MOANMORE LOWER GREEN ENERGY LIMITED

MOANMORE LOWER WIND FARM, MOANMORE, CO. CLARE

CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN (CEMP)

April 2025

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DOCUMENT APPROVAL

PROJECT	Moanmore Lower Wind Farm	
CLIENT / JOB NO	Moanmore Lower Green Energy Ltd.	6778
DOCUMENT TITLE	Construction Environmental Management Plan	

	Prepared by	**Reviewed /Approved by**
Document Final	Name Padraig O' Dowd Angelika Thiel	Name Sarah Moore
Date April 2025	Signature	Signature

MOANMORE LOWER WIND FARM, CO. CLARE

CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN

CONTENTS

FIGURES

TABLES

MANAGEMENT PLANS

1 INTRODUCTION

1.1 BACKGROUND TO REPORT

Jennings O'Donovan & Partners Limited, on behalf of Moanmore Lower Green Energy Limited, has prepared this Construction Environmental Management Plan (CEMP) for the construction of the proposed Development of 3 no. wind turbines, an Onsite Substation and Control Building; all ancillary works and the construction of an underground Grid Connection to Tullabrack 110 kV Substation, Co. Clare. 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.

In this document the proposed Development refers to all works within the Red-line Boundary and the Project refers to all the works within the Red-line Boundary and the temporary works along the Turbine Delivery Route (TDR).

This document has been prepared on the basis that this document will be further minor amendments if necessary and expanded following the appointment of the Contractors for the main construction works as some of the details can only be definitively confirmed once the Contractors are appointed but that all mitigation measures identified in the EIAR and CEMP will be followed. 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 Appropriate Assessment Screening Report, 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 impacts associated with the proposed Development.

This CEMP defines good practice, as well as specific actions, to implement mitigation measures required to comply with the environmental commitments outlined in the EIAR, NIS, the planning process and/or other licensing or consenting processes.

In the event planning permission is granted for the proposed Development, this 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 this CEMP, as above. This 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 Contractor will take account of the structure, content, methods and requirements contained within the various sections of this CEMP when further developing this CEMP and Management Plans as required by their Contract.

While this version of this CEMP provides a benchmark for good practice, where avoidance or further minimisation of risks to the environment can be demonstrated to the Environmental Manager 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 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 Ecological Clerk of Works) 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 on site. 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 any further necessary minor amendment of this 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 this CEMP, carry out compliance auditing during the construction phase, and coordinate the Environmental Management Group and required liaisons between Moanmore Lower Green Energy Limited, the Planning Authority and other statutory authorities.

The Contractor will appoint an Environmental Manager who will be responsible for coordination and development of this CEMP and any other surveys, reports or construction management plans required for discharge of relevant pre-commencement planning conditions. In conjunction with the Ecological Clerk of Works, the Environmental Manager will also review the Contractor's construction management plans, method statements and environmental plans as required by this CEMP, carry out compliance auditing during the construction phase, and coordinate the Environmental Management Group and required liaisons between the Employer, the Contractor and other statutory authorities.

The Developer will appoint a Project Manager to monitor the construction phase of The Project and ensure works are being carried out in accordance with the agreed method statements, safety procedures and pollution control measures. The Environmental Management Group will liaise regularly with the Project Manager.

1.4 CEMP DEVELOPMENT & IMPLEMENTATION

This CEMP has been prepared as part of the planning application for Moanmore Lower Wind Farm. It is a live document on site 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 project, it is acknowledged that this CEMP is a continually evolving document which can be updated in part or whole, at any phase 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 this 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 implementing this 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.

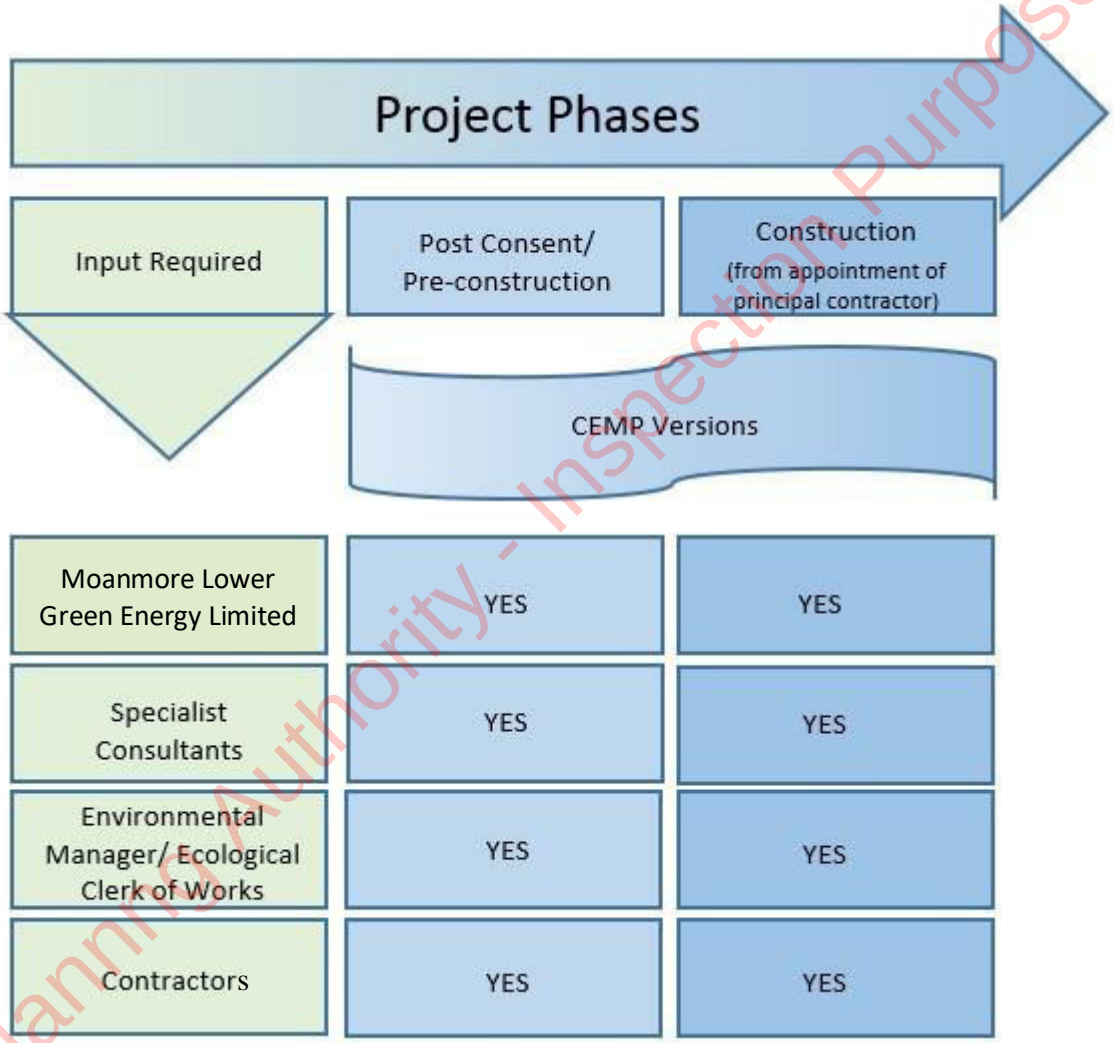


Figure 1.1 Summary of CEMP Development Process

1.5 CEMP STRUCTURE

This CEMP is divided into discrete Sections which are designed to be filed as separate documents / folders if required. A copy of this 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 this CEMP and will keep all sections updated throughout the construction phase.

Where a Contractor has standard documents within their own company / corporate Environmental Management Plans which cover a particular requirement of this CEMP, these will be reviewed by the Ecological Clerk of Works to confirm that they are appropriate and sufficient to meet the environmental commitments outlined in the EIAR and NIS, and in the event that they do meet these requirements the documents will either be inserted or cross referenced within the relevant Section of this CEMP.

This 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 Appropriate Assessment Screenings and other information where available).	No (Information purposes only)
3	**Environmental Controls** Provides details on relevant Planning Consent Conditions and mitigation measures outlined in the EIAR and NIS. Any documents prepared by Moanmore Lower Green Energy Limited in response to Consent Conditions will be recorded in Table 3.9. Table 3.10 contains a record of all Scheme Amendments and Table 3.11 a Register of Variations.	**Yes** Any documents prepared by the Contractors in response to Consent Conditions will be recorded by the Contractors in Table 3.9 and inserted in this CEMP where necessary. Any Scheme Amendments and / or Variations to this CEMP required during the works will be recorded by the Contractors in Tables 3.2 and 3.3.
4	**Environmental Communications Plan** Contains details on specific requirements relating to: • Contact details for Moanmore Lower Green Energy Limited, personnel, technical specialists, Contractor's personnel, regulators, landowners, other stakeholders etc.; • Meetings, reports and consultations; • Roles and responsibilities; and	Yes The Contractors will: i) Insert contact information for regulatory authorities and other stakeholders (where not already provided) into Table 4.1 ii) Refer to Table 4.2 for details on requirements for meetings, reports and consultations

Section	Title & Brief Description	Contractors Development Required
	• General reporting procedures and tasks.	iii) Insert information on Contractors appointments and responsibilities relating to environmental management and implementation of this CEMP into Table 4.3. iv) Refer to Figure 4.1 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 4 provides: • A list of all documents to be retained / filed within this CEMP. Table 5.1 provides a record of all Environmental Consents, Licenses and Permits issued for The Project.	**Yes** The Contractors will complete Table 5.1. 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 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 5.
6	**Management Plans & Available Information** Management Plans include the following: • Appendix A Emergency Response Plan (ERP) • Appendix B Surface Water Management Plan • Appendix C Peat and Spoil Management Plan • Appendix D Decommissioning Management Plan	**Yes** The Contractors are 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 form

Section	Title & Brief Description	Contractors Development Required
		the Contractors Environmental Plans (for example, Peat and Spoil Management Plan). Table 6.1 lists all Management Plans and provides information on Contractor's responsibilities.

2 PROJECT INFORMATION

2.1 SITE LOCATION AND SCHEME DESCRIPTION

The Site boundary area extends to approximately 26.84ha all of which is owned by private third-party landowners. The Site is characterised by a combination of agricultural grassland and cutover peatland bog. The Redline Boundary extends to 36.77ha. The Site is located 3km north-west of Kilrush, Co. Clare, 6.8km south-west of Cooraclare village, and 7.1km north of the county boundary between counties Clare and Kerry. The Project which includes all the work within the Redline Boundary and the temporary works outside the Redline Boundary is shown in Figure 2.1a and 2.1b.

Figure 2.1a Moanmore Lower Wind Farm Layout

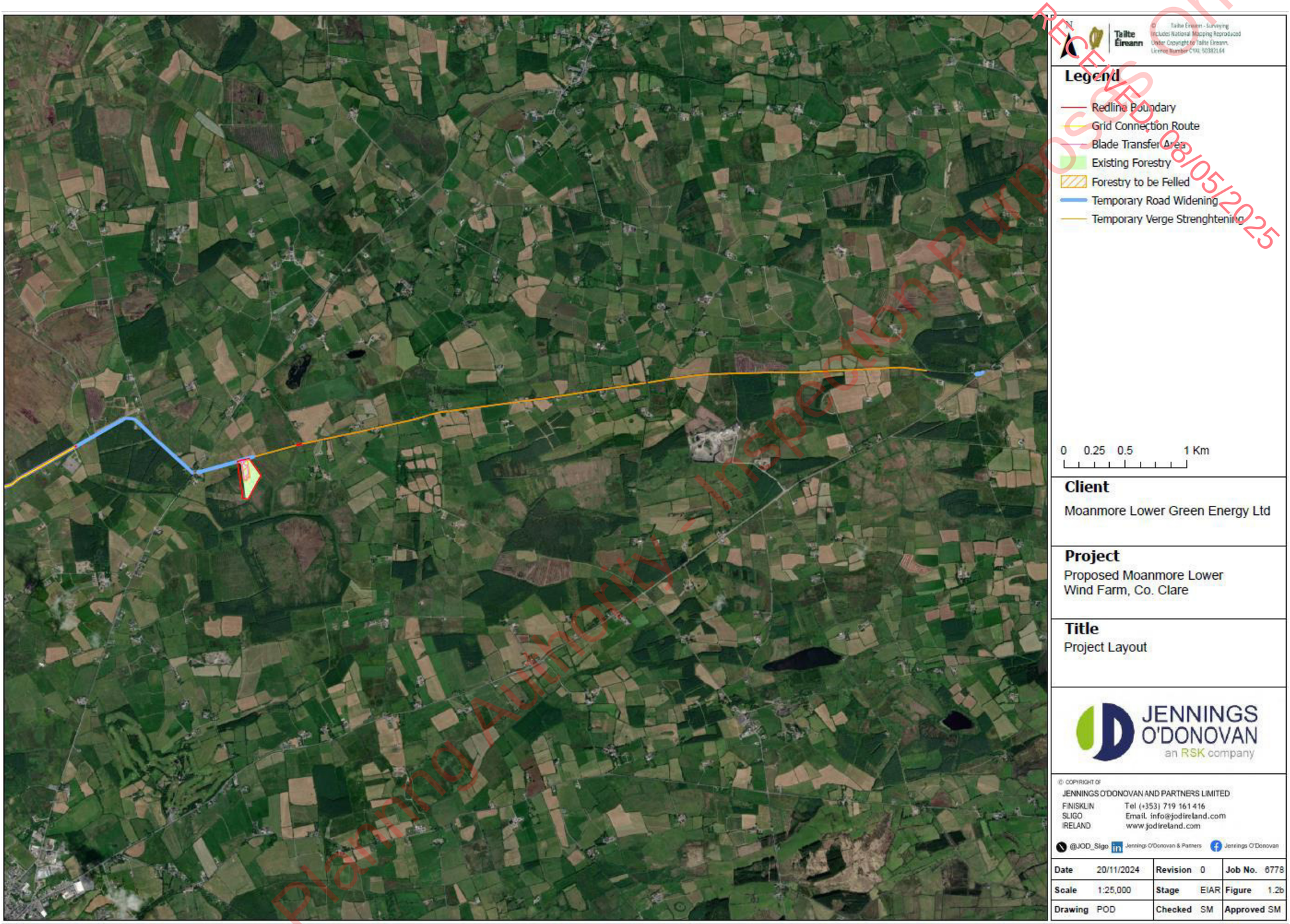


Figure 2.1b Moanmore Lower

Wind Farm Layout

The proposed Development will consist of the following:

- Erection of 3 no. wind turbines with an overall ground to blade tip height of 150m, with a rotor diameter of 136m and a hub height of 82m and a total generating capacity of 15MW,
- Construction of turbine hardstand areas and turbine foundations,
- Construction of new internal site access tracks and upgrade of existing site track, to include all associated site drainage,
- Construction of 1. no new site entrance along the turbine delivery route with access onto the adjoining local road network (L6132),
- Construction of 1 no. temporary construction compound with associated temporary site offices, parking areas and security fencing,
- Development of a site drainage network,
- Construction of 1 no. 38kV electrical substation with all associated electrical plant and equipment, security fencing, lightening protection, security cameras and gates, and all ancillary structures and works,
- 1 no. permanent spoil storage area,
- All wind farm internal cabling connecting the wind turbines to the electrical substation,
- All works associated with the permanent connection of the wind farm to the national electricity grid comprising a 38kV underground cable in permanent cable ducts from the proposed, permanent, on-site substation and to the existing Tullabrack 110kV ESBN Substation,
- 2 no. flood compensation areas,
- Vertical realignment of an existing crest curve on the L6132 local road in order to prevent grounding of abnormal load vehicles during delivery of turbine components,
- Ancillary forestry felling to facilitate construction and operation of the development,
- Construction of a blade transfer area off the L6132,
- Provision of 2 no. biodiversity enhancement areas,
- Upgrade of an existing site entrance onto the adjoining local road network (L2034) including the demolition of an existing wall and removal of hedgerow at the site entrance to facilitate abnormal load vehicles during delivery of turbine components and reconstruction of same wall and replanting of hedgerow,
- Landscaping and all associated ancillary works.

The Project which includes the proposed Development as outlined above; it includes improvements and temporary accommodation requirements to the existing public road infrastructure to facilitate delivery of abnormal loads and turbine delivery.

3 ENVIRONMENTAL CONTROLS

This CEMP sets out the key environmental considerations to be taken into account by the contractor during construction of the proposed development. 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 proposed Development, this 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. 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.

- Construction Industry Research and Information Association (CIRIA) (2006) Control of Water Pollution from Construction Sites - Guidance for Consultants and Contractors. CIRIA C532. London.
- CIRIA (2006) Guidance on 'Control of Water Pollution from Linear Construction Projects' (CIRIA Report No. C648, 2006).
- COFORD (2004) Forest Road Manual – Guidelines for the Design, Construction and Management of Forest Roads.
- CIRIA (2015) SuDS Manual, (CIRIA Report C753, 2015)
- Coillte (2009): Forest Operations & Water Protection Guidelines.
- Department of Agriculture, Food and the Marine (2018) DRAFT Plan for Forests & Freshwater Pearl Mussel in Ireland – Consultation Document.
- Forestry Commission (2004) Forests and Water Guidelines, Fourth Edition. Publ. Forestry Commission, Edinburgh.
- Forest Services (2006) Draft Plan for Forestry and Freshwater Pearl Mussel Requirements – Site Assessment and Mitigation Measures.
- Forest Service (2000) Forestry and Water Quality Guidelines. Forest Service,
- IFI (2016) Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters.
- GPP1 (2020) Understanding your Environmental Responsibilities – Good environmental Practices, NetRegs.

- GPP 5 (2018) Works and Maintenance In or Near Water, NetRegs.
- GPP21 (2021) Pollution Incident Response Planning, NetRegs.
- GPP 22 (2018) Dealing with Spills, NetRegs.

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 Project 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. A constraints map was developed for the Project during the design phase (see **Figure 3.1**).

The construction, operation and Decommissioning of the Project 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).

As required under the Safety, Health and Welfare at Work (Construction) Regulations 2013, the Developer shall appoint a Project Supervisor for the Design Process (PSDP) and a Project Supervisor for the Construction Stage (PSCS). The PSDP shall compile a Preliminary Safety and Health Plan (PSHP), which details general information about the Project and envisaged health and safety risks. The PSHP shall be made available to the PSCS. The PSCS shall 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 Project.

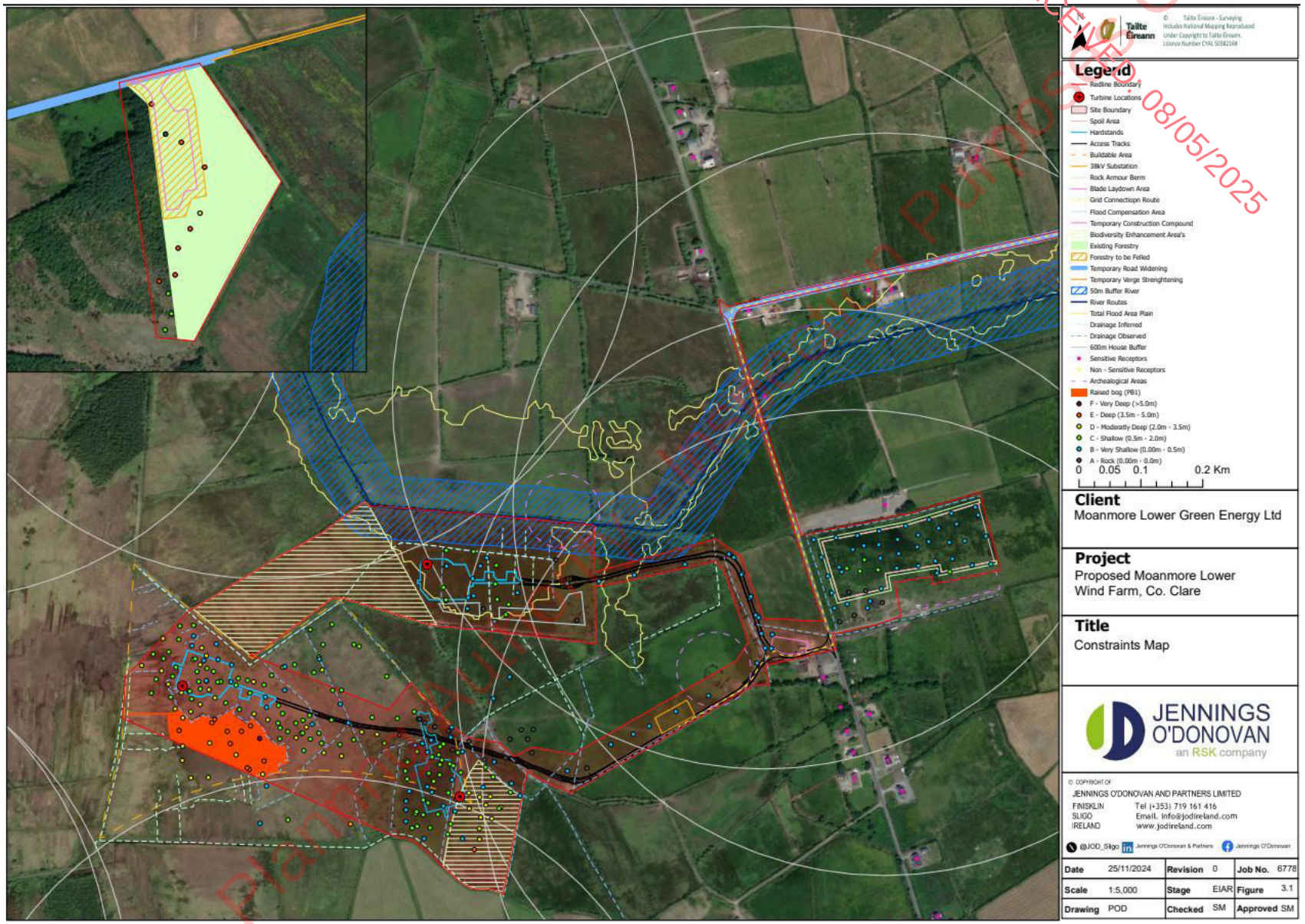


Figure 3.1 Constraints Map

3.2 ECOLOGY

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 this CEMP and method statements are as follows:

- EPA (2022) Guidelines on the Information to be Contained in Environmental Impact Assessment Report (May 2022). Environmental Protection Agency, Dublin
- European Commission (2017) Environmental Impact Assessment of Projects. Guidance on the preparation of the Environmental Impact Assessment Report. (Directive 2011/92/EU as amended).
- Inland Fisheries Ireland (2016) Guidelines on protection of fisheries during construction works in and adjacent to waters.
- 'Transport Infrastructure Ireland (TII) (formerly (NRA) (2006a) Guidelines for the Treatment of Badgers prior to the Construction of National Road Schemes. National Roads Authority
- 'Guidelines for the protection and preservation of trees, hedgerows and scrub prior to, during and post construction of National Road Schemes' (National Roads Authority, 2006a)
- 'Guidelines for the treatment of bats during the construction of national road schemes' (National Roads Authority, 2006b)
- TII (formerly (NRA)) (2008) Guidelines for the Treatment of Otters prior to the Construction of National Road Schemes. National Roads Authority
- Transport Infrastructure Ireland (TII) (formerly (NRA 2008) Guidelines for the crossing of watercourses during the construction of national road schemes
- Transport Infrastructure Ireland (TII) (formerly (NRA) (2009a) Guidelines for the Assessment of Ecological Impacts of National Road Schemes (Rev 2). National Roads Authority, Dublin
- Transport Infrastructure Ireland (TII) (formerly (NRA)) (2009b) Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes (Rev 2). National Roads Authority
- Guidelines on the Management of Noxious Weeds and Non-Native Invasive Plant Species on National Roads' (National Roads Authority, 2010)

The description of mitigation measures is provided in terms of mitigation by avoidance, reduction and remediation.

3.2.1 Ecology Mitigation Measures

3.2.2 Designated sites

The **EIAR Chapter 6 Biodiversity** has identified pathways between the proposed Project and two European sites (Lower River Shannon SAC and River Shannon and River Fergus Estuaries SPA), as well as the Poulnasherry Bay pNHA. The pathways are via the local drainage system and the Moyasta River.

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

The mitigation proposed to maintain water quality in the drainage channels and watercourses which drain the Site are detailed in **Section 3.5** of this CEMP. 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 impacts on water quality at the Site. A 50m buffer zone around watercourses and at least a 10m buffer at main drains will be implemented at the Site which will largely result in the avoidance of sensitive hydrological features. Direct discharges to surface waters of dewatered loads will not be permitted under any circumstances (See **Section 3.5.3** for dewatering mitigation measures). This in turn will avoid or reduce the potential for adverse impacts on downstream designated sites.

This CEMP requires the contractor to appoint an Ecological Clerk of Works (ECoW), with experience in overseeing wind farm construction projects, for the duration of the construction phase. The ECoW will have responsibility for ensuring the CEMP is implemented and have oversight for compliance with all planning conditions relating to ecology.

This CEMP provides a contractual commitment to mitigation and monitoring and reduces the risk of pollution whilst improving the sustainable management of resources. The environmental mitigation for the Project will be managed through this CEMP and will be secured in contract documentation and arrangements for construction and later phases, to ensure there will be a robust mechanism in place for their implementation. This CEMP

addresses the construction phase, and will be continued through to the commissioning, operation, and final decommissioning phases.

The mitigation detailed in **Section 3.5** will apply to all watercourses associated with the Project site and will thus provide protection to the connected designated sites.

3.2.3 Habitats

3.2.3.1 Mitigation for habitat loss

The project will result in the permanent loss of an estimated 3.07 ha of habitats on the wind farm Site, as well as the loss of 0.845 ha of conifer plantation at Tullabrack East for the blade set-down area. The majority of the habitat loss at the wind farm site comprises wet grassland or semi-improved/improved grassland, which is not of significant conservation importance and is not rated as a key ecological receptor.

However, there will be loss of: (i) an area of approximately 0.8 ha of cutover bog as a result of the construction of T2 turbine, and (ii) a small area (200 m^2) of Molinia meadow as a result of the construction of T3 turbine. These losses will be offset through a Biodiversity Enhancement and Management Plan (BEMP) attached as **Appendix E**.

An estimated 20 m of hedging will be lost due to track construction. A further 70 m of former hedging (now an overgrown willow strip) will be lost at the entrance to the blade set-down area at Tullabrack East. To offset this loss, and following best practice, a minimum of 180m of compensatory hedging will be replanted within the redline boundary of the wind farm site as detailed in the BEMP. In addition, an estimated 175 m of hedging will be removed along the boundary to the west of T1 location to provide a buffer for bats. This is a low hedge dominated by gorse and bramble. At T2 and T3 locations, there is no hedging to be removed for bat buffers. Habitat loss associated with the proposed Development is detailed in **Table 3.1.**

Table 3.1 Habitat loss for the proposed project (before mitigation / enhancement)

Infrastructure	Habitat Type	Permanent Area of Loss (Ha)	Temporary Area of Loss (Ha)
T1 hardstand & foundation	Wet-Grassland (GS4)	0.7285	
T3 hardstand & foundation	Wet-Grassland (GS4)	0.537	
Access Track to T1	Wet-Grassland (GS4)	0.123	
Access Track to T3	Wet-Grassland (GS4)	0.0174	
Flood Compensation Areas	Wet-Grassland (GS4)		0.343
T2 hardstand & foundation	Cutover Bog (PB4)	0.5995	
Access Track between T2 and T3	Cutover Bog (PB4)	0.18	
T3 hardstand & foundation	Cutover Bog (PB4)	0.078	
Substation	Semi-Improved Wet Grassland (GS4/GA1)	0.176	
Access Track	Semi-Improved Wet Grassland (GS4/GA1)	0.533	
Contractors Compound	Semi-Improved Wet Grassland (GS4/GA1)		0.131
Spoil Storage Area	Semi-Improved Wet Grassland (GS4/GA1)		0.189
Access Track to T1	Improved grassland (GA1)	0.084	
Flood Compensation Areas	Improved grassland (GA1)		0.2525
T2 hardstand & foundation	Molinia meadow (GS4)/ Cutover Bog (PB4)	0.0185	
Blade Transfer Area	Conifer Plantation (WD4)	0.845	
Access track to T3	Hedgerow	0.002	
Blade transfer area	Hedgerow	0.007	
Site Entrance	Hedgerow		0.025
Total		**3.92**	**3.41**

The new plantings, which will be a minimum of 530 m, *i.e.* twice the total loss, will comprise native hawthorn and willow (*Salix aurita* and/or *Salix cinerea* subsp. *oleifolia).* All plantings will be of certified Irish genetic stock. Planting will be along the boundaries of fields where there is either no existing hedging (usually just a drainage ditch) or where there is an existing hedge that is poorly grown with gaps and may require bolstering. Details of the planting programme are within the Biodiversity Enhancement and Management Plan (**Appendix E).**

The habitats for the Site are show on in Figure 3.2.

