbine AT08

Turbine AT08 has a thick southern hedge bordering a stream to the south within the 88 m buffer. Instead of felling these areas, curtailment will be implemented, offering an alternative protection to bat species.

Measures Specific for Turbine AT14

Turbine AT14 has a number of trees and scrubby woodland of good quality within the 94 m buffer. Instead of felling these areas, curtailment will be implemented, offering an alternative protection to bat species.

Measures Specific for Turbine AT16

Turbine AT16 is located within an abandoned quarry that contains scrub around its border and within the quarry itself. Instead of felling a buffer around the turbine, additional curtailment measures will be implemented to offset potential effects on bats and monitoring will be conducted post construction to maintain this quarry as a wildlife diversity area.

Lighting Restrictions

In general, artificial light creates a barrier to bats so lighting should be avoided where possible. Construction operations within the Wind Farm Site will take place during the hours of daylight where possible to minimise disturbances to faunal species at night. Some works

along the GCR and Wind Farm Site may occur at night but the Environmental Manager/ ECoW shall limit night-time works to sections of the route / site which avoid sensitive features (e.g., mature treelines). Where lighting is required, directional lighting, i.e. lighting which only shines on work areas and not nearby countryside, will be used to prevent overspill. This will be achieved by the design of the luminaire and by using accessories such as hoods, cowls, louvers and shields to direct the light to the intended area only

Pre-construction Bat Surveys

Should three years lapse from between the planning-stage baseline surveys and installation of the wind turbines, it will be necessary to repeat one full season of surveys during the activity period (EUROBATS, 2014). Future survey work will be completed according to best practice guidelines available (NatureScot 2021) and will include static detector, activity and roost inspection surveys.

Pre-Felling of Trees

A preliminary survey of trees within a 252 m zone of each turbine was undertaken on the 8th and 9th of March 2023 and 14th to 15th of February 2024, the correct times of year to carry out such survey. This had identified 65 trees and shrubs with a potential roost feature (PRF) (see Appendix 6.2 for full details). It should be noted many of these trees are not now within the zone of influence of the development and will not be impacted. All trees will require at-height surveys conducted by a suitably qualified ecologist with roost disturbance and inspection camera licences should felling or trimming be required. Should PRF's be found above ladder height the use of tree climbing / cherry pickers, scaffolding will be required in order to gain access to PRFs for detailed examination with the use of recording inspection cameras.

Surveyors shall carry out a detailed internal inspection using a torch, mirror and endoscope. Data such as internal dimensions particularly length of cavity shall be gathered. Should the removal of the roost be required at a later stage these dimensions will be vital. Should a bat roost be found a derogation licence shall be sought from the NPWS seeking permission for the roost's translocation (if possible).

Evidence of bat usage sought during the surveys should include:

- Bat droppings (these will accumulate under an established roost or under access points);
- Live bats;
- Insect remains (under feeding perches);
- Oil (from fur) and urine stains;

- Scratch marks; and
- Bat corpses.

Pre-Construction Otter Survey

As several years will have lapsed from the time of the planning-stage surveys (carried out in 2023-24) and the commencement of construction works at water crossings, it will be necessary to carry out a survey for otter in areas of potential suitable habitat which will be disturbed by the works as the local distribution of otter may have changed in that period. This will be carried out by an ecologist with experience of otter survey.

It is noted that should the pre-construction survey indicate a requirement for protection of the relevant species (in this case otter), appropriate measures will be taken to comply with all relevant legislation and best practice guidance in force at the time.

Pre-Construction Badger Survey

As several years will have lapsed from the time of the planning-stage surveys (carried out in 2023-24) and the commencement of construction works at water crossings, it will be necessary to carry out a survey for otter in areas of potential suitable habitat which will be disturbed by the works as the local distribution of otter may have changed in that period. This will be carried out by an ecologist with experience of otter survey.

It is noted that should the pre-construction survey indicate a requirement for protection of the relevant species (in this case otter), appropriate measures will be taken to comply with all relevant legislation and best practice guidance in force at the time.

Pre-Construction Amphibian Surveys

The status of the common frog and smooth newt within the ponds within the abandoned quarry at Castlelackan Demesne will be determined prior to the commencement of any construction works, including those in relation to spoil deposition.

Should the pre-construction survey indicate a requirement for protection of the relevant species, appropriate measures will be taken to comply with all relevant legislation and best practice guidance in force at the time. This will include removal (under licence) of spawn, tadpoles and/or adults from the pond which will be lost to one of the other ponds onsite.

3.2.3 Post Construction Monitoring

3.2.3.1 Habitats

Post-construction habitat monitoring will focus on the following:

- Blanket bog at wind turbine AT13 location which had been disturbed by construction activities;
- The newly planted hedgerows and the woodland plot;
- The Biodiversity and Enhancement Management Plan area (see details in **Appendix 6.4**).

When all ground works are complete on the bog at wind turbine AT13 location, a vegetation survey will take place by an ecologist. This will describe the state of the vegetation in the area where disturbance has occurred. A series of monitoring quadrats will be established to accurately describe the vegetation, including proportion of bare peat, at the time (Year 1) and in subsequent years. Details will be worked out by the Ecologist, but it is likely that quadrats will be 2 m x 2 m in size and will be geo-referenced and photographed. Vegetation recovery will be monitored over a period as follows: Years 1, 2, 3, 5, 10, 15, 20, 25, 35.

All newly planted hedging and woodland will be monitored annually for the first 10 years of the operation of the scheme. Any identified failed trees will be replaced. Repairs will be made to fencing and any specific tree wire protection as required.

Reports will be prepared for each year of monitoring and issued to the relevant planning authority.

3.2.3.2 Bat Monitoring

Monitoring of operating wind farms is essential to increase our understanding of their potential impacts on different bat species (Rodrigues et al., 2015). Surveys for the Proposed Development shall include monitoring of mortality – this shall comprise searches from April to October for three years and every five years thereafter during the lifetime of the project. Due to the small size of bat corpses and the difficulty for detection by humans a trained sniffer dog will be employed in fatality searches. In keeping with best practice guidance, all fatality estimates will incorporate searcher efficiency and scavenger removal trials specific to the site, as well as the effect of search plot size (Rodrigues et al., 2015, Fiona Mathews, 2015). Survey frequency shall reflect results from the onsite predation levels, whilst the predation trial shall be conducted in such a way as to not be influenced by predator swarming effects, i.e. placing too many carcasses for the predation local predation level (see Smallwood, 2010).

Annual monitoring reports shall be submitted to the local authority and the NPWS. Should significant casualties be found at a particular turbine(s) additional mitigation may be required to prevent further fatalities (Wellig, 2018). The definition of significant in this respect shall reflect the most up-to-date research at the time of commencement of operation with particular reference to Eurobat guidance.

Discussion of the results of the curtailment program for turbines AT01 and AT02 will be conducted with the determining authority (involving NPWS). This will include a review of the adequacy of the monitoring effort (in light of the results) and discussion of whether turbine curtailment parameters should be varied based on any fatalities, activity and weather conditions recorded. Any variations to the mitigation will be monitored to confirm the mitigation is effective.

3.2.3.3 Monitoring curtailment

If, following the initial 3 years of post-construction surveys, bat activity increases above the baseline and/or remains consistently high and carcass searches indicate fatalities are occurring (refer below), increased cut-in speeds will continue. This will subsequently be monitored in Years 5, 7, 10, 15, 20, 25 and 35, with further review after each monitoring period.

Alternatively, if it is found that the results of bat activity surveys and fatality searches confirm that the level of bat activity at turbine locations is low then consent will be sought from Mayo County Council for the cessation in the requirement for these cut-in speeds / curtailment measures, or a reduction on the timing restrictions for these measures.

Where post construction acoustic surveys are undertaken, they will utilise full spectrum automatic detectors deployed, as a minimum, for one complete bat activity season.

Acoustic monitoring will be supplemented with thermal imaging cameras etc. to provide more detailed information on bat activity in the vicinity of turbines.

An assessment of static data gathered during operational surveillance will be completed using Ecobat type analysis as recommended by SNH (2021) as a minimum, or other equivalent guidance as dictated by up-to date standards and practices.

3.2.3.4 Monitoring of Mitigation Measures

The success of the implemented mitigation measures for bats on the project will be monitored for a period of three years after construction and every five years thereafter during the lifetime of the project.

A recommended schedule for monitoring is given in **Table 3.1** below.

Bat fatality monitoring

Although curtailment is a mitigation proven to lower bat fatalities it is recommended that the scheme be monitored for bat fatalities for the first three years of operation (post construction surveys) and subsequently in years 5, 7, 10, 15, 20, 25 and 35 as part of the additional curtailment monitoring schedule. A comprehensive onsite fatality monitoring programme is to be undertaken following published best practice (e.g. SNH 2021 or equivalent at the time of operation), as follows:

a) Carcass removal trials to establish levels of predator removal of possible fatalities. This will be done following best recommended practice and with due cognisance of published effects such as predator swamping, whereby excessive placement of carcasses increases predator presence and consequently skews results. At the time of writing (2024), predation trials set using trail cameras following guidance set out in Smallwood (2010) provides the most accurate results.
b) Turbine searches for fatalities will be undertaken with the use of conservation dogs following best practice in terms of search area (minimum radius hub height) and at intervals selected to effectively sample fatality rates as determined by carcass removal trials in (a) above. At the time of writing (2024), the typical search area surrounding the turbine bases follow Edkins (2014) *Impacts Of Wind Energy Developments On Birds And Bats: Looking Into The Problem*, who recommends the "search width should be equal to the maximum rotor tip height'', *e.g*. turbines at Tirawley have a max tip height of 135 m thus the spread of searched area, as a rectangle, square or circle, should be 67.5 m in either direction from the turbine base."
c) Search intervals would follow SNH (2021).
d) Recorded fatalities would be calibrated against known predator removal rates to provide an estimate of overall fatality rates.
e) Monitoring report to be submitted annually to Mayo County Council at agreed intervals

Table 3.1: Monitoring schedule for bat mitigation measures.

Mitigation measure	Monitoring required	Description	Duration
Bat boxes, tubes	Monitor bat use	Bat boxes, rocket boxes and tubes to be placed at locations removed from wind farm as determined by project ecologist/ECoW at least 1 year before start of construction. These shall be examined by a licenced bat specialist according to NPWS recommendations. Records should be submitted to Bat Conservation Ireland for inclusion in its bat distribution database. If the boxes / tubes are not used within the first three years of deployment re-site if necessary. Annual clearing required if well used by bats or if used by birds. Replace if damaged/lost.	From mounting to 3 years post construction
Mortality study	Fatality monitoring	Corpse searches beneath turbines to assess the impact of operation on bats.	From initial operation conducted during years 1, 2, 3, 5, 7, 10, 15, 20, 25 and 30 post construction.

3.2.4 Mitigation by avoidance

The greatest risk of adverse impacts on the aquatic environment will occur during the construction phase of the development. Key to minimising this risk has been the siting of all turbine locations and other key infrastructure at a minimum set-back from watercourses (i.e. 50 m to main watercourses and 10 m to main drains). Where works are proposed within the buffer zone, such as at watercourse crossings, additional mitigation measures will be implemented, namely the placement of double row silt fences immediately down-gradient of the construction area.

3.2.5 Mitigation by Reduction

Implementation of the following specific measures will ensure the protection of water quality in local watercourses and will ensure that contaminated water does not reach the identified European sites which have hydrological connectivity with the proposed development area.

This is a summary of the principal required mitigation measures, with full details being presented in the **Section 3.4**

- Sediment traps or settlement ponds will be provided at all outfalls during construction. All construction site run-off will be channelled through a stilling process to allow suspended solids to settle out and through a spill-containment facility prior to discharge.

- Daily monitoring of all sediment traps and settlement ponds will be undertaken by the Contractor and supervised by the Environmental Manager to ensure satisfactory operation and/or maintenance requirements.
- The storage on site of oils, hydraulic fluids, etc. will be undertaken in accordance with current best practice for oil storage (Enterprise Ireland, BPGCS005).
- The pouring of concrete, sealing of joints, application of water-proofing paint or protective systems, curing agents, etc. will be completed in the dry to avoid pollution of the freshwater environment.
- Vehicles will be refuelled off-site where possible. For vehicles that require refuelling on-site, fuels will be stored in the temporary construction compound and bunded to at least 110% of the storage capacity of fuels to be stored. Refuelling will take place via a mobile double skinned fuel bowser. The bowser will be a double axle refuelling trailer which will be towed to the refuelling locations by a 4x4 vehicle. The 4x4 will carry, a drip tray, spill kit and absorbent mats in case of any accidental spillages. Only designated competent personnel will refuel plant and machinery on the Site.
- All machinery operating on water course crossings will be steam-cleaned in advance of works and routinely checked to ensure no leakage of oils or lubricants occurs. All fuelling of machinery will be undertaken on dry land.
- Instream works shall be undertaken during the period 1st July to 30th September as required by Inland Fisheries Ireland Guidance (2016) to avoid accidental damage or siltation of spawning beds, and unless otherwise specified by IFI during consultations in advance of works.
- Culverting works will be undertaken in dry conditions and in low flow conditions on drains that do not run dry. This will be within the summer period during periods of dry stable weather.
- During the culvert installation and associated construction work, double silt fences shall be emplaced immediately downgradient and downstream of the construction area for the duration of the construction phase.
- There will be no concrete batching on the Wind Farm Site. Rather, it will be transported to the Site as it is required. A dedicated, bunded area will be created to cater for concrete wash-out. This will be for the wash-out of the chutes only after the pour. Concrete trucks will then exit the Site and return to the supply plant to wash out the mixer itself. The main concrete pours at the turbine locations will be planned in advance and will adhere to the following:
    1. Avoiding large concrete pours, for Turbine Foundations for example, on days when heavy or prolonged rainfall is forecast, i.e., 25 mm in a 24-hour period (heavy frontal rainfall lasting most of the day); or rainfall depth greater than

monthly average in seven days (prolonged heavy rainfall over a week). Concrete pouring will be avoided during a period in which a Met Éireann Status Red weather event has been implemented.

2. Ensuring that all concrete pour areas are dewatered prior to pouring concrete and while the concrete is curing.
3. Making covers available so that areas can be covered if heavy rain arrives during the curing process which will prevent runoff of concrete which has a high pH.

- In the unlikely event of any incidents of pollution to watercourses, immediate steps will be undertaken to resolve the cause of the pollution and mitigate against the impact of pollution, following the advice set out in, the site-specific Emergency Response Plan (**CEMP- Management Plan 1**).

3.2.6 Ground and Peat Stability

The following specific mitigation measures will be applied as recommended in the PLHRA (included in EIAR **Appendix 8.1**):

- Avoidance of floating roads in areas where ground slopes exceed 5 degrees to the horizontal.
- Avoidance of stockpiling on the peat
- Avoidance of peat berms in areas of potential instability (highlighted by elevated hazard rankings), where ground slopes exceed 5 degrees to the horizontal
- Additional engineered drainage in areas of construction
- Avoidance of drains discharging onto areas of weak or deep peat or areas of elevated hazard ranking
- Avoidance of blasting within 1 km of areas highlighted by elevated hazard rankings

As noted in the PLHRA, vehicular access to any areas of deep peat (>1.0 m) during construction will be restricted to low ground pressure vehicles, with all construction vehicles travelling on existing access tracks whenever possible.

Best practice will be applied during construction which will minimise the risk of ground instability. All works will be managed and carried out in accordance with the Construction Environmental Management Plan (CEMP), which will be updated by the civil engineering contractor and agreed prior to any site works commencing.

A Geotechnical Clerk of Works will be employed during the construction phase in order to continuously monitor areas of peat, in particular areas of deep peat and the areas of potential

instability highlighted in the PLHRA. Ongoing physical stability checks and calculations will be undertaken in order to verify that safety standards are being met.

The CEMP includes an emergency response to be applied in the event of a landslide or ground instability. In particular, catch fences and other physical barriers (i.e. concrete blocks) will be on-site and available in sufficient quantities to be used in the event of ground instability. A plan will be made to prevent or divert any landslide away from the European sites associated with Killala Bay.

On-site training and toolbox talks will ensure any response to any potential incident is escalated quickly and efficiently.

Following best practice guidelines (as outlined by The Scottish Executive & Halcrow Group Ltd in "Peat Landslide Hazard and Risk Assessment - Best Practice Guide for Proposed Electricity Generation Developments", April 2017), peat landslide risk analysis has indicated a NEGLIGIBLE HAZARD of instability in relation to the proposed turbine locations and proposed access tracks, should all mitigation measures and recommendations be adhered to, and as such the project should have no adverse effect on the soils, geology or surface water aspects in the vicinity of the proposed Tirawley Wind Farm project.

3.2.7 Horizontal Directional Drilling

During the HDD processes there is a risk of leakages of drilling fluids which can have toxic effects on aquatic biota (depending on the type of lubricant used).

It is noted that for this Project, 'Clearbore' or a similar environmentally friendly drilling fluid product will be used during the HDD process. Clearbore is produced using free flowing polymers and is designed to instantly break down and become chemically destroyed in the presence of small quantities of calcium hypochlorite. At normal usage, the product is not toxic to aquatic organisms and is biodegradable. Full details for mitigation during the HDD process are given in **Section 3.4**.

3.2.8 Clear Felling

As the proposed Development requires a substantial amount of clear felling, all felling operations will conform to current best practice Forest Service regulations, policies and strategic guidance documents as well as Coillte and DAFM guidance documents to ensure that felling, planting and other forestry operations result in minimal potential negative effects to the receiving environment.

Strict mitigation measures will be implemented which will reduce the risk of entrainment of suspended solids and nutrient release in surface watercourses.

Full details for mitigation during the felling operations are given in **Section 3.4**. and in the **Forestry Management Plan, Appendix 14.1** of EIAR.

3.2.9 Aquatic Ecology

3.2.9.1 Mitigation Measures

A Surface Water Management Plan (SWMP) (**Management Plan 3**) is included in the CEMP. Furthermore, this CEMP has regard to NatureScot (2019), CIRIA (2016), NRA (2008b), and IFI (2016) guidelines. The Surface Water Management Plan will set out measures to avoid siltation, erosion, surface water run-off and accidental pollution events which all have the potential to adversely affect water quality within the site during the construction phase. It will also include preparatory works on the site, including installation of silt fences and bunds.

All Site Access Tracks will be designed to minimise excavation on the site and reduce the risk of sediment runoff. A sealed silt fence must be placed at both sides of points where rivers or streams are crossed and to a minimum of 10 m upstream and downstream of each crossing at both sides of the road. Swales for turbine bases and hard standings must be constructed.

All infrastructures must have a setback distance of 50 m away from all streams within the site except for the watercourse crossings. If Site Access Tracks cross watercourses they will be constructed as clear span bridges or precast concrete culverts. No instream wet concrete operations or construction will be permitted, and installation of any instream elements should be completed in dry conditions. There are also 15 stream crossings proposed within the Wind Farm Site. Where Site Access Tracks pass close to watercourses, silt fencing should be used to protect the streams. Stream crossings will be constructed during low flow conditions and within a 5-day weather window. How this will take place will be detailed in the SWMP. A silt fence will be placed downstream of all works and regularly maintained. Materials used to install culverts and stream crossings should be ore-cast.