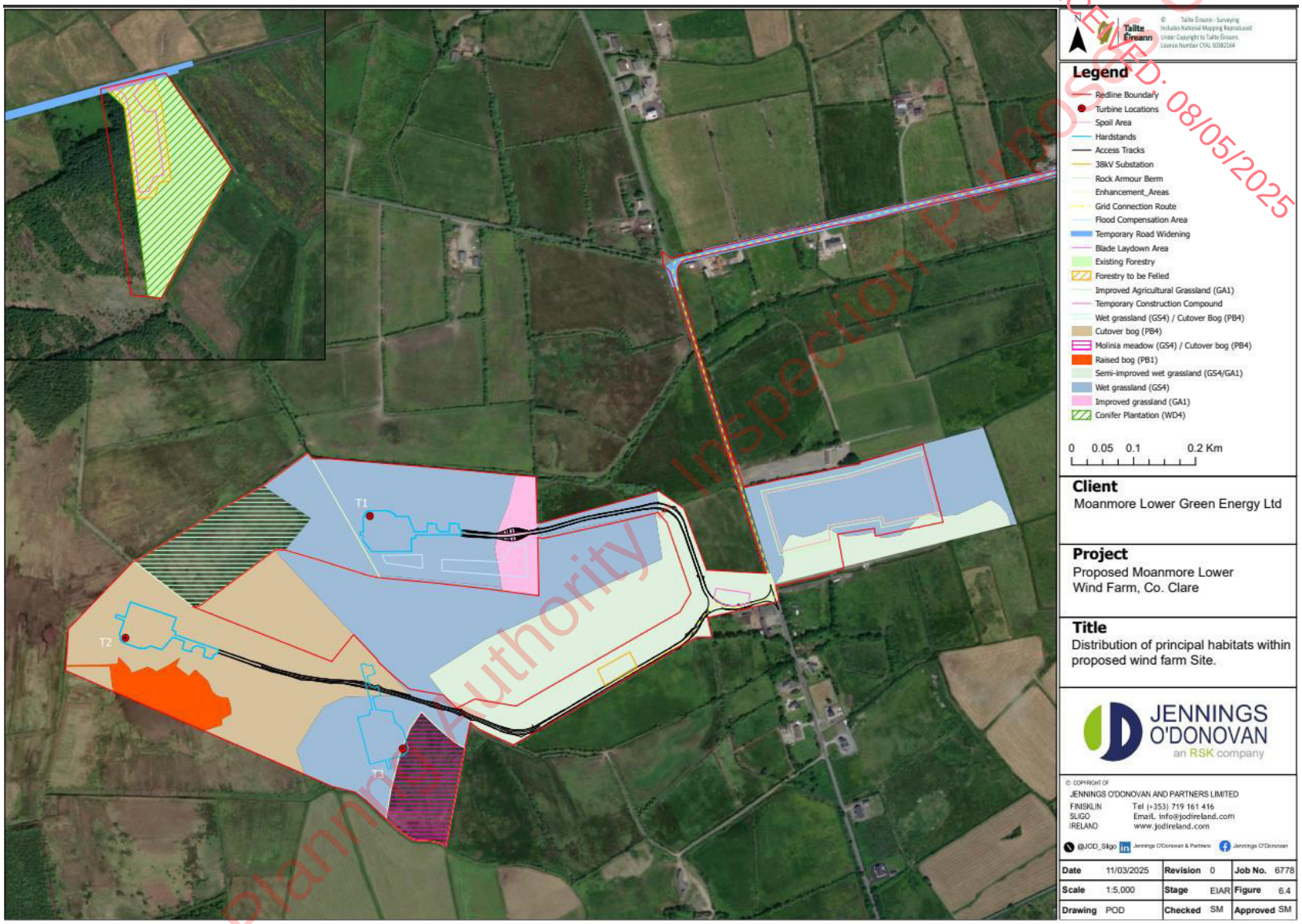


Figure 3.2 Habitat Map

3.2.3.2 *Mitigation for habitat loss*

The project will result in the permanent loss of an estimated 3.9 ha of habitats on Site. The majority of the habitat loss at the wind farm site comprises wet grassland or semi-improved/improved grassland, which is not of significant conservation importance and is not rated as a key ecological receptor.

However, there will be loss of: (i) an area of approximately 0.8 ha of cutover bog, rated as a Significant Negative effect, as a result of the construction of T2 turbine, and (ii) a small area (200 m^2) of Molinia meadow as a result of the construction of T3 turbine, rated as a Slight Negative effect. These losses will be offset through a Biodiversity Enhancement and Management Plan (**Appendix E**).

An estimated 20 m of hedging will be lost permanently due to a new access track on approach to T3. A further 70 m of former hedging (now an overgrown willow strip) will be lost permanently at the entrance to the blade transfer area at Tullabrack East. In addition, an estimated 175 m of hedging will be removed along the boundary to the west of T1 location to provide a buffer for bats. This is a low hedge dominated by gorse and bramble. At T2 and T3 locations, there is no hedging to be removed for bat buffers. A further 25m of hedgerow will be lost at the site entrance. In total, 265 m of hedgerow habitat will be lost.

Hedgerows will be reinstated where possible (at the site entrance) and where reinstatement is not possible (due to permanent works or around bat buffer zones), replacement on a like-for-like basis within the redlined boundary will occur.

Additional hedgerow habitat will be created to offset the loss following best practice, a minimum of 530 m, *i.e.* twice the total loss, will be replanted within the redline boundary of the wind farm site.

The new plantings will comprise native hawthorn and willow (*Salix aurita* and/or *Salix cinerea* subsp. *oleifolia).* All plantings will be of certified Irish genetic stock. Planting will be along the boundaries of fields where there is either no existing hedging (usually just a drainage ditch) or where there is an existing hedge that is poorly grown with gaps and may require bolstering. Details of the planting programme are within the Biodiversity Enhancement and Management Plan (**Appendix E**).

3.2.3.3 Mitigation to minimise disturbance of cutover bog

Inevitably the construction works will cause disturbance to cutover bog habitat around the turbine and hardstand for the T2 turbine and along the access road, 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, a programme of ongoing monitoring and rehabilitation will be followed during construction phase.

Restricted access to cutover bog

At the commencement of works at the T2 location, the required work footprint on the bog will be identified and the area will be marked by a rope fence (using range poles or similar) and with appropriate signage. No activities will be allowed outside of this agreed work area. The ECoW will inspect the area regularly whilst works are on-going at T2. Excavated peat and other material will be removed to the approved storage area with no storage of spoil or materials on unplanted bog or in areas immediately adjoining the bog. The fence will remain in place until the works are fully complete.

Re-vegetation of bare surfaces

Mitigation is required to minimise the area of exposed peat surface and to encourage revegetation. This will be achieved by removing suitable areas of the vegetated cutover bog surface (cut out as sods or 'turves') within the work footprint at T2 and including the section of access track over the cutover bog. This material will be stored appropriately on-site, and reused to re-instate areas around the turbine, hardstand margins and along the edges of the access tracks. It is noted that wet areas of the bog surface (such as along old drains) and/or undulating areas at old peat banks are unlikely to be suitable for the removal of peat turves (however, such surfaces will be removed and stored separately from sub-soils for later surface re-instatement works.

The surface turves of vegetated bog will be dug out to a minimum depth of approximately 30 cm using a dumper/digger with a bucket. Care will be taken to keep the turve as intact as possible and the vegetated side upwards (though this is not always possible). The turves will be loaded to a trailer and transported to a pre-identified storage area. The storage area will be located in an area of Site (not vegetated bog) where disturbance during the storage period will not occur. The turves will be off-loaded from the trailer and placed side by side and vegetation side upwards. They will be placed in single layers, *i.e.* not piled on top of each other. Should storage be for prolonged periods (months), the turves may need to be watered during dry spells. When ready for placement at the finished turbine/hardstand/track, they will be lifted with a dumper and bucket and taken to the

destination. Here they will be off-loaded, 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 and is highly effective in reducing the potential for surface erosion. All of the above will be monitored by the ECoW.

3.2.3.4 Mitigation to minimise disturbance of Molinia meadow

While the encroachment into the Molinia meadow by the construction of turbine T3 is fairly minor (estimated 200 m^2), care is required to minimise disturbance to the meadow area adjoining the work area.

As described for cutover bog, at the commencement of works at the T3 location, the required work footprint within the Molinia meadow will be identified and the area will be marked by a rope fence and with appropriate signage. No activities will be allowed outside of this agreed work area. The ECoW will inspect the area regularly whilst works are on-going at T3. The fence will remain in place until the works are fully complete.

In addition, some of the grass surface will be dug out and stored during the construction phase and later replaced over the disturbed surface around the turbine foundation. This will follow the same procedure as described for the cutover bog, though a smaller amount of sods will be required as only the actual turbine protrudes into the Molinia meadow.

3.2.4 Otter

Otter occurs along the Moyasta River, as well as in Poulnasherry Bay. While the baseline survey did not record any presence of otter in the immediate vicinity of the Site, a pre-construction survey will be carried out along the stretch of river which skirts the project redline boundary, and upstream and downstream of the boundary, should more than 24 months have elapsed since the baseline 2024 survey (NRA 2008). Should an active holt be located in the immediate area of the proposed works, measures may need to be taken to evacuate the animals from the holt to ensure that there is no disturbance to breeding animals (ensuring all the necessary consents are in place).

The mitigation proposed to maintain water quality in the aquatic zones (as detailed in **Section 3.4**) will ensure that the food supplies for otters within local watercourses are not affected by contaminants generated by the proposed Development.

3.2.5 Common frog and common lizard

The common frog is widespread on Site, occurring within both wet grassland fields and cutover bog. 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. The licence will have been sought before construction in anticipation that frogs will be encountered.

During the walk-over survey for presence of the common frog, any common lizards observed will be removed from the work area and placed on bog elsewhere within the site.

3.2.6 Bats

3.2.6.1 Construction phase mitigation

3.2.6.1.1 Tree and hedgerow clearance

Some sections of hedgerow (WL1) and coniferous plantation (WD4) habitat removal is required to accommodate the development of the new site access tracks and buffer areas for bats. Also, NatureScot (2021) recommends a minimum 50 m buffer from the blade tip to the nearest key habitat features (e.g. hedgerows) to be implemented to avoid encouraging bat activity within the 'blade-swept' area. These areas will be maintained vegetation-free during the operational life of the development. The clearance area surrounding each individual turbine was calculated using the formula presented below (after NatureScot 2021).

Calculate the distance between the edge of the feature and the centre of the tower (b) using the formula:

$$b = \sqrt{(50 + bl)^2 - (hh - fh)^2}$$

where:
bl = blade length,
hh = hub height,
fh = feature height (all in metres).

For the example shown, b = 69.3m.

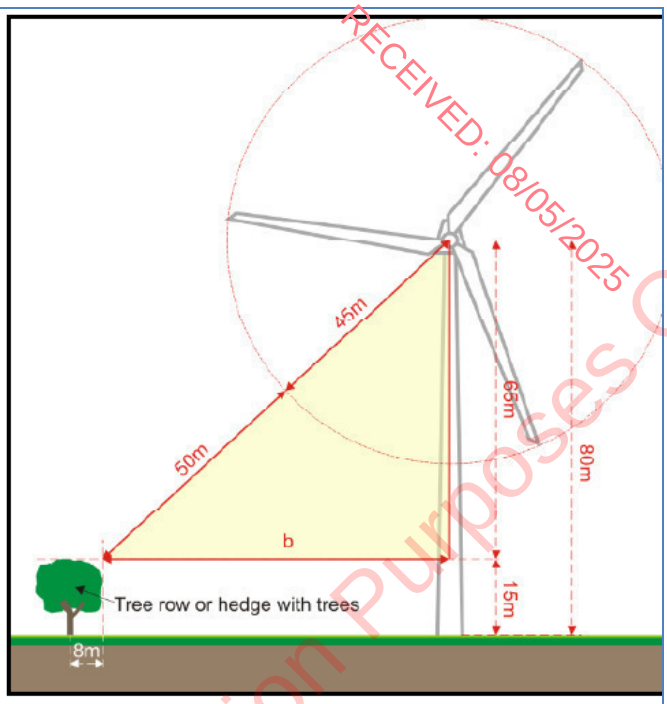


Illustration © Entec Ltd.

T2 will be located within a cutover bog without significant landscape features and no clearance buffer is required for this turbine. Similarly, T3 will be located within a grassland field with no significant landscape features, besides a deepened drain with a strip of gorse and bramble along its bank. It is considered that vegetation removal in this instance is not required. The remaining T1 will be placed within an improved agricultural field, with a low gorse dominated hedge west of the proposed turbine (approx. 2-3 meters high), running north to south, which will be removed to avoid encouraging bat activity in the 'blade-swept' area. No trees of any significant height are present proximal to the proposed locations. For this turbine, a recommended minimum clearance distance of 87.6m from the centre of the tower was calculated.

A comprehensive survey effort was carried out in relation to potential roost features in structures following Collins (2023). Disused structures of 'Low' to 'Moderate' suitability for roosting bats were identified along both grid connection routes assessed and the TDR. No evidence of historic or contemporary roosting was identified at the time of the surveys. Additionally, private residential dwellings are located along the grid connection route and the relevant section of the TDR which were not surveyed internally as part of this assessment. Considering the scale and extent of the proposed facilitation works along the grid connection routes and turbine delivery route, it is not likely that these structures will be significantly affected by the construction phase impacts and thus no mitigation measures are considered.

Construction operations will take place during the hours of daylight in as far as possible to minimise disturbances to bats and other wildlife. It is recognised that key works such as turbine delivery and erection may require night-time working. Two 17m high lightning monopole protection masts are proposed at the control building and a warning light will be fixed to two of the turbines. Otherwise, motion sensitive lighting only will be used.

3.2.6.2 Operation phase mitigation

A 'High' level of overall collision risk has not been identified for any bat species in any of the bat activity seasons. Based on best available information, a 'Medium' overall collision risk level has been identified in relation to high-collision-risk bat species, across all three activity seasons, with the exception of a 'Low' risk for *Nathusius' pipistrelle* in the autumn period.

In addition to the creation of buffers between the proposed turbines and surrounding vegetation (discussed above) reduced rotation speeds will be implemented when turbines are idling. 'Feathering' of idling blades may reduce fatality rates by up to 50% and does not result in loss of output (NatureScot, 2021). No additional control measures to avoid/reduce collision related bat fatalities are considered warranted for this project.

There will be 8 no. bat boxes erected at suitable locations, in consultation with a bat-licensed Ecologist. 'Woodcrete' bat boxes will be used as they are durable and do not require maintenance. A mixture of bat box types should be used to cater for seasonal and species requirements. The following products (or similar) are suitable:

- Schwegler 1FS Colony Bat Box 95
- Schwegler 2F Universal Bat Box
- Schwegler 2FN Bat Box 55

Bat boxes will be installed on suitably large trees or specially installed poles. Boxes will be installed at a minimum height of 4 meters above ground level, at suitable aspects (not northern) and in locations which are inaccessible to unaided climbing and not vulnerable to artificial light or noise pollution. Monitoring of proposed bat boxes will be carried out by a bat-licensed Ecologist, and relocation of any boxes with no evidence of use in the first year after construction.

All permanent lighting systems will be designed in accordance with ILP (2023)[1] in order to minimise nuisance through light spillage. All non-essential lighting will be switched off during

[1] https://theilp.org.uk/publication/guidance-note-8-bats-and-artificial-lighting/ [Last accessed on: 23/01/2024]

the hours of darkness. No artificial lighting will illuminate any trees or structures with potential to be used by roosting bats to prevent disturbance to bats roosting within upon emergence and re-entry. To reduce the ecological disturbance from artificial lighting, the following guidance is recommended:

- Reduce non-essential external night lighting.
- Lower the angle of external night lighting.
- Use of LEDs, as these emit minimal ultra-violet light.
- White and blue wavelengths should be avoided; wavelength will be <2,700 kelvin.
- Lights should peak higher than 550nm.

3.2.6.3 Grid connection route mitigation for bats

No trees of PRF-M suitability were recorded along either grid connection route assessed. Additionally, no tree clearance or tree trimming works are proposed to facilitate the grid connection. Due to the limited and temporary nature of the works proposed, no further surveys or other mitigation measures are considered necessary.

3.2.6.4 Turbine Delivery Route Mitigation for Bats

Enabling works along the proposed turbine delivery route will result in the loss of 0.0845 ha of conifer plantation to facilitate the blade set-down area and approximately 70 m of hedgerow. It is considered that that further survey of trees with a decreasing probability of use by roosting bats including "coniferous plantation with no specimen trees" is not warranted (Marnell et al., 2022). Although no evidence of current or historic roosting by bats was recorded along the TDR at the time of survey, the assessment was based on the design information to date and will be subject to future assessment and application, should a delay of more than 24 months occur between this survey and the proposed works. Surveys will be carried out according to Collins (2023). If required, a derogation license will be secured in advance of any tree-felling works, if any, and appropriate mitigation measures will be put in place to avoid or reduce impacts on bats

3.2.6.5 Decommissioning phase mitigation for bats

The potential for impacts during decommissioning are similar to those assessed for the Construction Phase. All decommissioning works will be governed by the same requirements to control run-off or potential pollution to watercourses (feeding resources for bats), as have been implemented during the construction phase. The site compound will need to conform to the construction phase mitigation measures including those related to lighting design.

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 Spoil Management Plan and a Waste Management Plan (see **Appendix C and D** respectively) have been prepared which provide further details of control measures and monitoring procedures.

3.3.1 Mitigation by avoidance

A process of "mitigation by avoidance" was undertaken by the EIA team during the design of the turbine and associated infrastructure layout. Arising from the results of this study, a constraints map (**Figure 8.8**) was produced that identifies areas where geotechnical constraints (deep peat and saturated areas) could make parts of the study area less suitable for the Project. The infrastructure design sought to avoid those areas as much as possible. The layout plan was reviewed and the best layout design available for protecting the existing geotechnical, geological (and hydrological) regime was identified, while also incorporating engineering constraints and avoiding other environmental and ecological constraints.

3.3.1.1 Engineering controls

Following mitigation by avoidance where areas of peat were unavoidable engineering controls were used for the design of access tracks. Newly constructed site access tracks in areas with peat greater than 1m deep will be of a floating road construction type, using layers of geosynthetic materials and aggregates. Site access tracks on peat less than 1m deep will generally be constructed using traditional cut and fill methodology.

Floating roads can help to reduce the impact of the construction phase on the underlying peat by reducing the amount of peat excavated and reducing the quantities of imported aggregate. The floating tracks will be monitored by a civil/geotechnical engineer at a reasonable frequency during the construction, operation and decommissioning of the wind farm.

3.3.2 Land take

The turbines and other infrastructure are located in areas where the existing track infrastructure is utilised, and the topography and geology are favourable. Similarly, infrastructure has been designed such that the areas of land take are to be located outside of buffer zones for sensitive receptors and constraints areas.

Land take along the TDR will be reinstated following the delivery of the components. Works along the GCR will be reinstated following the laying of route. Following construction, temporary construction areas will be reinstated reducing the land take during the operational phase.

3.3.3 Soil compaction and subsidence

By design, the development footprint utilises any existing infrastructure, avoids areas of deep peat and the footprint has been limited as far as practicable. This helps to reduce the overall area of potential soil compaction and subsidence.

The waterlogged Spoil Storage Area will be drained to increase load bearing capacity of the underlying soil prior to constructing the edge berms which will be brought down to competent ground. A rock berm and silt fencing will be installed around the spoil storage area. The runoff from the spoil area, will directed to an appropriately sized settlement pond before being discharged to an existing drain that flows for 640m before entering the Order 1 Durha stream.

Vehicular movement will be limited to the development footprint as far as practicable to prevent the damage and compaction of soils outside of the construction area.

Excavation volumes have been minimised through the design phase by avoiding excessive cut and fill during construction and by the orderly management of materials. This will result in reduced site traffic and a reduction in the potential for additional compaction.

3.3.4 Soil sealing

There is potential for soil sealing at some locations at the wind farm site due to the use of impermeable material, typical of most types of construction particularly in greenfield sites. The effect of soil sealing will be mitigated by reducing the area where impermeable material is used and using semi permeable material where possible, to allow water to pass through and preserve the health of the underlying soil. Site access tracks across peat greater than 1m deep will be floated using layers of geosynthetic materials and aggregates. The use of semi permeable material will reduce changes to the geotechnical and hydrogeological attributes compared to impermeable material.

3.3.5 Soil erosion and degradation

Erosion and degradation of exposed soils will occur primarily during the construction phase. Mitigation against the potential effects, includes:

- Limiting the amount of exposed soil at any one time.
- Limiting vehicular movement to the development footprint as far as practicable.
- Ceasing construction activities during periods of sustained significant rainfall events, or directly after such events.
- Covering exposed temporary stockpiles with plastic sheeting during periods where works have temporarily ceased (e.g., weekends / overnight) and ahead of heavy rainfall / storm alerts.
- Where possible when excavating peat, the upper vegetative layer will be stored separately from subsoil and with the vegetation part of the sod facing upwards 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.
- Reusing soils and subsoils as quickly as possible.
- Any areas not required for operation will be reinstated, including drainage, to minimise future erosion of the soils.
- Following the construction phase, temporary areas and drainage will be reinstated and revegetated so as to minimise future erosion of the soils.
- No stockpiles will remain on site following the construction phase of the Project.
- Peat on site will be managed as per the Peat Spoil Management Plan (**Appendix Appendix C**).

3.3.6 Subsoil and bedrock removal

The proposed turbines and infrastructure layout was dictated to a large degree by the existing infrastructure, peat depth and the topography, locating turbines in areas where the existing infrastructure is utilised, peat is shallow, and the topography is favourable. Engineered cut and fill extents which have been designed to minimise the volumes of subsoils to be removed either directly by excavation (turbine foundations) or as a function of cut and fill requirements (hardstands).

Mitigation measures to reduce the effects to the natural soil profile from excavation activities include minimising excavation, appropriate storage for reinstatement or reuse on site where possible. Soils and excavated material that cannot be used on site will be moved to a licensed facility will be treated as an Article 27 by-product where possible. Peat Spoil with be will Be used as backfill or reinstatement where possible.

The designated Spoil Storage Area has a capacity of 44,928m^3 for the estimated excavation quantities (**Table 2.7**, **Appendix C**). Refer to The Peat Spoil Management Plan (**Appendix Appendix C**) for additional detail on the management of peat.

- All soil and subsoil types or horizons identified construction, will be treated as separate materials and arisings separated accordingly. This includes, for example acrotelm peat, catotelm peat, topsoil, clays, subsoils, weathered rock. Therefore, during reinstatement works, the soil profile can be returned to as close to baseline as possible with material in identified soil horizons.
- Peat material excavated will be reused as backfill in areas previously excavated as much as possible, and/or for reinstatement works elsewhere on the Site. These areas include exposed areas around infrastructure such as slopes or graded ground around Site access tracks, turbine hardstands and foundations. Excavated peat will also be reinstated in degraded cutaway bog. To facilitate this, the acrotelm (living layer) and the catotelm (lower layer), will be treated as two separate materials. Catotelm peat will be used to backfill, for example in the working space around turbine foundations. Acrotelm peat will be used as a dressing on top of deposited catotelm peat in order to promote and re-establish flora and ensure the acrotelm layer becomes relatively cohesive in terms of localised peat stability (vegetated).
- While excavated bedrock is not expected on site, if it is encountered it will be re-used on site wherever possible for construction of site access tracks and/or turbine hardstands or as ballast on top of turbine foundations. Using the local bedrock as fill will ensure that effects to hydrochemistry are minimised.

3.3.7 Soil contamination

Soil contamination, or the potential for contamination, is an inherent risk associated with any development. Protecting soils from contamination from construction materials such as hydrocarbons, drilling fluids and other contaminants will, in turn, mitigate against the potential for contaminants reaching the hydrological network associated with the site and therefore additional sensitive receptors.

- As discussed, construction activities will be restricted to the footprint of the development, therefore the potential for contaminants reaching soils is likely limited to the footprint of the development or construction area.
- Dedicated, bunded storage areas will be used for all fuels or hazardous substances.
- Any and all contaminants including any contaminated soil will be removed from the site in an appropriate manner if and when they should be produced or observed, and suitable remediation work undertaken.
- A suitably qualified Resident Engineer will be present on site to supervise construction activities.
- In the event of a significant contamination or pollution incident e.g., discharge or accidental release of hydrocarbons / fuel, contamination occurrences will be addressed

immediately, this includes the cessation of works in the area of the spillage until the issue is resolved. If necessary, the relevant authorities will be notified, and stakeholders will also be promptly informed.

3.3.7.1 Release of hydrocarbons

- Any vehicles coming onto the site will be required to be inspected and cleaned before leaving the temporary construction compound and advancing to the construction area. Machines will be inspected twice a day during the day to check for leaks.
- Onsite re-fuelling of plant and machinery will be carried out using a mobile double skinned fuel bowser:
- The fuel bowser, a double-axel custom-built refuelling trailer will be re-filled off site, and will be towed around the site by a 4x4 jeep to where machinery is located;
- The 4x4 jeep will also carry fuel absorbent material and pads in the event of any accidental spillages.
- The fuel bowser will be parked on a level area in the construction compound when not in use and only designated trained and competent operatives will be authorised to refuel plant on site.
- All machinery will carry a spill kit.

In the event of an accidental spill of hydrocarbons, contamination occurrences will be addressed immediately (as outlined in the CEMP). This includes the cessation of works in the area of the spillage until the issue is resolved. No materials contaminated including soils will be left on the site.

With appropriate environmental engineering controls and measures, this potential risk can be significantly reduced.

3.3.7.2 Imported aggregate

To mitigate against the potential effects of importing contaminated aggregate to the land and soils, only verified clean, inert material with an Article 27 declaration will be used. A list of local quarries is provided in **Table 2.5, Chapter 2** as indicative of where the material may come from.

Imported rock will be locally sourced and conform to relevant standards, it will not change the baseline conditions.

3.3.8 Stability

Peat and slope stability investigations at the wind farm Site indicate that the area has a low risk probability with respect to peat slippage and slope failure under the footprint of the development.

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 this CEMP, which will be updated by the civil engineering contractor and agreed prior to any Site works commencing.

3.3.8.1 General stability

An experienced civil engineer / geotechnical engineer / engineering geologist will be employed during the construction phase to monitor excavation activities, to verify that safety standards are being met and monitor for any potential stability issues, particularly in areas of deep peat or where there are deeper excavations.

Emergency responses to potential stability incidents have been assessed and established to form part of the CEMP, Emergency Response Plan.

Construction activities will not occur during periods of sustained significant rainfall events, or directly after such events. Vehicular movements will be restricted to the footprint of the development.

3.3.8.2 Stockpile stability

- Short term stockpilings will be limited to the footprint of the development, outside of any sensitive buffers, slopes or areas which are indicated as high risk. Stockpiling will only in areas which have been risk assessed.
- No stockpiles will be placed in the area to the west and south of T2.
- Short term temporary stockpiles will be limited to 1m height and removed for reuse/remediation purposes or transported to the designated Spoil Storage Area where the height will be 2m for peat and 3.5m for soil.
- Stockpiles will have side slopes battered back to a safe angle of repose.
- Exposed temporary stockpiles will be covered in plastic sheeting during periods where works have temporarily ceased (e.g., weekends / overnight) and ahead of heavy rainfall / storm alerts.

3.3.8.3 Designated Spoil Storage Area

Surplus excavated peat will be stored in the designated Spoil Storage Area to the east of the windfarm site. Prior to construction, this area will be drained with new drainage constructed.

- Retention berms will be used at the edge of the permanent storage location to prevent any movement of material from the storage location and mitigate against high organic material entering the surrounding surface water network. Silt fencing will surround the berms. This a specific and appropriate measure for peat storage.
- The stone retention berm will be brought down to firm ground, with peat and soft waterlogged soil removed.
- This permanent storage area will be topped with the excavated top surface layer of acrotelm peat and topsoil excavated from that area to encourage rapid revegetation.
- The Spoil Storage Area will be monitored daily during the construction phase.
- The Spoil Storage Arae will drain to an appropriately sized settlement pond before discharging to an existing drain as detailed in the Surface Water Management Plan – **Appendix B** and shown on **Drawing No. 6778-JOD-MM-XX-DR-C-1401**.

3.3.8.4 Peat stability

It is noted that peat depth at the wind farm site is very shallow to moderately deep, and management of saturated peat will be required at relatively few locations.

- In those parts of the Site where excavation may intercept areas of peat that are >1.0m depth, a geotechnical engineer/engineering geologist will be onsite to supervise and manage the excavation works and confirm the necessity for supporting newly excavated peat exposures or redirect initial construction phase drainage to maintain ground stability, particularly around T2.
- Peat will only be stockpiled temporarily in areas of thin or absent peat and only in areas which have been assessed for stability by a suitably experienced geotechnical engineer. Peat will be stockpiled no higher than 2m and will follow the recommendations set out in the (NRA, 2014[2]).
- No temporary stockpiles will be positioned or placed on areas of peat which have not been assessed or are indicated as high risk, including to the south and west of T2.
- In areas of saturated peatlands, prior to excavation, drains will be established to effectively drain grounds prior to earthworks. Such drains will be positioned at an oblique angle to slope contours to ensure ground stability. Drains on areas of the Site with minimal risk of bog failure as identified by Site Investigations will be positioned at

[2] National Roads Authority (2014), Guidelines for the Management of Waste from National Road Construction Projects

a more acute angle to the slope contour in order to reduce the velocity of surface water drainage.

- Draining water from the construction area will be done through advanced dewatering techniques. In particular, ponding of water will not be allowed to occur in recent excavations, particularly in any areas encountered where peat is >1m deep. All deliberate or incidental sumps will be drained to carry water away from the sump following rainfall to the nearest stilling pond via the constructed drainage network.
- Groundwater level (pore water pressure) will be kept low at all times (excavation dewatering) to avoid ground stability risks (subsidence) associated with peat and careful attention will be given to the existing drainage and how structures might affect it.
- Vehicular access to any areas of deep peat (>1m) during construction will be restricted to low ground pressure vehicles, with all construction vehicles travelling on existing access tracks whenever possible.
- In the unlikely event of a peat stability issue, all ongoing construction activities at the particular area of the Site and all ongoing activities in the vicinity will cease immediately. The assigned geotechnical supervisor will inspect and characterise the issue at hand, before advising on the corrective measures to be implemented.
- Provision for a peat stability monitoring programme to identify early signs of potential bog slides (pre-failure indicators, for example cracks forming). This will be done in line with Scottish Governments' Guidance (2017[3]).

Adhering to the mitigation measures described will minimise the adverse impacts posed by excavation activities, vehicular movements, storage of material and the potential for stability issues arising or affecting the Project will be reduced.

3.4 AQUATIC ECOLOGY

The following sections describe the appropriate mitigation measures for the potential effects, outlined in the previous section, that will be adopted at the construction, operational, and decommissioning stages of the Project.

3.4.1 Embedded Mitigation

The proposed Project incorporates embedded mitigation aimed at minimising the potential significant effects during the design phase. This includes the design principle of maintaining set-backs of 50m for turbines and associated infrastructure from EPA mapped streams and

[3] Scottish Government (2017) Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Developments

rivers (IWEA, 2012) and utilising existing forestry access tracks where feasible. Peatland and agricultural drains at the Site are not considered a major hydrological constraint and therefore a reduced 10m buffer is applied to these.

3.4.2 Mitigation by Avoidance

The greatest risk of significant adverse effects on the aquatic environment will occur during the construction phase of the development. The key to minimising this risk is the siting of all turbine locations and other key infrastructure (including the spoil area) at a minimum set-back of 50m from EPA mapped streams and rivers, (namely the main channel of the Moyasta River following best practice guideline of the Irish Wind Energy Authority (IWEA, 2012).

The only exception to this rule will be where upgrades to pre-existing access tracks that are already located within the 50m buffer zone are required, where unavoidable stream crossings are required. Avoidance of the area to the West and South of T2 is recommended as per the Peat Stability Risk Assessment (**Appendix 8.1**). Peatland and agricultural drains at the Site are not considered a major hydrological constraint and therefore a reduced 10m buffer is applied to these. Every effort has been made to minimise the length of additional Site access tracks. In designing the layout of the access tracks careful consideration has been given to minimise the number of watercourse crossings, and in choosing locations where crossing design can readily achieve the objective of maintaining the potential for unimpeded fish pass and ecological connectivity.

3.4.3 Mitigation by Design

A comprehensive suite of drainage measures has been developed to protect all receiving waters from potential significant effects during the construction of the Project in the catchment, and along the proposed TDR. They are outlined in full in **Chapter 9: Hydrology and Hydrogeology** and are also referenced in the accompanying NIS document. These measures are summarised below. These measures are aimed at preventing sediments or other pollutants from entering watercourses through best practice management and treatment of all surface water run-off from areas of works. The Developer will appoint an Ecological Clerk of Works (ECoW) to ensure compliance during the construction stage with all mitigation measures, planning conditions and legislative requirements related to ecology. They will consult and assist with the Client in evaluating compliance with applicable legislation by means of a monthly Environmental Audit.

The mitigation measures have been incorporated this Construction and Environmental Management Plan (CEMP). This CEMP includes a Surface Water Management Plan (SWMP). The CEMP and SWMP will require mandatory adherence by all parties involved in the construction phase of the Project (including any sub-contractors) in order to protect aquatic conservation interests in the immediate vicinity of the site and downstream. The development of the mitigation measures and all method statements for watercourse crossings follows all relevant guidance and current best practice as detailed in:

- Construction Industry Research and Information Association (CIRIA) (2006) Control of Water Pollution from Construction Sites - Guidance for Consultants and Contractors. CIRIA C532. London.
- CIRIA (2006) Guidance on 'Control of Water Pollution from Linear Construction Projects' (CIRIA Report No. C648, 2006).
- COFORD (2004) Forest Road Manual – Guidelines for the Design, Construction and Management of Forest Roads.
- CIRIA (2015) SuDS Manual, (CIRIA Report C753, 2015)
- Coillte (2009): Forest Operations & Water Protection Guidelines.
- Department of Agriculture, Food and the Marine (2018) DRAFT Plan for Forests & Freshwater Pearl Mussel in Ireland – Consultation Document.
- Atkinson, S., Magee, M., Moorkens, E.A. & Heavey, M. (2024). *Guidance on Assessment and Construction Management in Margaritifera Catchments in Ireland.* https://e-mussels.eu/europe/conservation-guidelines
- Forestry Commission (2004) Forests and Water Guidelines, Fourth Edition. Publ. Forestry Commission, Edinburgh.
- Forest Services (2006) Draft Plan for Forestry and Freshwater Pearl Mussel Requirements – Site Assessment and Mitigation Measures.
- Forest Service (2000) Forestry and Water Quality Guidelines. Forest Service, DAF, Johnstown Castle Estate, Co. Wexford.
- IFI (2016) Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters.
- GPP1 (2020) Understanding your Environmental Responsibilities – Good environmental Practices, NetRegs.

- GPP 5 (2018) Works and Maintenance in or Near Water, NetRegs.
- GPP21 (2021) Pollution Incident Response Planning, NetRegs.
- GPP 22 (2018) Dealing with Spills, NetRegs.
- EU Construction and Demolition Waste Management Protocol - BIBM.
- EPA Best practice guidelines for the preparation of resource & waste management plans for construction & demolition projects.
- IEMA's latest Impact Assessment Guidance, 'A New Perspective on Land and Soil in Environmental Impact Assessment' (Feb 2022)

All turbine locations are located a minimum of 50m from the nearest watercourse. No works will take place within a 50m buffer zone of main watercourses and 10m for the eight drainage channels within the wind farm Site. Hydrological constraints maps have been developed which identified areas of the Site where surface water and drainage constraints resulted in areas of the Site being deemed less suitable for development. The identified constraints have been extensively discussed in consultation with the design team. The final Site layout plan has been identified as the optimal layout design available for protecting the existing hydrological regime of the Site, with due regard to overlaying engineering and other environmental constraints.

Nature Based Solutions (NBS) will be implemented on site where possible. The use of Sustainable Drainage Systems (SuDS) on site will eliminate risk to watercourses from sedimentation during the construction and operational phases of the proposed development. SuDS adopts the following design principles to drainage:

Minimise → *Intercept* → *Treat* → *Disperse* → *Dilute*

Extending or maximising this approach sufficiently has the potential to attain net beneficial effects i.e., a net reduction in runoff rates at the Site, beneficial effects to water quality and reducing flood risk to downstream flood risk areas.

Surface water management measures, including the installation of silt fencing and delineation of buffers will be put in place in advance of the development of the internal road network. All other measures, including the following key elements, are described in detail within this CEMP (**Appendix 2.1**).

- Open constructed drains for development run-off collection and treatment.
- Collection drains for upslope "clean" water collection and dispersion.
- Filtration check dams to reduce velocities along sections of road which run perpendicular to contours.
- Settlement ponds, settlement lagoons and buffered outfalls to control and store development runoff to encourage settlement prior to discharge at greenfield runoff rates.
- Ongoing monitoring of on-site surface water management infrastructure to ensure systems are operated and managed in accordance with best practice
- Post significant rainfall events the surface water management drainage infrastructure will be assessed to ensure no risk of silt laden run off, including discharges from the flood compensation /spoil storage area

There will be no direct site run-off to watercourses during the construction phase with all outflows from drainage via check dams and stilling ponds and buffered outfalls from which treated surface water is released by diffuse overland flow at appropriate locations. To reduce the amount of silt laden water to be treated, clean water drains will be created upstream of the works area to divert water away from construction areas, thereby lessening the volume of water to be treated onsite. This will prevent the risk of suspended solids or dissolved substances entering the watercourses.

Dewatering flow rate or pumping rate will be controlled by an inline gate valve or similar infrastructure. This will facilitate reduction of loading on the receiving drainage and attenuation network, thus enhancing the attenuation and settlement of suspended solids. All pumped water will be discharged to constructed drainage and in line treatment train or to a vegetated surface through a silt bag outside of surface water buffer zones. Dewatering is a dynamic process and will require continuous monitoring and modification depending on conditions encountered.

Contaminated water arising from construction works, namely, excavations, drilling and temporary stockpiling, will be contained and treated prior to release or discharge.

In terms of mapped streams and rivers, the Project will not require any surface water crossings, *i.e.* there will be no in-stream works along the main channel of the Moyasta River. Within the wind farm site, the existing network of drainage channels will need to be crossed at eight locations (see **EIAR Chapter 9 Section 9.7.2.7**). These crossings will be constructed using pre-cast concrete or pre-formed plastic pipes. The GCR will cross the

Moyasta River at one location on the L2034 and trenching within the verge of the Bridge or HDD technology will be implemented for this.

For the laying of the proposed culverts, mitigation will be implemented to ensure that pollutants are not released to downstream waters (**Chapter 9 Hydrology and Hydrogeology Section 9.7.2.1**). There will be no tracking of machinery across any watercourse. Machinery will stay within designated routes (working corridor) within the Site Boundary.

There are 8 proposed water crossings of artificial drains on sites where a 10m buffer will be imposed during the proposed works. Where works are proposed within the buffer zone, i.e. at watercourse crossings additional mitigation measures will be proposed.

Peat Stability

The proposed spoil storage area is located outside of the delineated 50m hydrological buffer zone which was applied to EPA mapped watercourses. During the initial placement of subsoil, silt fences, straw bales and biodegradable matting will be used to control surface water runoff from the storage area.

Where applicable the vegetative topsoil layer of the spoil storage area will be rolled back to facilitate placement of excavated spoil, following which the vegetative topsoil later will be reinstated. Where reinstatement is not possible, the spoil storage area will be sealed with a digger bucket and seeded as soon as possible to reduce sediment entrainment in runoff.

Drainage from the spoil storage area will ultimately be routed to an oversized swale and a number of stilling ponds with appropriate storage and settlement designed for a 1 in 10 year return period before being discharged to the onsite watercourses.

Method statements for watercourse crossings will be prepared at the construction stage and submitted to the ECoW for prior approval, and incorporation in the works program. All banksides in the vicinity of the new crossings will be fully reinstated with vegetation cover as quickly as possible using only native species appropriate to the existing environment.

The risk of landslides occurring on the Site as a result of the proposed Project has been assessed by RSK ("Moanmore Lower Wind Farm, Site Investigation and Peat Stability Risk Assessment", October 2024). The following will be required to minimise any risk of landslides and/or peat movement occurring;

- The use of floating tracks in areas where there is deeper peat (>1m).

- Works will be limited to the development footprint as far as practical (vehicle movements, personnel movements, temporary storage, etc) and otherwise avoiding areas of elevated risk or close to sensitive receptors. This includes avoiding the area to the west and south of T2.
- No temporary stockpiles will be positioned or placed on areas of peat which have not been assessed or are indicated as being geo-hazards, particularly in areas of unacceptable factor of safety / stability including to the west and south of T2.
- No temporary stockpiles will exceed 1 m.
- No permanent stockpiles will remain on site following reinstatement work. Any material not reused on site will be removed to the designated permanent storage location.
- Stockpiles at the permanent storage location will not exceed 2m for peat and 3.5m for soil.
- Earthworks will not occur during sustained or intense rainfall events.
- All works are to be supervised and monitored by a competent person (e.g. Geotechnical Engineer) throughout the construction phase.
- Monitoring of the spoil storage area, particularly during construction, but also in the first 5 years post construction.
- Currently most of the western side of the permanent spoil storage area is waterlogged. Drainage will be constructed in the permanent spoil area.
- Retention berms will be used at the edge of the permanent storage location to prevent any movement of material from the storage location and mitigate against high organic material entering the surrounding surface water network. Settlement ponds and drainage will surround the berms.
- The stone retention berm will be brought down to firm ground, with peat and soft waterlogged soil removed.
- The site is to be monitored at a reasonable frequency during the operational phase of the proposed development. The frequency of monitoring during the operational phase will be conducted at a high frequency (*e.g.* weekly) during the initial months and will reduce gradually (*e.g.* monthly) over the following year minimum, or until site conditions are observed to be stable.
- The spoil material at the permanent storage will need to dry out over a number of years to increase the shear strength. Therefore, the permanent spoil deposition area will require additional monitoring, including restricted access following the construction phase until the storage area is deemed to be stable.

For abnormal load deliveries on the TDR, steel plates are to be placed along the road in ecologically sensitive areas (where the route traverses unprotected watercourses on local roads), resting against the existing carriage way and supported on the verge by sandbags. This includes three TDR river crossings (i.e., the GOWERHASS TULLAGOWER, and BRISLA EAST stream). These steel plates will be placed on 10 metres each side of the water courses. An Ecological Clerk of Works ("ECoW") will be employed from the commencement to completion of construction works and will be onsite to oversee the crossings of the watercourses during the turbine deliveries. The steel plates will only be in use for the duration of the turbine delivery as outlined in Appendix 16.2 (Traffic Management Plan) and will avoid the need for excavation and disturbance of the existing grounds. They will be removed afterwards leaving no significant effect on the surrounding area. This approach for crossing the Tullagower stream at this part of the Doonbeg catchment for turbine delivery will have no physical effect on the watercourses and the potential for effects on the Freshwater Pearl Mussels in the lower Doonbeg catchment is negligible.

3.4.4 Mitigation by Reduction

The specified measures detailed below are aimed at protection of instream aquatic biota within the vicinity of any proposed works at watercourses on the Site but equally with regards to the protection of the downstream population of Freshwater pearl mussel, salmonids, lamprey and eels. With adherence to these measures, there will be no significant effects on any aquatic receptors as a result of the Project These measures are a summary of the principal requirements with full detail being presented in **Chapter 9: Hydrogeology and Hydrology**, which are transposed into this CEMP.

Sediment-laden Runoff and Contamination by Pollutants

During the construction phase the appointed contractor(s) will ensure that the following mitigation is adhered to in line with IFI (2016) *Guidelines on Protection of Fisheries during* Construction Works in and Adjacent to Waters:

- All site drainage, as described in the SWMP (**Appendix B**) and **Chapter 9: Hydrogeology and Hydrology, Section 9.7.2** and shown on associated planning drawings, will be directed through either sediment traps, settlement ponds and/or buffered drainage outfalls to ensure that total suspended solid levels in all waters discharging to any watercourse will not exceed 25mg/l (IFI, 2016). 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 Environmental Manager or Ecological Clerk of Works to ensure satisfactory operation

and/or maintenance requirements. A full specification for the water quality monitoring is presented in this CEMP.

- The storage of hydrocarbons etc., will be undertaken in accordance with current best practice and detailed within **Chapter 9: Hydrogeology and Hydrology, Section 9.7.2.4**,
- All machinery operating at the Site will be fully maintained and routinely checked to ensure no leakage of oils or lubricants occurs.
- Refuelling or maintenance of machinery will not occur within 50m of an aquatic zone or within 20m of any other hydrological feature and where possible, all refuelling on site will be within the temporary compound within the dedicated re-fuelling area. Only essential refuelling will be completed outside of the dedicated refuelling area via use of a mobile bowser, drip kits, and qualified personnel. Any extensions to existing drainage culverts on the Site Access Roads will be undertaken in dry conditions and in low flow.
- During the culvert installation and associated construction work, double silt fences shall be installed immediately downgradient and downstream of the construction area for the duration of the construction phase.
- 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 (see **Chapter 9, Section 9.7.2.5** for further details).
- Raw or uncured waste concrete will be disposed of by removal from the Site and returned to the source location or disposed of appropriately at a suitably licensed facility.
- 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 bunded area will be created to cater for concrete wash-out and this will be located in the Temporary Construction Compound.
- An emergency plan for the construction phase to deal with accidental spillages is included within the **Appendix A** of this CEMP. Spill kits will be available to deal with any accidental spillage in and outside the re-fuelling area.
- Re-seeding / re-vegetation of all areas of bare ground or the placement of geo-jute (or similar) matting will take place prior to the operational phase to prevent silt-laden run-off. Seed mixes will contain only suitable native species of plant that occur in the local area.
- Silt traps erected during the construction phase within roadside and artificial drainage will be replaced with stone check dams for the lifetime of the project. These stone check

dams will only be placed within artificial drainage systems such as roadside drains and not in natural streams or drainage lines.

- A full review of construction stage temporary drainage will be undertaken by the Developer (in conjunction with the Project Hydrologist/ Site Engineer and the Project Ecologist) following the completion of construction, and drainage removed or appropriately blocked where this will not interfere with infrastructure.

Horizontal Directional Drilling

Horizontal Directional Drilling (HDD) is one of two techniques that will be considered for the GCR crossing the Moyasta River at WC01.

- The HDD works are described in detail in the **Chapter 2: Section 2.5.10.2**, as well as in **Chapter 9: Section 9.7.2.11**.
- 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).
- 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.
- The following general mitigations will be implemented during the directional drilling works:
    - No in-stream works will be permitted.
    - Works shall not take place at periods of high rainfall and shall be scaled back or suspended if heavy rain is forecast.
    - A floating hydrocarbon boom and spill kit will be available.
    - Plant will travel slowly across bare ground at a maximum of 5 km/hr. If truck rutting is observed, then bog mats or rolling road will be employed.
    - Silt fencing will be erected at a setback distance of 5 m from the works during excavation.
    - Any excess construction material shall be removed from the works areas and disposed of in a fully licensed landfill.
    - No re-fuelling of machinery will take place on site or within 50 metres of any watercourse.
    - All construction workers will be given a toolbox talk addressing the environmental topics concerning the drilling prior to commencement of construction.

- Also, the Inland Fisheries Ireland published guidelines relating to construction works along water bodies entitled 'Requirements for the Protection of Fisheries Habitats during Construction and Development Works at River Sites" will be adhered to during works at watercourses.

Trenching

The GCR will require excavation of cable trenches in existing roadways. These works are transient in nature with very limited excavation at any one time. Any excess spoil from trenches in public roadways will be removed as it is excavated and transported to a licenced facility. A silt fencing filtration system will be installed on all existing drainage channels for the duration of the cable construction to prevent contamination of any watercourse. Full mitigation measures prescribed for works along the GCR are detailed in **Chapter 9: Hydrogeology and Hydrology, Section 9.7.2.7**.

Clear felling

The Development requires clear felling (0.845 ha) to facilitate the construction of the blade set-down area (see EIAR **Chapter 2: Project Description, Section 2.3.2**). A felling licence will be obtained prior to the commencement of felling activities.

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.

- All of the proposed felling as part of the Project at the Blade Transfer Area is located outside of the 50m self-imposed hydrological buffer zone, therefore no felling which will occur in close proximity to any EPA mapped watercourse. The large distance between the felling area and sensitive aquatic zones means that any poor-quality runoff arising from the felling area can be adequately managed and attenuated prior to reaching the primary drainage routes.
- Machine combinations (i.e. handheld or mechanical) will be chosen which are most suitable for ground conditions and which will minimise soils disturbance.
- All machinery will be operated by suitably qualified personnel.
- Checking and maintenance of roads and culverts will be on-going through any felling operation. No tracking of vehicle through watercourses will occur, as vehicles will use road infrastructure and existing watercourse crossing points. Existing drains will not be disturbed during felling works.
- Machines will traverse the site along specified off-road routes (referred to as racks).

- The location of racks will be chosen to avoid wet and potentially sensitive areas.
- Brash mats will be placed on the racks to support the vehicles on soft ground, reducing peat and mineral soil disturbance and erosion and avoiding the formation of rutted areas, in which surface water ponding can occur. Brash mat renewal will take place when they become heavily used and worn. Provision will be made for brash mats along all off-road routes, to protect the soil from compaction and rutting. Where there is risk of severe erosion occurring, extraction will be suspended during periods of high rainfall.
- Silt fences will be installed at the outfalls of existing drains downstream of felling areas. No direct discharge of such drains to watercourses will occur. Sediment traps and silt fences will be installed in advance of any felling works and will provide surface water settlement for runoff from work areas and will prevent sediment from entering downstream watercourses. Accumulated sediment will be carefully disposed of at pre-selected peat and spoil repository areas. Where possible, all new silt traps will be constructed on even ground and not on sloping ground.
- In areas particularly sensitive to erosion it will be necessary to install double or triple sediment traps and increase buffer zone width. These measures will be reviewed on site during construction.
- Double silt fencing will also be put down slope of felling areas which are located in close proximity to streams and/or relevant watercourses.
- Drains and silt traps will be maintained throughout all felling works, ensuring that they are clear of sediment build-up and are not severely eroded.
- Timber will be stacked in dry areas, and outside watercourse buffer zones. Straw bales and check dams to be emplaced on the down gradient side of timber storage/processing sites.
- Works will be carried out during periods of no, or low rainfall, in order to minimise entrainment of exposed sediment in surface water runoff.
- Refuelling or maintenance of machinery will not occur within 50m of an aquatic zone or within 20m of any other hydrological feature. Mobile bowser, drip kits, qualified personnel will be used where refuelling is required.
- Branches, logs or debris will not be allowed to build up in aquatic zones. All such material will be removed when harvesting operations have been completed, but care will be taken to avoid removing natural debris deflectors.
- Silt traps will be strategically placed down-gradient within forestry drains near streams. The main purpose of the silt traps and drain blocking is to slow water flow, increase residence time, and allow settling of silt in a controlled manner.

- Felling will only be carried out during periods of low rainfall, and therefore minimum runoff rates. This will minimise the risk of entrainment of suspended sediment in surface water runoff, and transport via this pathway to surface watercourses.

Drain Inspection and Maintenance:

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

- Communication with tree felling operatives in advance to determine whether any areas have been reported where there is unusual water logging or bogging of machines.
- Inspection of all areas reported as having unusual ground conditions.
- Inspection of main drainage ditches and outfalls. During pre-felling inspections, the main drainage ditches will be identified. Ideally the pre-felling inspection will be carried out during rainfall.
- Following tree felling all main drains will be inspected to ensure that they are functioning.
- Extraction tracks within 10m of drains will 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, if impeded by silt or debris, 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.

3.5 HYDROLOGY AND DRAINAGE

3.5.1 Potential Effects from Earthworks Resulting in Suspended Sediment Entrainment in Surface Waters

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. 50m to main watercourses, and 10m to main drains).

Where possible all of the key Development areas (turbines, hardstands, construction compound, substation etc.) have been located significantly away from the delineated 50m natural watercourse buffer zones. The spoil storage area is also located outside of the delineated 50m hydrological buffer applied to EPA mapped watercourses. Where works are proposed within the buffer zone, i.e. at watercourse crossings, additional mitigation measures are proposed.

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.

Proposed Mitigation by Design: The Project design has been optimised to utilise the existing infrastructure (existing site access tracks) 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. As stated above there is an existing drainage network at the Site which comprises of peat and agricultural drains. 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, 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 temporary stockpiles, cessation of works in certain areas or other similar/equivalent or appropriate measures.

In-Line controls:

- Interceptor drains/swales, erosion and velocity control measures such as check dams, sand bags, oyster bags, straw bales, baffles, silt bags, silt fences, sedimats, filter fabrics, and collection sumps, temporary sumps, sediment traps, temporary pumping systems, settlement ponds, 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 drains present in some areas will be integrated and enhanced as required and used within the Project drainage system. The integration of the existing 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, silt fences will be used during the upgrade construction works.
- Existing culverts will be lengthened where necessary to facilitate access road widening.

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 50m buffer zone.

Silt Fences: Silt fences will be emplaced within drains down-gradient of all construction areas. Silt fences are effective at removing heavy settleable solids. 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 will be completed and is critical to their functioning to stated purpose. They will remain in place throughout the entire construction phase.

Silt Bags: Silt bags will be used where small to medium volumes of water need to be pumped from excavations. As water is pumped through the bag, the sediment is retained by the geotextile fabric allowing filtered water to pass through.

Settlement Ponds: The Project footprint will be divided into drainage catchments (based on topography, outfall locations, catchment size) and stormwater runoff rates based on the 10-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 4.1hr or 24hr retention times used to settle out medium silt (0.01mm) and fine silt (0.004mm) respectively (EPA, 2006). Settlement ponds along Site Access Tracks and at Turbine Hardstands will have 4.1hr retention as there is additional in-line drainage controls proposed along Site Access Tracks and at hardstands.

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).

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.

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.

Management of Runoff from Spoil Storage Area: It is proposed that excavated peat/subsoil will be stored in a spoil storage area to the east of the L2034 or used for landscaping throughout the Site. The proposed spoil storage area is located outside of the delineated 50m hydrological buffer zone which was applied to EPA mapped watercourses.

The waterlogged Spoil Storage Area will be drained to increase load bearing capacity of the underlying soil prior to constructing the edge berms which will be brought down to competent ground. A rock berm and silt fencing will be installed around the spoil storage area (Drawing No. 6778-JOD-MM-XX-DR-C-1401). The runoff from the spoil area, will be directed to an oversized swale and a number of stilling ponds with appropriate storage and settlement designed for a 1 in 10 year return period before discharge to an existing drain that flows for 640m before entering the Order 1 Durha stream.