Spoil heaps from the excavations for the turbine bases and trenches (where cables are to be buried) will be covered with geotextile and surrounded by silt fences to filter sediment from the surface water run-off from excavated material. Any berms will be covered with a geo-textile matting to avoid sediment runoff; berms will be surrounded by silt fencing until vegetation has been established in the following growing season. If cables will be installed in

trenches, they will be located underneath and directly adjacent to access tracks as far as possible. Trenches will be excavated during dry periods where possible in short sections and left open for minimal periods to avoid acting as a conduit for surface water flows. Clay bunds will be constructed within any cable trenches at intervals.

The Surface Water Management Plan (**Management Plan 3**) included in the CEMP, should be distributed for consultation, detailing the required measures for the Contractor to implement in the event of a 'worst case' scenario on the site. Timing of the proposed instream works will also take account of the fisheries constraints within the study area, where no works will be undertaken in the instream environment during the salmonid close season (October–June annually), which also avoids the lamprey spawning season.

Secure concrete washout areas will be designated onsite. Standing water in the excavations at the turbine bases will contain an increased concentration of suspended solids. The excavations will be pumped into temporary settlement basins as necessary which should be lined and which should drain into existing or proposed drainage channels onsite. The settlement basins will be constructed in advance of any excavations for the turbine bases.

Wheel washing facilities will be provided at the Site entrance draining to silt traps. Additional silt fencing will be kept on Site for the ongoing maintenance of the structures provided. Portaloos will be used to provide toilet facilities for site personnel. Sanitary waste will be removed from Site via a licensed waste disposal contractor and will not be discharged onsite.

Any diesel or fuel oils stored on Site will be bunded to 110% of the capacity of the storage tank. Such facilities will not be located near any drain or watercourse. Design and installation of fuel tanks will be in accordance with best practice guidelines. Refuelling of plant during construction will be carried out in an appropriately designed designated area, away from watercourses. Drip trays and spill kits will be kept available on Site. Appropriate containment facilities will be provided to ensure that any spills from the vehicle are contained and removed offsite.

Appropriate preventative measures will be detailed in the CEMP to ensure that non-native aquatic/riparian species are not introduced into the Site. These measures should follow as relevant the manual 'The Management of Noxious Weeds and Non-Native Invasive Plant Species on National Roads' by NRA (2010).

3.3 SOILS AND GEOLOGY

The following section details the environmental control measures which must be incorporated into the Contractors' Construction Method Statement (CMS) to ensure the protection of soils and geology. In addition, a Peat and Spoil Management Plan and a Waste and Resources Management Plan (see **Management Plans 4 and 5** respectively) have been prepared which provide further details of control measures and monitoring procedures.

3.3.1 Subsoil and Bedrock Removal – Mitigation Measures

Subsoil and bedrock removal will occur throughout the construction of the Wind Farm and is unavoidable. However, the impacts associated with this removal will be minimised using the following practices.

3.3.1.1 Mitigation by Avoidance

Areas of deep peat and shallow bedrock have been avoided during construction by careful design of the Wind Farm.

3.3.1.2 Mitigation by Good Practices

Best practice will be applied during construction which will minimise the amount of soil and rock excavation.

All works will be managed and carried out in accordance with the Construction Environmental Management Plan (CEMP), which will be updated by the civil engineering contractor and agreed prior to any works commencing onsite.

The majority of the excavated peat and mineral soil spoil will be placed in the designated spoil storage area at Lacken Hill. Localised areas of landscaping will be sealed and levelled using the back of an excavator bucket to prevent erosion. The spoil repository will be restored to match the local environment when filling operations are complete.

3.3.1.3 Mitigation by Reduction

The disturbance of soil, subsoil and bedrock is an unavoidable effect of the Proposed Development, but every effort will be made to ensure that the amount of earth materials excavated is kept to a minimum in order to limit the effect on the geological aspects of the site.

The management of geological materials is an important component of controlling dust and sediment and erosion control.

3.3.1.4 Mitigation by Reuse

Bedrock will be re-used for construction of Site Access Tracks wherever possible. The bedrock will comprise predominantly granite and quartzite which, when crushed and graded, should provide a good sub-base for Site Access Track construction.

Peat, overburden and rock will be reused where possible onsite to reinstate excavated areas where appropriate. Where possible, the upper vegetative layer will be stored with the vegetation part of the sod facing the right way up to encourage growth of plants and vegetation at the surface of the landscaped peat. These measures will prevent the erosion of peat in the short and long term.

3.3.1.5 Mitigation by Remediation

On completion of the construction stage, any areas not required for operation will be reinstated. This may include the Temporary Construction Compound, turning areas and materials storage areas. Granular material will be removed as required and reinstated with peat or other soils in keeping with the adjacent soils. Drainage measures will be reinstated as required in order to minimise future erosion of the soils.

3.3.2 Storage and Stockpiles – Mitigation Measures

3.3.2.1 Mitigation by Avoidance and Good Practice

Best practice will be applied during construction which will minimise the amount of soil and rock excavation and therefore also reduce storage and stockpile requirements. All works will be managed and carried out in accordance with the Construction and Environmental Management Plan (CEMP), which will be updated by the civil engineering contractor and agreed prior to any site works commencing.

3.3.2.2 Mitigation by Reduction

Whenever possible, soil and rock will be re-used on the Wind Farm Site immediately, thereby reducing the need for double handling, which will also reduce the requirements to stockpile soils. Generally excavated rock will be used immediately for Site Access Track construction. Excess Topsoil, peat and non-reuseable mineral soil will be transported to the long-term storage at one of the 19 no. designated storage areas. Whenever possible stockpiles will be avoided. Stockpiles of rock on peat soils will be avoided to prevent instability. Peat will only be stockpiled temporarily to a maximum height of 2 m in areas of thin or absent peat and only in areas of shallow ground slopes, which have been assessed for stability by a suitably experienced geotechnical engineer. In the case of the 3 no. spoil repositories at Lacken Hill, a “cell” arrangement with perimeter berms constructed out of crushed rock will be employed

to locally confine spoil at heights of up to 3 m. The precise design of the spoil repositories will be developed further at construction stage when the benefit of further ground investigation will aid final design and restoration landscaping.

3.3.2.3 Vehicular Movements – Mitigation Measures

Vehicular movements will be restricted to the footprint of the Proposed Development, particularly with respect to the newly constructed Site Access Tracks. This implies that machinery must be kept on tracks and will not move onto areas that are not permitted for the Proposed Development.

Vehicular traffic onsite is reduced through the re-use of excavated material onsite which will reduce the need to source material from external quarries.

3.3.2.4 Mitigation by Avoidance and Good Practice

Best practice will be applied during construction which will minimise double handling, again reducing the Site traffic. All works will be managed and carried out in accordance with the Construction Environmental Management Plan (CEMP), which will be updated by the civil engineering contractor and agreed prior to any Site works commencing.

Excavated peat will only be moved short distances from the point of extraction and will be used locally for landscaping, thus again reducing the onsite traffic.

Excavated rock (and any glacial till) will be used for access track construction as close to the source of extraction as possible.

3.3.3 Ground Stability – Mitigation Measures

3.3.3.1 Mitigation by Avoidance and Good Practice

The following mitigation measures will also be applied as recommended in the PLHRA (included as **Appendix 8.1**):

- Avoidance of floating roads in areas where ground slopes exceed 5 degrees to the horizontal.
- Avoidance of stockpiling on the peat
- Avoidance of peat berms in areas of potential instability (highlighted by elevated hazard rankings), where ground slopes exceed 5 degrees to the horizontal
- Additional engineered drainage in areas of construction
- Avoidance of drains discharging onto areas of weak or deep peat or areas of elevated hazard ranking
- Avoidance of blasting within 1 km of areas highlighted by elevated hazard rankings

As noted in the PLHRA, vehicular access to any areas of deep peat (>1.0 m) during construction will be restricted to low ground pressure vehicles, with all construction vehicles travelling on existing access tracks whenever possible.

Best practice will be applied during construction which will minimise the risk of ground instability. All works will be managed and carried out in accordance with the Construction Environmental Management Plan (CEMP), which will be updated by the civil engineering contractor and agreed prior to any site works commencing.

A Geotechnical Clerk of Works will be employed during the construction phase in order to continuously monitor areas of peat, in particular areas of deep peat and the areas of potential instability highlighted in the PLHRA. Ongoing physical stability checks and calculations will be undertaken in order to verify that safety standards are being met.

3.3.3.2 Emergency Response

The emergency response plan, as detailed in the CEMP and the **Emergency Response Plan** (**Management Plan 1**), has been developed in order to deal with any emergency accidents or spills.

Fences and other physical barriers (i.e. concrete blocks) should be onsite and available in sufficient quantities to be used in the event of ground instability. A plan should be made to prevent or divert any landslide away from protected areas (NHA, SPA, SAC).

3.3.4 Soil Contamination

The purpose of this management control is to ensure that the measures in place are operating effectively, prevent accidental leakages, and identify potential breaches in the protective retention and attenuation network during earthworks operations.

3.3.4.1 Mitigation by Avoidance and Good Practice

Protecting soils from spills will in turn mitigate against the potential for contaminates reaching watercourses, mitigation measures for contaminants are presented in detail in **Section 3.4**.

A fuel management plan will be prepared (and included in the CEMP) which will incorporate the following elements:

- Mobile bowsers, tanks and drums will be stored in secure, impermeable storage area, away from drains and open water;

- Fuel containers will be stored within a secondary containment system e.g. bund for static tanks or a drip tray for mobile stores;
- Ancillary equipment such as hoses, pipes will be contained within the bund;
- Taps, nozzles or valves will be fitted with a lock system;
- Fuel and oil stores including tanks and drums will be regularly inspected for leaks and signs of damage;
- Only designated trained operators will be authorised to refuel plant onsite.

3.3.4.2 Mitigation by Reduction

Careful design of the Wind Farm has reduced the amount of site traffic required onsite by reducing access tracks lengths, excavation volumes and double handling. Similarly, good site practice and a robust CEMP will also result in less traffic and a lower potential for fuel spills and leakages.

3.3.4.3 Emergency Response

Procedures and contingency plans will be set up to deal with an emergency accidents or spills. In particular an emergency spill kit with oil boom and absorbers will be kept onsite in the event of an accidental spill. All site operatives will be trained in its use.

3.3.4.4 Material and Waste Management

All materials used onsite, and wastes generated onsite will be reduced by good site practice and attention to the CEMP. A policy of reduce, re-use and recycle will apply. All waste will be segregated and re-used where possible or removed from site for recycling. Any waste which is not recyclable or compostable will be properly disposed of landfill. Whenever possible, excavated materials will be re-used close to the area of excavation. Careful design will result in minimal excess soil and rock.

Additionally, Material and Waste Management methodologies, are specified in the **Management Plan 5: Waste and Resources Management Plan**

3.4 HYDROLOGY AND DRAINAGE

The following section details environmental control measures which will be implemented onsite in relation to hydrology and drainage and provide the framework within which the targeted CMS must be prepared. In addition, a Water Quality Management Plan and a Surface Water Management Plan have been prepared (see **Management Plans 2** and **3** respectively) which provide further details of control measures and monitoring procedures.

3.4.1 Earthworks Resulting in Suspended Solids Entrainment in Surface Waters

3.4.1.1 Mitigation by Avoidance

Proposed Mitigation by Avoidance: The key mitigation measure during the construction phase is the avoidance of sensitive hydrological features, by application of suitable buffer zones (i.e. 50 m to main watercourses, and 10 m to main drains).

Where possible all of the key Proposed Development areas (turbines, hardstands, construction compounds etc.) have been located significantly away from the delineated 50 m watercourse buffer zones. Where works are proposed within the buffer zone *i.e.* at watercourse crossings additional mitigation measures will be proposed and are detailed below.

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

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

3.4.1.2 Proposed Mitigation by Design

The Proposed Developments design has been optimised to utilise the existing infrastructure (roads and hardstands) where practicable. This design prevents the unnecessary disturbance of peat and spoil, significantly reducing the potential for elevated concentrations of suspended solids in runoff.

Presented below are temporary and long-term drainage control measures that will be utilised during the construction phase of the Proposed Development. As stated above there is an existing drainage network in some areas of the Wind Farm Site which comprises forestry drains and roadside drains and headwater streams. The measures outlined below will be used in conjunction with the existing drainage network to ensure the protection of all rivers and downstream watercourses.

Source controls*:*

- Interceptor drains, vee-drains, diversion drains, erosion and velocity control measures such as the use of sand bags, oyster bags filled with gravel, filter fabrics and other similar/ equivalent or appropriate systems.
- Small working areas, covering temporary stockpiles, weathering off of side-cast peat/ spoil, cessation of works in certain areas or other similar/equivalent or appropriate measures.

In-Line controls:

- Interceptor drains, vee-drains, oversized swales, erosion and velocity control measures such as check dams, sand bags, oyster bags, straw bales, flow limiters, weirs, baffles, silt bags, silt fences, sedimats, filter fabrics, and collection sumps, temporary sumps, sediment traps, pumping systems, settlement ponds, temporary pumping chambers, or other similar/equivalent or appropriate systems.

Treatment systems:

- Temporary sumps and attenuation ponds, temporary storage lagoons, sediment traps, and settlement ponds, and proprietary settlement systems such as “Siltbuster”, and/or other similar/equivalent or appropriate systems.

It should be noted that the existing network of forestry drains present in some areas will be integrated and enhanced as required and used within the Proposed Developments drainage system. The integration of the existing forestry drainage network and the proposed wind farm network is relatively simple. The key elements are the upgrading and improvements to water treatment elements, such as in-line controls and treatment systems, including silt traps, settlement ponds and buffered outfalls.

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

- Apart from interceptor drains, which will convey clean runoff water to the downstream drainage system, there will be no direct discharge (without treatment for sediment reduction, and attenuation for flow management) of runoff from the proposed wind farm drainage into the existing site drainage network. This will reduce the potential for any increased risk of downstream flooding or sediment transport/erosion.
- Temporary silt traps will be placed in the existing drains downstream of construction works, and these will be diverted into proposed interceptor drains, or culverted under/across the works area.

- During the operational phase of the Wind Farm, runoff from individual Turbine Hardstanding areas will be not discharged directly into the existing drainage network but discharged locally at each turbine location through field drains, main drains, and existing settlement ponds.
- Buffered outfalls which will be numerous over the site will promote percolation of drainage waters across the bog surface and close to the point at which the additional runoff is generated, rather than direct discharge to the existing drains of the site.
- Velocity 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.
- Existing culverts will be lengthened where necessary to facilitate access road widening.

3.4.1.3 Pre-Commencement Temporary Drainage Works

Prior to the commencement of road upgrades (or new road/hardstand or turbine base installs) the following key temporary drainage measures will be installed:

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

3.4.1.4 Silt Fences

Silt fences will be emplaced within drains down-gradient of all construction areas. Silt fences are effective at removing heavy settleable solids. This will act to prevent entry to the existing drainage network of sand and gravel-sized sediment, released from the 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 are critical to their functioning to stated purpose. They will remain in place throughout the entire construction phase.

3.4.1.5 Silt Bags

Silt bags will be used where small to medium volumes of water need to be pumped from excavations (e.g. the proposed underpass locations). As water is pumped through the bag, most of the sediment is retained by the geotextile fabric allowing filtered water to pass through.

3.4.1.6 Settlement Ponds

The Proposed Development's footprint will be divided into drainage catchments (based on topography, outfall locations, catchment size) and stormwater runoff rates based on the 200-year return period rainfall event will be calculated for each catchment. These flows will then be used to design settlement ponds for each drainage catchment. The settlement ponds will either be designed for 4.1 hr or 24 hr retention times used to settle out medium silt (0.01 mm) and fine silt (0.004 mm) respectively (EPA, 2006). Settlement ponds along Site Access Tracks and at Turbine Hardstands will have 4.1 hr retention as there is additional in-line drainage controls proposed along Site Access Tracks and at hardstands.

3.4.1.7 Level Spreaders and Vegetation Filters

The purpose of level spreaders is to release treated drainage flow in a diffuse manner, and to prevent the concentration of flows at any one location thereby avoiding erosion. Level spreaders are not intended to be a primary treatment component for development surface water runoff. They are not stand alone but occur as part of a treatment train of systems that will reduce the velocity of runoff prior to be released at the level spreader. In the absence of level spreaders, the potential for ground erosion is significantly greater than not using them.

Vegetation filters are essentially end-of-line polishing filters that are located at the end of the treatment train. In fact, vegetation filters are ultimately a positive consequence of not discharging directly into watercourses which is one of the mitigation components of the drainage philosophy. This makes use of the natural vegetation of the Wind Farm Site to provide a polishing filter for the wind farm drainage prior to reaching the downstream watercourses.

Again, vegetation filters are not intended to be a single or primary treatment component for treatment of works area runoff. They are not stand alone but are intended as part of a treatment train of water quality improvement/control systems (i.e. source controls >check dams > silt traps > settlement ponds > level spreaders > silt fences> vegetation filters).

3.4.1.8 Water Treatment Train

If the discharge water from construction areas fails to be of a high quality, 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 to all of the construction phase.

3.4.1.9 Pre-emptive Site Drainage Management

The works programme for the construction stage of the Proposed Development will also take account of weather forecasts and predicted rainfall in particular. Large excavations and movements of peat/subsoil or peat stripping will be suspended or scaled back if heavy rain is forecast. The extent to which works will be scaled back or suspended will relate directly to the amount of rainfall forecast.

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

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

Using the safe threshold rainfall values will allow planned works to be safely executed (from a water quality perspective) in the event of forecasting of an impending high rainfall intensity event.

Earthworks will be suspended if forecasting suggests any of the following is likely to occur:

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

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

- All open peat/spoil excavations will be secured and sealed.
- Temporary or emergency drainage will be created to prevent back-up of surface runoff.
- Working during heavy rainfall and for up to 24 hours after heavy events will not be allowed to ensure drainage systems are not overloaded.

3.4.1.10 Management of Runoff from Peat/Subsoil Storage Areas

Excavated material can be used onsite in several ways. Suitable excavation material can be used onsite for reprofiling and landscaping or it can be permanently reposited onsite in the proposed 17 no. spoil deposition areas.

During the initial placement of subsoil, silt fences, straw bales and biodegradable matting will be used to control surface water runoff from the spoil deposition areas.

Drainage from the spoil deposition areas will ultimately be routed to an oversized swale and a number of stilling ponds and a 'Siltbuster' with appropriate storage and settlement designed for a 1 in 100 year return period before being discharged to the onsite watercourses. Soil/subsoil deposition areas will be sealed with a digger bucket and vegetated as soon possible to reduce sediment entrainment in runoff. Once re-vegetated and stabilised soil/subsoil deposition areas will no longer be a potential source of silt laden runoff.

3.4.1.11 Timing of Site Construction Works

Construction of the site drainage system will only be carried out during periods of low rainfall, and therefore minimum runoff rates. This will minimise the risk of entrainment of suspended sediment in surface water runoff, and transport via this pathway to surface watercourses. Construction of the drainage system during this period will also ensure that attenuation features associated with the drainage system will be in place and operational for all subsequent construction works.

3.4.1.12 Proposed Drainage and Water Quality Monitoring

An inspection and maintenance plan for the onsite drainage system will be prepared in advance of the commencement of any works and will be included in the CEMP. 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.

Any excess build-up of silt levels at dams, the settlement ponds, or any other drainage features that may decrease the effectiveness of the drainage feature, will be removed.

During the construction phase field testing (visual, supplemented with pH, electrical conductivity, temperature, dissolved oxygen and turbidity monitoring), sampling and laboratory analysis of a range of parameters with relevant regulatory limits and EQSs will be undertaken for each primary watercourse, and specifically following heavy rainfall events (i.e. weekly, monthly and event-based).

3.4.1.13 Allowance for Climate Change

Climate Change rainfall projections are typically for a mid-century (2050) timeline. The projected effects of climate change on rainfall are therefore modelled towards the end of the life cycle of the Proposed Development, as the turbines have a life span of ~35 years.

It is likely that the long-term effects of climate change on rainfall patterns will not be observed during the lifetime of the proposed wind farm. As outlined in the above sections we have designed settlement ponds for a 1 in 100 year return flow.

This approach is conservative given that the project will likely be built over a much shorter period (12-18 months), and therefore this in-built redundancy in the drainage design more than accounts for any potential short term climate change rainfall effects.

3.4.1.14 Additional Measures for Works within Buffer Zones

In addition to the above mitigation measures, where works are proposed within the delineated 50 m hydrological buffer zone the following additional mitigation measures will be implemented:

- Double row silt fences will be emplaced immediately down-gradient of the construction areas.

3.4.2 Excavation Dewatering and Potential Effects on Surface Water Quality

Management of surface water and groundwater seepages and subsequent treatment prior to discharge into the drainage network will be undertaken as follows:

- Appropriate interceptor drainage, to prevent upslope surface runoff from entering excavations will be put in place.
- If required, pumping of excavation inflows will prevent build-up of water in the excavation.
- The interceptor drainage will be discharged to the Wind Farm Site constructed drainage system or onto natural vegetated surfaces and not directly to surface waters.
- The pumped water volumes will be discharged via volume and sediment attenuation ponds adjacent to excavation areas, or via specialist treatment systems such as a 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.
- A mobile 'Siltbuster' or similar equivalent specialist treatment system will be available onsite for emergencies in order to treat sediment polluted waters from settlement ponds or excavations should they occur. Siltbusters are mobile silt traps that can remove fine particles from water using a proven technology and hydraulic design in a rugged unit.

The mobile units are specifically designed for use on construction-sites. They will be used as final line of defence if needed.

3.4.3 Potential Release of Hydrocarbons

- All plant will be inspected and certified to ensure they are leak free and in good working order prior to use onsite.
- Vehicles will be refuelled offsite where possible.
- Onsite 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 or truck will be re-filled offsite and will be towed/driven around the site to where machinery is located. The 4 x 4 jeep/fuel truck 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.
- Fuel storage onsite will be minimised. Any fuels will be stores on the Temporary Construction Compound and will be bunded to at least 100 % of the capacity of the largest tank.
- 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 to ground 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.
- Only designated competent personnel will refuel plant and machinery.
- 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.

3.4.4 Potential Release of Cement-Based Products

- No batching of wet-cement products will occur onsite. Ready-mixed supply of wet concrete products and emplacement of pre-cast elements will take place.
- Where possible pre-cast elements for culverts and concrete works will be used.
- Where concrete is delivered onsite, only the chute will be cleaned, using the smallest volume of water possible. No discharge of cement contaminated waters to the construction phase drainage system or directly to any artificial drain or watercourse will be allowed. A dedicated bunder area will be created to cater for concrete wash-out and this will be located in the Temporary Construction Compound.
- The contractor will use weather forecasting to plan dry days for pouring concrete.
- The contractor will ensure pour site is free of standing water and plastic covers will be ready in case of a sudden rainfall event.

No mitigation is required for potential groundwater effects as these are imperceptible at the outset.

3.4.5 Groundwater and Surface Water Contamination from Waste Disposal

- During the construction phase, a self-contained port-a-loo with an integrated waste holding tank will be used at each of the site construction compounds, maintained by the providing contractor, and removed from the site on completion of the construction works.
- Water supply for the site office and other sanitation will be brought to site and removed after use by a licensed contractor to be discharged at a suitable offsite treatment location, likely to be Killala or Ballycastle Waste Water Treatment Plants.
- No water or wastewater will be sourced on the Site, nor discharged to the site.

3.4.6 Potential Surface Wate Quality Effects from Clear Felling

All felling operations will conform to current best practice Forest Service regulations, policies and strategic guidance documents as well as Coillte and DAFM guidance documents, including the specific guidelines listed below, to ensure that felling, planting and other forestry operations result in minimal potential negative effects to the receiving environment.

- Forestry Standards Manual (Forest Service, 2015)
- Environmental Requirements for Afforestation (Forest Service, 2016a)
- Land Types for Afforestation (Forest Service, 2016b)
- Forest Protection Guidelines (Forest Service, 2002)
- Forest Operations and Water Protection Guidelines (Coillte, 2013)
- Forestry and Water Quality Guidelines (Forest Service, 2000b)
- Forestry and the Landscape Guidelines (Forest Service, 2000c)

- Forestry and Archaeology Guidelines (Forest Service, 2000d)
- Forest Biodiversity Guidelines (Forest Service, 2000e)
- Forests and Water, Achieving Objectives under Ireland's River Basin Management Plan 2018-2021 (DAFM, 2018)
- Coillte Planting Guideline SOP
- A Guide to Forest Tree Species Selection and Silviculture in Ireland (Horgan et al., 2003)
- Management Guidelines for Ireland's Native Woodlands. Jointly published by the National Parks & Wildlife Service (Cross and Collins, 2017)
- Native Woodland Scheme Framework (Forest Service, 2018)
- Code of Best Forest Practice (Forest Service, 2000)

3.4.6.1 Mitigation by Avoidance

There is a requirement in the Forest Service Code of Practice and in the FSC Certification Standard for the installation of buffer zones adjacent to aquatic zones at planting stage. Minimum buffer zone widths recommended in the Forest Service (2000) guidance document "Forestry and Water Quality Guidelines" are shown in **Table 3.2**.

With gentle to moderate slopes existing across much of the forested areas of the Wind Farm Site, a 10 m setback will be established along aquatic zones. Furthermore, a 5 m setback will be established along all relevant watercourses and water hotspots.

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

- Avoid physical damage (river/stream banks and river/stream beds) to watercourses and the associated release of sediment.
- Avoid peat/soil disturbance and compaction within close proximity to surface watercourses.
- Avoid the entry of suspended sediment from works into watercourses.
- Avoid the entry of suspended sediment from the drainage system into watercourses, achieved in part by ending drain discharge outside the buffer zone and allowing percolation across the vegetation of the buffer zone.

Table 3.2: Recommended Minimum Buffer Zone Width

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

In addition to the application of buffer/setback zones, the following supplementary mitigation measures will be employed during felling works (**Section 3.5.6.2**).

3.4.6.2 Mitigation by Design

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

- Machine combinations will be chosen which are most suitable for ground conditions at the time of felling, and which will minimise soils disturbance. The harvester and the forwarder are designed specifically for the forest environment and are low ground pressure machines.
- Suitably qualified personnel will operate all machinery.
- Checking and maintenance of roads and culverts will be on-going through any felling operations. No tracking of vehicle through watercourses will occur, as vehicles will use existing watercourse crossing points. Where possible, existing drains will not be disturbed during felling works.
- These machines will traverse the site along specified off-road routes (referred to as racks).
- The location of racks will be chosen to avoid wet and potentially sensitive areas.
- Brash mats will be placed on the racks to support the vehicles on soft ground, reducing peat and mineral soil disturbance and erosion and avoiding the formation of rutted areas, in which surface water ponding can occur. Brash mat renewal will take place when they become heavily used and worn. Provision will be made for brash mats along all off-road routes, to protect the soil from compaction and rutting. Where there is risk of severe erosion occurring, extraction will be suspended during periods of high rainfall.
- Silt fences will be installed at the outfalls of existing drains downstream of felling areas. No direct discharge of such drains to watercourses will occur. Sediment traps and silt fences will be installed in advance of any felling works and will provide surface water settlement, preventing sediment from entering downstream watercourses. Accumulated

sediment will be carefully disposed of at pre-selected peat disposal areas. Where possible, all new silt traps will be constructed on even ground and not on sloping ground.

- In areas particularly sensitive to erosion it will be necessary to install double or triple sediment traps and increase buffer zone width. These measures will be reviewed on-site during construction.
- Double silt fencing will also be put down slope of felling areas which are located in close proximity to natural watercourses and/or relevant watercourses.
- Drains and silt traps will be maintained throughout all felling works, ensuring that they are clear of sediment build-up and are not severely eroded.
- Timber will be stacked in dry areas, and outside watercourse buffer zones. Straw bales and check dams to be emplaced on the down gradient side of timber storage/processing sites.
- Works will be carried out during periods of no, or low rainfall, in order to minimise entrainment of exposed sediment in surface water runoff.
- Refuelling or maintenance of machinery will not occur within 50 m of an aquatic zone or within 20 m of any other hydrological feature. Mobile bowser, drip kits, qualified personnel will be used where refuelling is required.
- 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.

3.4.6.3 Silt Traps

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

3.4.6.4 Pre-emptive Site Drainage Management

The works programme for the felling operations will also take account of weather forecasts and predicted rainfall in particular.

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

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

3.4.6.5 Drain Inspection and Maintenance

The following items shall be carried out during inspection pre-felling 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.
- 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 near 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.
- 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.

3.4.7 Morphological Changes to Surface Watercourses (Wind Farm Site)

The Proposed Development's design has been optimised to utilise the existing infrastructure (roads and hardstands) where practicable. This design prevents the unnecessary disturbance of the existing drainage network and prevents the requirement for widespread instream works.

Mitigation measures for the upgrade of the existing crossings and the new proposed crossing are detailed below:

- The crossing upgrades and the new proposed watercourse crossing will be via a bottomless or clear span culverts and the existing banks will remain undisturbed as much as possible.
- No instream excavation works are proposed and therefore there will be no direct effect on the stream at the proposed crossing location.
- Any guidance / mitigation measures proposed by the OPW or the Inland Fisheries Ireland will be 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", that is, May to September inclusive. This time period coincides with the period of lowest expected rainfall, and therefore minimum runoff rates and the risk of entrainment of suspended sediment in runoff.

- During the near stream construction work double row silt fences will be emplaced immediately down-gradient of the construction area. There will be no batching or storage of cement allowed on-site.
- All new road river/stream crossings will require a Section 50 application (Arterial Drainage Act, 1945). The river/stream crossings will be designed in accordance with OPW guidelines/requirements on applying for a Section 50 consent.

3.4.8 Potential Effects Groundwater Levels During Excavations Works

All proposed infrastructure is underlain by Poor and Locally Important Aquifers.

An existing abandoned quarry was recorded at the proposed location of wind turbine AT16 and the adjacent proposed spoil deposition areas. This was inspected during the site walkover surveys and no significant groundwater inflows were noted.

The proposed turbine bases are predominantly located over bedrock, which is generally unproductive, whilst some areas of the Wind Farm Site are underlain by Locally Important Aquifers.

No significant groundwater dewatering will be required due to the relatively shallow nature of the excavations. Direct rainfall and surface water runoff will be the main inflows that will require water volume and water quality management. For the avoidance of doubt, we would generally define dewatering as a requirement to permanently drawdown the local groundwater table by means of over pumping, e.g. as would be required for the operation of a bedrock quarry in a valley floor.

No significant effect on groundwater levels will occur due to the following reasons:

- There are no Regionally Important Aquifers underlying the Wind Farm Site.
- All proposed works overlie Poor and Locally Important Bedrock Aquifers, which are typically characterised by low productivity bedrock.
- Furthermore, no works are proposed overlying the Locally Important Karst Aquifer, no karst features are mapped by the GSI within the Wind Farm Site and no karst features were recorded during the site walkover surveys.
- A total of 10 no. turbines are underlain by a Poor Bedrock Aquifer and the Belmullet GWB. This GWB is composed of low transmissivity rocks, groundwater flow will be concentrated in the upper weathered zone of the aquifer and groundwater flowpaths will be short, discharge to local streams and rivers. No regional groundwater flow regime,

i.e. large volumes of groundwater flow, will be encountered in these areas of the Wind Farm Site.

- 2 no. turbines in the northeast of the Wind Farm Site (wind turbines AT15 and AT16) are underlain by a Locally Important Aquifer and the Killala North GWB which is characterised by productive fissured bedrock. No significant groundwater dewatering will occur due to the topographic elevation of this area of the Wind Farm Site which stands in excess of 100 mOD. Furthermore, no significant groundwater inflows or faults were recorded in the existing abandoned quarry in the vicinity of wind turbine AT16.
- 4 no. turbines in the south of the Wind Farm Site (wind turbines AT01, AT02, AT03 and AT04) and the Substation are also underlain by the Killala North GWB and stand at lower ground elevations (40-60 mOD). However, no significant dewatering will be required due to the shallow nature of the excavations and the low-permeability of the local subsoils.
- Shallow groundwater inflows into turbine base excavations will be largely fed by recent rainfall.
- Any shallow groundwater seepage will be small in comparison to the expected surface water flows during heavy rainfall events.
- The management of surface water will form the largest portion of water to be managed and treated.

In terms of locally mapped and unmapped wells, the implementation of the drainage design measures will ensure that the recharge to the aquifers will not be altered, thus downgradient water levels will not be altered. As such there are no well supplies down-gradient of the Wind Farm Site that can be affected by temporary dewatering during turbine base construction.

Relevant environmental management guidelines from the EPA quarry 2006 guidance document – “Environmental Management in the Extractive Industry” in relation to groundwater issues will be implemented during the construction phase.

3.4.9 Use of Siltbuster and Effect on Downstream Surface Water Quality

Measures employed to prevent overdosing and potential chemical carryover:

- The Siltbuster system comprises an electronic in-line dosing system which provides an accurate means of adding agents so overdosing does not occur.
- Continued monitoring and water analysis of pre and post treated water by means of an inhouse lab and dedicated staff, means the correct amount of chemical is added by the dosing system.
- Dosing rates of chemical to initiate settlement is small, being in the order of 2-10 mg/L and the vast majority of the chemical is removed in the deposited sediment.

- Final effluent not meeting the discharge criteria is recycled and retreated, which has a secondary positive effect of reducing carryover.
- Use of biodegradable chemical agents can be used at very sensitive sites (i.e. adjacent to SACs).

3.4.9.1 Potential Effects on Groundwater Quality in Well Supplies

Regardless if private wells are located downslope of the Proposed Development or not (or if wells are installed in the future), the potential for effects is negligible for the following conclusive reasons:

- The Wind Farm Site is underlain by aquifers of relatively low or moderate permeability (Poor Aquifers and Locally Important Aquifers).
- Groundwater flowpaths are typically short (~300 m maximum).
- Consequently, the majority of groundwater flows within the Wind Farm Site emerge as springs/baseline along streams/rivers and leave the Site as surface water flows and not groundwater flows.
- Therefore, the potential to effect local wells (whether they are downslope or not) is very low as groundwater flowpaths between the Proposed Development's infrastructure and potential source typically do not exist due to the large setback distance.
- Nevertheless, mitigation is provided in the EIAR to deal with typical construction phase groundwater hazards such as oils and fuels.
- Therefore, based on our hydrogeological assessment of the Site with regard to groundwater user risk and the proposed mitigation measures, we can robustly say the potential to effect local wells/water supply sources is negligible.

3.4.10 Potential Surface Water Quality Effects along Grid Connection

3.4.10.1 Silt Fences/Roadside Drain Blocking

Silt fences will be placed down-gradient of the proposed cable route during construction work. Silt fences are effective at removing larger particle sized solids. 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 down-gradient of all construction areas inside the hydrological buffer zones.

Any road side drains will be temporarily blocked using sand bags in the area where trenching works is taking place.

3.4.10.2 Surplus Excavated Spoil

Excavated spoil emanating from the trenches, where appropriate (i.e. when trenching within private tracks or the public road verge) will be used to backfill the trenches. Any excess will be disposed at an appropriate licenced facility. All excavated material emanating from trenches within the public road will be disposed at an appropriate licenced facility.

3.4.10.3 Timing of Site Construction Works

Excavation of cable trench will not be undertaken during periods of high rainfall. This will minimise the risk of entrainment of suspended sediment in surface water runoff and transport via this pathway to surface watercourses.

3.4.10.4 OPW Drainage Channels:

As stated above 2 no. crossings along the Grid Connection are over watercourses maintained by the OPW. Existing watercourse crossings along public roads already exist at these locations and there will be no instream works or interference with the existing bridge/culvert capacity. The mitigation measures prescribed in the preceding paragraphs in relation to the pollution prevention will be implemented at all crossing locations. Site-specific method statements will be prepared and agreed with the OPW prior to the commencement of works at these locations. Whilst there is no intended alteration to the existing watercourse crossings, pre and post construction surveys can be completed to demonstrate that their conveyance capacity remains unchanged. All OPW maintenance corridors will be kept accessible during the works.

3.4.11 Potential Surface Water Quality Effects During Directional Drilling

- Although no in-stream works are proposed, the drilling works will only be done over a dry period between July and September (as required by IFI for in-stream works) to avoid the salmon spawning season and to have more favourable (dryer) ground conditions.
- The crossing works area will be clearly marked out with fencing or flagging tape to avoid unnecessary disturbance.
- There will be no storage of material / equipment or overnight parking of machinery inside the 15 m buffer zone.
- Before any ground works are undertaken, double silt fencing will be placed upslope of the watercourse channel along the 15 m buffer zone boundary.