Where applicable the vegetative topsoil layer of the spoil storage area will be rolled back to facilitate placement of excavated spoil, following which the vegetative topsoil later will be

reinstated. Where reinstatement is not possible, the spoil storage area will be sealed with a digger bucket and seeded as soon as possible to reduce sediment entrainment in runoff.

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.

Proposed Drainage and Water Quality Monitoring: Monitoring is detailed in **Section 3.5.5** below.

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 Project, as the turbines have a life span of 40 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 10 year return flow. This approach is conservative given that the project will likely be built over a much shorter period (36-40 weeks), and therefore this in-built redundancy in the drainage design more than accounts for any potential short term climate change rainfall effects.

Additional Measures for Works within Buffer Zone: In addition to the above mitigation measures, where works are proposed within the delineated hydrological buffer zones the following additional mitigation measures will be implemented:

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

Additional Measures along the GCR: The GCR will require excavation of cable trenches in existing roadways. These works are transient in nature with very limited excavation at any one time. Any excess spoil from trenches in public roadways will be removed as it is excavated and transported to a licenced facility. A silt fencing filtration system will be installed on all existing drainage channels for the duration of the cable construction to prevent contamination of any watercourse. Full mitigation measures prescribed for works along the GCR are detailed in **Section 3.5.7**.

Additional Measures along the TDR: Verge and road strengthening (rock aggregate) along the L2036 will involve removing the verge material, placing geotextile and geogrid at the base of the verge and backfilling the verge with granular material compacted in layers. Silt fencing will be placed around works areas and at watercourse crossings steel plates will be placed on the verge for 10m each side of watercourse crossings to avoid excavation and disturbance of the existing ground

3.5.2 Potential Effects from Clear Felling

A felling licence will be obtained prior to the commencement of felling activities.

Forestry operations will comply with the conditions of the licence and 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)

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 are recommended in the Forest Service (2000) guidance document "Forestry and Water Quality Guidelines".

These forestry buffer zones will ensure that water quality is protected during the felling operations. However, all of the proposed felling as part of the Project at the Blade Transfer Area is located outside of the 50m self-imposed hydrological buffer zone, thereby limiting the felling which will occur in close proximity to natural watercourses.

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

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

Mitigation by Design:

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

- Machine combinations (i.e. handheld or mechanical) will be chosen which are most suitable for ground conditions and which will minimise soils disturbance.
- All machinery will be operated by suitably qualified personnel.
- Checking and maintenance of roads and culverts will be on-going through any felling operation. No tracking of vehicle through watercourses will occur, as vehicles will use road infrastructure and existing watercourse crossing points. Existing drains will not be disturbed during felling works.
- Machines will traverse the site along specified off-road routes (referred to as racks).
- The location of racks will be chosen to avoid wet and potentially sensitive areas.

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

Silt Traps:

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

Timing of Proposed Project Felling Works:

Felling will only be carried out during periods of low rainfall, and therefore minimum runoff rates. This will minimise the risk of entrainment of suspended sediment in surface water runoff, and transport via this pathway to surface watercourses.

Drain Inspection and Maintenance:

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

- Communication with tree felling operatives in advance to determine whether any areas have been reported where there is unusual water logging or bogging of machines.
- Inspection of all areas reported as having unusual ground conditions.
- Inspection of main drainage ditches and outfalls. During pre-felling inspections, the main drainage ditches will be identified. Ideally the pre-felling inspection will be carried out during rainfall.
- Following tree felling all main drains will be inspected to ensure that they are functioning.
- Extraction tracks within 10m of drains will 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, if impeded by silt or debris, 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.

3.5.3 Potential Effects from 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 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.

3.5.4 Potential Effects from the Release of Hydrocarbons

- During construction, where possible, all refuelling on site will be within the temporary compound within the dedicated re-fuelling area.
- All plant will be inspected and certified to ensure they are leak free and in good working order prior to use onsite.
- Site vehicles will be refuelled offsite where possible.
- Only essential refuelling will be completed outside of the dedicated re-fuelling area but not within 50m of any watercourses. Onsite re-fuelling of plant and machinery will be carried out using a mobile double skinned fuel bowser:
    - The fuel bowser, a double-axel custom-built refuelling trailer will be re-filled off site, and will be towed around the site by a 4x4 jeep to where machinery is located;
    - The 4x4 jeep will also carry fuel absorbent material and pads in the event of any accidental spillages.
    - The fuel bowser will be parked on a level area in the construction compound when not in use and only designated trained and competent operatives will be authorised to refuel plant on site.
    - Mobile measures such as drip trays and fuel absorbent mats will be used during all refuelling operations.
    - A non-permeable High-Density Polyethylene (HDPE) membrane will be provided beneath connection points to catch any residual oil during filling and disconnection.

These membrane will be inspected and if there is any sign of oil contamination will be removed from the site by a specialist waste contractor.

- Onsite refuelling will be carried out by trained personnel only;
- A permit to fuel system will be put in place;
- Taps, nozzles or valves associated with refuelling equipment will be fitted with a lock system;
- All fuel storage areas will be bunded appropriately for the duration of the construction phase. Fuels will be stored in the Temporary Construction Compound and bunded to at least 110% of the storage capacity of fuels to be stored. All bunded areas will be fitted with a storm drainage system and an appropriate oil interceptor. Ancillary equipment such as hoses, pipes will be contained within the bunded area;
- Fuel and oil stores including tanks and drums will be regularly inspected for leaks and signs of damage;
- The electrical control building (at the substation) will be bunded appropriately to 110% of the volume of oils that will be stored, and to prevent leakage of any associated chemicals to groundwater or surface water. The bunded area will be fitted with a storm drainage system and an appropriate oil interceptor;
- The plant used during construction will be regularly inspected for leaks and fitness for purpose; and,
- An emergency plan for the construction phase to deal with accidental spillages is included within the Construction and Environmental Management. Spill kits will be available to deal with any accidental spillage in and outside the re-fuelling area.

3.5.5 Potential Effects from the 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.
- Vehicles will undergo a visual inspection prior to being permitted to drive into the wind farm Site to ensure that there is no excess cementitious material which could be deposited on site.
- 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 bunded 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 surplus concrete will be stored or deposited anywhere on Site.
- Raw or uncured waste concrete will be disposed of by removal from the Site and returned to the source location or disposed of appropriately at a suitably licensed facility.
- Where shuttering is required to be installed in order contain the concrete during pouring, it will be installed to a high standard with minimal potential for leaks. Additional measures will be taken to ensure minimal potential of leaking, these measures are the use of plastic sheeting and the use sealing products at joints.

3.5.6 Potential Effects from Wastewater Disposal

- During the construction phase, the Project will include an enclosed wastewater management system at the temporary compound capable of handling the demand during the construction phase with 50 construction workers on site at peak.
- A self-contained port-a-loo with an enclosed wastewater holding tank will be used at the on-site temporary construction compound area, 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.
- Wastewater/sewerage from the staff welfare facilities located in the temporary construction compound will be collected and held in a sealed storage holding tank, fitted with a high-level alarm. The high-level alarm is a device installed in the storage tank that is capable of sounding an alarm during a filling operation when the liquid level nears the top of the tank.
- All wastewater will be emptied periodically, tankered off-site by a licensed waste collector to the local Kilrush wastewater sanitation plant for treatment and disposal, or to other suitable facilities for treatment and disposal. There will be no onsite treatment of wastewater.
- No water or wastewater will be sourced on the Site, nor discharged to the site.

3.5.7 Potential Effects from Morphological Changes to Surface Watercourses

Mitigation measures for the upgrade of the existing drain crossings and new proposed drain crossings at the Site are detailed below:

- The crossing upgrades and the new proposed drain crossings will be constructed using pre-cast concrete and pre-formed plastic pipe culverts and the existing banks will remain undisturbed as much as possible.

- No instream excavation works are proposed in any natural watercourses and therefore there will be no direct effect on natural watercourses.
- 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 guidance document "*Guidelines on protection of fisheries during construction works in and adjacent to waters*", that is, May to September inclusive (IFI, 2016). 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.

Grid Connection Route

In regard to the GCR, 1 no. watercourse crossing (WC01) is proposed which will be completed via HDD or by laying the cables in the curtilage of the carriageway within the bridge. Mitigation measures in relation to HDD are detailed in **Section 3.5.11**. There are also several crossings of drains and non-EPA mapped hydrological features.

All spoil generated along the public roadways along the GCR will be disposed of at a licenced facility where not suitable for reuse. The remaining spoil generated along the GCR, not located in public roads, will be disposed of in the designated spoil storage area.

Prior to the commencement of cable trenching or crossing works the following key temporary drainage measures will be installed:

- All existing roadside drains that intercept the proposed works area will be temporarily blocked down-gradient of the works using check dams/silt traps.
- Culverts, manholes and other drainage inlets will also be temporarily blocked.
- A double silt fence perimeter will be placed along the road verge on the down-slope side of works areas that are located inside the watercourse 50m buffer zone.

The following mitigation measures are proposed for the crossing works:

- No stockpiling of construction materials will take place along the grid route.
- No refuelling of machinery or overnight parking of machinery is permitted in this area (within 50m of the watercourse crossings).

- No concrete truck chute cleaning is permitted in this area (within 50m of the watercourse crossing).
- Works will not take place at periods of high rainfall and will be scaled back or suspended if heavy rain is forecast.
- Local road drainage, culverts and manholes will be temporarily blocked during the works.
- Machinery deliveries will be arranged using existing structures along the public road.
- All machinery operations will take place away from the stream and ditch banks, apart from where crossings occur. Although no instream works are proposed or will occur.
- Any excess construction material will be immediately removed from the area and sent to a licenced waste facility or spoil storage area depending on whether it was excavated from the public roadway.
- No stockpiling of materials will be permitted in the constraint zones.
- Spill kits will be available in each item of plant required to complete the stream crossing.
- Silt fencing will be erected on ground sloping towards watercourses at the stream crossings if required.

Turbine Delivery Route

With regard to the TDR, upgrades are proposed on 3 no. watercourse crossings (over the Gowerhass, Tullagower and Brisla West watercourses at WC02, WC03 and WC04). At these locations, steel plates will be placed on the verge for 10m each side of watercourse crossings to avoid excavation and unnecessary disturbance of the existing ground (reducing the potential for the entrainment of suspended solids in runoff). An Ecological Clerk of Works ("ECoW") will be employed from the commencement to completion of construction works and will be onsite to oversee the crossings of the watercourses during the turbine deliveries. The steel plates will only be in use for the duration of the turbine delivery and will be removed afterwards leaving no significant effect on the surrounding area. This approach for crossing the Tullagower stream at this part of the Doonbeg catchment for turbine delivery will have no physical effect on the watercourses and the potential for effects on the Freshwater Pearl Mussels in the lower Doonbeg catchment is negligible.

3.5.8 Potential Effects on Groundwater Levels During Excavation Works

The Site is underlain by a Locally Important Aquifer.

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

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.

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 Site that can be affected by temporary dewatering during turbine base construction.

3.5.9 Potential Effects on Groundwater Quality in Local Well Supplies

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

- The Site is underlain by low permeability soils and subsoils.
- Groundwater flowpaths are typically short (~300m maximum).
- Groundwater flows within the Site emerge as springs/seeps along drains and leave the Site as surface water flows and not groundwater flows.
- Groundwater flow directions will mimic surface topography and flow towards the Moyasta River.
- All local dwellings are located upgradient of the proposed turbine locations and the substation.
- Therefore, the potential to effect local wells is very low as groundwater flowpaths between the Projects infrastructure and potential source typically do not exist.
- 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 affect local wells/water supply sources is negligible.

3.5.10 Potential Effects from the Use of Siltbuster

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 reagents, 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).

3.5.11 Potential Effects Associated with 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 15m buffer zone.
- Before any ground works are undertaken, double silt fencing will be placed upslope of the watercourse channel along the 15m buffer zone boundary.
- Additional silt fencing or straw bales (pinned down firmly with stakes) will be placed across any natural surface depressions / channels that slope towards the watercourse.
- Silt fencing will be embedded into the local soils to ensure all site water is captured and filtered.
- The area around the bentonite batching, pumping and recycling plant will be bunded using terram (as it will clog) and sandbags in order to contain any spillages.
- Drilling fluid returns will be contained within a sealed tank / sump to prevent migration from the works area.
- Spills of drilling fluid will be cleaned up immediately and stored in an adequately sized skip before been taken 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 50m from the watercourse.

- The discharge of water onto vegetated ground at the percolation area will be via a silt bag which will filter any remaining sediment from the pumped water. The entire percolation area will be enclosed by a perimeter of double silt fencing.
- Any sediment laden water from the works area will not be discharged directly to a watercourse or drain.
- Works will 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 100m of the watercourse crossing.
- All plant will be checked for purpose of use prior to mobilisation at the watercourse crossing.

<u>Fracture Blow-out (Frac-out) Prevention and Contingency Plan</u>:

- 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.

3.5.12 Potential Effects Associated with Biodiversity Enhancement Proposals

To maximise the effectiveness of the re-wetting proposals in the cutover area and to increase the chances of future success, any works undertaken as part of the enhancement plan will be based on approaches and methods that were successful at other peatland sites in Ireland.

Peat water level monitoring, by means proposed standpipe installations, will also be carried out to monitor the effectiveness of the bog re-wetting. The monitoring will continue through the lifetime of the Project.

3.5.13 Potential Effects on Surface Water Quality Due to Fluvial Flooding During Construction

Despite the low likelihood of a fluvial flood event occurring during the construction of the wind farm, weather/rainfall events of those magnitudes likely to generate significant rainfall which would in turn cause fluvial flooding would be forecastable.

An emergency response system has been development for the construction phase of the project to respond to high rainfall events which may result in fluvial flooding.

A potential high intensity rainfall event would likely to be identified 3-5 days in advance, with more accurate forecasts of severity within 24-48 hours of occurrence. Preparations for a flood event would begin from the initial indications that there may be a high rainfall event. This would allow time for the preparation and the implementation of additional emergency mitigation measures.

As above, the first point of mitigation is ongoing monitoring of weather forecasts and weather warning. The project EM (Environmental Manager) or the site ECoW will be responsible for monitoring weather forecasts during the construction phase. There will be a 24-hour advance meteorological forecasting (Met Eireann download) linked to a trigger-

response system. When a pre-determined rainfall trigger levels is exceeded (e.g., sustained rainfall (any foreseen rainfall event longer than 4 hour duration) and/or any yellow or greater rainfall warning (>25mm/hour) issued by Met Eireann), planned responses will be undertaken.

- Cessation of all construction works until the storm event, including the storm runoff has passed. All construction works will cease during storm events such as yellow warning rainfall events. Following heavy rainfall events, and before construction works recommence, the Site will be inspected and corrective measures implemented to ensure safe working conditions e.g. dewatering of standing water in open excavations, etc.
- Exposed soils/peat (exposed temporary stockpiles) will be covered with plastic sheeting during all relatively heavy rainfall events and during periods where works have temporarily ceased before completion at a particular area (e.g., overnight and weekends).

With regards to the fluvial flood zones at the Site, a managed retreat from the fluvial flood zones will be implemented in the event of a high intensity rainfall event and/or weather warning related to rainfall. This will include the following:

- Any areas where soil/subsoil is exposed at the surface will be compacted firmly with a digger bucket of a suitably sized excavator.
- Open trenches will be backfilled and compacted.
- All oils, fuels and waste material will be removed from the flood zones.
- Existing sediment control measures will be removed, as these may be washed away and deposited elsewhere by the floodwaters.
- Site access tracks will be scraps and any excess soft material will be removed from the flood zones.
- All plant, machinery and equipment will be removed from the flood zones.

3.5.14 Potential Effects on Raised Bog

No significant effects on the remnant high bog to the south of T2 will occur due to the:

- Mitigation by avoidance – the proposed wind farm layout has avoided proposed works within or immediately adjacent to the area of remnant high bog.
- Turbary peat cutting in the cutover bog areas, where the infrastructure is proposed, has already impacted the peat water table around the margins of the remnant high bog. A ~1.2m high peat face bank exists around the perimeter of this high bog and water levels in the high bog adjacent to this peat face have already experienced local drawdown.

- The presence of low permeability clay subsoils underlying the peat acts as a hydrogeological barrier, preventing groundwater recharge, essentially isolating the peat water table from the underlying regional groundwater system.
- Mitigation is provided in the EIAR to deal with typical construction phase groundwater quality hazards such as oils and fuels.
- No significant groundwater dewatering will be required due to the relatively shallow nature of the turbine base excavations.

3.5.15 Potential Effects on Hydrologically Connected Designated Sites

No significant effects on the Lower River Shannon SAC, River Shannon and River Fergus Estuaries SPA, Poulnasherry Bay pNHA and the West Shannon Poulnasherry Bay designated shellfish waters will occur due to the following:

- The implementation of the prescribed mitigation measures for sediment control as detailed in **Section 3.5.1** (earthworks), **Section 3.5.2** (Clear felling) and **Section 3.5.3** (excavation dewatering).
- The implementation of the prescribed mitigation measures for the control of hydrocarbons as detailed in **Section 3.5.4.**
- The implementation of the mitigation measures for the control of cement-based products as detailed in **Section 3.5.5**.
- Their distant location from the Site (hydrological flowpath length of approximately 2.7 km).
- The assimilative capacity of the coastal SWB associated with these designated sites.

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

3.5.16 Potential Effects on the Doonbeg River Freshwater Pearl Mussel Sensitive Area

No significant effects on the Doonbeg River Freshwater Pearl Mussel Sensitive Area will occur due to the following:

- The small scale and transient nature of the proposed works along the TDR route (road verge strengthening and road widening) in the Mal Bay surface water catchment.
- The implementation of the mitigation measures prescribed for sediment control in **Section 3.5.1**.
- Mitigation measures for the control of hydrocarbons during construction works are detailed in **Section 3.5.4.**

- Upgrades are proposed on 3 no. watercourse crossings (over the Gowerhass, Tullagower and Brisla Wast watercourses). At these locations, steel plates will be placed on the verge for 10m each side of watercourse crossings to avoid excavation and disturbance of the existing ground. An Ecological Clerk of Works ("ECoW") will be employed from the commencement to completion of construction works and will be onsite to oversee the crossings of the watercourses during the turbine deliveries. The steel plates will only be in use for the duration of the turbine delivery and will be removed afterwards leaving no significant effect on the surrounding area. This approach for crossing the Tullagower stream at this part of the Doonbeg catchment for turbine delivery will have no physical effect on the watercourses and the potential for effects on the Freshwater Pearl Mussels in the lower Doonbeg catchment is negligible.

Implementation of these mitigation measures will ensure the protection of surface water quality in receiving waters and the Doonbeg River Freshwater Pearl Mussel Sensitive Area.

3.5.17 Potential Effects on WFD Status

Mitigation measures relating to the protection of surface water drainage regimes and surface water quality within the Site have been detailed in **Section 3.5.1 to 3.5.3** (suspended solids), **Section 3.5.4** (hydrocarbons), **Section 3.5.5** (cement-based products), **Section 3.5.6** (wastewater) and **Section 3.5.7** (morphological changes to watercourses).

These mitigation measures will also be implemented during the construction of the GCR and works along the TDR.

Similarly, mitigation measures for the protection of groundwater quantity and quality have been detailed in **Section 3.5.8** (groundwater levels), **Section 3.5.4** (hydrocarbons), **Section 3.5.5** (cement-based products) and **Section 3.5.6** (wastewater).

The implementation of these mitigation measures will ensure the protection of downstream SWBs and underlying GWBs. There will be no deterioration in the status of any WFD waterbody and the Project will not impact the ability of any waterbody to achieve its WFD objectives.

3.6 AIR AND CLIMATE

3.6.1 Air- Mitigation Measures

The main potential effect during the construction phase of the Development will be from dust nuisance at sensitive receptors close to the Site. The contractor will be contractually required to follow best practice construction procedures to prevent dirt and dust being transported onto the local road network and to minimise vehicle exhaust emissions. All mitigation measures detailed and assessed in this EIAR and outlined in this CEMP will be implemented on site. Best practice site control measures will comprise the following:

- Site access tracks will be upgraded and constructed during the initial phases. These tracks will be surfaced with graded aggregate, which compacts to reduce dust generation.
- Approach roads and construction areas will be regularly monitored and maintained, including routine sweeping and cleaning, to prevent the buildup of mud. This will help prevent mud from migrating around the site, onto the public road network, and into roadside drains. Wheel wash facilities will be provided, managed, and maintained near the site entrance to prevent mud and dirt from being transferred onto the public road network. The wheel wash will be located outside the 50m watercourse buffer zone.
- Public roads along the construction haul routes will be inspected and cleaned daily. 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 nuisance 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 Grid Connection route) and construction haul route roads to suppress dust migration from the Site.
- Vehicles delivering materials to the 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 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 and stored in a secure, bunded location (e.g. construction compound).
- Ready-mix concrete will be delivered to the Site; no batching of concrete will be permitted on Site. Only washing out of chutes will take place on Site and this will be undertaken at

a designated concrete washout facility at the contractor's Temporary Construction Compound. The concrete washout facility is a lined containment system designed to prevent run-off into soil, surface water or groundwater.

- 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 Site speed limits are policed by the Contractor and referred to in the toolbox talks.
- Good practice will be applied and care will be taken with stockpiled materials 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 project 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 Site where complaints will be reported, logged and appropriate action taken.
- Careful management of the L6132 is essential, as sections of this road are within the Doonbeg catchment, which supports a viable population of Freshwater Pearl Mussels. Excessive sweeping or washdown of solids from the road could result in the deposition of sediment into small streams, potentially affecting water quality. Particular attention will be given to this route to ensure that mud and silt do not accumulate, preventing washdown into the local natural drainage system.

3.6.2 Climate- Mitigation Measures

- 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 **Chapter 16: Traffic and Transport**, minimising travel distances
- A robust Traffic Management Plan (**Appendix 16.2**) has been developed, utilising the most direct routes where possible. This Plan will be updated to reflect project needs.

3.7 ARCHAEOLOGY AND CULTURAL HERITAGE

The Wind Farm layout was informed by Cultural Heritage desktop studies and fieldwork undertaken during the design and assessment phases and was designed to avoid the locations of known and potential heritage receptors.

Ground works during the Construction phase of the Development will be subject to archaeological monitoring by a suitably qualified archaeologist under licence by the National Monuments Service. In the event that any archaeological features are identified during monitoring they will be recorded and then securely cordoned off while the National Monuments Service are consulted to determine further appropriate mitigation measures, which may include preservation *in situ* (by avoidance) or preservation by record (by archaeological excavation).

The appointed archaeologist will supervise the establishment of a fenced off exclusion zone located 20m from the outer extent of ringfort (CL057-037----). The sub-surface remains of a levelled enclosure (CL057-023----) are located immediately outside the north end of the Site boundary. A fenced off archaeological exclusion area will also be established within the area of the Site to the south of this enclosure which will extend for 20m from its recorded location. There are no guidance criteria for the extent of development exclusion areas around archaeological sites and the extent of these 20m exclusion areas are based on professional judgement which has been informed by the results of desktop studies and field surveys carried out as part of this assessment. The boundary of the spoil retention area within the areas to the north and west of the potential archaeological features will also be fenced off during the construction phase. These fenced off exclusion areas will be clearly signed as 'no entry' locations for the duration of the construction phase and no activities will occur within their confines including, but not limited to, ground works, construction traffic, storage or compounds.

3.8 NOISE & VIBRATION

The core hours for the proposed works will be normal construction hours 07:00 to 19:00 Monday to Friday and 08:00 to 16:30 Saturday. There will be no working on Saturday afternoons, Sundays and Public Holidays, however, it should be noted that out of necessity some activity outside of the core hours could arise, from delivery and unloading of abnormal loads or health and safety requirements, or to ensure optimal use is made of fair weather windows for concrete deliveries, the erection of turbine blades and the erection and dismantling of cranes. If occasional work is undertaken outside of core hours, especially during construction of access tracks at the site entrance, this will be agreed in advance with the local planning authority.

Good site practices, both for construction of the Proposed Wind Farm and the Proposed Grid Connection Route will be implemented to minimise the likely effects. Particular care will be taken at the M1 crossing along the Proposed Grid Connection Route. Section 8 of BS5228-1:2009+A1:2014 recommends a number of simple control measures as summarised below that will be employed onsite:

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

3.9 WASTE

Staff Facilities

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

Sewage

A rainwater harvesting system will be proposed 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.

Concrete

During the construction phase:

- Mitigation measures detailed in **Section 3.5.5**

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 65m 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. This inventory will include:

- List of all substances stored on-site (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 will have secondary containment when in use/out on site

All dangerous substances will be conveyed in a container that compiles with the ADR[4]. As such the manufacturer of each bowser will provide certification to contractors of the following:

- A leak-proof test certificate.
- A copy of the IBC (intermediate bulk containers) approval certificate.
- An identification plate attached to the container.

Where mobile bowsers are used on site, guidelines (EU Directive 95/55/EC) will be followed so that:

[4] 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

- 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;
- The pump or valve will have a lock and be locked shut when not in use.

Refuelling

During construction/decommissioning, all refuelling on site will be within the temporary compound within the re-fuelling area (see **Drawing No. 6778-JOD-MM-XX-DR-C-0501)**. Only essential refuelling (e.g., cranes) will be carried out, outside of this area, but not within 50m 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.

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 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.

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 to be transferred offsite by a licensed contractor to a licenced facility.

Metals

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

3.10 TRAFFIC AND TRANSPORT

Although no 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 and road closures 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.
- Prior to delivery of abnormal loads i.e. turbine components, the Applicant or their representatives, will consult with An Garda Síochána, TII, PPP operators and all relevant Local Authorities to obtain all necessary abnormal load permits and discuss the requirement for a Garda escort. The Applicant will also outline the intended timescale for deliveries and efforts can be made to avoid peak times such as school drop off times, church services, peak traffic times where it is considered this may lead to unnecessary disruption, and abnormal loads may travel at night and outside the normal construction times as may be required by An Garda Síochána. Local residents at sensitive locations along the affected route will be notified of the timescale for abnormal load deliveries.
- Prior to delivery of abnormal loads, the Applicant or their representatives, will consult with TII, PPP operators and all Local Authorities through which the abnormal loads will pass and agree the specification for any enabling works to be carried out on the Turbine Delivery Route.
- Prior to the transportation of turbine components on the national road network. the Developer will submit details of the turbine components to TII bridge management section and determine the requirement for an abnormal load assessment to ensure that structures on the national road network are not adversely affected.
- Prior to the delivery of turbine components, a survey of the Turbine Delivery Route will be undertaken to identify if any overhead lines or height restrictions at toll booths will need to be lifted along the route to allow abnormal loads such as tower sections and nacelles to be delivered.
- Prior to the delivery of turbine components, a trial run shall be carried out between Shannon Foynes Port and the proposed Development entrance using an abnormal load

vehicle with a retractable load gauge to determine that abnormal load vehicles can transverse the route without undue delay and disruption to public road users.

- During the construction and decommissioning phases, road works signs in accordance with the requirements of Chapter 8 of the Traffic Signs Manual will be erected at all the proposed Development entrances and at all locations on the Grid Connection route and Turbine Delivery Route which are being modified to facilitate turbine delivery. Details of signage are given in the Traffic management plan in **Appendix 16-2**.
- Wheel cleaning equipment will be used at all site entrances with the public road 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 Site.
- To reduce dust emissions, vehicle containers/loads will be covered during both entrance and egress to the Site where required.
- All 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 may be employed.
- Access to the construction site will be controlled by on Site 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 Contractor's temporary compound and will be required to wear appropriate Personal Protective Equipment (PPE) while onsite.
- A condition survey of the road network in the vicinity of the site entrances will be carried out and agreed with Clare County Council prior to any works being carried out on site.
- All works on the public road network will be carried out using an approved road opening licence and traffic management plan.
- All wind farm vehicles shall have roof mounted flashing beacons when working on the public road network or will use their hazard lights within the Site.
- A speed limit of 25 km/h shall apply to all vehicles within the Site.

3.11 CONSTRUCTION PLAN

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.