- Additional silt fencing or straw bales (pinned down firmly with stakes) will be placed across any natural surface depressions / channels that slope towards the watercourse.
- Silt fencing will be embedded into the local soils to ensure all site water is captured and filtered.
- The area around the bentonite batching, pumping and recycling plant will be bunded using terram (as it will clog) and sandbags in order to contain any spillages.
- Drilling fluid returns will be contained within a sealed tank / sump to prevent migration from the works area.
- Spills of drilling fluid will be clean up immediately and stored in an adequately sized skip before been taken offsite.
- If rainfall events occur during the works, there will be a requirement to collect and treat small volumes of surface water from areas of disturbed ground (i.e. soil and subsoil exposures created during site preparation works).
- This will be completed using a shallow swale and sump down slope of the disturbed ground; and water will be pumped to a proposed percolation area at least 50 m from the watercourse.
- The discharge of water onto vegetated ground at the percolation area will be via a silt bag which will filter any remaining sediment from the pumped water. The entire percolation area will be enclosed by a perimeter of double silt fencing.
- Any sediment laden water from the works area will not be discharged directly to a watercourse or drain.
- Works shall not take place during periods of heavy rainfall and will be scaled back or suspended if heavy rain is forecasted.
- Daily monitoring of the compound works area, the water treatment and pumping system and the percolation area will be completed by a suitably qualified person during the construction phase. All necessary preventative measures will be implemented to ensure no entrained sediment, or deleterious matter is discharged to the watercourse.
- If high levels of silt or other contamination is noted in the pumped water or the treatment systems, all construction works will be stopped. No works will recommence until the issue is resolved and the cause of the elevated source is remedied.
- On completion of the works, the ground surface disturbed during the site preparation works and at the entry and exit pits will be carefully reinstated and re-seeded at the soonest opportunity to prevent soil erosion.
- The silt fencing upslope of the river will be left in place and maintained until the disturbed ground has re-vegetated.
- There will be no batching or storage of cement allowed at the watercourse crossing.
- There will be no refuelling allowed within 100 m of the watercourse crossing.

- All plant will be checked for purpose of use prior to mobilisation at the watercourse crossing.

3.4.11.1 Fracture Blow-out (Frac-out) Prevention and Contingency Plan

- The drilling fluid/bentonite will be non-toxic and naturally biodegradable (i.e., Clear Bore Drilling Fluid or similar will be used).
- The area around the drilling fluid batching, pumping and recycling plants will be bunded using terram and/or sandbags to contain any potential spillage.
- One or more lines of silt fencing will be placed between the works area and the adjacent river.
- Spills of drilling fluid will be cleaned up immediately and transported off-site for disposal at a licensed facility.
- Adequately sized skips will be used where temporary storage of arisings are required.
- The drilling process / pressure will be constantly monitored to detect any possible leaks or breakouts into the surrounding geology or local watercourse.
- This will be gauged by observation and by monitoring the pumping rates and pressures. If any signs of breakout occur then drilling will be immediately stopped.
- Any frac-out material will be contained and removed off-site.
- The drilling location will be reviewed, before re-commencing with a higher viscosity drilling fluid mix.
- If the risk of further frac-out is high, a new drilling alignment will be sought at the crossing location.

3.4.12 Turbine Delivery Works

No significant effects will occur for the following reasons:

- All works are relatively minor and localised and cover very small areas.
- Excavation/earthworks will all be small scale.
- These works are distributed over a wide area.
- All works are temporary in nature.

Nevertheless, the “Pre-commencement Temporary Drainage Works” described in **Section 3.4.1** will be employed at all the TDR works areas.

3.4.13 Potential Effects on Hydrological Connected Sites

Mitigation measures for sediment control are detailed in **Section 3.4.1** and **Section 3.4.2**. Mitigation measures for the control of hydrocarbons during construction works are detailed in **Section 3.4.3**.

Mitigation measures for the control of cement-based products during construction works are detailed in **Section 3.4.4**.

Implementation of these mitigation measures will ensure the protection of surface water quality in receiving waters.

3.4.14 Potential Effects on Surface and Groundwater WFD Status

Mitigation measures for sediment control are detailed in **Section 3.4.1** and **Section 3.4.2.**

Mitigation measures for the control of hydrocarbons during construction works are detailed in **Section 3.4.3.**

Mitigation measures for the control of cement-based products during construction works are detailed in **Section 3.4.4.**

3.5 AIR AND CLIMATE

3.5.1 Air Quality Mitigation Measures

The main potential impact during the construction phase of the Proposed Development will be from dust nuisance at sensitive receptors close to the Site. Good practice construction procedures will be followed by the appointed contractor to prevent dirt and dust being transported onto the local road network. Good practice site control measures will comprise the following:

- Site Access Tracks will be upgraded and built in the initial construction phases. These tracks will be finished with graded aggregate which compacts, preventing dust
- Approach roads and construction areas will be cleaned on a regular basis to prevent build-up of mud and prevent it from migrating around the Site and onto the public road network.
- Wheel wash facilities will be provided at 6 no. locations throughout the Wind Farm Site to prevent mud/dirt being transferred from the Wind Farm Site to the public road network. Wheel wash 1 will be located at the Temporary Construction Compound (site entrance 2) to the south of the Wind Farm Site. Wheel wash 2 will be located at site entrance 1. Wheel wash 3 will be located at site entrance 3. Wheel wash 4 will be located at site entrance 5. Wheel wash 5 will be located at the Temporary Construction Compound (site entrance 11) to the north of the Wind Farm Site. Wheel wash six will be located at site entrance 14 (spoil deposition area).
- The wheel wash facilities will be located outside the 50 m watercourse buffer zone

- Public roads along the Construction Haul Route will be inspected and cleaned daily when required. In the unlikely event that dirt/mud is identified on public roads, the roads will be cleaned. The wheel wash facility will be investigated and the problem fixed to prevent this from happening again.
- During periods of dry and windy weather, there is potential for dust to become friable and cause disturbance to nearby residences and users of the local road network. This requires wetting material and ensuring water is supplied at the correct levels for the duration of the work activity. The weather will be monitored so that the need for damping down activities can be predicted. Water bowsers will be available to spray work areas (Turbine Hardstand areas and GCR) and Construction Haul Route roads to suppress dust migration from the Wind Farm Site.
- Vehicles delivering materials to the Wind Farm Site will be covered appropriately when transporting materials that could result in dust, e.g., crushed rock or sand.
- Exhaust emissions from vehicles operating within the Wind Farm Site, including trucks, excavators, diesel generators or other plant equipment, will be controlled by the Contractor by ensuring that emissions from vehicles are minimised through regular servicing of machinery.
- All machinery, when not in use, will be turned off.
- Ready-mix concrete will be delivered to the Wind Farm Site and no batching of concrete will take place onsite. Only washing out of chutes will take place onsite and this will be undertaken at a designated concrete washout facility at the contractor's Temporary Construction Compound. The concrete wash water will be disposed of at a license facility outlined in the CEMP - **Management Plan 5** Waste and Resources Management Plan (**Appendix 2.1**).
- Speed restrictions of 15 km/h on Site Access Tracks will be implemented to reduce the likelihood of dust becoming airborne. Consideration will be given to how onsite speed limits are policed by the Contractor and referred to in the toolbox talks.
- Stockpiling of materials will be carried out in such a way as to minimise their exposure to wind. Stockpiles will be covered with geotextiles layering and damping down will be carried out when weather conditions require it.
- Earthworks and exposed areas/soil stockpiles will be re-vegetated to stabilise surfaces as soon as practicable.
- An independent, qualified Geotechnical Engineer will be contracted for the detailed design stage of the Proposed Development and geotechnical services and will be retained throughout the construction phase, including monitoring and supervision of construction activities on a regular basis. The methodology statement will be signed off by a suitably qualified Geotechnical Engineer.

- A complaints procedure will be implemented on the Wind Farm Site where complaints will be reported, logged and appropriate action taken.

3.5.2 Climate and Greenhouse Gases Mitigation Measures

Mitigation measures for reduction of GHGs are:

- All machinery when not in use will be turned off.
- Exhaust emissions from vehicles operating within the site, including trucks, excavators, diesel generators or other plant equipment, will be controlled by the Contractor by ensuring that emissions from vehicles are minimised through regular servicing of machinery.
- Use of local quarries, materials suppliers and waste facilities will be used, as outlined in **Section 3.8**, minimising travel distances.
- A robust Traffic Management Plan (**CEMP, Management Plan 7**) has been developed, utilising the most direct routes where possible. This plan will be updated to reflect project needs.

3.6 CULTURAL HERITAGE

The following section details the environmental control measures which will be incorporated into the Contractors' Construction Method Statement in respect of archaeology and cultural heritage. An assessment of the impacts from works on Archaeology and Cultural Heritage can be found in the EIAR, **Chapter 14: Cultural Heritage**. The Wind Farm layout was informed by the archaeological desktop studies and fieldwork undertaken during the design and assessment phases and was designed to avoid the known locations of known and potential archaeological constraints.

3.6.1 Mitigation

Ground works during the construction phase will be subject to archaeological monitoring by a suitably qualified archaeologist under licence by the National Monuments Service. A systematic advance programme of archaeological field-walking surveys will also be carried out within Proposed Development areas in forestry plantations following tree felling to confirm the conditions predicted in this assessment, i.e., that they contain no visible surface traces of potential unrecorded archaeological or architectural heritage sites.

In the event that any sub-surface archaeological features are identified during archaeological monitoring they will be securely cordoned off, cleaned and recorded *in situ*. The National Monuments Service will then be notified and consulted to determine further appropriate mitigation measures, which may include preservation *in situ* (by avoidance) or preservation by record (archaeological excavation).

There are three undesignated vernacular structures located within the Wind Farm Site and one of these, in Leacarrowntemple townland, will be directly impacted during the construction phase. The remains of this structure will be subject to a written, drawn and built heritage survey prior to removal (preservation by record).

There are no direct or indirect predicted impacts on Palmerstown Bridge. However, in order to prevent any inadvertent risk of damage to the masonry fabric of the bridge (parapets and wing walls) strict traffic management protocols (speed) and protection of the wing walls with temporary hi-visibility fencing and markers will be installed during construction stage works.

The identified temporary indirect negative impacts on the Cultural Heritage resource during construction stage are of a visual nature only that detract from the setting and/or amenity value/access to the identified sensitive receptor. There are no appropriate mitigation measures to reduce or offset these indirect impacts on setting.

3.7 NOISE & VIBRATION

No significant construction noise effects have been identified. Therefore, no specific mitigation measures are required. However, general guidance for controlling construction noise through the use of good practice given in BS 5228 will be followed. Construction and decommissioning of the Proposed Development shall be limited to working times given and any controls incorporated in any planning permission.

During the decommissioning phase of the Proposed Development, noise levels are likely be no more than predicted in **Table 11.14,** however, it is envisaged that decommissioning will be of shorter duration. Any legislation, guidance or best practice relevant at the time of decommissioning will be complied with. Construction and decommissioning is a temporary day time activity.

3.8 TRAFFIC

The following mitigation measures are recommended:

- A Traffic Management Plan (TMP) has been developed (see **Management No. Plan 7** attached to the **CEMP**). Prior to construction and once the Contractors have confirmed their suppliers, the TMP will be updated in consultation with and Mayo County Council and An Garda Síochána as necessary. HGV trips will be scheduled to avoid times when drop offs and pick-ups generally take place at schools. All drivers will be made aware of the location and presence of schools and other sensitive receptors at an induction session prior to construction activities taking place and will be made aware of the speed limits of the various

roads on the route which are contained in the TMP. This is to ensure compliance with speed limits and school drop off and pick-up zones.

- All significant traffic likely to be generated by the Proposed Development will be during the construction of the Proposed Development and will be temporary in nature. It is envisaged that the construction period for the Proposed Development will span a 21-month period with the underground cable being installed over a concurrent 12-month period. The construction-phase Traffic Management Plan will mitigate these effects.
- Use special transporter vehicles with rear wheel steering in delivery of wind turbine components to ensure safe transportation and manoeuvrability on the roads. Extendable transporter vehicles will be retracted on return journeys.
- Prior to delivery of abnormal loads i.e. turbine components, the Applicant or their representatives, will consult with An Garda Síochána and Mayo County Council Roads Departments to discuss the requirement for a Garda escort.
- The Developer will confirm the intended timescale for deliveries and every effort will be made to avoid peak times such as school drop off times, church services, sporting events, peak traffic times where it is considered this may lead to unnecessary disruption.
- Abnormal loads are likely to travel at night and outside the normal construction times as may be required by An Garda Síochána. Due to the distance between Killybegs Port, Galway Port and Foynes Port and the Proposed Development site, the journey is achievable within a 4 - 6 hour timeframe. Accordingly, locations for resting will not be required. Local residents along the affected route will be notified of the timescale for abnormal load deliveries.
- The Developer will lodge a bond with Mayo County Council prior to commencement of construction in the amount to be agreed with the Council for the possible repair/upkeep of the roads. During the construction period, these roads will be inspected weekly by the Developer's Resident Engineer and the Contractor will be instructed to repair any defects within the following two weeks. At the end of the construction period, any further defects will be remedied to the satisfaction of Mayo County Council.
- Wheel cleaning equipment will be used at the exit to the Proposed Development site to prevent any mud and/or stones being transferred from site to the public road network. All drivers will be required to see that their vehicle is free from dirt and stones prior to departure from the construction sites.
- The sites' entry points will also be appropriately signed. Access to the Proposed Development site will be controlled by onsite personnel and all visitors will be asked to sign in and out of the site by security / site personnel on entering and exiting the site. All site visitors will undergo a site induction covering Health and Safety issues at the Wind

Farm Site TCC and will be required to wear appropriate Personal Protective Equipment (PPE) while onsite.

- In addition, any dust generating activities will be minimised where practical during windy conditions, and drivers will adopt driving practices to minimise the creation of dust. Where conditions exist for dust to become friable, techniques such as damping down of the potentially affected areas will be employed.
- To reduce dust emissions, vehicles transporting crushed stone will be covered during both entrance and egress to the site.
- A survey of the TDR will be undertaken prior to commencement to identify if any new overhead lines or broadband lines will need to be lifted along the route to allow abnormal loads such as tower sections and nacelles to be delivered.
- During the construction phase, clear construction warning signs will be placed on the R314, L-5177-0,5176-0, L-1107-99, L-1110-87, L-1110-117 and L-1111-0 as necessary, which will advise road users of the presence of a construction site and of the likelihood of vehicles entering and exiting the site or road construction areas. This will help improve road safety.
- Works on public roads on the TDR and GCR will be strictly in accordance with “Guidance for the Control and Management of Traffic at Road Works – 2nd Edition 2010” as well as “Traffic Signs Manual 2010-Chapter 8 -Temporary Traffic Measures and Signs at Roadworks”.
- Road Closures will be obtained for Grid Connection works on narrow public roads with passing bays available. A number of options are available in some areas for diverting traffic that will allow flexibility during construction. For the works within the L-31143, L-1114, R314, L-5177, L-5176, L-1107, L-1111, L-1116 and the L-5147, passing bays can be utilised if necessary. While traffic diversions are in place, local access will be maintained at all times. All access points (domestic, business, farm) will be considered when finalising the proposed road closures and diversions. Additional measures such as local road widening, traffic shuttle systems and ‘Stop-Go’ systems will also be considered subject to agreement with Mayo County Council. Road closures will be scheduled in consultation with local residents, and the Contractor shall endeavour to avoid times of high agricultural activity e.g. silage cutting.
- The widening/straightening of the TDR on the R315, L51732, L5179, R314, L31143, L51791, L5179-23, L51731, L31142, L5187, L5187-47 and the L21147 is proposed to be completed in advance of road closures.
- Road Closures on the R314, L-5177-0,5176-0, L-1107-99, L-1110-87, L-1110-117 and L-1111-0 will be required during construction. Each road will be closed as required and for as short a time possible. Only one road will be closed at a time so as not to disrupt

local traffic i.e. one road will close and the other left open to detour vehicles within the local road network.

- Road Opening Licences will be obtained for the Grid Connection trench and chambers within public roads as well as for the widening of public roads.
- All vehicles using or while in operation at the Proposed Development Site shall either have roof mounted flashing beacons or will use their hazard lights.
- A speed limit of 25 km/h shall apply to all vehicles within the Proposed Development site.
- Provide a footpath adjacent to the upgraded carriageway where works are being undertaken. This footpath should provide a safe method of permitting pedestrians to access the pre-exiting carriageway at the terminations of the works.
- Ensure all visibility envelopes are kept clear of high vegetation.
- Provide visibility splays set back a suitable distance from the yield line.
- Provide signage opposite each entry arm.
- Provide a uniform radius from the roundabout entry to the exit.
- Reinstate any speed limit signs removed by the works.
- Redesign this arm or roadside treatment to enable road users to differentiate this private access from the public ones.

3.9 WASTE

3.9.1 Waste from Staff Facilities

Provision for separation of waste streams will be provided so that e.g., paper, and cardboard waste and bottles may be recycled. This waste will be appropriately stored to prevent exposure to wind, rain and wildlife.

3.9.2 Sewage

It is proposed to install a rainwater harvesting system as the source of water for toilet facilities for the operational phase. Wastewater from the staff welfare facilities in the control building will be collected in a sealed storage tank, fitted with a high-level alarm. This is a device installed in a fuel storage tank that is capable of sounding an alarm, during a filling operation, when the liquid level nears the top of the tank.

3.9.3 Concrete

- Precast concrete will be used wherever possible i.e., formed offsite. Elements of the Proposed Development where precast concrete will be used have been identified and are indicated in the CEMP. Elements of the Proposed Development where the use of precast concrete will be used include structural elements of watercourse crossings (single span / closed culverts) as well as Cable Joint Bays. Elements of the Proposed Development

where the use of precast concrete is not possible include Turbine Foundations and joint bay pit excavations. Where the use of precast concrete is not possible the following mitigation measures will apply.

- The acquisition, transport and use of any cement or concrete onsite will be planned fully in advance and supervised at all times.
- Vehicles transporting such material will be relatively clean upon arrival onsite, that is; vehicles will be washed/rinsed removing cementitious material leaving the source location of the material. There will be no excess cementitious material on vehicles which could be deposited on trackways or anywhere else onsite. To this end, vehicles will undergo a visual inspection prior to being permitted to drive onto the proposed site or progress beyond the contractor's yard. Vehicles will also be in good working order.
- Any shuttering installed to contain the concrete during pouring will be installed to a high standard with minimal potential for leaks. Additional measures will be taken to ensure this, for example the use of plastic sheeting or other sealing products at joints.
- Concrete will be poured during metrological dry periods/seasons. This will reduce the potential for surface water run off being significantly affected by freshly poured concrete. This will require limiting these works to dry meteorological conditions i.e. avoid foreseen sustained rainfall (any foreseen rainfall event longer than 4-hour duration) and/or any foreseen intense rainfall event (>3 mm/hour, yellow on Met Eireann rain forecast maps), and do not proceed during any yellow (or worse) rainfall warning issued by Met Eireann. This also will avoid such conditions while concrete is curing, in so far as practical.
- Ground crew will have a spill kit readily available, and any spillages or deposits will be cleaned/removed as soon as possible and disposed of appropriately.
- Pouring of concrete into standing water within excavations will be avoided. Excavations will be prepared before pouring of concrete by pumping standing water out of excavations to the buffered surface water discharge systems in place.
- Temporary storage of cement bound sand (if required) will be on hardstand areas only where there is no direct drainage to surface waters and where the area has been bunded e.g., using sand-bags and geotextile sheeting or silt fencing to contain any solids in run-off.
- No surplus concrete will be stored or deposited anywhere onsite. Such material will be returned to the source location or disposed of off-site appropriately.

3.9.4 Chemicals, Fuels and Oils

All storage containers of over 200 litres will have a secondary containment of 110% capacity to ensure that any leaking oil is contained and does not enter the aquatic environment.

Only essential refuelling (e.g., cranes) will be carried out, outside of this area but not within 50 m of any watercourse. In such cases a non-permeable High-density Polyethylene (HDPE) membrane will be provided beneath connection points to catch any residual oil during filling and disconnection.

A Chemical and Waste Inventory will be kept as outlined in the Waste and Resources Management Plan (**Management Plan 5**). This inventory will include:

- List of all substances stored onsite (volume and description)
- Procedures and location details for storage of all materials listed
- Waste disposal records, including copies of all Waste Transfer Notes detailing disposal routes and waste carriers used
- Any tap or valve permanently fixed to the mobile unit through which oil can be discharged to the open or when delivered through a flexible pipe which is fitted permanently to the mobile unit, will be fitted with a lock and locked shut when not in use
- Sight gauges will be fitted with a valve or tap, which will be shut when not in use Sight gauge tubes, if used will be well supported and fitted with a valve
- Mobile units must have secondary containment when in use/out onsite

Under the EU Directive 2008/68/EC/55/EC all such dangerous substances will be conveyed in a container that compiles with the ADR1. As such the manufacturer of each bowser will provide certification to contractors that the following:

- A leak-proof test certificate
- A copy of the IBC approval certificate
- An identification plate attached to the container

Where mobile bowsers are used on site, guidelines will be followed so that:

- Any flexible pipe, tap or valve will be fitted with a lock where it leaves the container and be locked shut when not in use;
- Flexible delivery pipes will be fitted with manually operated pumps or a valve at the delivery end that closes automatically when not in use. Where possible, a nozzle designed to dispense oil is used; and
- The pump or valve will have a lock and be locked shut when not in use.

[1] ADR, 2023 (European Agreement Concerning the International Carriage of Dangerous Goods by Road). https://unece.org/transport/standards/transport/dangerous-goods/adr-2023-agreement-concerning-international-carriage Accessed 29/01/2024

For loads in excess of 1000 litres (220 gallons), the bowser vehicle driver will have undergone training and hold a special license.

3.9.5 Refuelling

During construction/decommissioning, where possible all refuelling onsite will be within the Temporary Site Compounds within the re-fuelling area (**see Drawing 6289-PL-400** and **Drawing 6289-PL-401**). Only essential refuelling (e.g., cranes) will be carried out, outside of this area, but not within 50 m of any watercourse. In such cases a non-permeable High-density Polyethylene (HDPE) membrane will be provided beneath connection points to catch any residual oil during filling and disconnection. This membrane will be inspected and if there is any sign of oil contamination, it will be removed from site by a specialist licensed waste contractor.

All vehicles will be well maintained and free from oil or hydraulic fuel leaks. Refuelling will take place via a mobile double skinned fuel bowser. The bowser will be a double axel refuelling trailer which will be towed to the refuelling locations by a 4x4 vehicle. The 4x4 will carry, a drip tray, spill kit and absorbent mats in case of any accidental spillages. Only designated competent personnel will refuel plant and machinery on the Wind Farm Site.

3.9.6 Packaging

In accordance with the waste hierarchy, packaging will be returned to the originator ahead of re-use or recycling. Where this is not possible, waste will be separated as appropriate and safely stored on site appropriately in anticipation of recycling.

3.9.7 Metals

Waste metals from concrete reinforcing etc. will have a commercial value and therefore there is an additional economic incentive for the appropriate re-use or recycling with the appropriate licensed waste contractor.

4 CONSTRUCTION

The following sections detail an outline construction sequence to provide an overview of the construction process. The construction-stage details of the sequence and methodologies, to be undertaken within the framework of this CEMP, will be determined by the Contractors.

4.1 PHASING OF WORKS

It is envisaged that the following will be the sequence of construction for the Proposed Development:

1. Contractor compound and welfare facilities
2. Site preparation
3. Site Access Tracks
4. Turbine Hardstands
5. Turbine Foundations
6. Met Mast Foundation
7. Wind Farm Internal Cabling
8. Installation of the Grid Connection
9. Erection of Wind Turbines
10. Commissioning and Energisation

The 110 kV Onsite Substation and BESS will be constructed in parallel with Turbine Hardstands, Turbine Foundations and Wind Farm Internal Cabling.

4.2 CONSTRUCTION HOURS

The Proposed Development will have 45 to 63 construction workers during the construction phase. Working hours for construction will be from 07:00 to 19:00 throughout the week, with reduced working hours at weekends, from 8:00 to 13:00 on a Saturday. It should be noted that during the turbine erection phase, operations will need to take place outside those hours with concrete pours commencing at 05:00 and continuing until 16:00, to facilitate Turbine Foundation construction and so that lifting operations are completed safely. Hours of working for Turbine Foundation construction will be agreed with Mayo County Council prior to the commencement of turbine foundation construction. **Chapter 17: Traffic and Transportation** refers to this in further detail.

A detailed Traffic Management Plan ("TMP") (**Management Plan 7**) (**Appendix 2.1**) will be implemented during the construction phase. This shall be agreed during the planning compliance stage with the Planning Authority so that strict controls described therein are in place with all suppliers coming to the Wind Farm Site.

4.3 SITE MANAGEMENT PROCEDURES AND CONSTRUCTION METHODOLOGIES

Prior to commencement of construction, the appointed Contractors(s) will prepare detailed method statements and work programmes for the construction stage. These method statements will be prepared in the context of measures set out in this CEMP and will take account of mitigation measures as outlined in the planning application and accompanying environment reports, and site investigations to be carried out prior to construction. Any specific requirements will be fully incorporated into the appointed Contractors scopes of work and appropriate supervision and management will be carried out to ensure full compliance.

The method statements produced by the Contractors(s) will be reviewed by the Environmental Manger / Ecological Clerk of Works and will be agreed with the appropriate parties, including Mayo County Council. The Developer will employ a project manager to monitor the construction phase of the Proposed Development and ensure works are being carried out in accordance with the agreed method statements, safety procedures and pollution control measures.

4.3.1 Mobilisation of Contractors Plant

Prior to commencement of construction works, the selected Contractors shall submit to the Developer a full list of plant, equipment and accommodation (site offices etc.) proposed for use during the works.

Dates for mobilisation will be agreed with the developer and/or his representative/Owners Engineer.

4.3.2 Site Infrastructure

Site Access Roads / Turbines

Machinery and vehicles used in Site Access Track construction is operated from the track only as it is constructed.

The location of all infrastructure required for this Proposed Development shall be set out by GPS (Real-Time Kinematicenabled[2]) equipment to the permitted detail as noted on the approved drawings. The Wind Farm Site will be set out using wooden posts to mark the boundary and extent of construction activities, in accordance with the site layout and environmental constraints drawings, and with contributions from the appointed ecologist. The boundaries of the buffer zones will be taped/fenced off to prevent construction plant from entering the buffer zones and impacting on water quality. Site personnel will be informed of the buffer zones through toolbox talks onsite, both before and during construction. New personnel will be informed of the construction buffer zones with induction training before commencing work.

4.3.3 Establish Pre-Commencement Mitigation Measures

Prior to construction works advancing onsite, the Contractors shall confirm to the Employer of their intention to advance the works in a sound practical manner with no undue impact on the receiving environment. The Contractors shall identify all sensitive environmental areas

[2] Real-time kinematic (RTK) processing on a drone records GPS information and geotags images as they're captured during flight.

within the Employer's site and confirm their intended method of construction works regarding these areas in line with the methods outlined in this CEMP. All environmentally sensitive areas shall be identified prior to the detailed design/construction phase.

Where the estimated working area is reduced by any sensitive environmental areas i.e., buffer zones, post and tape marking shall be used to set out these locations and thus prevent the entry of Contractors plant within these areas during construction works.

To protect any known ecological features that occur close to the planned infrastructure, a delineated working corridor will be employed throughout the construction. Posts and tape will be used to establish these areas and thus prevent the entry of Contractors plant outside the working corridor during construction works. Locations of ecological significance or where invasive species are identified will also be fenced off.

A 50 m buffer to natural watercourses will be employed during construction to protect water quality and to see that there is no significant direct effect on existing watercourses. The proposed locations for spoil storage are highlighted in the attached **Management Plan 4, Peat and Spoil Management Plan.** Where spoil storage areas are located in proximity to watercourse buffer zones, silt fencing will be installed along the area facing the buffer zone and maintained in line with the instructions of the manufacturer. Works within the buffer zone will be subject to specific method statements.

4.3.4 Site Preparation

Entrance Formation

Access to the Wind Farm Site will be from a total of 14 entrances, 5 new and 9 existing, refer to **Table 4.9**, **Site Entrance Description**. Each entrance will open out onto a local road, (speed limit 60 km to 80 km) and will be constructed or upgraded to accommodate the swept path of abnormal load vehicles accessing the Wind Farm Site during the delivery of turbine components. Visibility splays of 70 m to 160 m will be available from a 3.0 m setback in accordance with TII specifications and with the Mayo County Development Plan. The junctions will be a stop-controlled junction with priority for public traffic. The location of the Wind Farm Site entrance junctions is shown in **Figure 4.1.**

Works Required at the Site Entrance will include:

- Clearing visibility splays of vegetation / soil to a level surface;
- Excavating to solid formation level;
- Installing roadside drainage features;

- Placing entrance sub-base with rockfill material;
- Placing capping layer;
- Providing surface dressing where necessary to prevent rutting of existing road surface.

The detailed construction method statement for site entrance preparation is included in **Table 4.1**.

Table 4.1: Site Entrance Preparation CMS

Activity	Notes
Video Road Condition Survey.	The Contractors will arrange and provide a video survey to establish the condition of the road prior to mobilisation to site.
Prepare a Traffic Management Plan (TMP) in coordination with Mayo County Council and An Garda Síochána and implement.	The Contractors will agree an approved TMP with the Roads Section at Mayo County Council, An Garda Síochána and the Developer.
Set out the alignment of the site entrance using GPS equipment.	Wooden pegs/posts or similar to be used in setting out, following a site walkover by the Ecological Clerk of Works.
Archaeology Requirements.	The Site will be accessible to the appointed archaeologist at all times during working hours. The nominated archaeologist will monitor all invasive works.
Install drainage treatment features as per the Surface Water Management Plan.	Required to minimise the transportation of suspended solids generated during the construction stage.
Excavate and/or clear the area which is required to accommodate the visibility splays.	The top layer of vegetated material is set aside for re-use as a sealing layer to prevent sediment runoff and reduce visual impact.
Re-align private fences as required by the visibility splays and detailed design.	Required for stock control, security, and sight line visibility requirements.

Activity	Notes
Excavate to track formation level along the extent of the site entrance and accommodate drainage.	The Contractors shall provide that soil is carefully distributed and banked adjacent to the entrance within the construction boundary. Soil will be managed as per the spoil management plan. Any storage of material will be located to see that no interference with visibility splays occurs.
Installation of stone foundation and surfacing of apron to be installed.	In the interests of road safety, appropriate construction measures will be implemented to see that site debris is not deposited on the carriageway. In the unlikely event of same occurring, the Contractors shall ensure that all material is removed immediately in accordance with the provisions of the TMP to be agreed with Mayo County Council.
Installation of security gates/hut (where required), tied into the re-aligned fence.	Required for site security.

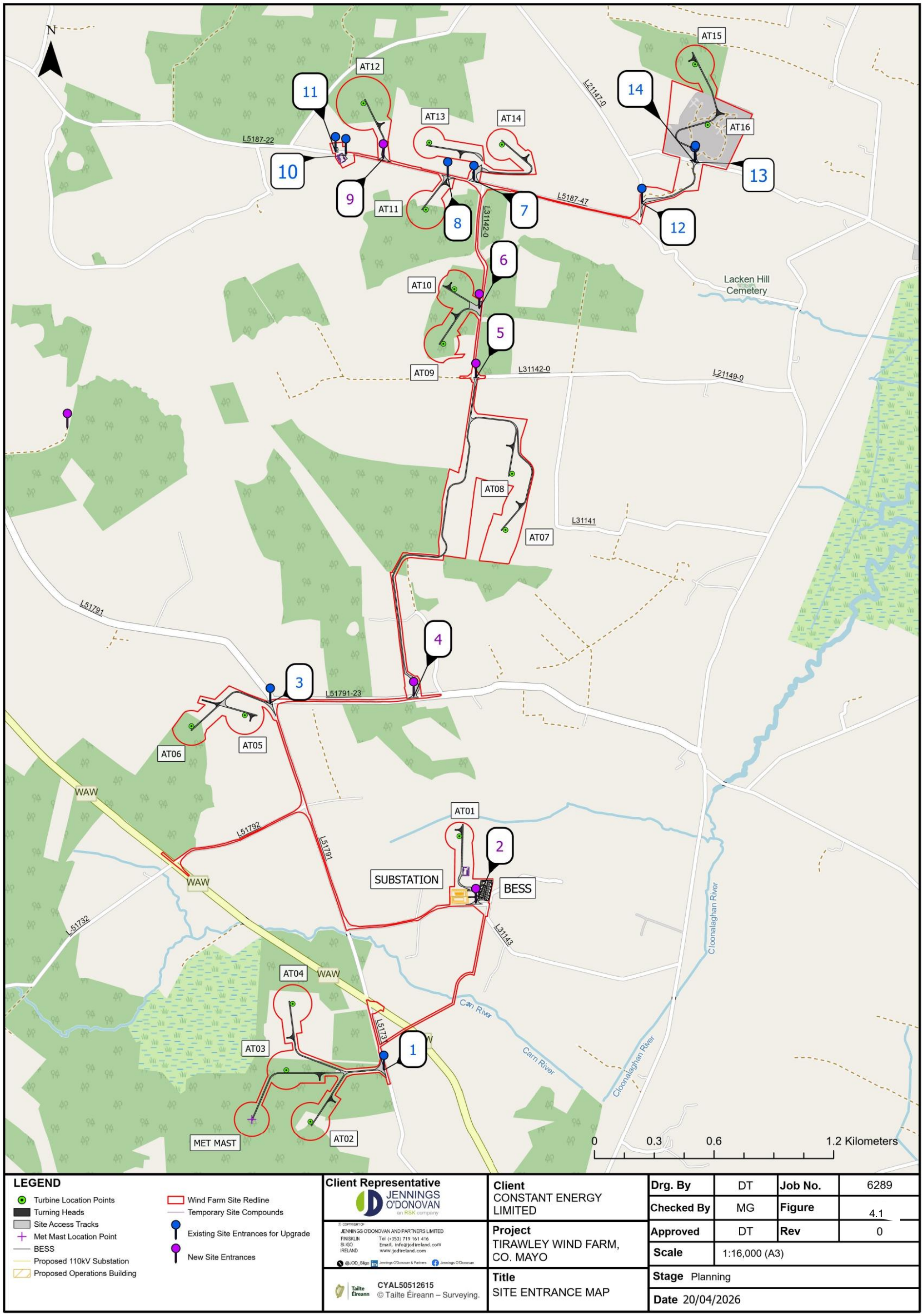

Figure 4.1 Site Entrances to Turbine Locations

Temporary Construction Compounds and Permanent Operations Compounds

The two number temporary Construction Compounds (TCC), which can be seen below in **Figure 4.2** respectively, will be in place for the duration of the construction works only. The first TCC located in the south of the Wind Farm Site is located south of wind turbine AT01 and the second located in the north of the Wind Farm Site is south of wind turbine AT12.

Both compounds will be used as a secure storage area for construction materials and to contain temporary site accommodation units for sealed type staff welfare facilities. The compounds will contain cabins for office space, meeting rooms, canteen area, a drying room, parking facilities, and similar personnel facilities.

An area within each compound will be used for the storage of fuel and oils and this will be suitably bunded and the bund will be lined with an impermeable membrane in order to prevent any contamination of the surrounding soils, vegetation and water table. Double protection containers / equipment will be used along with drip trays.

The second TCC to the North of the Wind Farm Site is currently a farmyard. It is proposed to demolish the existing buildings and use the area as a Temporary Construction Compound. Demolition will involve the dismantling and removal of the two bay slatted cattle shed and associated slurry pit, hay shed, 3 bay stables and associated infrastructure (external pipe works, materials etc.).

A refurbishment/demolition survey and report will be carried out by an appropriate qualified person(s) before any demolition activities take place. All materials, before being removed offsite will be segregated and disposed of at a licensed waste management provider. An experienced demolition contractor will be appointed to undertake the works required. Demolition works will be completed to current regulations, permits and codes of practice.

An experienced demolition contractor will be appointed to undertake the works required. Demolition works will be completed to current regulations, permits and codes of practice. The following management plans will be developed to manage work and disposal and treatment of materials:

- A Demolition Management Plan
- Construction Environmental Management Plan
- Traffic Management Plan
- Noise and Air Quality Management Plan
- Waste Disposal Management Plant

- Asbestos Management Plan

The proposed construction method statement for the construction compound / storage area is detailed in **Table 4.2.**

Table 4.2: Contractors' Compound and Welfare Facilities CMS

Activity	Notes
Set out the perimeter of the site compound using GPS equipment following a site walkover by the Ecological Clerk of Works.	Setting out must be undertaken to Irish Grid co-ordinates and to sub-centimetre accuracy in the X, Y and Z plane.
Archaeology	The Site will be accessible to the appointed archaeologist at all times during working hours. The nominated archaeologist will monitor all invasive works.
Install drainage treatment and flow attenuation features as per the detailed design.	Required to minimise the transportation of suspended solids generated during the construction stage.
The top layer of vegetated material will be stripped and stored for re-use onsite.	The top layer of vegetated material is set aside for re-use as a sealing layer to prevent sediment runoff and reduce visual impact. The location for storage of these vegetated turves will be around the perimeter of the site compound away from any sensitive habitats.
Stone will be placed in layers to form the hardstanding area for the site compound.	Hardcore area with Clause 804 stone on geotextile layer (Netlon SS30 or similar) for temporary site offices and for vehicle movements / parking.
The accommodation, eating and sanitary cabins will be installed in accordance with the construction drawings. The site office will be located in the temporary storage area.	Foul drainage from site welfare accommodation will discharge to a holding tank. The holding tank will be fully enclosed with no discharge outlet. The toilets will be the 'portaloo' chemical toilet type. The holding tank will be emptied as required by a licenced waste disposal operator. Temporary power supply and telecommunications will be connected to the relevant cabins.
Construct an impervious covered bunded area for plant refuelling and	Bund to absorb 110% of potential spill volume.

Activity	Notes
plant maintenance and cleaning operations.	Non-permeable concrete refuelling area with petrol interceptor. An oil interceptor will be installed on the drainage outlet from the bunded area to separate any oils from the surface run off. Generators and associated diesel tanks are to be installed on such an area.
Storage units for hazardous products and covered waste skips will be installed as per best industry practice.	All storage units for hazardous products will be fully lockable and bunded proprietary steel containers.
Provide measures for waste management.	Waste segregation skips will be deployed for optimum recycling and re-use of materials. Skips will be covered with lid.
Parking	Parking areas shall be identified by signage with a handrail system or barrier separating pedestrian areas and vehicle routes.
Reinstatement	Compound areas to be restored to pre-construction condition at completion and demobilisation stage.