3.11.1 Phasing of Works

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

1. Site Preparation including Flood Compensation Areas, felling and drainage
2. Site Access Roads
3. Contractors Compound and Welfare Facilities
4. Crane hardstandings
5. Turbine Foundations
6. Internal cable ducting
7. Installation of the Grid Connection
8. Erection of wind turbines
9. Commissioning and Energisation

3.11.2 Working Hours

The Proposed Development will have approximately 50 construction workers during the peak of the construction phase. Working hours for construction will be from 07:00 to 19:00 on weekdays, with reduced working hours at weekends, from 08:00 to 16:30 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 till 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 Clare County Council prior to the commencement of turbine foundation construction. **Chapter 16: Traffic and Transportation** refers to this in further detail. A detailed Traffic Management Plan will be implemented for the construction phase. This shall be agreed during the prior to the commencement of construction works with the Planning Authority so that strict controls described therein are in place with all suppliers coming to the Site.

3.11.3 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 comply with 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 Ecological Clerk of Works and will be agreed with the appropriate parties, including Clare County Council. The Developer will employ a Project Manager to monitor the construction phase of The Project and ensure works are being carried out in accordance with the agreed method statements, safety procedures and pollution control measures.

3.12 PLANNING CONDITIONS AND OUTLINE METHOD STATEMENTS

This CEMP and its future versions/revisions will form part of the Contract for Moanmore Lower Wind Farm. It will therefore be updated and revised during the different phases of the Proposed Development. Where the Proposed Development is granted planning permission, all the planning conditions associated with the Planning Application will be listed in **Table 3.9**.

Table 3.9: Relevant Planning Conditions and Related Documentation

Condition No.	Planning Condition	Reason
Planning Ref: INSERT NUMBER		

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

4 COMMUNICATION PLAN

4.1 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.

4.2 CONTACT SHEETS

Table 4.1 provides a list of Moanmore Lower Green 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 4.1: Contact Sheets

Company	Position	Name	Telephone
Moanmore Lower Green 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
Moanmore Lower Green Energy Limited	Construction Project Manager	TBC	TBC

4.3 MEETINGS REPORTS AND CONSULTATIONS

Table 4.2 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.

4.4 ROLES & RESPONSIBILITIES

Roles and responsibilities for environmental management, monitoring and reporting are detailed in **Table 4.3**. The Ecological Clerk of Works/Environmental Manager Contractors will be responsible for the delivery of all elements of the Environmental Management Plan.

The Ecological Clerk of Works/Environmental Manager Contractors will retain all responsibility for issuing, changing and monitoring the Environmental Management Plan.

4.5 REPORTING PROCEDURES

Figure 4.1 provides a diagrammatic outline of the general tasks and communication lines, based on the roles described in **Tables 4.2** and **4.3** and tasks detailed in the Management Plans. The Contractors will update this information as part of the construction phase CEMP upon receipt of a planning permission.

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 Clare County Council, will be managed by the relevant Contractors in accordance with an agreed reporting schedule.

Table 4.2: 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	Attendance required: Ecological Clerk of Works Contractors Site Manager, and any other relevant personnel or statutory consultees where necessary.

Meeting/ Report	Schedule/ Frequency	Scope & Objective	Attendees/Responsibilities
		maintenance. The results of these checks will be discussed at the meeting and corrective actions agreed as required.	
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/Environmental Manager. 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
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	As required in advance of construction works regular	Environmental Checks are to be carried out in advance of construction works. This will comprise	Environmental checks will be undertaken by the Contractors Ecological Clerk of Works. The Ecological Clerk of Works may

Meeting/ Report	Schedule/ Frequency	Scope & Objective	Attendees/Responsibilities
Mitigation Works	checks will also be made at least every 14 days.	an on-site 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 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	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
		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 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 Moanmore Lower Green Energy

Meeting/ Report	Schedule/ Frequency	Scope & Objective	Attendees/Responsibilities
			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 environmental performance and maintain good working relationships with the regulatory bodies.	Contractors and Ecological Clerk of Works where required. Meetings will be initiated as required by Planning Conditions, Management Plans or as agreed throughout the duration of the construction phase. The Contractors are 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 4.3: 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

Position	Roles and Responsibilities
	where required. Ensure that the Contractors has submitted all relevant documentation to 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 people(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.
Ecological Clerk of Works/Environmental Manager	The Ecological Clerk of Works will be a member of the Environmental Management group and will work with the Contractors to ensure 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 toolbox talks as agreed with the Contractors to address key areas, including water pollution prevention, protected species management, and on-site 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

Position	Roles and Responsibilities
	• Inspect pollution control measures during the works • Maintain a presence on site 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 EIAR, 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 • 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 Moanmore Lower Green Energy Limited., the Contractors to ensure that compliance is achieved with best practice and with all environmental mitigation and monitoring requirements as detailed within the NIS, EIAR and CEMP and relevant planning conditions. 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 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

Position	Roles and Responsibilities
	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 on-site 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, 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 on-site biodiversity. • Monitor potential environmental impacts, including: - Use of and storage of oils and toxic chemicals on site, 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

Position	Roles and Responsibilities
	• 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 will be appointed. They will have responsibility for fulfilling the requirements of the Water Quality Management Plan, including: - Daily visual inspection of: access roads 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 along access roads (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) 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.

Position	Roles and Responsibilities
	• 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. • 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]

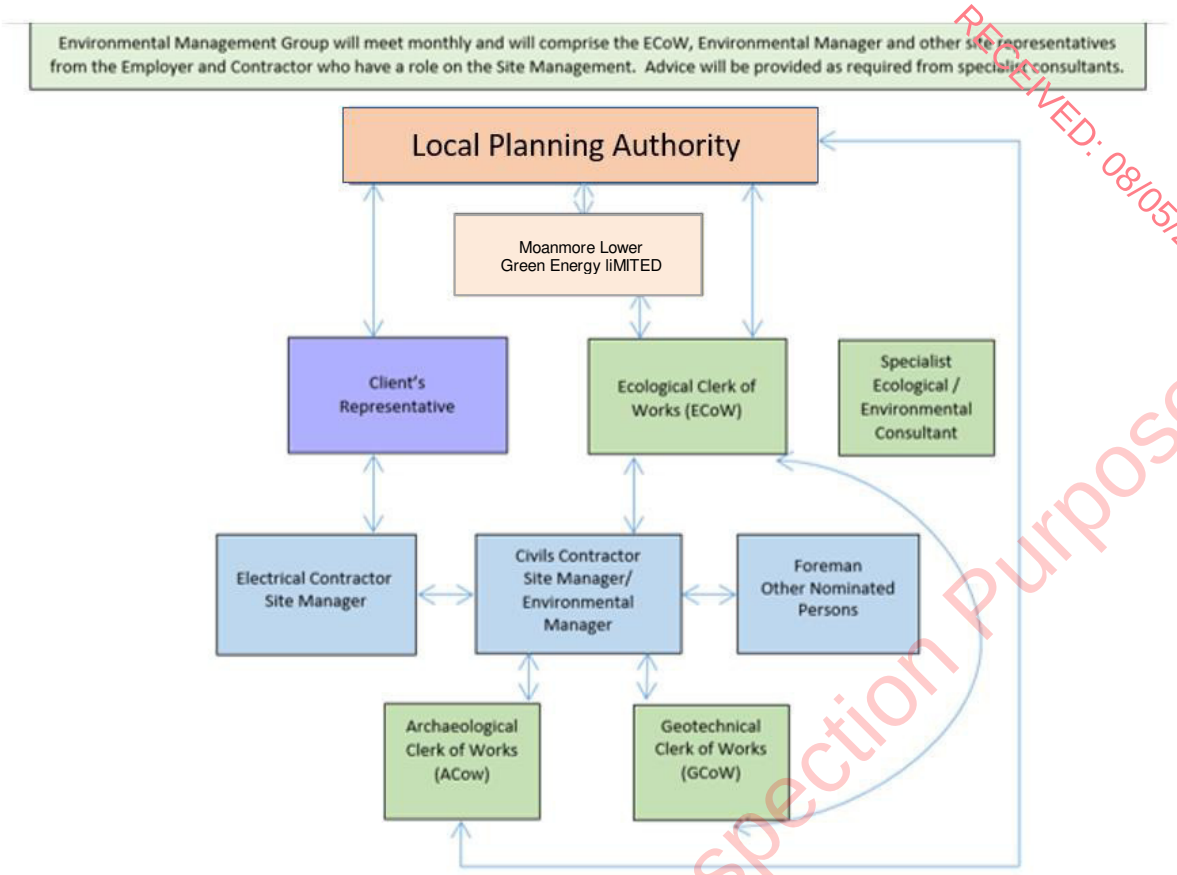


Figure 4.1 General Communication Plan

4.6 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.

The CEMP will be posted on the main site notice board during the Project. The environmental performance at the Site will be on the agenda of the monthly project management meetings for the Project. 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.

4.7 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, Clare County Council will be informed immediately. In the case of water pollution, in addition to Clare County Council, Inland Fisheries Ireland will also be informed immediately. Further details in relation to emergency responses are provided at **Appendix A Emergency Response Plan.**

5 CORRESPONDENCE, RECORDS & REPORTS

5.1 REQUIREMENTS

The Contractors will insert / file all communication records and reports associated with Environmental Management and implementation of this CEMP under this Section 5. As a guide, the following sub-sections of filed information will be required (at a minimum):

5-A) Meeting minutes and attendance record

5-B) Weekly Environmental Reports

5-C) Monthly Environmental Reports

5-D) Environmental Checks

5-E) Audit Reports

5-F) Ecology documentation and monitoring records

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

5-H) Water Quality documentation and monitoring records

5-I) Archaeology documentation and monitoring records

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

5-K) Waste Management documentation

5-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 5.1** of this CEMP.

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

5-N) Training Records

5-O) Toolbox Talk Records

5-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.

5.2 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.

5.3 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 Site. This record will follow the format provided in **Table 5.1**.

Table 5.1: 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		

5.4 ENVIRONMENTAL MONITORING AND MEASURING

All of the mitigation measures outlined in Section 3.0 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.

5.5 NON-CONFORMANCE, CORRECTIVE AND PREVENTATIVE ACTION

Non-Conformance Notices will be issued where there is a situation where limits associated with activities on The Project 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.

6 MANAGEMENT PLANS & AVAILABLE INFORMATION

6.1 MANAGEMENT PLANS

Various Management Plans have been prepared as listed in **Table 6.1**. These are intended to provide a benchmark for best practice and to define Moanmore Lower Green Energy Limited's minimum requirements for environmental management and mitigation.

6.2 CONTRACTORS REQUIREMENTS

The Contractor(s) is required to further develop the Management Plans into detailed site and works specific environmental plans, method statements and procedural documents. **Table 6.1** provides a summary of the content of the Management Plans and the Contractor's obligations for their further Proposed Development.

Table 6.1: List of Management Plans

No.	Name	Details
Appendix A	Emergency Response Plan	The Contractors will further develop the (Emergency 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.
Appendix B	Surface Water Management Plan	The Contractors are obliged to implement the water quality monitoring proposals set out therein. The Contractors are obliged to implement the water crossing proposals set out therein.
Appendix C	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 outlines the locations where the material can be re-used on site. The Spoil Management Plan is a live document and can be subject to the ability to amend if required.
Appendix D	Decommissioning Plan	The Contractors will comply with and further develop the Decommissioning Plan. Where

No.	Name	Details
		changes to the plan are required, the Contractors must consult with the Ecological Clerk of Works.

Appendix A

Emergency Response Plan

MOANMORE LOWER GREEN ENERGY LIMITED

MOANMORE LOWER WIND FARM, MOANMORE, CO. CLARE

CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN (CEMP)

EMERGENCY RESPONSE PLAN (ERP)

APRIL 2025

Moanmore Lower Green Energy Ltd.,
C/O Greensource Sustainable Limited,
Station Road,
Adare,
Co. Limerick,
V94 C6HF.

Jennings O'Donovan & Partners Limited,
Consulting Engineers,
Finisklin Business Park,
Sligo.
Tel.: 071 9161416
Fax: 071 9161080
email: info@jodireland.com

JENNINGS O'DONOVAN & PARTNERS LIMITED
Project, Civil and Structural Consulting Engineers,
FINISKLIN BUSINESS PARK,
SLIGO,
IRELAND.
Telephone (071) 9161416
Fax (071) 9161080
Email info@jodireland.com
Web Site www.jodireland.com

DOCUMENT APPROVAL

PROJECT	Moanmore Lower Wind Farm, Co. Clare	
CLIENT / JOB NO	Moanmore Lower Green Energy Limited	6778
DOCUMENT TITLE	Construction Environmental Management Plan (CEMP) Emergency Response Plan (ERP)	

	Prepared by	**Reviewed / Approved by**
Document FINAL	Name Sarah Moore/ Angelika Thiel / Padraig O'Dowd	Name David Kiely
Date April 2025	Signature	Signature

CONTENTS

1. INTRODUCTION

1.1 Why have an Emergency Response Plan?

Many construction and industrial sites intrinsically have the potential to cause significant environmental harm which could threaten water supplies, public health and wildlife in the event of an environmental incident. The aim of this plan is to ensure that in the event of an emergency, quick action will limit any impacts on humans and the local environment.

This response plan forms part of the conditions of work for staff, and for every contractor or sub-contractor at the site.

1.2 Outline of this Environmental (Incident & Emergency) Response Plan

The information contained in this plan forms the Emergency Response Plan (ERP), part of the Construction Environmental Management Plan (CEMP) for Moanmore Lower Wind Farm.

It contains details of:

- Who should be contacted in an emergency?
- Procedures to be followed in an emergency
- Staff responsibilities in an emergency

1.3 What is an Environmental Incident?

This plan should be instigated once there has been an emergency or environmental incident on site or elsewhere, linked to the construction of Moanmore Lower Wind Farm. Such an incident is a discharge to air, land or water that could cause environmental damage. Potential causes of environmental incidents on this site include:

- Leaking plant or equipment
- Containment Failure
- Fire
- Land Slide
- Vandalism
- Overfilling of containment vessels
- Flooding on site
- Leaking Portaloo

- Discharge of raw or partially treated effluent
- Wind-blown waste, litter or dust
- Fuel drips or spills during refuelling
- Leak from fuel or chemical containers
- Contaminated water or sediment/silt entering a water course or drain
- Failure of pumps and pipelines
- Blade throw (results from wind turbine failure and may include the splintering of rotor blades and detachment of debris)

Any of these incidents could affect drainage systems, surface waters, aquatic ecosystems, groundwater and soil. These incidents could also affect air quality by producing toxic fumes and airborne pollutants which may damage human health, wild and domestic animals and ecosystems. The emergency procedures to be followed for each of the incidents listed above are detailed in **Section 6.1**.

1.4 Reference Documents

Current legislation including the Safety, Health and Welfare at Work Act 2005 and the Safety Health and Welfare at Work (Construction) Regulations 2013, has been taken into account into the production of this Plan and will be accounted for in the further development of the Contractor's Construction Management Plan.

2. GENERAL REQUIREMENTS OF AN ERP

As mentioned, environmental incidents may include flooding, spillages (oil and chemicals), contaminated run-off, riverbed disturbance, damage to underground services, damage to habitats, poor waste disposal and storage.

This Emergency Response Plan:

- Identifies key staff and 24-hour contact details to be contacted in the event of an emergency (**Section 6.5**)
- Identifies key external bodies and emergency response numbers who should be contacted in the event of an emergency (**Section 6.4)**
- Details an Inventory of Chemical Products and Waste Inventory on Site (**Section 6.6**)*
- Details an Inventory of Pollution Prevention Equipment (**Section 6.7**)

- Provides details of staff trained in the use of spill kits and booms etc. (**Section 6.8**)
- Provides details of reporting requirements (**Sections 6.3 to 6.9**)
- Provides detailed procedures to be followed in the event of an emergency (**Sections 6.1**)
- Provides a Communication Plan for operatives outlining key actions in the event of an emergency (**Section 6.2**). This will be available to all operatives on site.

*****_Because of the nature of wind farm construction operations and the nature of works on site, the potential pollutants will vary._

3. INCIDENT & HAZARD REPORTING

A blank Environmental Incident Report Form for reporting environmental incidents or hazards for the site is attached in **Section 6.9**. A blank Site Environmental Audit Form is attached in **Section 6.10** to record audit results. The details recorded in these forms will be regularly reviewed and will form part of the response plan procedural review.

4. WASTE DISPOSAL AFTER ENVIRONMENTAL INCIDENCES

If spill kits etc. are used in the event of a pollution incident, operatives will carefully dispose of used equipment by carefully placing them in a sealed bag or container. They will then be removed from site by a licensed waste contractor as per the **Waste Management Plan**. Contaminated soil also needs to be disposed of as hazardous waste by an appropriate licenced waste contractor.

5. SITE INDUCTION AND TOOLBOX TALKS

It is imperative that all contractors, sub-contractors and staff on site are fully familiar with this Emergency Response Plan and it will be detailed regularly in toolbox talks. During these talks, they will also receive regular reminders of the importance of the local environment and of the necessary environmental controls that are in place on site.

6. PROCEDURE AND COMMUNICATION PLAN IN EVENT OF AN INCIDENT

6.1 Procedures to be followed in the event of an incident:

The following procedures are intended as a guide in dealing with incidents. Health & Safety guidance should be followed at all times applying common sense and ensuring the health & safety of yourself and others:

6.1.1 Spillages/Leaks/Containment Failure

1. Identify the source of the spillage and cut off source, if possible, e.g. by closing valve, righting container etc.
2. Work on site will cease and all operatives will assist in placing spill mats on the affected area. Site Manager/Environmental Manager must be notified.
3. Identify where spillage may go. If spillage is near a watercourse (drainage/ditch/ river) divert spillage away from the watercourse through the use of absorbent materials from the spill kit.
4. Notify all parties in the order listed in **Sections 6.4 and 6.5**. Notification should be made by one member of staff whilst remainder of staff present deal with the spill/incident.
5. Dig up all contaminated ground as soon as possible/immediately. All contaminated materials should be placed in sealed polythene bags/containers and disposed of appropriately by an appropriate licensed waste contractor.
6. Complete required record of incident and response into reporting system.

6.1.2 Contamination of Watercourse

Suspended Solids

If watercourse is at risk of contamination from suspended solids from a slope failure, the Site Manager/Environmental Manager must be notified and the following actions must be implemented:

a) Place straw bales wrapped in geotextile or sand/gravel bags with geotextile curtains **immediately** in the watercourse(s) at regular intervals downstream from the incident. These sand/straw bags and bales will be removed and replaced with stone filters once water quality is stabilised.

b) Stone check dams faced with a layer of geotextile will be constructed at critical points along the watercourse.

c) Small sumps will be formed intermittently between the check dams to reduce the amount of suspended solids contained in the water.

Oil Spill in Watercourse

If spill has reached the watercourse the Site Manager/Environmental Manager must be notified and the following actions must be implemented:

a) Place flexible absorbent booms across watercourse, ahead of the contamination within a quiet stretch of water.

b) Place absorbent cushions in the water immediately upstream of these booms as well as downstream of the booms.

c) Remove and replace saturated absorbent material as required. Ensure removed cushions are placed in sealed polythene bags/containers and disposed of by the principal waste contractor.

6.1.3 Land Slide

Please see EIAR Figure 8.7 Landslide risk & events for further detail of flow routes and storage locations for excavated materials to be re-used for reinstatement works. Where the onset or actual detachment of peat (e.g., cracking, surface rippling) occurs:

a) All activities in the area will cease and all available resources will be diverted to assist in the required mitigation procedures.

b) The Site Manager/ Environmental Manager must be notified

c) All relevant authorities will be notified if a peat slide event occurs on site and this Emergency Response Plan (ERP) followed.

d) Where peat slides do not represent a risk to a watercourse and have stopped moving, they will be stabilised using rock infill, if required. The failed area and surrounding area will then be assessed by the engineering staff and a stabilisation procedure implemented. The area will be monitored, as appropriate, until movements have stopped.

e) Where possible, check barrages (comprises the placement of rock fill across a watercourse which allows the passage of water but will prevent peat debris from passing through) will be constructed on land using rock fill to prevent a peat slide reaching any watercourse.

f) If peat reaches a watercourse a check barrage will need to be constructed across the watercourse preventing the peat from moving downstream. The check barrage will allow water to flow through it, but the peat will be trapped.

g) The size of the check barrage will depend on the scale of the peat slide to be contained and the geometry of the watercourse at the location of the barrage.

h) All measures to contain the peat slide must be approved by Clare County Council or Inland Fisheries Ireland (IFI).

6.1.4 Fire

In the unlikely event of a fire at a turbine or at the substation, all personnel on site will meet at a designated fire point (for example in the Temporary Construction Compound) and emergency services will be contacted.

Procedures in case of fire will be outlined by all contractors in their induction. Only appropriately trained personnel will be permitted to enter turbines. Firefighting equipment will be stored and maintained in the Temporary Construction compound. Firefighting equipment for different types of fires i.e. electrical and oil based will be segregated and clearly marked.

The Contractor's fire plans will be reviewed and updated on a regular basis. A nominated competent person shall carry out checks and routine maintenance work to ensure the reliability and safe operation of firefighting equipment and installed systems such as fire alarms and emergency lighting. A record of the work carried out on such equipment and systems will be kept on Site at all times.

6.1.5 Ice Throw

The wind turbines will be fitted with anti-vibration sensors, which will detect any imbalance caused by icing of the blades. The sensors will prevent the turbine from operating until the blades have been de-iced.

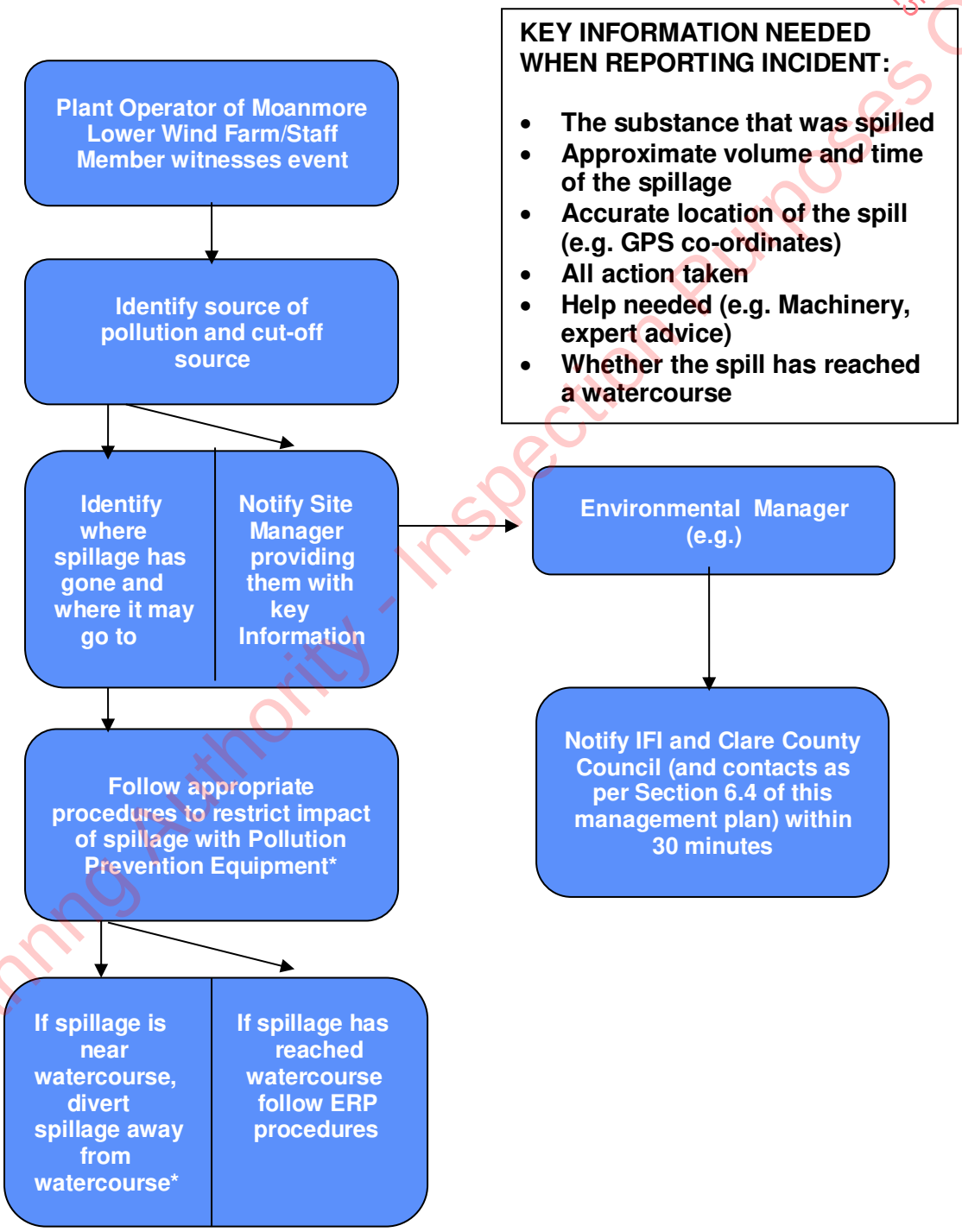
If any icing of blades occurs, all activities in the area will cease and site personnel will stand clear of turbines where possible until they have been shut down completely.

6.1.6 Vandalism

In the event of a vandalism at the site, all personnel on site will be notified and An Garda Síochána will be contacted.

6.2 Communication Plan

A Communication Plan (to be followed in the event of an incident) will be provided by the Contactor, in liaison with relevant stakeholders and will be included in the updated ERP prior to commencement of site development works. A Communication Plan is proposed below:



6.3 Environmental Response Plan for Moanmore Lower Wind Farm

INCIDENT RESPONSE PLAN FOR MOANMORE LOWER WIND FARM ***Based on template provided in GPP 21 – Pollution Prevention Guidelines.***	
Site Address: Moanmore Lower Wind Farm, Moanmore Lower, Kilrush, Co. Clare. **Official Company Address:** Moanmore Lower Green Energy Limited, C/O Greensource, Station Road, Adare, Co. Limerick. **KEY HOLDERS FOR SITE – NAME & CONTACT NUMBERS:** Mr. Harry Harbison, Moanmore Lower Green Energy Limited, Tel: 061 953600 Email: info@greensource.ie	**Middle of Site** **ITM:** (ITM X: 497908), (ITM Y: 657925) **Site Entrance** **ITM**: (ITM X: 498394), (ITM Y: 658010) **Link to Map:** https://www.google.com/maps/@52.6647554,-9.506449,2113m/data=!3m1!1e3?entry=ttu&g_ep=EgoyMDI0MDkxMS4wIKXMDSoASAFQAw%3D%3D
Overview of the activities on site: **Include number of employees at different time of the day:** Daylight Hours: Dusk to Dawn: Weekend Dusk to Dawn: Bank Holidays:	
Date & Version of the plan:	**Name & position of person responsible for compiling/approving the plan:**
Review Date	**Date of next exercise:**
Objectives of the plan: To limit any potential harmful impact to the local environment through swift and appropriate actions in the event of an emergency.	
List of external organisations consulted in the preparation of this plan with contact details	
Distribution list of who has received this plan and which version. *Please note that it is recommended that you review and revise this plan regularly:*	

6.4 External Contacts

Contact	Office Hours	Out of Office
Emergency Services (Fire/Police/Ambulance)	999 or 112	999 or 112
Local Garda Station Kilrush	065 908 0550	*999/112*
Local Hospital. Ennis General Hospital	065 682 4464	
Environment and Water Services Department, Clare County Council, Áras Contae an Chláir, New Road, Ennis, Co. Clare, V95 DXP2.	065 684 6331	
EPA	053 916 0600	1850 365 123
Inland Fisheries Ireland	01 884 2600	**1818 347 424 (24 hours a day)**
Roads Service (Blocked/Flooded Roads)	(West Clare Municipal District) 065 905 1047 (OPW Flood info) 353 46 942 2000 (Flooding.ie Clare CC) 065 682 1616	(Flooding.ie Clare CC) 087 416 9496
ESB- Electricity Company	021 238 6555 (ESB Clare) 1800 372 999 (ESB Emergency) 1800 372 757 (ESB Fault Report)	1800 372 999 **(24 hours a day)**
Telecommunications – Eircom	1800 245 245	

6.5 Internal Contacts

Names and position of staff authorised and trainers to activate and co-ordinate the plan. Staff to be contacted if need to move or evacuate the site		
Other Staff:		
Managing Director		
Project Manager		
Site Manager		
Environmental Manager		
Health & Safety Manager		

6.6 Chemical Product & Waste Inventory

Trade name/ substance	Solid/liquid/ gas or powder	UN number	Max amount	Location marked on site plan	Type of Containment	Relevant health & Environmental properties

6.7 Pollution Prevention Equipment Inventory (On/Off-Site Resources)			
Type	**Location**	**Amount**	**Staff contact**

For example:

- *Personal protective Equipment (PPE) available that should be worn*
- *absorbents (booms, cushions, Spill kits)*
- *drain mats/covers*
- *pipe blockers*
- *booms*
- *pumps*
- *sandbags*
- *silt fencing*
- *over drums*

IF ANY OF THIS EQUIPMENT REQUIRES SPECIALIST TRAINING – STATE WHO HAS BEEN TRAINED IN ITS USE AND DATE OF TRAINING (attach evidence where possible).