To the north of the Wind Farm Site, there is a vacant dwelling located to the south of Wind Turbine AT12, this property is in control and ownership of the application (the Developer). A change of use is sought for this existing residential site (**Plate 4.1**) to a Permanent Operations Compound. This will involve the change of use of the existing dwelling to an operations office, providing meeting rooms and welfare facilities for the operational and maintenance staff. The remaining lands will be used as a compound for the secure storage of maintenance materials, light equipment, and staff parking. Existing services include a septic tank, existing water main, and electricity supply. The existing services will be upgraded to meet the needs of the Proposed Development including the septic tank to an appropriately sized effluent treatment system and percolation area in line with the appropriate guidelines.

Plate 4.1: Proposed Existing Residential Site to be Converted to an Operations Building

Site Security

From an operational point of view, for control of site access and for proper site management, all access to the Wind Farm Site will require passage through a controlled safety barrier/gate or hut. The exact location(s) shall be decided by the Contractors with primary responsibility for safety on the Site. It is proposed that the barrier(s) be located at all site entrances. The barrier will be set back sufficiently so that HGVs can enter the Site without stopping.

The Contractors shall be responsible for securing each area of work, so as to ensure the safety and health of all affected persons (Contractors personnel, site supervision staff, members of the general public, traffic, etc.). The Contractors will provide details to the Developer of security arrangements for the following:

- Fencing specification;
- Provision of personnel to man site access point(s);
- Signage; and
- Signing in/out procedures.

Figure 4.2: Temporary Construction Compound Location Map

4.4 SITE CLEARANCE AND CONSTRUCTION METHODS

The management of earthworks will be of paramount importance throughout the construction of the Proposed Development. The general principles that will apply to earthworks include:

- Excavations to only take place following implementation of setting out the working corridor, drainage treatment and flow attenuation provisions.
- Archaeological supervision works will be undertaken during all earthworks.
- Vegetation within the construction corridor will be cleared as part of the excavation works.
- Suitable plant to be used, particularly when working off road i.e., use of geotextile mats.
- Machinery and vehicles used in Site Access Track construction are operated from the track only as it is constructed.
- The methods for the handling, storage and stockpiling of spoil is outlined in **Section 3.3.2** and **Management Plan 4** (Peat and Spoil Management Plan)
- Monitor all rock breaking activities and survey areas for indicators of soil movement/slide. The appropriate remedial action will be taken.

The construction method statement for excavation and spoil management is shown in **Table 4.3**.

Table 4.3: Excavation and Spoil Management Method Statement

Activity	Notes
Set out the permitter of the spoil excavation and management areas with the use of GPS (RTK) equipment.	The Contractors will tape off buffer zones with assistance from the Ecological Clerk of Works and Ecological Clerk of Works, and toolbox talks will be used to inform site staff of the importance of the buffer zones.
Archaeology	The Site will be accessible to the appointed archaeologist at all times during working hours. The nominated archaeologist will monitor all invasive works.
Install drainage treatment and flow attenuation features as per the detailed design, which includes recommendations of an expert ecologist	Required to minimise the transportation of suspended solids generated during the construction stage. Temporary and permanent ponds and outflow buffers will be constructed as per the attached Surface Water Management Plan.

Activity	Notes
Spoil locations to be identified to machine drivers	Spoil storage areas to be mapped and pegged out prior to excavation commencing.
A Risk Assessment will be developed for each and every excavation location to be carried out on-site.	Control measures to mitigate safety, stability and environmental risks specific to the local conditions.
The vegetated layer will always be removed and set aside separately from any spoil material.	Required to enhance revegetation.
Excavated material will only be stored to a maximum height of 0.5 m along Site Access Tracks	Prevent movement of stored material and protect watercourses.
Excavated material will not be stored in areas which have been identified as unsuitable for spoil storage.	Prevent movement of stored material and protect watercourses against harmful run offs.
Excavated material will be separated and stored so that it is not left exposed to the elements. This will be provided for through the immediate application of a vegetated capping layer.	No spoil is permitted to be stored on areas identified as sensitive or high value habitats. Other material will be used for landscaping.
Interim (temporary) material storage during the construction stage will be kept to a minimum by the implementation of a continuous construction cycle: 1) Excavate material; 2) Handle material; 3) Permanently store material	Return and re-vegetate the Site to its original state as soon as possible.
Permanent excavated or spoil surfaces will be re-vegetated without undue delay using seed collected pre-construction, final details of which will be approved by the ecologist. Reseeding will occur within the growing season.	To encourage growth of locally-common habitats
Material from excavations in rock, suitable sands and gravels will be	To minimise the volume of imported material required and ensure no impact on the local pH

Activity	Notes
carefully managed and re-used as structural fill in the locality of the excavation where possible.	level. No spoil will be permitted to be stored on areas identified as sensitive or high value habitats.

4.4.1 Site Access Tracks

Carrying capacity will be based on the weight restriction for the installation crane, which is expected to have a minimum of 12 tonnes. The roads will be constructed in stable areas predominantly as founded or occasionally as floating roads (where required to fulfil some other geotechnical or environmental purpose). Founded roads are excavated down to and constructed up from a competent geological stratum (e.g. glacial till or rock), whereas floated roads are built directly on top of the peat and soft soils. The roads shall be constructed to average heights of 0.5 m to 1.0 m above existing ground level.

Prior to advancing any construction works, final road design shall take into account the following:

- Existing Ground Profile
- Existing Ground Soil Type
- Bearing Capacity
- Natural Drainage
- Proposed Turbine Delivery Specification
- Existing Environmental Buffers

Site Access Tracks are built as follows:

- The alignment of the new Site Access Tracks will be established and the centrelines will be marked out with ranging rods or timber posts.
- Any trees/hedgerow within the construction corridor will be cleared prior to any construction works. All works will be undertaken outside of the breeding season.
- The first phase of drainage will then be installed in accordance with the detailed drainage design. Road construction will require the crossings of a number of cut drains and minor drainage paths.
- The angle of repose of the cut face of excavations will be battered back approximately 45 degrees.
- Slopes will not be undercut or excavations left unsupported for periods in excess of 24 hours.

- Soil excavation will be observed by a qualified archaeologist, in accordance with the approved scheme of archaeological monitoring in order to respond appropriately to identification of any potential archaeological remains.
- The Site Access Tracks will be excavated to a suitable formation level. Roadside berms will be constructed. Where necessary, stone will be delivered to site by tipper trucks from approved local quarries (please see **EIAR Figure 17.7**) and will be placed, spread and compacted in layers to form the running surface. The compaction will be carried out using a dead weight roller.
    - Imported stone will be used throughout for the final surfacing layer.
    - All imported stone to the Site will have undergone appropriate quality testing to Transport Infrastructure Ireland (TII) specifications
    - Well-graded granular fill (quarry sourced clean stone) will be spread and compacted in layers to provide a homogeneous running surface. The thickness of layers and amount of compaction required will be decided by The Site Manager based on the characteristics of the material and the compaction plant to be used.

4.4.2 Road Drainage

A vegetative filter strip and under-road drainage will allow discharge in a controlled manner downslope of the works.

Any crossing of field drains, man-made drains and vegetated drains will be piped directly under the road through appropriately sized drainage pipes. Where appropriate, a lateral drainage ditch (interceptor drain) will be cut along the uphill side of the road to intercept the natural runoff. This lateral drain will be drained under the road at regular intervals through correctly sized cross drains. In cases where the roads must run significantly downhill, transverse drains (‘grips’) will be constructed where appropriate in the surface of the roads to divert any runoff down the road into the drainage ditch. Where the crossing of ditches, field drains, man-made drains and vegetated drains cannot be avoided, the design of the crossing, (in this case culverts) will be prepared in line with the drainage design philosophy. This is further detailed in the **Surface Water Management Plan** (**Management Plan 3**) and **Water Quality Management Plan** (**Management Plan 2**).

Under road drainage will be provided under the excavated roads at all locations where existing land drainage passes under the proposed roads. Conventional cross drains will be 150 mm diameter and increased to 300 mm diameter (minimum) at points for land drainage or natural drainage paths. The spacing of the cross drains will be dependent upon whether the roads run parallel or tangential with the general contours of the Site.

The detailed design of all under-road drains in areas near flushes will have the input from the Environmental Manger and Ecological Clerk of Works to see that there is sufficient flow connecting the upstream and downstream habitats. These will be inspected by the Environmental Manager and Ecological Clerk of Works during construction.

All existing site drainage channels and culverts shall be maintained, and any additional drainage design required on-site shall be carried out as per the detailed design. Any such additional requirements will be reviewed by the Engineer, Environmental Manager and Ecological Clerk of Works prior to site clearance activities taking place onsite.

4.4.3 Turbine Bases/Foundation

Foundation requirements will be provided by the wind turbine supplier, and appropriate factors of safety will be applied to these in accordance with Wind Energy Development Guidelines, 2006. The turbine towers will be anchored to the concrete foundation using a bolt assembly which shall be cast into the concrete. Foundation requirements will be provided by the wind turbine supplier, and appropriate factors of safety will be applied to these in accordance with Wind Energy Development Guidelines, 2006.

The turbine foundations for turbines will be 21.6 m in diameter and will range in depth from 0.5 m at the edge to 2.7 m at the centre. The central part of the foundation (plinth) as shown in **Planning Drawing 6289-PL-502-01** will be a maximum of 6 m in diameter and will be raised 0.795 m from the main Turbine Foundation. It will encompass a cast-in insert or bolts to connect to the bottom of the turbine tower and reinforced bar structural.

The main concrete pours at the turbine locations will be planned in advance and proposed mitigation measures will be as follows:

- Avoiding large concrete pours, for Turbine Foundations for example, on days when temperatures are not optimal as per (BS 8110) (EN1992-1-2) or when heavy or prolonged rainfall is forecast i.e., during a period in which a Met Éireann Status Yellow, Orange or Red weather event has been notified.
- Providing that all concrete pour areas are dewatered prior to pouring concrete while the concrete is curing.
- Making covers available so that areas can be covered if heavy rain arrives during the curing process which will prevent runoff concrete which has a high pH.

Plate 4.2: Turbine foundation under construction with adjoining crane pad[3]

There are two options for design and construction of Turbine Foundations as follows:

- **Option 1 – Turbine Foundation constructed directly on in-situ ground:**
  The Contractors will demonstrate that the soil/rock properties at the formation level are in compliance with the Turbine Foundation Design limiting criteria for a ground bearing base.

- **Option 2 –Turbine Foundation constructed on engineering fill:**
  If it cannot be demonstrated that Option 1 is achievable, the Contractors will establish and demonstrate a suitable bearing stratum at a lower level, design and construct engineering fill to the formation level of the foundation and demonstrate that the fill properties at the formation level are in compliance with the Turbine Foundation Design limiting criteria for a ground bearing base.

[3] Good Practice during Wind Farm Construction, 2019. Online: https://www.nature.scot/doc/guidance-good-practice-during-wind-farm-construction [Accessed 20/06/2024]

Plate 4.3: Wind Turbine Foundation

The construction method statement for the turbine bases will generally follow the sequence as defined in **Table 4.4**.

Table 4.4: Turbine Base Construction Method Statement

Activity	Notes
Set out the turbine location with the use of GPS (RTK) equipment.	The Contractors will tape off buffer zones with assistance from the Ecological Clerk of Works and Ecological Clerk of Works, and toolbox talks will be used to inform site staff of the importance of the buffer zones.
Archaeology	The Site will be accessible to the appointed archaeologist at all times during working hours. The nominated archaeologist will monitor all invasive works.
Set out and install drainage treatment and flow attenuation features.	Required to minimise the transportation of suspended solids generated during the construction stage.
Remove and locally store the top layer of vegetated material over the excavation area.	This material will be stored for re-use to cover and promote natural re-vegetation of the inorganic spoils that will be deposited at the nearest suitable location to the excavation, monitored by the Ecological Clerk of Works.
Excavate remaining material to 1 m depth and segregate organic material from mineral material.	Selected excavated organic material will be considered for re-use as backfilling material.
Excavate to formation level. Complete plate bearing tests.	Any excavated inorganic material will be re-used as structural ballast to minimise the required volumes of spoil and imported stone.
A reinforcement steel cage for the foundation will be assembled after insertion of the Turbine Foundation insert arrangement (required for fixing steel tower) and formwork will be fixed to surround the cage.	Reinforcing steel shall be checked for design compliance and signed off upon acceptance.
Reinforcement steel for the top section of the foundation is fixed along with the required number of cable ducts.	Reinforcing steel will be checked for design compliance and signed off upon acceptance.
Erect the formwork to contain the concrete pour.	Formwork will be re-used and removed offsite when foundation construction is complete.

Activity	Notes
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 the appointed Turbine Contractors for their approval.	
The foundation will be backfilled with a cohesive material.	Using the material arising during the excavation and landscaped using the vegetated soil set-aside during the excavation.

Plate 4.4: Wind Turbine Erection

Plate 4.5: Assembly of wind turbine blades

4.4.3.1 Turbine Hardstands/Crane Pads

A crane pad hardstand area will be required at each turbine. The hardstands must allow for two cranes (including outriggers) to operate in the vicinity of the turbine to allow for turbine erection. The hardstand must also provide storage and set down areas for turbine components. The hardstand requirements are specified by the turbine supplier and require strict compliance so that there are no stability issues during erection of the turbine sections.

Each of the Turbine Hardstand areas will have a crane platform surface area of 1,391 m^2 and will be of 0.5 m in depth, depending on the local soil profile. The combined crane platform surface areas for the 16 no. turbines is c. 22,256 m^2. The combined Temporary (stoned) Hardstand areas is approximately 26,016 m^2 (1,626 x 16) and the combined secondary cranes areas (including areas for assembly location at boom) is 6,816 m2 (426 m2 x 16) for the 16 no. turbines. The 2 no. temporary blade finger areas are c. 210 m^2 in total for each turbine, combined, are approximately 3,360 m^2 across for the 16 no. turbines.

All Turbine Hardstands will be designed to take account of the loadings which will be provided by the appointed turbine and installation Contractors and will consist of a compacted stone structure which is to be installed in accordance with the Transport Infrastructure Ireland (TII) Specification 800 2013.

Two types of hardstands are facilitated:

- Locations that will require a turning head.
- Standard Hardstand arrangement where delivery vehicles do not require a turning area.

Hardstand formation will consist of either 1 or 2 layers of stone depending on the properties of the underlying load bearing layer. Where the underlying layer is clay, 2 layers of stone formation are used, the stone capping layer and the running layer. In areas where the load bearing layer is rock, the capping layer is omitted, and the running layer is installed directly onto the rock surface (in this case siltstone).

The hardstand area will be excavated to a formation level of weathered rock where possible or on stiff bearing strata on overlaying material.

Following completion of the hardstands, a series of plate load tests will be undertaken to demonstrate compliance with the turbine supplier requirements of 260kN/m^2.

Excavated material will be used for side slope formation local to the hardstands. Material from the excavation of the hardstands will be used to dress exposed areas around the hardstand with the remainder being used for landscaping around the turbine base in accordance with the attached Peat and Spoil Management Plan (**Management Plan 4**). A Hardstand construction method statement is set out in **Table 4.5**.

Table 4.5: Typical Hardstands Construction Method Statement

Activity	Notes
Set out the crane hardstands with the use of GPS (RTK) equipment.	The Contractors will see that buffer zones and areas of restricted working width are taped off with assistance from the ECoW and toolbox talks used to inform site staff of the importance of the buffer zones with identification of areas on drawings and maps.
Archaeology	The Site will be accessible to the appointed archaeologist at all times during working hours.
Set out and install drainage treatment and flow attenuation features around the crane hardstand and turbine area.	In areas of peat only 'bog master' low ground pressure excavators will be used to minimise the impact on the vegetation layer. Temporary and permanent ponds and outflow buffers will not be constructed in sensitive habitats or buffer zones. Liaison with the ECoW at the detailed design stage will assist in the identification of suitable locations.
Remove and locally store the top layer of vegetated material over the area of the crane hardstand excavation.	This material will be stored for re-use to cover and promote natural re-vegetation of the amorphous peat and /or inorganic spoils that will have to be deposited at the nearest suitable location to the excavation.
Excavate remaining material to 1 m depth and segregate organic material from mineral material.	Selected excavated organic material will be considered for re-use as backfilling material.
Excavate material to the required formation level.	The formation level for the crane hardstands will be on weathered rock or stiff overlaying material. Where suitable, the excavated material will be re-used as structural backfill material to minimise the required volumes of spoil and stone.
Place rock fill in accordance with the design to form the crane hardstand structure. Where appropriate, geotextile and/or geogrid will be used to help reduce the volume of stone. Fence off steep edges.	Special consideration will be given towards the stone placement and compaction so that the structural integrity meets the loading requirements.

Activity	Notes
Plate bearing tests will be undertaken following completion of the hardstand structure.	The number and location of the plate bearing tests will be specified by the Contractor's designer.

Plate 4.6: Crane for wind turbine erection [2]

4.4.3.2 Handling/Disposal of Excavated Material

Details of spoil management methodology are outlined in the attached **Peat and Spoil Management Plan** (**Management Plan 4**)

4.5 TRAFFIC MANAGEMENT

Although no long-term significant effects have been predicted, the proposed mitigation measures have been incorporated into the design to maintain the highest standard of road safety, minimise delay and disruption to all public road users, and to comply with statutory regulations:

- The appointed Contractor shall inform local residents, businesses and emergency services of proposed works on the public road network in advance of any works taking place on Site. Access shall be maintained to properties at all times during the course of the works. The Contractor will appoint a project coordinator who will be the main point of contact for matters relating to traffic which will affect the general public, local businesses and emergency services. An out of hours contact number shall also be provided.

- A Traffic Management Plan (TMP) has been developed (see **Management Plan 7** attached to the **CEMP**). Prior to construction and once the Contractors have confirmed their suppliers, the TMP will be updated in consultation with and Mayo County Council and An Garda Síochána as necessary. HGV trips will be scheduled to avoid times when drop offs and pick-ups generally take place at schools. All drivers will be made aware of the location and presence of schools and other sensitive receptors at an induction session prior to construction activities taking place and will be made aware of the speed limits of the various roads on the route which are contained in the TMP. This is to ensure compliance with speed limits and school drop off and pick-up zones.
- All significant traffic likely to be generated by the Proposed Development will be during the construction of the Proposed Development and will be temporary in nature. It is envisaged that the construction period for the Proposed Development will span a 21-month period with the underground cable being installed over a concurrent 12-month period. The construction-phase Traffic Management Plan will mitigate these effects.
- Use special transporter vehicles with rear wheel steering in delivery of wind turbine components to ensure safe transportation and manoeuvrability on the roads. Extendable transporter vehicles will be retracted on return journeys.
- Prior to delivery of abnormal loads i.e. turbine components, the Applicant or their representatives, will consult with An Garda Síochána and Mayo County Council Roads Departments to discuss the requirement for a Garda escort.
- The Developer will confirm the intended timescale for deliveries and every effort will be made to avoid peak times such as school drop off times, church services, sporting events, peak traffic times where it is considered this may lead to unnecessary disruption.
- Abnormal loads are likely to travel at night and outside the normal construction times as may be required by An Garda Síochána. Due to the distance between Killybegs Port, Galway Port and Foynes Port and the Proposed Development site, the journey is achievable within a 4 - 6 hour timeframe. Accordingly, locations for resting will not be required. Local residents along the affected route will be notified of the timescale for abnormal load deliveries.
- The Developer will lodge a bond with Mayo County Council prior to commencement of construction in the amount to be agreed with the Council for the possible repair/upkeep of the roads. During the construction period, these roads will be inspected weekly by the Developer's Resident Engineer and the Contractor will be instructed to repair any defects within the following two weeks. At the end of the construction period, any further defects will be remedied to the satisfaction of Mayo County Council.
- Wheel cleaning equipment will be used at the exit to the Proposed Development site to prevent any mud and/or stones being transferred from site to the public road network. All

drivers will be required to see that their vehicle is free from dirt and stones prior to departure from the construction sites.

- The sites' entry points will also be appropriately signed. Access to the Proposed Development site will be controlled by onsite personnel and all visitors will be asked to sign in and out of the site by security / site personnel on entering and exiting the site. All site visitors will undergo a site induction covering Health and Safety issues at the Wind Farm Site TCC and will be required to wear appropriate Personal Protective Equipment (PPE) while onsite.
- In addition, any dust generating activities will be minimised where practical during windy conditions, and drivers will adopt driving practices to minimise the creation of dust. Where conditions exist for dust to become friable, techniques such as damping down of the potentially affected areas will be employed.
- To reduce dust emissions, vehicles transporting crushed stone will be covered during both entrance and egress to the site.
- A survey of the TDR will be undertaken prior to commencement to identify if any new overhead lines or broadband lines will need to be lifted along the route to allow abnormal loads such as tower sections and nacelles to be delivered.
- During the construction phase, clear construction warning signs will be placed on the R314, L-5177-0,5176-0, L-1107-99, L-1110-87, L-1110-117 and L-1111-0 as necessary, which will advise road users of the presence of a construction site and of the likelihood of vehicles entering and exiting the site or road construction areas. This will help improve road safety.
- Works on public roads on the TDR and GCR will be strictly in accordance with "Guidance for the Control and Management of Traffic at Road Works – 2nd Edition 2010" as well as "Traffic Signs Manual 2010-Chapter 8 -Temporary Traffic Measures and Signs at Roadworks".
- Road Closures will be obtained for Grid Connection works on narrow public roads with passing bays available. A number of options are available in some areas for diverting traffic that will allow flexibility during construction. For the works within the L-31143, L-1114, R314, L-5177, L-5176, L-1107, L-1111, L-1116 and the L-5147, passing bays can be utilised if necessary. While traffic diversions are in place, local access will be maintained at all times. All access points (domestic, business, farm) will be considered when finalising the proposed road closures and diversions. Additional measures such as local road widening, traffic shuttle systems and 'Stop-Go' systems will also be considered subject to agreement with Mayo County Council. Road closures will be scheduled in consultation with local residents, and the Contractor shall endeavour to avoid times of high agricultural activity e.g. silage cutting.

- The widening/straightening of the TDR on the R315, L51732, L5179, R314, L31143, L51791, L5179-23, L51731, L31142, L5187, L5187-47 and the L21147 is proposed to be completed in advance of road closures.
- Road Closures on the R314, L-5177-0,5176-0, L-1107-99, L-1110-87, L-1110-117 and L-1111-0 will be required during construction. Each road will be closed as required and for as short a time possible. Only one road will be closed at a time so as not to disrupt local traffic i.e. one road will close and the other left open to detour vehicles within the local road network.
- Road Opening Licences will be obtained for the Grid Connection trench and chambers within public roads as well as for the widening of public roads.
- All vehicles using or while in operation at the Proposed Development Site shall either have roof mounted flashing beacons or will use their hazard lights.
- A speed limit of 25 km/h shall apply to all vehicles within the Proposed Development site.
- Provide a footpath adjacent to the upgraded carriageway where works are being undertaken. This footpath should provide a safe method of permitting pedestrians to access the pre-exiting carriageway at the terminations of the works.
- Ensure all visibility envelopes are kept clear of high vegetation.
- Provide visibility splays set back a suitable distance from the yield line.
- Provide signage opposite each entry arm.
- Provide a uniform radius from the roundabout entry to the exit.
- Reinstate any speed limit signs removed by the works.
- Redesign this arm or roadside treatment to enable road users to differentiate this private access from the public ones.

Table 4.6: HGV and Abnormal Load Deliveries – Associated with Civil/Electrical Construction Works

Materials	Quantity	No. of Deliveries
Concrete	15,948 m^3	1,994
Reinforcing Steel	1,570 t	63
Substation Building and electrical equipment	-	60
Other – Geotextile Mats, Tools, Fencing etc.	-	50
Proposed Development Internal Cabling Materials incl. bedding	-	400
Imported Crushed Stone (engineering fill) as Upfill to Foundations	11,352 m^3	649
Imported Crushed Stone for Substation, 600 mm thick	502 m^3	29
Imported Crushed Stone for BESS Compound, 300 mm thick	1,908 m^3	109
Imported Crushed Stone for Site Access Track and Turbine Hardstands including road widening for Turbine Delivery	18,155 m^3	1,038
Tree Felling	14,486 t	547
Waste – 1 container/month		18
Total		4,957

Table 4.7: HGV and Abnormal Load Deliveries – Associated with Wind Turbine Components

Materials	Quantity	No. of Deliveries
Site Establishment and Removal	24	24
Miscellaneous Deliveries (fencing, silt fencing, silt busters, drainage, Met Mast, sumps etc.) incl. Removal	30	30
Anchor Cages & Foundation Templates	18	18
Tower Sections	-	84
Nacelles	18	18
Rotor Blades	54	54
Transformers, Panels and Cabling	-	8
Tools etc.	-	1
Crane Deliveries to Site, including ballast, booms, etc. and removal of same	2 Cranes	50
Ducting and Miscellaneous Deliveries to Turbine Delivery Route	3	3
Total		290
Materials	Quantity	No. of Deliveries
Site Establishment and Removal	24	24
Miscellaneous Deliveries (fencing, silt fencing, silt busters, drainage, Met Mast, sumps etc.) incl. Removal	30	30

Table 4.8: HGV Load Deliveries – Associated with Grid works

Materials	Quantity	No. of Deliveries
Concrete Blinding for Joint Bays, Comms Chambers and Link Boxes	26.01 m^3	3
Concrete for Floors of Joint Bays	67.5 m^3	11
Pre-cast Concrete Joint Bays and Communication Chambers	14	14
Other – Steel mesh, Geotextiles, Silt Fencing, Fencing, Danger Tape, etc.	7	7
Grid Connection Cables	268 t	15
Grid Connection Ducting	67,750 m	23
Disposal of Excavated Materials from trenches in Public Roads	11,235 m^3	936
Lean Mix Concrete for Trenches	5,285 m^3	881
Crushed Stone for Trenches in Public Roads	4,675 m^3	390
Road Surfacing	2,470 m^3	342
Total		2,622

4.5.1 Site Entrances

Access to the Wind Farm Site will be from a total of 14 entrances, 5 new and 9 existing, refer to **Table 4.9**, Site Entrance Description. Each entrance will open out onto a local road, (speed limit 60 km to 80 km) and will be constructed or upgraded to accommodate the swept path of abnormal load vehicles accessing the Wind Farm Site during the delivery of turbine components. Visibility splays of 70 m to 160 m will be available from a 3.0 m setback in accordance with TII specifications and with the Mayo County Development Plan. The junctions will be a stop-controlled junction with priority for public traffic. The location of the Wind Farm Site entrance junctions is shown in **Figure 4.1**.

Table 4.9: Site Entrance Description

Site Entrance Description				
No.	Entrance	Access To	Description	Road Class
1	Existing	AT02, AT03, AT04 and Met Mast	Turn Left off the L5173 onto Site Access Track	Local
2	New	AT01, TCC, Onsite Substation and BESS	Turn right off L51791, travel south along local road L31143, then turn right onto Site Access Track	Local
3	Existing	AT05, AT06	Turn right off local L5179 road, then onto Site Access Track	Local
4	New	AT07, AT08,	Turn left off local road L5179-23 onto Site Access Track	Local
5	New	AT07, AT08,	Turn left off local road L-5179-0 onto Site Access Track to AT07, AT08 Turn right off local road L-5179-0 onto local road L-311420 onto	Local

Site Entrance Description				
No.	Entrance	Access To	Description	Road Class
			Site Access Track to AT09 and AT10.	
7	Existing	AT13, AT14	Turn left off local road L5187-47 , then right on access track.	Local
8	Existing	AT11	Turn left off local road L5187-47 onto Site Access Track	Local
9	New	AT12	Turn right off local road L5187-47 onto Site Access Track	Local
10	Existing	TCC	Turn left off local road L5187-47 onto Site Access Track	Local
11	Existing	Operations Building	Turn right off local road L5187-47 onto Site Access Track	Local
12	Existing	Site Access Track, Entrance 13	Turn right off local L21147-0 road onto Site Access Track	Local
13	Existing	Site Entrance 14	Exit Site Access Track at Site Entrance 13, continue north across width of local road to Site Entrance 14	Local
14	Existing	Abandoned Quarry, AT15, AT16	Continue north across width of local road from Site Entrance 13 to 14 and onto Site Access Track	Local

4.5.2 Construction Material Haul Route

The haul route of quarry materials i.e. readymix concrete will be established after the appointment of the Contractors, but it is envisaged that material will be sourced from quarries local to the Wind Farm Site to minimise disruption on the public road network as per EIAR **Figure 17.8**.

4.6 PLANNING CONDITIONS AND OUTLINE METHOD STATEMENTS

This CEMP and its future versions/revisions will form part of the Contract for Tirawley Wind Farm. It will therefore be updated and revised during the different stages of the Proposed Development. Where the Proposed Development is granted planning permission all the planning conditions associated with the Planning Application, applicant Constant Energy Limited will be listed in **Table 4.10**.

Table 4.10: Relevant Planning Conditions and Related Documentation

Condition No.	Planning Condition	Reason
Planning Ref: INSERT NUMBER		

Condition No.	Planning Condition	Reason

The Contractors will address all of the mitigation measures and best practice construction methods detailed within the above consent in his design and in any detailed environmental plans as required by this CEMP or the Contract.

4.7 SCHEME AMENDMENTS

Scheme Amendments will be recorded in **Table 4.11**. These amendments do not include changes to the scheme design which are completed in accordance with the existing planning consent. Instead, this refers to changes in the design of the wind farm for which additional approvals and / or consents may be required from Mayo County Council. For example, amendments to layouts or in accordance with the current grant of planning permission.

Table 4.11: Scheme Amendments

Reference	Date	Scheme Amendment Description	Environmental Sensitivities potentially

4.8 REGISTER OF VARIATIONS

Where any variations to the Management Plans and CEMP are required (either as a result of Scheme Amendments or through corrective actions or improvements noted and undertaken on site) these will be recorded in **Table 4.12**, Register of Variations. Furthermore, all changes to construction methods, design, mitigation and the implications of these changes and authorising personnel will be recorded in **Table 4.12**.

Table 4.12: Register of Variations

No.	Variation Description	Authorising Personnel	Completion Date

5 COMMUNICATION PLAN

5.1 INTRODUCTION

Appointed Project Managers will be the main points of contact during the construction phase. This includes the Contractors, Construction Project Manager and the Client.

It is envisaged that main project communications will take the form of structured reporting arrangements and meetings.

All issues in relation to environmental management/monitoring will be reported to the Ecological Clerk of Works. The Contractors Ecological Clerk of Works will report to the Contractors and Client on a regular basis.

5.2 CONTACT SHEETS

Table 5.1 provides a list of Constant Energy Limited., Contractors and relevant third-party contact details. This table will be updated and maintained by the Contractors for the duration of the Contract.

Table 5.1: Contact Sheets

Company	Position	Name	Telephone
Constant Energy Limited	Client Project Manager	TBC	TBC
Contractors	Site Manager / EM	TBC	TBC
Contractors	Contracts Manager	TBC	TBC
Contractors	General Manager	TBC	TBC
Contractors	Foreman	TBC	TBC
Constant Energy Limited	Construction Project Manager	TBC	TBC

5.3 MEETINGS REPORTS AND CONSULTATIONS

Table 5.2 lists all meetings and consultations as required by the Contract. The table also provides details on the schedule/frequency, scope & objectives and attendees / responsibility for each meeting.

5.4 ROLES & RESPONSIBILITIES

Roles and responsibilities for environmental management, monitoring and reporting are detailed in **Table 5.3**. The Ecological Clerk of Works Contractors will be responsible for the delivery of all elements of the Environmental Management Plan. The Ecological Clerk of Works Contractors will retain all responsibility for issuing, changing and monitoring the Environmental Management Plan.

5.5 REPORTING PROCEDURES

Figure 5.1 provides a diagrammatic outline of the general tasks and communication lines, based on the roles described in **Tables 5.2** and **5.3** and tasks detailed in the Management Plans. The Contractors will update this information as part of the construction stage CEMP.

Management Plan (1) Emergency Response Plan includes the communications plan for reporting procedures for all potential environmental risks, hazards or incidents which may relate to ecology, water quality, dust, noise or archaeology. Environmental reporting to statutory bodies, such as Mayo County Council, will be managed by the relevant Contractors in accordance with an agreed reporting schedule.

Table 5.2: Meetings, Reports and Consultations

Meeting/ Report	Schedule/ Frequency	Scope & Objective	Attendees/Responsibilities
A Record of all meetings, checks, permissions and licenses will be retained within Section 4 of this CEMP			
Site Inductions	All new site personnel and visitors		Contractors to organize and maintain records
Weekly environmental meetings	Weekly	To provide updates on environmental mitigation measures and performance and identify actions for improvement. The Ecological Clerk of Works Contractors is required to maintain a Pollution Prevention Measures Register in which mitigation measures put into place will be listed and checked weekly to assess the requirement for maintenance. The results of these checks will be discussed at the meeting and corrective actions agreed as required.	Attendance required: Ecological Clerk of Works Contractors Site Manager, and any other relevant personnel or statutory consultees where necessary.
Monthly Environmental Report & Monthly Environmental Management Group Meeting	Monthly	To provide a compiled record of weekly meeting minutes and environmental performance and monitoring results (e.g. air, noise or water quality monitoring as appropriate). To identify any areas / action for improvement.	To be prepared by Ecological Clerk of Works. Report to be issued to the Contractors and Construction Project Manager before the end of each calendar month. Report to be discussed at the monthly meeting with recommendations for improvement passed to the Contractors in written format

Meeting/ Report	Schedule/ Frequency	Scope & Objective	Attendees/Responsibilities
Final Environmental Report	Upon completion of construction works	The final report will document the environmental and ecological effects of the construction period. The evidence for effects will be based on findings included in the minutes of weekly meetings and monthly meetings, together with other recording information maintained by the Ecological Clerk of Works. The report will relate results to residual effects predicted in the EIS.	The Final Report will be prepared by the Ecological Clerk of Works. The report will be made available to the Contractors, Construction Project Manager and Planning Authority, if required.
Environmental Checks and Monitoring of Mitigation Works	As required in advance of construction works regular checks will also be made at least every 14 days.	Environmental Checks are to be carried out in advance of construction works. This will comprise an onsite meeting / inspection to confirm the appropriate use of identified mitigation measures and highlight any further issues / measures which may be relevant prior to commencement of works in any area. As a minimum, Environmental Checks will be completed at each main piece of site infrastructure (turbine bases, construction	Environmental checks will be undertaken by the Contractors Ecological Clerk of Works. The Ecological Clerk of Works may also undertake regular checks, either independently or in conjunction with the Contractors checks as required. The Contractors and Ecological Clerk of Works will retain a record of all inspections / findings of Environmental Checks within Section 4 of this CEMP. All records will be made available for audit / review. All records will also be made available for discussion during regular meetings as scheduled herein.

Meeting/ Report	Schedule/ Frequency	Scope & Objective	Attendees/Responsibilities
		compounds, sub-station, control room) prior to works commencing in that area. Environmental Checks will include: • Checks for visual evidence of contamination / sediment alongside watercourses, nearby working areas and in areas of surface water discharge. • Regular checks of all plant and equipment to identify any oil or fuel leaks to confirm the condition of the plant. • Inspection of drainage and erosion and sediment control measures. Additional checks will be made before, during (where safe to do so) and immediately following anticipated storm events or periods of continuous or heavy intermittent rainfall over one or more days. • Environmental checks will also	

Meeting/ Report	Schedule/ Frequency	Scope & Objective	Attendees/Responsibilities
		encompass a review of: - Waste management procedures - General site tidiness - Temporary materials storage (extracted materials stockpiles) and restoration works and - Soil stability - Signs of any mammal activity on site - Buffer zones (if any) are being maintained	
Environmental Audit	At least once every month.		Environmental Audits may be carried out by the Contractors, or Constant Energy Limited. at any time during the works. Audit procedures and forms are included within Section 4 and TS1. These will be followed / completed by the Employer when undertaking environmental audits and may also be adopted by the Contractors, unless alternative procedures and forms are submitted and approved as part of the Contractors' construction stage CEMP.
Liaison with regulator / statutory Consultees	As Required	Provide regular updates to relevant authority on	Contractors and Ecological Clerk of Works where required.

Meeting/ Report	Schedule/ Frequency	Scope & Objective	Attendees/Responsibilities
		environmental performance and maintain good working relationships with the regulatory bodies.	Meetings will be initiated as required by Planning Conditions, Management Plans or as agreed throughout the duration of the construction phase. The Contractors is responsible for obtaining all relevant permissions, consents, licenses and permits. Some permits may require application and implementation by an appropriately qualified person. In these instances, the Contractors will consult with the other specialist Environmental Consultants where required.