6.8 List of Staff Trained in the Use of Spill kits and Booms	
Name	**Date of Training**

6.9 Site Environmental Incident Report Form

Site		Date	
Time		Weather:	
Report By:		Position:	
Moanmore Lower Wind Farm personnel present:		Position:	
Contractor Personnel Present:		Position:	

Description of Incident

Item Spilled	
Estimate of Volume of Spillage	

List of actions followed once incident was noted	Time	Corrective Action By	
		Action	By
Who first observed incident?			
First action			
Next Action			
Time Pollution Hotline was contacted			
Other			

Details of Clean-Up contractor or how contamination was removed from site:

Details of how this could be avoided in future:	
Details of review of internal procedures as result of this incident:	

DATE REPORT COMPLETED_____

6.10 Site Environmental Audit Form

Site:		Date:	
Time:		Weather conditions:	
Report by:		Position:	
Moanmore Lower Wind Farm personnel present:		Position:	
Contractor personnel present:		Position:	

Item	Questions	Yes	No	Corrective Action Required	
				Action	By
1. Miscellaneous					
1.01	Does the contractor carry out regular internal environment audits on the site? Are recommendations recorded and is corrective action monitored?				
1.02	Have any environment incidents occurred and have these been reported as per on site procedure?				
1.03	Does the site induction contain a section on environmental requirements, including spill procedures, and is this communicated effectively?				
2. Land					
2.01	Are areas of hard standing (excluding bunded and refuelling areas) appropriately drained?				
2.02	Have local roads been inspected and cleaned where necessary?				
2.03	Has all test pitting and soil stripping been monitored by an archaeologist?				
2.04	Have all site clearance works been checked by an ecologist prior to works?				

Item	Questions	Yes	No	Corrective Action Required	
				Action	By
3. Material and equipment					
3.01	Is there knowledge of the IFI |Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters (2016) and OPW Environmental Guidance: Drainage Maintenance & Construction (2019)				
3.02	Are transformers/ generators located in secondary containment bunds?				
3.03	Are all bunds capable of containing 110% of the volume of the largest container?				
3.04	Is refuelling carried out in a designated refuelling bay?				
3.05	Does all site drainage on hard standing drain to a stilling pond?				
3.06	Is the designated area for oil, fuel and chemical storage appropriately sited (i.e. on hard standing at least 10m from a watercourse)?				
3.07	Are there procedures in place to monitor bund integrity and mange bund rainwater levels? Are these followed and recorded?				
3.08	Is there awareness that oil or residue from contaminated water removed from bunds should be disposed of as special waste and not discharged to land or the water environment? (oil absorbent materials (pads etc.) should be used first)				
3.09	Are all drums and mobile plant (e.g. generators) placed on drip trays more than 10m from any watercourse?				
3.10	Is all plant maintained in a good state of leaks? Are there records of this?				
3.11	Are there adequate spill kits available and stored in close proximity to potential risks?				
3.12	Are all refuelling browsers double skinned, locked when not in use, and in a good state of repair?				
3.13	Is there evidence of unmanaged/ unrecorded fuel / oil spillages on site?				

Item	Questions	Yes	No	Corrective Action Required	
				Action	By
3.14	Are dry or wet wheel washing facilities fully operational and effective?				
3.15	If wet wheel washing facilities are required, are these closed systems with no discharge to the water environment as per the SWMP?				
3.16	Are there laboratory certificates (accredited by the Irish National Accreditation Board) to confirm that imported material stone aggregate brought onto site is free from any contamination?				
4. Noise, Dust and Light					
4.01	Are there facilities to dampen stockpiles and site working areas/roads to suppress dust?				
4.02	Are vehicles carrying loose material sheeted at all times?				
4.03	Are construction works, or deliveries of materials to and from the development, audible at noise sensitive premises?				
4.04	Has all external construction lighting received the approval of the planning authority (as part of planning compliance)?				
5. Waste					
5.01	Is the site tidy and free from litter?				
5.02	Is there evidence of waste beyond the site boundary?				
5.03	Is waste segregated and kept securely in containers in clearly designated areas?				
5.04	Does all waste leaving the site have the appropriate duty of care paperwork?				
5.05	Is all waste leaving the site being taken to an appropriately licenced site?				
5.06	Does all special/ hazardous waste (e.g. oil contaminated soils, waste oil) have the appropriate Special Waste Consignment Note?				
5.07	Is material re-used/recycled on site where possible?				

Item	Questions	Yes	No	Corrective Action Required	
				Action	By
5.08	Are waste management practices in line with the site waste management plan?				
5.09	Are relevant Waste Management Exemptions in place for use of waste on site (e.g. use of waste concrete to create foundation sub-base)?				
5.10	Is there any evidence of burning on site?				
5.11	Is there any evidence of unlicensed burial of waste?				
6. Water					
6.01	Do all discharges to land or watercourses have appropriate authorisation from Local Authorities /IFI?				
6.02	Does all watercourse engineering (bank protection, crossing etc.) have the appropriate authorization from Local Authorities / IFI?				
6.03	Do any abstractions from a watercourse or groundwater body have the appropriate authorization from Local Authority / IFI?				
6.04	Has confirmation for the SUDS design for access roads been gained from Local Authority / IFI?				
6.05	Are cut-off ditches installed on the uphill side of the working area to avoid contaminated surface water run-off?				
6.06	Have field drain been diverted where necessary?				
6.07	Is adequate treatment (e.g. settlement tank/lagoons/discharge to land) provided to prevent silt contaminated water entering watercourses and groundwater?				
6.08	Has vegetation removal/ clearance of the site been minimised to avoid unnecessary areas of bare ground?				
6.09	Have buffer-strips been left between working area and watercourses?				
6.10	Is plant operating in the watercourse?				
6.11	Have all culverts been installed at the base of stockpiles situated within close proximity to watercourses?				

Item	Questions	Yes	No	Corrective Action Required	
				Action	By
6.12	Have silt fences been installed at the base of stockpiles situated within close proximity to watercourses?				
6.13	Are there adequate controls on site construction roads to minimise sediment runoff into watercourses (in particular, are there adequate flow attenuation measures within surface drain)?				
6.14	Are there any sign of decaying straw bales in water courses? (this could lead to organic pollution of the water course)				
6.15	Are silt traps regularly maintained?				
6.16	Has ease of maintenance been considered in the design of permanent drainage features?				
6.17	Is there evidence of contamination of any watercourse (e.g. with oil, sediment, concrete, waste) in the vicinity of the works?				
6.18	Is monitoring of potential impacts on watercourses carried out on a regular basis and fully recorded?				
6.19	Are dewatering operations being carried out in such a way to minimise sediment contamination?				
6.20	Is drainage and run off in concrete batching areas adequate?				
6.21	Are adequate pollution prevention measures considered and put in place during concrete pours? i.e. measures outlined in the SWMP.				
7. Landscape					
7.01	Have earthworks been designed to promote successful re- instatement of vegetation?				
7.02	Are reinstatement and restoration works being implemented in a timely manner as per the requirements of the contract?				
8. Ecology					
8.01	Have storage sites (soil, plant etc.) been sited on areas of lower quality habitat where possible?				

Item	Questions	Yes	No	Corrective Action Required	
				Action	By
8.02	Is the ECoW a member of the institute of Ecology and /or Environmental Management as required by planning conditions?				
8.03	Have buffer zones been constructed and maintained around designated protected species exclusion areas (e.g. red squirrel dreys, water vole habitats, otter holts, badger holts etc.)?				
8.04	Have toolbox talks on the subject of ecology and environmental responsibilities on site been delivered? Have attendance record been maintained for these?				
9. Documentation Check					
9.01	Start-up meeting record				
9.02	Full contacts list in Section 3, Table 3.0 of CEMP				
9.03	Induction records				
9.04	Pollution Prevention Measures Register				
9.05	Geotechnical Risk Register				
9.06	Weekly meeting minutes				
9.07	Records of environmental checks and routine monitoring of mitigation measures				
9.10	Water Quality Monitoring Results				
9.11	Safety and Environmental Awareness Reports (SEARs). Filed and entered on database?				
9.12	Safety and Environmental Audit Reports for the site. (If yes, insert date of last audit_____)				
9.13	Contractor's Environmental Plans (or Construction Method Statements):				

Appendix B

Surface Water Management Plan

MOANMORE LOWER GREEN ENERGY LIMITED

MOANMORE LOWER WIND FARM, MOANMORE, CO. CLARE

CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN (CEMP)

SURFACE WATER MANAGEMENT PLAN

APRIL 2025

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DOCUMENT APPROVAL

PROJECT	Moanmore Lower Wind Farm, Co. Clare	
CLIENT / JOB NO	Moanmore Lower Green Energy Limited	6778
DOCUMENT TITLE	Construction Environmental Management Plan (CEMP) Surface Water Management Plan (SWMP)	

	Prepared by	**Reviewed / Approved by**
Document FINAL	Name Sarah Moore/ Angelika Thiel/ Padraig O'Dowd	Name David Kiely
Date April 2025	Signature	Signature

CONTENTS

1 INTRODUCTION

1.1 Overview

This Surface Water Management Plan (SWMP) for the Development describes the site drainage that has been designed for the site using the following principles:

- Ecologically Sensitive Processes
- Sustainable Drainage Systems (SuDS)

This is a live document and where there is a requirement for variation on the ground to provide more ecologically sensitive drainage then the SWMP will be updated to reflect this. The SWMP will be updated by the appointed contractor and changes to the document will be agreed with the Environmental Manager (EM) and Ecological Clerk of Works (ECoW) before drainage works commence.

The SWMP aims to:

- Describe environmental sensitivities of the site and the buffer zones
- Describe how the system will operate to minimise modification and disruption to the existing site hydrology
- Define mitigation measures for entrainment of suspended solids in watercourses
- Outline the proposed maintenance regime
- Outline the proposed drainage management post-construction

2 BASELINE ENVIRONMENT

2.1 Site Description

The wind farm Site, as shown in **Figure 1.1**, is located in south-west county Clare, 3km northwest of the town of Kilrush and 6.8km southwest of Cooraclare village. The wind farm Site is located within the townland Moanmore Lower. It is located within an area comprised of agricultural livestock grazing farmland, bog, and shrub land.

Figure 1.1: Moanmore Lower Wind Farm Site Location

2.2 Topography

The Site redline boundary area is approximately 36.2ha and is located in south-west county Clare, 3km north-west of the town of Kilrush and 6.8km south-west of Cooraclare village. It is located within an area comprised of agricultural livestock grazing farmland, bog, and shrub land.

The area is characterised by relatively flat lying topography with associated elevations ranging between 8 to 16mAOD and an average slope of 2.5°, ranging from between 0.1 and 24.5°.

2.3 Hydrology and Geology

The proposed wind farm Development and Grid Connection to the Tullabrack 110kV substation are situated within the Shannon Estuary North catchment (ID: 27, Area: c.1651.27km²). The Turbine Delivery Route is situated across three catchments, and they are as follows; Shannon Estuary North (ID: 27, Area: c.1651.27km2), Lower Shannon catchment (ID:25D, Area: c. 1041.27km²), and Shannon Estuary South catchment (ID:24, Area: c. 2033.96 km²).

The Site and its surroundings are located upstream of the Shannon Estuary which is located approximately 1.23km from the Site boundary at the closest extent near the proposed T2 turbine position. The Site has indirect hydraulic connectivity to the estuary via natural and artificial drainage that connect to the Moyasta River which drain the Site. The Mouth of the Shannon (EU Code: IE_SH_060_0000) has an area of 335.14km^2 and is designated as the Lower River Shannon SAC and River Shannon and River Fergus Estuaries SPA. The Moyasta_010 River has an overall catchment area of 43.95km^2 and rises further from the north-eastern end of the Site, flows past north of the redline boundary. The Moyasta River generally flows in a westward direction before draining to the Paulnasherry Bay and into the Shannon Estuary.

3 ENVIRONMENTAL CONSTRAINTS AND MITIGATION MEASURES

There are a number of construction phase mitigation measures that must be adhered to during the installation of the drainage system. The relevant EIA chapters where mitigation measures can be found are shown in **Table 3.1**.

Table 3.1 Location of relevant mitigation measures

Element	Location of Mitigation Measures
Biodiversity	**EIA Chapter 6**
Aquatic Ecology	**EIA Chapter 7**
Soils and Geology	**EIA Chapter 8**
Hydrology and Geology	**EIA Chapter 9**

4 DRAINAGE SYSTEM OVERVIEW

4.1 SuDS Drainage Design

The design criteria for the SuDS design are as follows:

- To select and install ecologically sensitive drainage.
- To minimise alterations to the ambient Site hydrology and hydrogeology.
- To provide settlement and treatment controls as close to the Site footprint as possible and to replicate where possible the existing hydrological environment of the Site.
- To minimise sediment loads resulting from the development run-off during the construction phase.
- To preserve Greenfield runoff rates and volumes.
- To provide settlement ponds to encourage sedimentation and storm water runoff settlement.
- To reduce stormwater runoff velocities throughout the Site to prevent scouring and encourage settlement of sediment locally.
- To manage the problems of erosion and allow for the effective revegetation of bare surfaces.
- To control water within the Site and allow for the discharge of runoff from the Site within the limits prescribed in the Salmonid Regulations.

4.2 SuDS Design Principles

The approach to treatment and attenuation of storm water is as follows:

- Additional drainage measures will only be added as necessary. The dimensions of these features will avoid intercepting large volumes of water. Any changes to the SWMP must be agreed with the EM and the ECoW.
- Surface water runoff from the proposed Site access tracks will be managed with crossfall downslope to mimic the natural drainage patterns of the Site.
- Drainage vegetation used will be appropriate to the local area and will be approved by the ECoW.
- Temporary erosion protection together with silt fences may be required until the vegetation becomes established (coir matting or similar).
- Roads will be constructed from aggregate and will not be surfaced with bitumen materials, thus allowing for permeation and helping to reduce runoff volumes. Therefore, a reduced runoff coefficient of 65% is applicable. For hardstands, an open textured stone will be used as these will only be functional during construction of the specific turbine, a higher permeability is envisaged and the run-off co-efficient is reduced to 50%.

- An additional 20% rainfall will be included to allow for a possible increase in rainfall intensity due to climate change.
- An additional 20% will be included to take account for climate change.
- Stormwater runoff within the trackside drainage will be treated through the provision of check dams, within a range depending on local slope of the drain.
- The stone used for the construction of the check dams will be washed graded stone with a size range between approximately 5mm and 40mm.
- Discharging directly back into the surrounding area will assist in maintaining the hydrological characteristics of the Site.
- Vegetation will be reinstated on slopes as early as possible.
- Under track drainage will be provided with drainage pipes at existing surface water features. The under-track drainage will provide a means for flows to pass and maintain the natural flow throughout the Site.
- A sump may be required for trench dewaterings. Water will subsequently be pumped into settlement ponds and allowed to settle. The general location of the small sump will ensure that they pose minimal health and safety risk to Site personnel.
- The settlement ponds will be designed to cater for infilling and rehabilitation post construction phase of the project.
- The level of silt runoff during construction will be monitored and if found to be excessive in any area, will subsequently be managed by the provision of additional silt attenuation features such as silt fences or silt traps. If the suspended solids levels remain high, water can be pumped from settlement ponds into tankers and transferred off Site to a suitable water treatment facility subject to agreement with the Local Authority. Note that works will be temporarily suspended in the area of the Site contributing to elevated suspended solids levels.
- Field drains will be piped directly under the track through appropriately sized drainage pipes.
- Appropriate Site management measures will be taken to ensure that runoff from the construction Site is not contaminated by fuel or lubricant spillages.
- There will be no discharge of trade effluent, sewage effluent or contaminated drainage into any surface water feature.

4.3 Purpose of a SuDS Drainage Design

There is increased potential for water pollution, in particular sedimentation to local surface water features due to the excavation and generation of spoil and emplacement of stone materials during the construction stage of the project.

The purpose of incorporating a SuDS design is:

- To provide sufficient detail to ensure that water pollution will not occur as a result of construction activities at the Site and to minimise the risk of any such occurrence.
- To regulate the rate of surface water run-off downslope to prevent scouring and to encourage settlement of sediment locally.
- To minimise the quantity of sediment laden stormwater and resulting settlement pond sizes by separating "clean" water from the "dirty" development runoff.

4.4 Design Philosophy

The SuDS design must be managed and monitored at all times and particularly after storm or heavy rainfall and during construction phase environmental auditing. The design rationale is that of an integrated approach where each element is assessed for its potential contribution to sediment suspension and the appropriate mitigation measures integrated into the layout design. The design principles are as follows:

Minimise	→	**Intercept**	→	**Treat**	→	**Disperse**	→	**Dilute**

4.4.1 Minimise

The main principle of this SuDS design is to minimise the volume of 'dirty' water requiring treatment through means of informed, integrated and sustainable drainage design. It achieves this by keeping 'clean' water clean by interception and separation, and by collecting the 'dirty' water and treating it by removing the suspended sediments. The resultant outflow is dispersed across vegetation and will become diluted through contact with the clean water runoff in the buffer areas before entering Site/ roadside drains.

4.4.2 Intercept

The key sediment control measure is the separation of construction runoff from the clean water runoff that arises in the undisturbed areas of the Site and surrounding lands. This significantly reduces the volume and velocity of dirty water that the sediment and erosion control measures need to deal with. To achieve separation, clean water infiltration collector drains, or silt fences are positioned on the upslope and dirty water v-drains positioned along the verge, with Site surfaces sloped towards dirty water v-drains. The remainder of this clean water will be regularly piped under the Site roads and dirty water v-drains to avoid contamination. Piping the clean water regularly under the Site roads allows the clean water to follow the course it would have taken before construction thus mimicking the existing surface water sheet flow pattern of the Site.

4.4.3 Treat, Disperse and Dilute

The clean water infiltration interceptor drains are positioned upslope of the Development footprint, to prevent any mixing of the clean and 'dirty' water. The infiltration interceptor drains redirect the clean water away from the Site infrastructure, as best suits the natural topography of each sector. The clean water outflow is then discharged into either, an existing drainage network or dispersed through an area of vegetation where it can percolate into the ground naturally.

In the drawings, 'dirty water' drains, indicated in orange, collect all incident rainwater that falls on the Development infrastructure. These then drain to buffered outfalls or into settlement ponds. The treated effluent from the settlement ponds is then dispersed across vegetation (through buffered outfalls) to further filter the discharge. Dispersal in this manner has the effect of allowing the smaller particle sizes to be taken up by the vegetation.

5 DETAILED DESIGN CONSIDERATIONS

5.1 Overview

This SuDS adopts a design for the drainage of the Site. The following elements in series are proposed:

- Open constructed drains for Development run-off collection and treatment;
- Collection drains for upslope "clean" water collection and dispersion;
- Filtration check dams to reduce velocities along sections of road which run perpendicular to contours;
- Settlement ponds and buffered outfalls to control and store Development runoff to encourage settlement prior to discharge at Greenfield runoff rates.

These measures provide a surface water management train that will mitigate any adverse impact on the hydrology of the Site and surrounds during the construction phase of the Project.

5.2 Cut-off Ditches / Collector Drains (Clean Water)

Drainage management will ensure that natural runoff is not permitted to mix with construction runoff from sources such as excavation dewatering or track runoff. Design will ensure that infiltration interceptor drains be installed upslope of Development, to intercept and divert clean surface water runoff, prior to it coming in contact with areas of excavation. Design will ensure that natural runoff infiltration interceptor drains are installed ahead of main earthworks wherever practical.

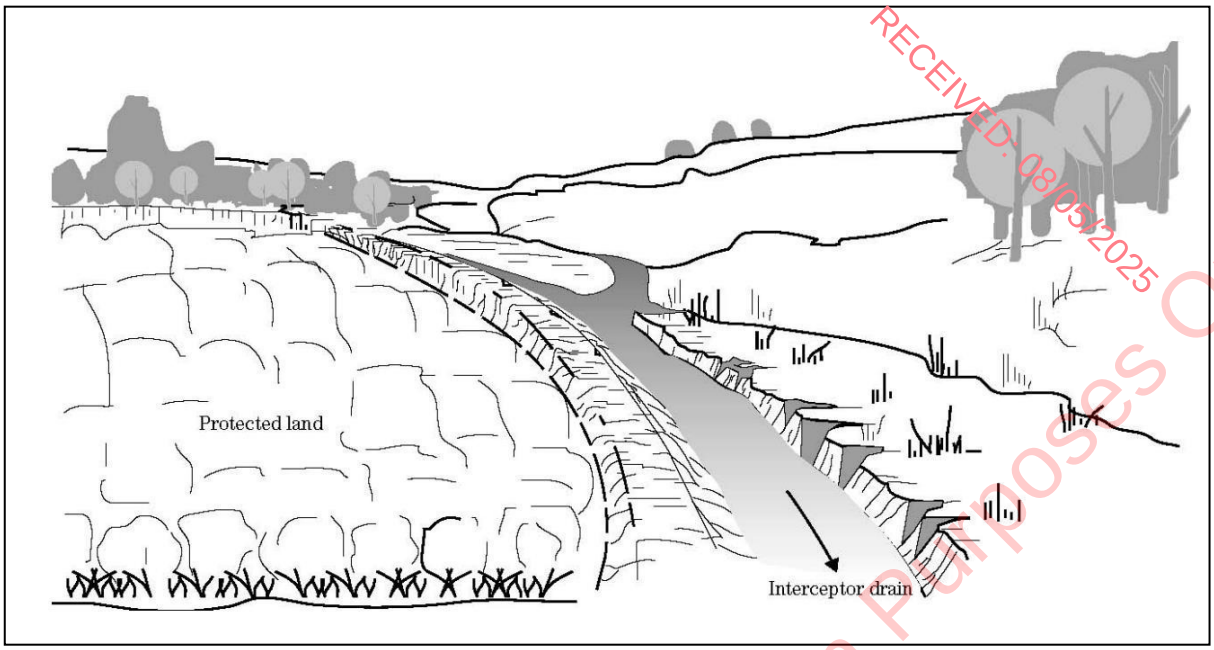

Figure 5.1: Diagram showing interceptor drain (Source: NJWMG, 2007) [1]

This is intended to reduce the flow of natural runoff onto any exposed areas of peat/soil, thereby reducing the amount of potential silt laden runoff requiring treatment. Installed drainage will allow provision for natural runoff water, upslope of the Development, to collect in infiltration interceptor drain and directed away from the Development. In certain areas it will be required to pass through under track clean water culverts, separate to drainage provided for track runoff, and be discharged downstream of the Development.

Temporary silt / pollution prevention and scour protection measures will be provided in artificial natural runoff drainage installed in order to mitigate potential for scouring and transport of sediment from newly excavated channels which will be formed as part of the construction runoff drainage provisions.

Frequency of outflow points are designed to avoid collection and interception of large catchments creating significant point flows, with associated risks due to scour and hydraulic capacity.

The drains will be max 350mm – 500mm in depth.

[1] New Jersey Water Management Guide, 2007. Online:https://www.nrcs.usda.gov/sites/default/files/2022-09/Water%20Management%20Guide.pdf. Accessed at: 16/09/2024]

5.3 Buffered Outfalls

Dirty water will be discharged to land via buffered outfalls. These drainage outfalls will contain hardcore material of similar or identical geology to the bedrock at the Site to entrap suspended sediment. In addition, these outfalls promote sediment percolation through vegetation in the buffer zone, reducing sediment loading to any adjacent watercourses and avoiding direct discharge to the watercourse. It is recommended that a relatively high number of discharge points are established, thus decreasing the loading on any particular outfall. Discharging at regular intervals mimics the natural hydrology by encouraging percolation and by decreasing individual hydraulic loadings from discharge points.

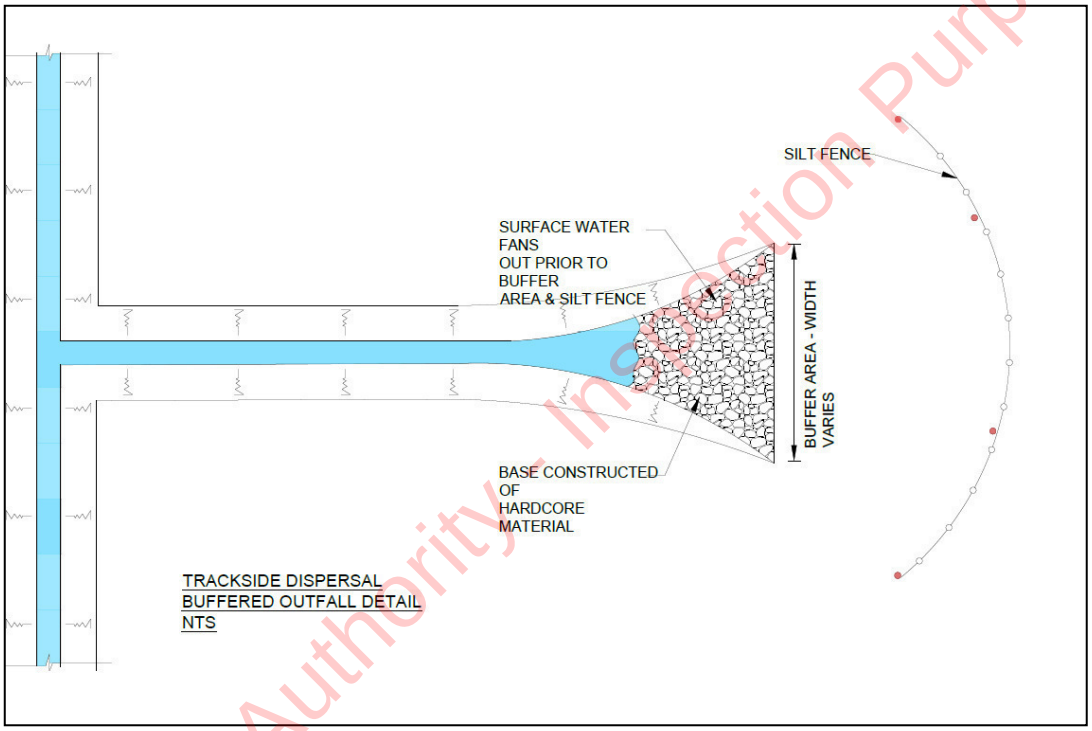

Figure 5.2: Diagram of Buffered Outfall

5.4 Trackside Drains (Dirty Water)

These are open gently sloping drainage channels to convey dirty water, trap sediment, enhance filtration and slow down the rate and magnitude of runoff that could enter the local watercourses. The drains will be max 350mm – 500mm Nin depth and the turve will be taken as a single piece and placed on the downslope side of the drain. Therefore, once construction works are complete the turve can be put back in place with minimal ecological damage. These drains will be reinstated following the works.

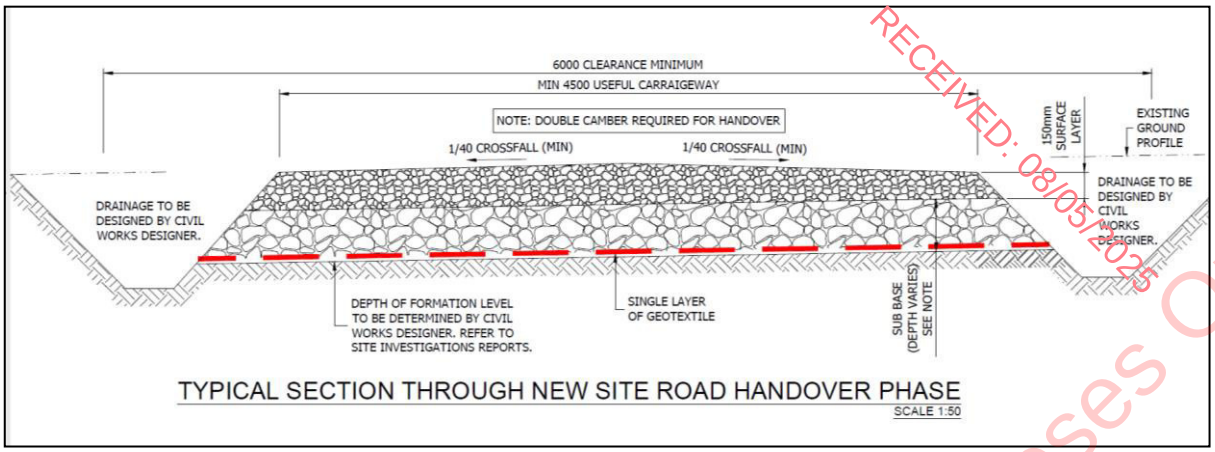

Figure 5.3: Site Access Track Section

5.5 Silt Fences

Silt Fences are designed in order to effectively filter the water, holding back the silt and allowing the water through, they require to be installed correctly with the lower part of the fence dug into the ground. Silt fences will also be required to be cleaned out on a regular basis, particularly after periods of heavy rainfall. Silt fences are required to be inspected and maintained on a regular basis in order to ensure that silty water is not running under or around the silt fences. Silt fences can also be used to divert clean water away from the Development area, minimising the volume of dirty water.

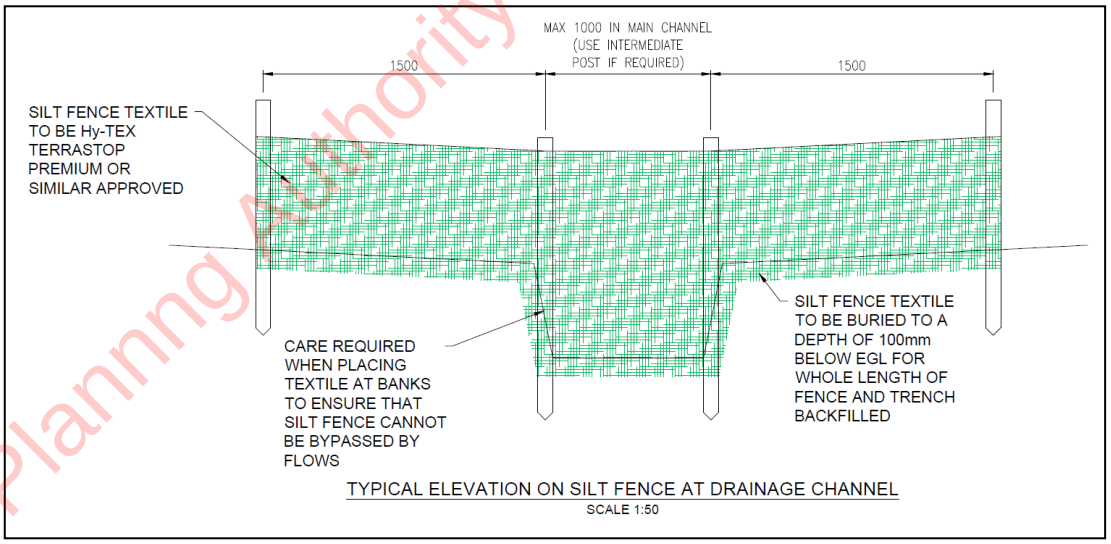

Figure 5.4: Illustration of Silt Fencing

Plate 5.1: Photograph of Silt Fencing

5.6 Filtration Check Dams

Check dams (flow barriers or dams constructed across the drainage channel) will be installed at regular intervals within the dirty trackside drains in order to reduce erosion and allow for greater flow control. These check dams are required in order to reduce the velocity of water and therefore allow settlement of coarser sediment particles as well as silt at low flow conditions. Reduction in flow velocity will also prevent scouring of the drainage channel itself. Rock filter bunds may be used for check dams however, stone can also be used if properly anchored. It is recommended that multiple check dams are installed, particularly in areas immediately downgradient of construction areas.

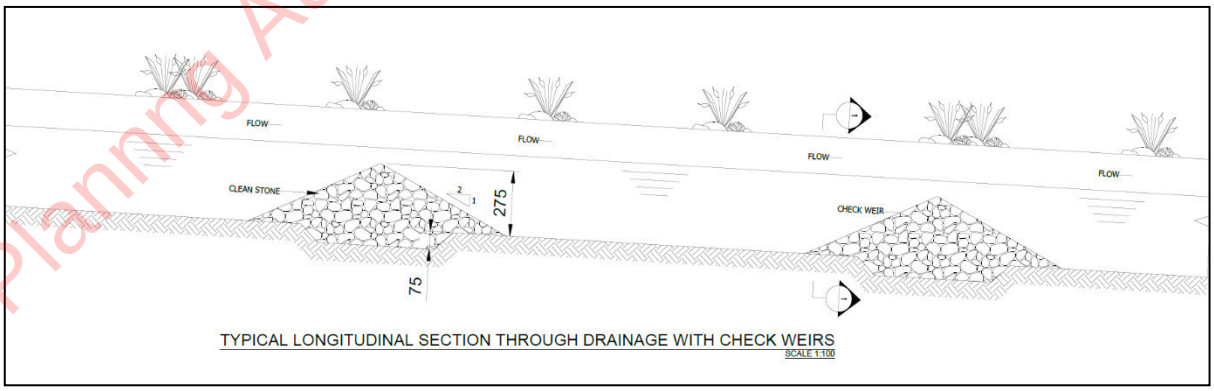

Figure 5.5: Diagram Showing the Function of Check Dams

Settlement build up will be monitored and cleaned during the construction stage when necessary. The number and location of check dams will be dependent on the slope, flow and

volume of water, although the following general rules will be applied;

- The maximum spacing between check dams should be such that the toe of the upstream dam is at the same elevation as the top of the downstream dam;
- The centre of the check dam should be at least 0.2m lower than the outside edges;
- Side slopes should be 1:2 or less;
- A terram membrane barrier or similar non-woven geotextile membrane placed around check dam
- Check dams should be keyed at least 0.1m into the drainage channel bottom in order to prevent the dam washing out; and
- Check dams will be maintained and monitored on a regular basis. Sediment will be removed before it reaches one half the original dam height.

Worked examples:

The depth of a check dam is 0.3m high: 0.3m x (1 in 100 gradient) = 30m spacing;
For a 0.3m high check dam: 0.3m x (1 in 50 gradient) = 15m spacing.
For a 0.5m high check dam: 0.5m x (1 in 50 gradient) = 25m spacing.

See **Table 5.1** for recommended spacing, relative to the gradient of drain, for a 0.3m high check dam.

Table 5.1: Check Dam Spacing

Max Spacing (m)	Gradient
3m	10% (1 in 10)
4m	8% (1 in 12)
5m	6% (1 in 17)
6m	5% (1 in 20)
8m	4% (1 in 25)
10m	3% (1 In 33)
15m	2% (1 In 50)
20m	1.5% (1 in 67)
30m	(1 in 100)

5.7 Settlement Ponds

Runoff from the wind farm track surface will be attenuated to mimic natural runoff patterns. To capture runoff generated within the Development footprint, it is proposed to use constructed trackside drains. Accumulations of runoff will then be transferred to settlement ponds. See **Figure 5.6** below and detail drawings (Planning Drawing No.

6778_JOD_MM_XX_DR_X_0303 which displays a diagrammatic cross section through a settlement pond within the drainage regime. All ponds will be kept as shallow as possible so that they pose no health and safety risk to plant or personnel. Settlement ponds are to be securely fenced to prevent easy access.

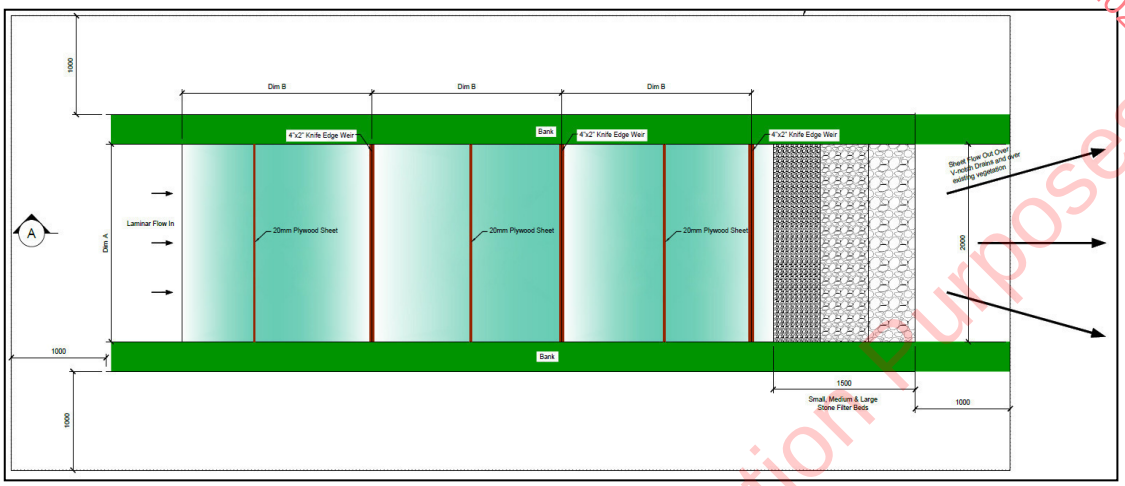

Figure 5.6: Plan View of Settlement Ponds (with Discharge to Drains where Applicable)

Plate 5.2: Completed Settlement Pond System

The ponds are utilised to attenuate and to aid the removal of suspended solids from Site runoff water. All the pond locations are displayed within the site drainage drawings. Settlement ponds will be emplaced at locations along the drainage footprint.

Calculation parameters for the determination of storage requirements have been undertaken and are as follows:

- A 1 in 200-year rainfall return design (Source: Met Éireann - Please refer to **Appendix A**).
- An initial outlet overflow rate is applied of 19.5 l/s/ha (litres per second) which approximates to Greenfield run-off rates for the Site. (Source: HR Wallingford – Please refer to **Appendix B**).
- The Rational Method is subsequently applied to calculate the flow volumes into each settlement pond over these respective periods. The Rational Method is expressed by the formula Q = 2.78 CIA, where Q is the peak volume of water generated in the settlement pond, C is the run-off co-efficient, I is rainfall intensity and A is the drainage area of the hardstanding / catchment.
- A runoff coefficient of 0.60 (0.50 runoff plus an additional 20% buffer for climate change) is applied to all hardstand areas. These areas are only used using during the construction of turbine bases and delivery of turbine components. Therefore, their porosity will not be impacted during the construction or operation of the proposed development.
- A runoff coefficient of 0.78 (0.65 runoff plus an additional 20% buffer for climate change) is conservatively applied to the footprint areas excluding hardstands. As these areas will be used more frequently, they are more likely to become clogged with dirt and their porosity to reduce.

Table 5.2 identifies settlement ponds designed to treat and attenuate each Development catchment area. The details in **Table 5.2** are based on calculations found in **Appendix C**.

Tables 5.2: Settlement Pond Sizing

Pond Ref.	Development Area (m^2)	Residual Volume (m^3)	Pond Dimensions			Overall Volume of Attenuation Pond (m^3)
			Dim. Length (m)	Dim. Width (m)	Dim. Height (m)	
SP1	228	4.5	6	2.00	1.0	12
SP2	542	10.6	6	2.00	1.0	12
SP3	1,580	30.8	9	3.00	1.0	27
SP4	550	10.7	6	2.00	1.0	12
SP5	375	5.1	6	2.00	1.0	12
SP6	520	7.1	6	2.00	1.0	12
SP7	1,596	21.7	9	3.00	1.0	27
SP8	1,596	21.7	9	3.00	1.0	27
SP9	1,596	21.7	9	3.00	1.0	27
SP10	525	10.2	6	2.00	1.0	12

Pond Ref.	Development Area (m^2)	Residual Volume (m^3)	Pond Dimensions			Overall Volume of Attenuation Pond (m^3)
			Dim. Length (m)	Dim. Width (m)	Dim. Height (m)	
SP11	530	10.3	6	2.00	1.0	12
SP12	1,790	34.9	12	3.00	1.0	36
SP13	1,070	20.9	9	3.00	1.0	27
SP14	1,440	19.6	9	3.00	1.0	27
SP15	1,440	19.6	9	3.00	1.0	27
SP16	1,440	19.6	9	3.00	1.0	27
SP17	1,580	21.5	9	3.00	1.0	27
SP18	1,596	21.7	9	3.00	1.0	27
SP19	1,596	21.7	9	3.00	1.0	27
SP20	1,596	21.7	9	3.00	1.0	27
SP21	1,660	22.6	9	3.00	1.0	27
SP22	22,464	305.6	33	10.00	1.0	330

5.8 Cable Trench Drainage

Cable trenches are typically constructed in short sections c. 100m this minimises for drainage runoff to pick up large volumes of silt or suspended solids. Drainage runoff from cable trench works areas, is managed by storing excavated material on the upgradient side of the trench. Where rainfall causes runoff from the excavated material, the material is captured in the downgradient cable trench. Excess subsoil is removed from the cable trench works area immediately upon excavation. The excavated trench will be dewatered if required, from a sump installed within the low section of the opened trench. Where dewatering is required, silt laden water will be fully and appropriately attenuated, through silt bags, before being appropriately discharged to vegetation or surface water drainage feature.

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

5.9 Forestry Felling Drainage Management

Best practise methods related to water incorporated into the forestry management and water quality protection measures are as follows:

- Forest Service (2000): Forestry and Water Quality Guidelines. Forest Service, DAF, Johnstown Castle Estate, Co. Wexford
- Forest Service, (2000): Code of Best Forest Practice – Ireland. Forest Service, DAF, Johnstown Castle Estate, Co. Wexford
- COFORD (2004): Forest Road Manual – Guidelines for the design, construction and management of forest roads

5.10 Control Measures

- Forestry felling works must be overseen by the ECoW. Prior to the forestry works commencing the ECoW will carry out a pre-felling inspection to identify the main drainage ditches.
- Works will be carried out during periods of no, or low rainfall, in order to minimise entrainment of exposed sediment in surface water runoff.
- Machinery will be chosen which will minimise soils disturbance. Consideration will be given to the use of cable-crane extraction, to reduce soil disturbance.
- Checking and maintenance of roads and culverts will be undertaken by the ECoW through the felling operation.
- No tracking of vehicles through watercourses will occur, as vehicles will use road infrastructure and watercourse crossing points.
- Drains which flow from the areas to be felled will be blocked, and temporary sediment settlement ponds and silt fences will be used.
- Brash mats will be used to support vehicles on soft ground, reducing peat and mineral soils erosion and avoiding the formation of rutted areas, in which surface water ponding will occur.
- Timber will be stacked in dry areas away from surface water buffer zones. Straw bales to be emplaced on the down-gradient side of timber processing areas.

5.11 High Rainfall Events

- An emergency response system has been developed for the construction phase of the project (see **CEMP Appendix A: Emergency Response Plan**).
- There will be a 24-hour advance meteorological forecasting (Met Eireann download) linked to a trigger-response system. When a pre-determined rainfall trigger levels is exceeded (e.g., sustained rainfall (any foreseen rainfall event longer than 4 hour

duration) and/or any yellow or greater rainfall warning (>25mm/hour) issued by Met Eireann), planned responses will be undertaken.

- These responses will include, inter alia; cessation of construction until the storm event including storm runoff has passed over. All construction works will cease during storm events such as yellow warning rainfall events. Following heavy rainfall events, and before construction works recommence, the Site will be inspected and corrective measures implemented to ensure safe working conditions e.g. dewatering of standing water in open excavations, etc.
- Exposed soils/peat (exposed temporary stockpiles) will be covered with plastic sheeting during all relatively heavy rainfall events and during periods where works have temporarily ceased before completion at a particular area (e.g., overnight and weekends).
- Mitigation measures related to surface water quality as outlined in the CEMP will be implemented before excavation works commence.

6 MAINTENANCE AND MONITORING

The monitoring programme during the course of construction works (unless otherwise specified by any required planning condition) will include:

- One baseline monitoring visit (in advance of construction), including upstream and downstream biological Q value sampling and reporting.
- Once daily general visual inspections by site EM at all sample sites identified.
- Weekly grab sample inspections by site EM (Sample parameters will include, suspended solids, and on-site measurement of: turbidity, pH, temperature, electrical conductivity). At two locations within the WF site in man-made drains, and at SW3 and SW4.
- Monthly grab sampling by site EM at locations SW3, and SW4 (refer to **Figure 6.1**). Analysis suite will include (suspended solids, BOD, nitrite, nitrate, ammonia, orthophosphate and chloride).
- Monthly inspections and grab sampling during post construction for 3 months.
- Annual upstream and downstream biological Q value sampling and reporting, including one post construction event.

The Site Environmental Manager (EM) will have a stop works authority. Weekly site meeting will include for scheduling of works according to weather forecast. Suitable locations (further downstream) for biological Q-Value sampling will be identified by Site EM.

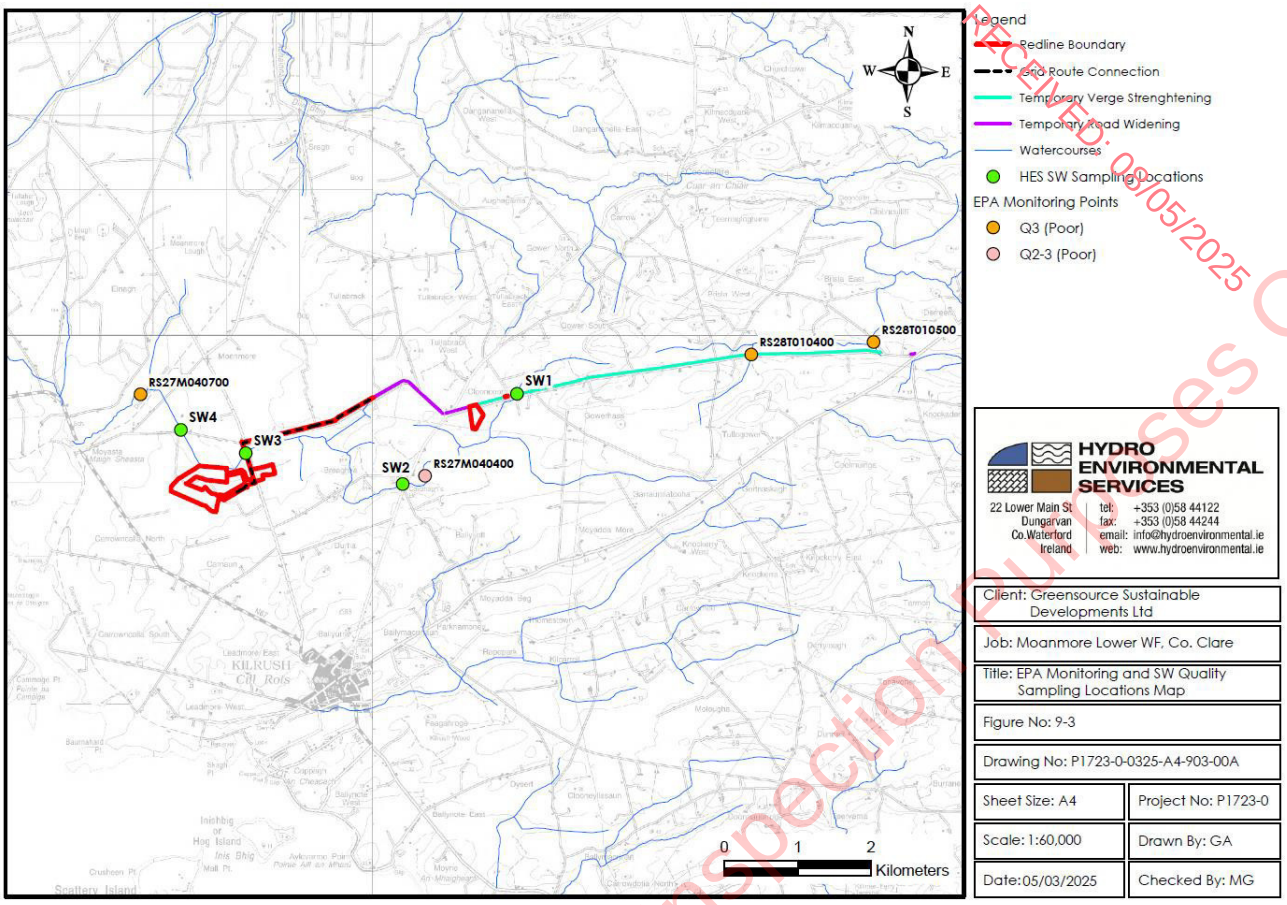

Figure 6.1: Water Quality Monitoring Locations (EIAR Figure 9.3)

6.1 General

The full scope of monitoring will be determined at the detailed design stages (prior to commencement of construction) and will be tailored to take into account the intended construction programme and phasing of works within each catchment.

Key trigger levels at which action will be required to prevent an impact occurring to a water feature will be determined through consultation with IFI and analysis of the results of any baseline monitoring data.

Water Quality Monitoring locations will be identified through grid reference, photographic record and indicated on a plan. For repeat sampling locations, each location will also be marked on the ground (stake/post) so that the correct location is sampled each time.

Sample locations shall be labelled consistently for the duration of the monitoring period. Where any additional locations are sampled during the works, the location (grid reference) of

the sampling point will be recorded and a photograph will be taken at the time of sampling. 'Control' sample locations may also be included in the scope of any monitoring.

6.2 Hydrochemistry Monitoring

Sample locations and monitoring frequency will be specified and agreed with IFI. There are currently proposed sampling locations (SW1-SW4) and these are shown on **Figure 6.1** which are the same locations used for baseline sampling for the EIAR.

As a minimum, the monitoring programme during the course of construction works (unless otherwise stated) will include:

- One baseline monitoring visit (in advance of construction), including upstream and downstream biological Q value sampling and reporting.
- Once daily general visual inspections by site EM at all sample sites identified.
- Weekly grab sample inspections by site EM (Sample parameters will include, suspended solids, and on-site measurement of: turbidity, pH, temperature, electrical conductivity). At two locations within the WF site in man-made drains, and at SW3 and SW4.
- Monthly grab sampling by site EM at locations SW3, and SW4 (refer to **Figure 6.1**). Analysis suite will include (including suspended solids, BOD, nitrite, nitrate, ammonia, orthophosphate and chloride).
- Monthly inspections and grab sampling during post construction for 3 months.
- Annual upstream and downstream biological Q value sampling and reporting, including one post construction event.

Site EM will have a stop works authority. Weekly site meeting will include for scheduling of works according to weather forecast. Suitable locations (further downstream) for biological Q-Value sampling will be identified by Site EM.

Post construction monitoring, to a frequency and specification to be agreed with IFI. Post construction will be defined as when the reinstatement phase is completed.

Analytical determinants (including limits of detection and frequency of analysis) will be specified and agreed with IFI for each sample location. The expected suite of grab sample determinants may include the following:

Parameters for hydrochemistry analysis

- pH
- Temperature
- Total Suspended Solids (TSS)
- Dissolved Organic Carbon (DOC)
- Conductivity
- Dissolved Oxygen (DO)
- Total Oxidized Nitrogen (TON)
- Ammoniacal Nitrogen
- Ammonia
- Potassium
- Phosphate
- Biological Oxygen Demand (BOD)
- Chemical Oxygen Demand (COD)
- Total Petroleum Hydrocarbons (TPH) (*Only during construction phase)

7 POST CONSTRUCTION DRAINAGE MANAGEMENT

Following the completion of construction, a full review of construction stage drainage will be undertaken by the appointed contractor (in conjunction with the EM and the ECoW) with a view to removing drainage infrastructure that is no longer required during the Development's operation phase.