Table 5.3: Roles and Responsibilities

Position	Roles and Responsibilities
Construction Project Manager	The Construction Project Manager will: Ensure that the Contractors has obtained the relevant approvals and licenses and consents from regulatory bodies and statutory consultees where required. Ensure that the Contractors has submitted all relevant documentation to t, liaise with the Site Manager and the Ecological Clerk of Works and ensure that corrective actions and variations to the CEMP have been instigated.
Project Site Manager/ Engineer	The Site Manager will provide liaison between the Ecological Clerk of Works and the Contractors where environmental sensitivities, instruction for environmental performance improvements or corrective actions are requested by the Ecological Clerk of Works or other appropriate person(s) as a result of environmental checks or audits conducted by these person(s). The Site Manager will ensure that all notifications of environmental sensitivities and incidents as well as other general observations on environmental performance are reported back to the Construction Project Manager. The Project Site Manager is responsible for review and further development of the CEMP.
Environmental Manager	The Ecological Clerk of Works will be a member of the Environmental Management group and will work with the Contractors to ensure

Position	Roles and Responsibilities
	compliance with best practice and with all environmental mitigation and monitoring requirements as detailed within the relevant planning conditions, compliance documents and CEMP during both the pre-construction and construction phases. The main roles of the Ecological Clerk of Works are as follows: • Organise start-up meeting / Toolbox talks with the Contractors to agree working methods, specifically including communications; schedules; monitoring of data storage; and preparation of plans indicating location of key features including mitigation measures, monitoring points and sensitive habitats (where not previously highlighted and approaches agreed). • Give tool box talks as agreed with the Contractors to address key areas, including water pollution prevention, protected species management, and onsite biodiversity. Highlight to staff the requirement for compliance with planning conditions. • Undertake a pre-construction walkover with the Site Engineer / Site Manager to confirm that access routes remain appropriate to the conditions present at the time of construction • Delineate any sensitive habitats or features with wooden stakes and high visibility tape • Undertake or delegate to an appropriately qualified person, a pre-construction Invasive Alien Species survey along the works route • Monitor the installation of poles and infrastructure • Inspect pollution control measures during the works • Maintain a presence onsite during the pre-construction and construction works, including setting out of access routes. • Organise a minimum of weekly meetings with the Site Environmental Supervisor and / or Foreman, to allow briefing on the programme of works on site and to provide on-site guidance during construction. • Identify environmentally sensitive areas and ecological hazards for demarcation by the Contractors. • Develop written reports / audits and submit to the Contractors and present findings at meetings as required. Prepare updated reports and a final report on mitigation measures, procedures and monitoring. • Monitor potential environmental impacts and the successful implementation of all mitigation as detailed in the NIS and this CEMP. • Maintain a weekly presence on site during the main construction works • Prepare a pre-construction Invasive Alien Species survey along the works route

Position	Roles and Responsibilities
	• Identify environmentally sensitive areas and ecological hazards for demarcation by the Contractors. • Produce written reports to the Contractors following site visits and meetings. This includes monthly reports and a final report. The Contractors will provide comprehensive information on all proposed works and all scheduling to the Ecological Clerk of Works in advance, in order to anticipate and address any issues, especially access to new areas including areas where Invasive Alien Species may occur, vegetation clearance, setting out of buffer zones, excavation and silt mitigation measures, temporary compound works and vegetation reinstatement.
Ecological Clerk of Works and/ or Water Quality Specialist	The Ecological Clerk of Works will work with Constant Energy Limited., the Contractors to see that compliance is achieved with best practice and with all environmental mitigation and monitoring requirements as detailed within the NIS and CEMP, relevant planning conditions and CEMP. The Ecological Clerk of Works will delegate and oversee the work to ensure competency of tasks achieved. Where a particular ecological concern exists at the Wind Farm Site, or specific habitat management activities are to be undertaken in conjunction with the main civils construction works, a Specialist Ecologist / Environmental Consultant may also be required unless the Ecological Clerk of Works is suitably qualified to undertake the particular ecological responsibilities. The main roles of the Ecological Clerk of Works are as follows: • Organise start-up meeting / Tool box talks with the Contractor to agree working methods, specifically including communications; weekly schedules; monitoring of data storage; and preparation of plans indicating location of key features including mitigation measures, monitoring points and sensitive habitats. • Maintain a weekly presence on site during the main construction works. • Organise a minimum of weekly meetings with the Site Manager and / or Foreman, to allow briefing on the programme of works on site and to provide onsite guidance during construction. Note: It is essential that the Contractor supplies information on works and scheduling to the ECoW in advance in order to anticipate and address any issues, specifically including drainage, buffer /protection zones, silt mitigation measures, cabling, roads, turbine bases, met masts, compounds,

Position	Roles and Responsibilities
	landscaping, topsoil removal, storage and replacement, vegetation reinstatement and restoration works, planting, felling and habitat management. • Highlight the need for compliance with planning conditions. Contractors Note: If failures occur and actions are taken which contravene legislation then the Project Ecologist has the power to stop works in the affected area with immediate effect. These actions will only be taken where appropriate. Notification to stop works will be by verbal means, followed up with written confirmation recording the time and date of the instruction, personnel involved and reasons for the instruction. Upon recommencement of works, details of any corrective actions and / or remedial measures implemented will be recorded within Section 4. • Give tool box talks as agreed with the site contractor to address key areas, including water pollution prevention, protected species management, and onsite biodiversity. • Monitor potential environmental impacts, including: - Use of and storage of oils and toxic chemicals onsite, e.g. cement - Dewatering of excavations (including turbine bases) - Silt control - Water management, including working in or close to watercourses - Protection of ecological interests, e.g. protected species and habitats • Identify environmentally-sensitive areas and ecological hazards for demarcation by the Contractor • Produce written reports to the Contractor following site visits and meetings. This includes monthly reports and a final report.
Specialist Ecologist/ Environmental Consultant	Where a Specialist Ecologist / Environmental Consultant is employed, this person(s) will: • Provide advice and maintain regular liaison with the Project Site Manager, Project Manager, Ecological Clerk of Works and Contractors and / or other specialist Environmental Consultant as and when required. • Undertake specific monitoring activities and reporting as defined in agreed documentation prepared as part of the planning process. • The Ecological Clerk of Works or a Water Quality Specialist will be appointed. They will have responsibility for fulfilling the requirements of the Water Quality Management Plan, including:

Position	Roles and Responsibilities
	- Daily visual inspection of: Site Access Tracks and public roads within the Wind Farm Site for signs of ground damage or solids escape to nearby watercourses in vicinity of construction works - The ground between the structure under construction and the nearest downslope watercourse for signs of solids escape or ground damage - Surface water features in vicinity of construction works - Any pollution control measures at structures and Site Access Tracks and public roads within the Wind Farm Site (e.g. silt fences, drain or stream crossings etc.) for evidence of contaminated run-off or mitigation failure - Attendance at the critical work phases including, access road construction, foundation excavation, watercourse crossings, concrete pouring and back-filling. - Collection and analysis of water samples at a number of monitoring locations (i.e. upstream & downstream of the 5 no. instream work locations) before, during (if potential pollution visually identified) and after construction works at that location. - EPA Q Value Biological Monitoring at monitoring locations (i.e., upstream & downstream of instream construction work locations) before and after construction works.
Archaeological Clerk of Works	The main roles of the Archaeological Clerk of Works (licenced) are as follows: • Maintain regular liaison with the Project Site Manager, Project Manager, Ecologist and Ecological Clerk of Works as appropriate. • Maintain liaison with officers of the Planning Authority, specifically the Council Archaeologist and Planning Officers as appropriate. • Where applicable apply for licence application; the Minister for Dept of Culture Heritage and Gaeltacht can approve and issue a licence under Section 26 of the National Monuments Act 1930. • Facilitate compliance with planning conditions and agreed Archaeological Programme of Works. • Demarcate any archaeologically-sensitive areas and set up exclusion zones as required on site. • Immediately notify the relevant authorities in the event of the discovery of archaeological finds or remains and suspend works in the immediate area pending consultation. Allowance will also be made for full archaeological excavation if required.

Position	Roles and Responsibilities
	• Complete a full report for submission to the Planning Authority and the Department of Arts, Heritage and the Gaeltacht on completion of the works.
Geotechnical Clerk of Works or Appointed Geotechnical Consultant	The Geotechnical Clerk of Works will be responsible for preparation and monitoring of a geotechnical risk register as well as specific duties relating to geotechnical issues as they may arise during site construction works. Soil instability and the potential for slide even can have a significant impact on environmental receptors. In completing the geotechnical risk register, the Geotechnical Clerk of Works will work with the Contractors to identify suitable mitigation and monitoring methods. Where possible, construction works will avoid causing change to local hydrological and hydrogeological flow patterns and water levels.
Contractors Appointments	
Construction Manager	[The Contractors is required to specify roles and responsibilities for each individual below]
Site Agent	[To Be Confirmed]
Foreman	[To Be Confirmed]
Other Nominated Person(s)	[To Be Confirmed]

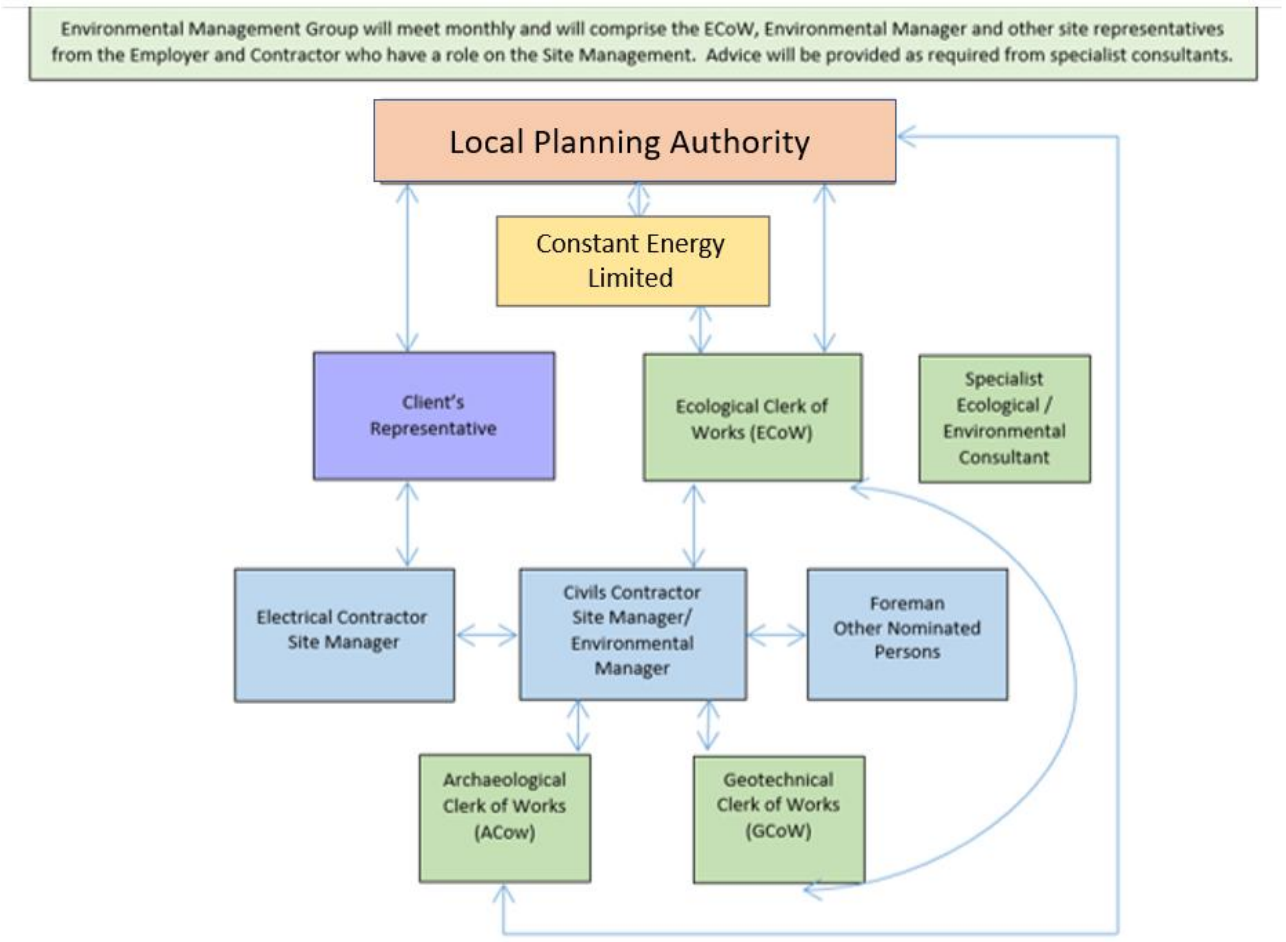

Figure 5.1: General Communication Plan

5.6 TRAINING, AWARENESS AND COMPETENCE

All site personnel will receive environmental awareness information as part of their initial site briefing. The detail of the information will be tailored to the scope of their work on site. This will ensure that personnel are familiar with the environmental aspects and impacts associated with their activities, the procedures in place to control these impacts and the consequences of departure from these procedures.

This CEMP will be posted on the main site notice board during the Proposed Development. The environmental performance at the Site will be on the agenda of the monthly project management meetings for the Proposed Development. Elements of the CEMP will be discussed at these meetings including objectives and targets, the effectiveness of environmental procedures etc. Two-way communication will be encouraged by inviting all personnel to offer their comments on environmental performance at the Site

5.7 EMERGENCY PREPAREDNESS AND RESPONSE

An emergency preparedness and response procedure is required to prevent environmental pollution incidents. Suitable spill kits and absorbent material for dealing with oil spills will be

maintained on site. In the event of pollution or potential risk of pollution, Mayo County Council will be informed immediately. In the case of water pollution, in addition to Mayo County Council, Inland Fisheries Ireland will also be informed immediately. Further details in relation to emergency responses are provided at **Management Plan 1: Emergency Response Plan.**

6 CORRESPONDENCE, RECORDS & REPORTS

6.1 REQUIREMENTS

The Contractors will insert / file all communication records and reports associated with Environmental Management and implementation of this CEMP under this Section 6. As a guide, the following sub-sections of filed information will be required (at a minimum):

6-A) Meeting minutes and attendance record

6-B) Weekly Environmental Reports

6-C) Monthly Environmental Reports

6-D) Environmental Checks

6-E) Audit Reports

6-F) Ecology documentation and monitoring records

6-G) Pollution Prevention, including a Pollution Prevention Measures Register

6-H) Water Quality documentation and monitoring records

6-I) Archaeology documentation and monitoring records

6-J) Ground Risk, including a Geotechnical Risk Register

6-K) Waste Management documentation

6-L) Licensing and Consents: copies of all permissions, consents, licenses and permits and related correspondence. A summary record of all such documents shall also be provided in accordance with **Table 6.1** of this CEMP.

6-M) General Correspondence: all other relevant internal and external communication records relating to environmental management issues and implementation of the CEMP.

6-N) Training Records

6-O) Toolbox Talk Records

6-P) Ecological Clerk of Works Reports

All of these documents and records will be made available for inspection in the site office. The documentation will be maintained and will be reviewed on a regular basis with revisions controlled in accordance with the site quality plan.

6.2 ENVIRONMENTAL AUDITS

The Contractors Ecological Clerk of Works will consult and assist with the Client in evaluating compliance with applicable legislation by means of a monthly Environmental Audit. A blank Environmental Audit Report form is included in **Management Plan 1: Emergency Response Plan**. All completed audit report forms and records of corrective actions (and close outs) must be filed within this section of the CEMP.

6.3 ENVIRONMENTAL CONSENTS, LICENSES & PERMITS

The Contractors Ecological Clerk of Works (or otherwise nominated responsible person(s)), will complete the summary record for all applicable permissions, consents, licenses and permits obtained for the Wind Farm Site. This record will follow the format provided in **Table 6.1**.

Table 6.1: Record of Environmental Consents, Licenses and Permits Issued

Consents, Licenses & Permits	Governing Legislation	Licensed Activity
Pollution Control & Hydrology		
Biodiversity		
Waste Management / Contaminated Land		
Noise / Vibration		
Archaeology		
Transport		
Other		

6.4 ENVIRONMENTAL MONITORING AND MEASURING

All of the mitigation measures outlined in **Section 4.0** will be monitored, where applicable. The Contractors will put in place a program of monitoring for dust, noise, vibration and water sampling in accordance with the requirements of this CEMP.

Copies of all records will be maintained in the site office and will be reviewed by the Contractors.

6.5 NON-CONFORMANCE, CORRECTIVE AND PREVENTATIVE ACTION

Non-Conformance Notices will be issued where there is a situation where limits associated with activities on the Proposed Development are exceeded, or there is an internal/external complaint associated with environmental performance.

Non-Conformance is the situation where essential components of the CEMP are not met, or where there is insufficient control of the activities and processes to the extent that the functionality of the CEMP, is compromised in terms of the policy, objectives and management programmes.

Correction will be required in order to improve the identified non-conformance. The CEMP must conform to its objectives and targets and the requirements of the ISO 14001 management standard. In the event of non-conformance with any of the above, the following must be undertaken:

- Investigate the non-compliance;
- Develop a plan for correction of the non-compliance;
- Determine preventive measures and ensure they are effective;
- Verify the effectiveness of the correction of the non-compliance.
- Ensure that any procedures affected by the corrective action taken are revised accordingly.

Responsibility must be designated for the investigation, correction, mitigation and prevention of non-conformance.

7 MANAGEMENT PLANS & AVAILABLE INFORMATION

7.1 MANAGEMENT PLANS

Various Management Plans have been prepared. as listed in **Table 7.1**. These are intended to provide a benchmark for best practice and to define Constant Energy Limited's minimum requirements for environmental management and mitigation.

7.2 CONTRACTORS REQUIREMENTS

The Contractors is required to further develop the Management Plans into detailed site and works specific environmental plans, method statements and procedural documents. **Table 7.1** provides a summary of the content of the Management Plans and the Contractor's obligations for their further development.

Table 7.1: List of Management Plans

No.	Name	Details
MP1	Emergency Response Plan	The Contractors will further develop the Environmental (Incident and Emergency) Communication Response Plan. This will include procedures for dealing with containment of accidental chemical or fuel spills, potential overload of the drainage system by silt during unforeseen adverse weather conditions etc. The Contractors will prepare a Communication Plan for emergency response in the event of a spillage. Detailed procedures will be outlined in this document.
MP2	Water Quality Management Plan	The Contractors is obliged to implement the water quality monitoring proposals set out therein. The Contractors is obliged to implement the water crossing proposals set out therein.
MP3	Surface Water Management Plan	The Contractors is obliged to implement the water quality monitoring proposals set out therein. Where changes to the plan are required the Contractors must consult with the Ecological Clerk of Works.
MP4	Peat and Spoil Management Plan	The Peat and Spoil Management Plan has estimated the volume of spoil that will be generated during the construction phase and it

No.	Name	Details
		outlines the locations where the material can be re-used onsite. The Peat and Spoil Management Plan is a live document and can be amended by the Contractors where required.
MP5	Waste and Resources Management Plan	The Contractors will further develop the Waste and Resources Management Plan. The detailed plan will specify the licensed waste facilities that will be used for the duration of the Proposed Development.
MP6	Decommissioning Plan	The Contractors will further develop the Decommissioning Plan. Where changes to the plan are required, the Contractors must consult with the Ecological Clerk of Works.
MP7	Traffic Management Plan	The Contractors will further develop the Traffic Management Plan. Where changes to the plan are required, it can be amended by the Contractors.

Management Plan 1

Emergency Response Plan

Management Plan 2

Water Quality Management Plan

Management Plan 3

Surface Water Management Plan

Management Plan 4

Peat and Spoil Management Plan

Management Plan 5

Waste and Resources Management Plan

Management Plan 6

Decommissioning Plan

Management Plan 7

Traffic Management Plan