APPENDIX A

MOANMORE LOWER RAINFALL DATA

Met Eireann
Return Period Rainfall Depths for sliding Durations
Irish Grid: Easting: 97956, Northing: 157973,

	Interval		Years											
DURATION	6months,	1year,	2,	3,	4,	5,	10,	20,	30,	50,	75,	100,	150,	200,	250,	500,
5 mins	2.8,	3.8,	4.3,	5.0,	5.5,	5.9,	7.1,	8.5,	9.4,	10.6,	11.6,	12.4,	13.6,	14.6,	15.4,	N/A ,
10 mins	3.9,	5.3,	6.0,	7.0,	7.7,	8.2,	9.9,	11.8,	13.0,	14.7,	16.2,	17.3,	19.0,	20.3,	21.4,	N/A ,
15 mins	4.6,	6.2,	7.0,	8.3,	9.1,	9.7,	11.7,	13.9,	15.3,	17.3,	19.0,	20.4,	22.4,	23.9,	25.2,	N/A ,
30 mins	6.2,	8.1,	9.1,	10.6,	11.6,	12.3,	14.7,	17.2,	18.8,	21.1,	23.0,	24.5,	26.8,	28.5,	29.9,	N/A ,
1 hours	8.2,	10.6,	11.8,	13.6,	14.7,	15.6,	18.3,	21.3,	23.2,	25.7,	27.9,	29.6,	32.1,	34.0,	35.5,	N/A ,
2 hours	11.0,	13.9,	15.4,	17.4,	18.8,	19.8,	23.0,	26.3,	28.5,	31.3,	33.8,	35.6,	38.4,	40.5,	42.2,	N/A ,
3 hours	13.0,	16.3,	17.9,	20.2,	21.6,	22.8,	26.2,	29.8,	32.1,	35.2,	37.8,	39.8,	42.7,	44.9,	46.7,	N/A ,
4 hours	14.7,	18.2,	19.9,	22.4,	23.9,	25.1,	28.8,	32.6,	35.0,	38.2,	40.9,	43.0,	46.0,	48.3,	50.1,	N/A ,
6 hours	17.4,	21.3,	23.2,	25.9,	27.6,	28.9,	32.8,	36.9,	39.5,	42.9,	45.8,	47.9,	51.1,	53.5,	55.4,	N/A ,
9 hours	20.6,	24.9,	27.0,	29.9,	31.8,	33.2,	37.4,	41.8,	44.5,	48.1,	51.2,	53.4,	56.8,	59.3,	61.3,	N/A ,
12 hours	23.2,	27.8,	30.1,	33.2,	35.2,	36.6,	41.1,	45.7,	48.5,	52.3,	55.4,	57.7,	61.2,	63.8,	65.8,	N/A ,
18 hours	27.5,	32.6,	35.0,	38.4,	40.5,	42.1,	46.9,	51.7,	54.7,	58.7,	62.0,	64.4,	68.0,	70.7,	72.8,	N/A ,
24 hours	31.0,	36.4,	39.0,	42.6,	44.8,	46.4,	51.4,	56.5,	59.6,	63.7,	67.1,	69.6,	73.3,	76.0,	78.2,	85.3,
2 days	39.2,	45.7,	48.8,	53.0,	55.6,	57.5,	63.3,	69.2,	72.8,	77.5,	81.4,	84.3,	88.5,	91.6,	94.1,	102.2,
3 days	46.3,	53.7,	57.2,	61.9,	64.9,	67.1,	73.6,	80.2,	84.2,	89.5,	93.8,	97.0,	101.7,	105.1,	107.9,	116.9,
4 days	52.8,	61.0,	64.9,	70.1,	73.4,	75.8,	83.0,	90.3,	94.6,	100.4,	105.1,	108.6,	113.7,	117.5,	120.5,	130.2,
6 days	64.8,	74.4,	78.9,	85.1,	88.9,	91.7,	100.1,	108.5,	113.6,	120.2,	125.7,	129.7,	135.6,	139.9,	143.3,	154.5,
8 days	75.8,	86.8,	91.9,	98.9,	103.2,	106.3,	115.8,	125.3,	131.0,	138.4,	144.5,	149.0,	155.6,	160.4,	164.2,	176.7,
10 days	86.3,	98.5,	104.2,	111.9,	116.7,	120.2,	130.6,	141.1,	147.4,	155.5,	162.3,	167.2,	174.4,	179.7,	183.9,	197.5,
12 days	96.3,	109.8,	116.0,	124.4,	129.6,	133.4,	144.8,	156.2,	163.0,	171.9,	179.2,	184.6,	192.4,	198.1,	202.6,	217.4,
16 days	115.7,	131.3,	138.6,	148.3,	154.4,	158.8,	172.0,	185.1,	192.9,	203.1,	211.5,	217.7,	226.6,	233.1,	238.3,	255.1,
20 days	134.4,	152.1,	160.3,	171.3,	178.1,	183.1,	197.9,	212.6,	221.5,	232.9,	242.3,	249.2,	259.1,	266.4,	272.2,	291.0,
25 days	157.1,	177.3,	186.6,	199.1,	206.8,	212.5,	229.3,	245.9,	255.9,	268.8,	279.4,	287.1,	298.3,	306.5,	313.0,	334.1,

NOTES:
N/A Data not available
These values are derived from a Depth Duration Frequency (DDF) Model
For details refer to:
'Fitzgerald D. L. (2007), Estimates of Point Rainfall Frequencies, Technical Note No. 61, Met Eireann, Dublin',
Available for download at www.met.ie/climate/dataproducts/Estimation-of-Point-Rainfall-Frequencies_TN61.pdf

APPENDIX B

GREENFIELD RUN-OFF RATE

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Sarah Moore
Site name:	Moanmore Lower Wind Farm
Site location:	Co. Clare

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013) , the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude:	52.65278° N
Longitude:	9.50253° W
Reference:	117875725
Date:	Nov 25 2024 11:44

Runoff estimation approach

IH124

Site characteristics

Total site area (ha):	26.8

Methodology

Q_{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics

	Default	Edited
SOIL type:	4	4
HOST class:	N/A	N/A
SPR/SPRHOST:	0.47	0.47

Hydrological characteristics

	Default	Edited
SAAR (mm):	1200	1200
Hydrological region:	13	13
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 30 years:	1.65	1.65
Growth curve factor 100 years:	1.95	1.95
Growth curve factor 200 years:	2.15	2.15

Notes

(1) Is Q_{BAR} < 2.0 l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is SPR/SPRHOST ≤ 0.3?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates

	Default	Edited

Q_{BAR} (l/s):	243.09	243.09
1 in 1 year (l/s):	206.63	206.63
1 in 30 years (l/s):	401.1	401.1
1 in 100 year (l/s):	474.02	474.02
1 in 200 years (l/s):	522.64	522.64

This report was produced using the greenfield runoff tool developed by HR Wallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement , which can both be found at www.uksuds.com/terms-and-conditions.htm. The outputs from this tool are estimates of greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of this data in the design or operational characteristics of any drainage scheme.

APPENDIX C

SETTLEMENT POND CALCULATIONS

Moanmore Lower WF SuDS Drainage Design

Ref	Total Catchment A (m^2)	Catchment Area: A Hardstand (m^2)	Catchment Area: A excl Hardstand (m^2)	Catchment Area: A Hardstand (km^2)	Catchment Area: A excl Hardstand (km^2)	Residual Volume (m3)	Width (m)	Height (m)	Required Length (m)	Optimised Length	Ratio
SP1	228	0	228	0.0000	0.0002	4.5	2.00	1.0	2.2	6	3
SP2	542	0	542	0.0000	0.0005	10.6	2.00	1.0	5.3	6	3
SP3	1580	0	1580	0.0000	0.0016	30.8	3.00	1.0	10.3	9	3
SP4	550	0	550	0.0000	0.0006	10.7	2.00	1.0	5.4	6	3
SP5	375	375	0	0.0004	0.0000	5.1	2.00	1.0	2.6	6	3
SP6	520	520	0	0.0005	0.0000	7.1	2.00	1.0	3.5	6	3
SP7	1596	1596	0	0.0016	0.0000	21.7	3.00	1.0	7.2	9	3
SP8	1596	1596	0	0.0016	0.0000	21.7	3.00	1.0	7.2	9	3
SP9	1596	1596	0	0.0016	0.0000	21.7	3.00	1.0	7.2	9	3
SP10	525	0	525	0.0000	0.0005	10.2	2.00	1.0	5.1	6	3
SP11	530	0	530	0.0000	0.0005	10.3	2.00	1.0	5.2	6	3
SP12	1790	0	1790	0.0000	0.0018	34.9	3.00	1.0	11.6	12	4
SP13	1070	0	1070	0.0000	0.0011	20.9	3.00	1.0	7.0	9	3
SP14	1440	1440	0	0.0014	0.0000	19.6	3.00	1.0	6.5	9	3
SP15	1440	1440	0	0.0014	0.0000	19.6	3.00	1.0	6.5	9	3
SP16	1440	1440	0	0.0014	0.0000	19.6	3.00	1.0	6.5	9	3
SP17	1580	1580	0	0.0016	0.0000	21.5	3.00	1.0	7.2	9	3
SP18	1596	1596	0	0.0016	0.0000	21.7	3.00	1.0	7.2	9	3
SP19	1596	1596	0	0.0016	0.0000	21.7	3.00	1.0	7.2	9	3
SP20	1596	1596	0	0.0016	0.0000	21.7	3.00	1.0	7.2	9	3
SP21	1660	1660	0	0.0017	0.0000	22.6	3.00	1.0	7.5	9	3
SP22	22464	0	22464	0.0000	0.0225	305.6	10.00	1.0	30.6	33	3.3

Catchment **SP1** Area Excl Hardstand — water discharge rate (l/s/ha) 19.50 l/s/ha

Clean water natural flow

1 in 200 year return	minutes	Rainfall (mm)	m3/hr to l/sec	C	i (mm/hr)	A (km^2)	(m^3/s)	Volume (m^3)	Discharge (m^3/ha)	Discharge (m^3)	Residual Volume (m^3)
M200 5min	5	14.6	0.278	0.78	175.2	0.00023	0.009	2.6	5.9	0.1	2.5
M200 10min	10	20.3	0.278	0.78	121.8	0.00023	0.006	3.6	11.7	0.3	3.3
M200 15min	15	2.9	0.278	0.78	11.6	0.00023	0.001	0.5	17.6	0.4	0.1
M200 30min	30	28.5	0.278	0.78	57	0.00023	0.003	5.1	35.1	0.8	4.3
M200 60min	60	34	0.278	0.78	34	0.00023	0.002	6.1	70.2	1.6	4.5
M200 2hr	120	40.5	0.278	0.78	20.25	0.00023	0.001	7.2	140.4	3.2	4.0
M200 4hr	240	48.3	0.278	0.78	12.075	0.00023	0.001	8.6	280.8	6.4	2.2
M200 6hr	300	53.5	0.278	0.78	10.7	0.00023	0.001	11.4	421.2	9.6	1.8
M200 12hr	600	63.8	0.278	0.78	6.38	0.00023	0.000	13.6	842.5	19.2	-5.6
M200 24hr	1200	76	0.278	0.78	3.8	0.00023	0.000	16.2	1684.9	38.4	-22.2
M200 48hr	2400	91.6	0.278	0.78	2.29	0.00023	0.000	19.6	3369.9	76.8	-57.3

Catchment **SP2** Area Excl Hardstand — water discharge rate (l/s) 19.50 l/s/ha

Clean water natural flow

1 in 200 year return	minutes	Rainfall (mm)		C	i (mm/hr)	A (km^2)	(m^3/s)	Volume (m^3)	Discharge (m^3/ha)	Discharge (m^3)	Residual Volume (m^3)
M200 5min	5	14.6	0.278	0.78	175.2	0.00054	0.021	6.2	5.9	0.3	5.9
M200 10min	10	20.3	0.278	0.78	121.8	0.00054	0.014	8.6	11.7	0.6	8.0
M200 15min	15	2.9	0.278	0.78	11.6	0.00054	0.001	1.2	17.6	1.0	0.3
M200 30min	30	28.5	0.278	0.78	57	0.00054	0.007	12.1	35.1	1.9	10.2
M200 60min	60	34	0.278	0.78	34	0.00054	0.004	14.4	70.2	3.8	10.6
M200 2hr	120	40.5	0.278	0.78	20.25	0.00054	0.002	17.1	140.4	7.6	9.5
M200 4hr	240	48.3	0.278	0.78	12.075	0.00054	0.001	20.4	280.8	15.2	5.2
M200 6hr	300	53.5	0.278	0.78	10.7	0.00054	0.001	27.2	421.2	22.8	4.3
M200 12hr	600	63.8	0.278	0.78	6.38	0.00054	0.001	32.4	842.5	45.7	-13.3
M200 24hr	1200	76	0.278	0.78	3.8	0.00054	0.000	38.6	1684.9	91.3	-52.7
M200 48hr	2400	91.6	0.278	0.78	2.29	0.00054	0.000	46.5	3369.9	182.6	-136.1

Catchment			SP3	Area Excl Hardstand					water discharge rate (l/s)		
Clean water natural flow									19.50		l/s/ha
1 in 200 year return	**minutes**	**Rainfall (mm)**		**C**	**i (mm/hr)**	**A (km^2)**	**(m^3/s)**	**Volume (m^3)**	**Discharge (m^3/ha)**	**Discharge (m^3)**	**Residual Volume (m^3)**
M200 5min	5	14.6	0.278	0.78	175.2	0.00158	0.060	18.0	5.9	0.9	17.1
M200 10min	10	20.3	0.278	0.78	121.8	0.00158	0.042	25.0	11.7	1.8	23.2
M200 15min	15	2.9	0.278	0.78	11.6	0.00158	0.004	3.6	17.6	2.8	0.8
M200 30min	30	28.5	0.278	0.78	57	0.00158	0.020	35.2	35.1	5.5	29.6
M200 60min	60	34	0.278	0.78	34	0.00158	0.012	41.9	70.2	11.1	30.8
M200 2hr	120	40.5	0.278	0.78	20.25	0.00158	0.007	50.0	140.4	22.2	27.8
M200 4hr	240	48.3	0.278	0.78	12.075	0.00158	0.004	59.6	280.8	44.4	15.2
M200 6hr	300	53.5	0.278	0.78	10.7	0.00158	0.004	79.2	421.2	66.6	12.6
M200 12hr	600	63.8	0.278	0.78	6.38	0.00158	0.002	94.4	842.5	133.1	-38.7
M200 24hr	1200	76	0.278	0.78	3.8	0.00158	0.001	112.5	1684.9	266.2	-153.7
M200 48hr	2400	91.6	0.278	0.78	2.29	0.00158	0.001	135.6	3369.9	532.4	-396.9

Catchment			SP4	Area Excl Hardstand					water discharge rate (l/s)		
Clean water natural flow									19.50		l/s/ha
1 in 200 year return	**minutes**	**Rainfall (mm)**		**C**	**i (mm/hr)**	**A (km^2)**	**(m^3/s)**	**Volume (m^3)**	**Discharge (m^3/ha)**	**Discharge (m^3)**	**Residual Volume (m^3)**
M200 5min	5	14.6	0.278	0.78	175.2	0.00055	0.021	6.3	5.9	0.3	5.9
M200 10min	10	20.3	0.278	0.78	121.8	0.00055	0.015	8.7	11.7	0.6	8.1
M200 15min	15	2.9	0.278	0.78	11.6	0.00055	0.001	1.2	17.6	1.0	0.3
M200 30min	30	28.5	0.278	0.78	57	0.00055	0.007	12.2	35.1	1.9	10.3
M200 60min	60	34	0.278	0.78	34	0.00055	0.004	14.6	70.2	3.9	10.7
M200 2hr	120	40.5	0.278	0.78	20.25	0.00055	0.002	17.4	140.4	7.7	9.7
M200 4hr	240	48.3	0.278	0.78	12.075	0.00055	0.001	20.7	280.8	15.4	5.3
M200 6hr	300	53.5	0.278	0.78	10.7	0.00055	0.001	27.6	421.2	23.2	4.4
M200 12hr	600	63.8	0.278	0.78	6.38	0.00055	0.001	32.9	842.5	46.3	-13.5
M200 24hr	1200	76	0.278	0.78	3.8	0.00055	0.000	39.2	1684.9	92.7	-53.5
M200 48hr	2400	91.6	0.278	0.78	2.29	0.00055	0.000	47.2	3369.9	185.3	-138.1

Catchment			SP5	Hardstand					water discharge rate (l/s)		
Clean water natural flow									19.50		l/s/ha
1 in 200 year return	**minutes**	**Rainfall (mm)**		**C**	**i (mm/hr)**	**A (km^2)**	**(m^3/s)**	**Volume (m^3)**	**Discharge (m^3/ha)**	**Discharge (m^3)**	**Residual Volume (m^3)**
M200 5min	5	14.6	0.278	0.6	175.2	0.00038	0.011	3.3	5.9	0.2	3.1
M200 10min	10	20.3	0.278	0.6	121.8	0.00038	0.008	4.6	11.7	0.4	4.1
M200 15min	15	2.9	0.278	0.6	11.6	0.00038	0.001	0.7	17.6	0.7	0.0
M200 30min	30	28.5	0.278	0.6	57	0.00038	0.004	6.4	35.1	1.3	5.1
M200 60min	60	34	0.278	0.6	34	0.00038	0.002	7.7	70.2	2.6	5.0
M200 2hr	120	40.5	0.278	0.6	20.25	0.00038	0.001	9.1	140.4	5.3	3.9
M200 4hr	240	48.3	0.278	0.6	12.075	0.00038	0.001	10.9	280.8	10.5	0.3
M200 6hr	300	53.5	0.278	0.6	10.7	0.00038	0.001	14.5	421.2	15.8	-1.3
M200 12hr	600	63.8	0.278	0.6	6.38	0.00038	0.000	17.2	842.5	31.6	-14.4
M200 24hr	1200	76	0.278	0.6	3.8	0.00038	0.000	20.5	1684.9	63.2	-42.6
M200 48hr	2400	91.6	0.278	0.6	2.29	0.00038	0.000	24.8	3369.9	126.4	-101.6

Catchment			SP7	Hardstand					water discharge rate (l/s)		
Clean water natural flow									19.50		l/s/ha
1 in 200 year return	**minutes**	**Rainfall (mm)**		**C**	**i (mm/hr)**	**A (km^2)**	**(m^3/s)**	**Volume (m^3)**	**Discharge (m^3/ha)**	**Discharge (m^3)**	**Residual Volume (m^3)**
M200 5min	5	14.6	0.278	0.6	175.2	0.00052	0.015	4.6	5.9	0.3	4.3
M200 10min	10	20.3	0.278	0.6	121.8	0.00052	0.011	6.3	11.7	0.6	5.7
M200 15min	15	2.9	0.278	0.6	11.6	0.00052	0.001	0.9	17.6	0.9	0.0
M200 30min	30	28.5	0.278	0.6	57	0.00052	0.005	8.9	35.1	1.8	7.1
M200 60min	60	34	0.278	0.6	34	0.00052	0.003	10.6	70.2	3.7	7.0
M200 2hr	120	40.5	0.278	0.6	20.25	0.00052	0.002	12.6	140.4	7.3	5.3
M200 4hr	240	48.3	0.278	0.6	12.075	0.00052	0.001	15.1	280.8	14.6	0.5
M200 6hr	300	53.5	0.278	0.6	10.7	0.00052	0.001	20.0	421.2	21.9	-1.9
M200 12hr	600	63.8	0.278	0.6	6.38	0.00052	0.001	23.9	842.5	43.8	-19.9
M200 24hr	1200	76	0.278	0.6	3.8	0.00052	0.000	28.5	1684.9	87.6	-59.1
M200 48hr	2400	91.6	0.278	0.6	2.29	0.00052	0.000	34.3	3369.9	175.2	-140.9

Catchment			SP7	Hardstand					water discharge rate (l/s)		
Clean water natural flow									19.50		l/s/ha
1 in 200 year return	**minutes**	**Rainfall (mm)**		**C**	**i (mm/hr)**	**A (km²)**	**(m³/s)**	**Volume (m³)**	**Discharge (m³/ha)**	**Discharge (m³)**	**Residual Volume (m³)**
M200 5min	5	14.6	0.278	0.6	175.2	0.00160	0.047	14.0	5.9	0.9	13.1
M200 10min	10	20.3	0.278	0.6	121.8	0.00160	0.032	19.5	11.7	1.9	17.6
M200 15min	15	2.9	0.278	0.6	11.6	0.00160	0.003	2.8	17.6	2.8	0.0
M200 30min	30	28.5	0.278	0.6	57	0.00160	0.015	27.3	35.1	5.6	21.7
M200 60min	60	34	0.278	0.6	34	0.00160	0.009	32.6	70.2	11.2	21.4
M200 2hr	120	40.5	0.278	0.6	20.25	0.00160	0.005	38.8	140.4	22.4	16.4
M200 4hr	240	48.3	0.278	0.6	12.075	0.00160	0.003	46.3	280.8	44.8	1.5
M200 6hr	300	53.5	0.278	0.6	10.7	0.00160	0.003	61.5	421.2	67.2	-5.7
M200 12hr	600	63.8	0.278	0.6	6.38	0.00160	0.002	73.4	842.5	134.5	-61.1
M200 24hr	1200	76	0.278	0.6	3.8	0.00160	0.001	87.4	1684.9	268.9	-181.5
M200 48hr	2400	91.6	0.278	0.6	2.29	0.00160	0.001	105.3	3369.9	537.8	-432.5

Catchment			SP8	Hardstand					water discharge rate (l/s)		
Clean water natural flow									19.50		l/s/ha
1 in 200 year return	**minutes**	**Rainfall (mm)**		**C**	**i (mm/hr)**	**A (km²)**	**(m³/s)**	**Volume (m³)**	**Discharge (m³/ha)**	**Discharge (m³)**	**Residual Volume (m³)**
M200 5min	5	14.6	0.278	0.6	175.2	0.00160	0.047	14.0	5.9	0.9	13.1
M200 10min	10	20.3	0.278	0.6	121.8	0.00160	0.032	19.5	11.7	1.9	17.6
M200 15min	15	2.9	0.278	0.6	11.6	0.00160	0.003	2.8	17.6	2.8	0.0
M200 30min	30	28.5	0.278	0.6	57	0.00160	0.015	27.3	35.1	5.6	21.7
M200 60min	60	34	0.278	0.6	34	0.00160	0.009	32.6	70.2	11.2	21.4
M200 2hr	120	40.5	0.278	0.6	20.25	0.00160	0.005	38.8	140.4	22.4	16.4
M200 4hr	240	48.3	0.278	0.6	12.075	0.00160	0.003	46.3	280.8	44.8	1.5
M200 6hr	300	53.5	0.278	0.6	10.7	0.00160	0.003	61.5	421.2	67.2	-5.7
M200 12hr	600	63.8	0.278	0.6	6.38	0.00160	0.002	73.4	842.5	134.5	-61.1
M200 24hr	1200	76	0.278	0.6	3.8	0.00160	0.001	87.4	1684.9	268.9	-181.5
M200 48hr	2400	91.6	0.278	0.6	2.29	0.00160	0.001	105.3	3369.9	537.8	-432.5

Catchment			SP9	Hardstand					water discharge rate (l/s)		
Clean water natural flow									19.50		l/s/ha
1 in 200 year return	**minutes**	**Rainfall (mm)**		**C**	**i (mm/hr)**	**A (km²)**	**(m³/s)**	**Volume (m³)**	**Discharge (m³/ha)**	**Discharge (m³)**	**Residual Volume (m³)**
M200 5min	5	14.6	0.278	0.6	175.2	0.00160	0.047	14.0	5.9	0.9	13.1
M200 10min	10	20.3	0.278	0.6	121.8	0.00160	0.032	19.5	11.7	1.9	17.6
M200 15min	15	2.9	0.278	0.6	11.6	0.00160	0.003	2.8	17.6	2.8	0.0
M200 30min	30	28.5	0.278	0.6	57	0.00160	0.015	27.3	35.1	5.6	21.7
M200 60min	60	34	0.278	0.6	34	0.00160	0.009	32.6	70.2	11.2	21.4
M200 2hr	120	40.5	0.278	0.6	20.25	0.00160	0.005	38.8	140.4	22.4	16.4
M200 4hr	240	48.3	0.278	0.6	12.075	0.00160	0.003	46.3	280.8	44.8	1.5
M200 6hr	300	53.5	0.278	0.6	10.7	0.00160	0.003	61.5	421.2	67.2	-5.7
M200 12hr	600	63.8	0.278	0.6	6.38	0.00160	0.002	73.4	842.5	134.5	-61.1
M200 24hr	1200	76	0.278	0.6	3.8	0.00160	0.001	87.4	1684.9	268.9	-181.5
M200 48hr	2400	91.6	0.278	0.6	2.29	0.00160	0.001	105.3	3369.9	537.8	-432.5

Catchment			SP10	Area Excl Hardstand					water discharge rate (l/s)		
Clean water natural flow									19.50		l/s/ha
1 in 200 year return	**minutes**	**Rainfall (mm)**		**C**	**i (mm/hr)**	**A (km²)**	**(m³/s)**	**Volume (m³)**	**Discharge (m³/ha)**	**Discharge (m³)**	**Residual Volume (m³)**
M200 5min	5	14.6	0.278	0.78	175.2	0.00053	0.020	6.0	5.9	0.3	5.7
M200 10min	10	20.3	0.278	0.78	121.8	0.00053	0.014	8.3	11.7	0.6	7.7
M200 15min	15	2.9	0.278	0.78	11.6	0.00053	0.001	1.2	17.6	0.9	0.3
M200 30min	30	28.5	0.278	0.78	57	0.00053	0.006	11.7	35.1	1.8	9.8
M200 60min	60	34	0.278	0.78	34	0.00053	0.004	13.9	70.2	3.7	10.2
M200 2hr	120	40.5	0.278	0.78	20.25	0.00053	0.002	16.6	140.4	7.4	9.2
M200 4hr	240	48.3	0.278	0.78	12.075	0.00053	0.001	19.8	280.8	14.7	5.1
M200 6hr	300	53.5	0.278	0.78	10.7	0.00053	0.001	26.3	421.2	22.1	4.2
M200 12hr	600	63.8	0.278	0.78	6.38	0.00053	0.001	31.4	842.5	44.2	-12.9
M200 24hr	1200	76	0.278	0.78	3.8	0.00053	0.000	37.4	1684.9	88.5	-51.1
M200 48hr	2400	91.6	0.278	0.78	2.29	0.00053	0.000	45.0	3369.9	176.9	-131.9

Catchment	SP11	Area Excl Hardstand						water discharge rate (l/s)		
Clean water natural flow								19.50		l/s/ha
1 in 200 year return	**minutes**	**Rainfall (mm)**		**C**	**i (mm/hr)**	**A (km²)**	**(m³/s)**	**Volume (m³)**	**Discharge (m³/ha)**	**Discharge (m³)**	**Residual Volume (m³)**
M200 5min	5	14.6	0.278	0.78	175.2	0.00053	0.020	6.0	5.9	0.3	5.7
M200 10min	10	20.3	0.278	0.78	121.8	0.00053	0.014	8.4	11.7	0.6	7.8
M200 15min	15	2.9	0.278	0.78	11.6	0.00053	0.001	1.2	17.6	0.9	0.3
M200 30min	30	28.5	0.278	0.78	57	0.00053	0.007	11.8	35.1	1.9	9.9
M200 60min	60	34	0.278	0.78	34	0.00053	0.004	14.1	70.2	3.7	10.3
M200 2hr	120	40.5	0.278	0.78	20.25	0.00053	0.002	16.8	140.4	7.4	9.3
M200 4hr	240	48.3	0.278	0.78	12.075	0.00053	0.001	20.0	280.8	14.9	5.1
M200 6hr	300	53.5	0.278	0.78	10.7	0.00053	0.001	26.6	421.2	22.3	4.2
M200 12hr	600	63.8	0.278	0.78	6.38	0.00053	0.001	31.7	842.5	44.7	-13.0
M200 24hr	1200	76	0.278	0.78	3.8	0.00053	0.000	37.7	1684.9	89.3	-51.6
M200 48hr	2400	91.6	0.278	0.78	2.29	0.00053	0.000	45.5	3369.9	178.6	-133.1

Catchment	SP12	Area Excl Hardstand						water discharge rate (l/s)		
Clean water natural flow								19.50		l/s/ha
1 in 200 year return	**minutes**	**Rainfall (mm)**		**C**	**i (mm/hr)**	**A (km²)**	**(m³/s)**	**Volume (m³)**	**Discharge (m³/ha)**	**Discharge (m³)**	**Residual Volume (m³)**
M200 5min	5	14.6	0.278	0.78	175.2	0.00179	0.068	20.4	5.9	1.0	19.4
M200 10min	10	20.3	0.278	0.78	121.8	0.00179	0.047	28.4	11.7	2.1	26.3
M200 15min	15	2.9	0.278	0.78	11.6	0.00179	0.005	4.1	17.6	3.1	0.9
M200 30min	30	28.5	0.278	0.78	57	0.00179	0.022	39.8	35.1	6.3	33.5
M200 60min	60	34	0.278	0.78	34	0.00179	0.013	47.5	70.2	12.6	34.9
M200 2hr	120	40.5	0.278	0.78	20.25	0.00179	0.008	56.6	140.4	25.1	31.5
M200 4hr	240	48.3	0.278	0.78	12.075	0.00179	0.005	67.5	280.8	50.3	17.2
M200 6hr	300	53.5	0.278	0.78	10.7	0.00179	0.004	89.7	421.2	75.4	14.3
M200 12hr	600	63.8	0.278	0.78	6.38	0.00179	0.002	107.0	842.5	150.8	-43.8
M200 24hr	1200	76	0.278	0.78	3.8	0.00179	0.001	127.4	1684.9	301.6	-174.2
M200 48hr	2400	91.6	0.278	0.78	2.29	0.00179	0.001	153.6	3369.9	603.2	-449.6

Catchment	SP13	Area Excl Hardstand						water discharge rate (l/s)		
Clean water natural flow								19.50		l/s/ha
1 in 200 year return	**minutes**	**Rainfall (mm)**		**C**	**i (mm/hr)**	**A (km²)**	**(m³/s)**	**Volume (m³)**	**Discharge (m³/ha)**	**Discharge (m³)**	**Residual Volume (m³)**
M200 5min	5	14.6	0.278	0.78	175.2	0.00107	0.041	12.2	5.9	0.6	11.6
M200 10min	10	20.3	0.278	0.78	121.8	0.00107	0.028	17.0	11.7	1.3	15.7
M200 15min	15	2.9	0.278	0.78	11.6	0.00107	0.003	2.4	17.6	1.9	0.5
M200 30min	30	28.5	0.278	0.78	57	0.00107	0.013	23.8	35.1	3.8	20.0
M200 60min	60	34	0.278	0.78	34	0.00107	0.008	28.4	70.2	7.5	20.9
M200 2hr	120	40.5	0.278	0.78	20.25	0.00107	0.005	33.8	140.4	15.0	18.8
M200 4hr	240	48.3	0.278	0.78	12.075	0.00107	0.003	40.3	280.8	30.0	10.3
M200 6hr	300	53.5	0.278	0.78	10.7	0.00107	0.002	53.6	421.2	45.1	8.6
M200 12hr	600	63.8	0.278	0.78	6.38	0.00107	0.001	63.9	842.5	90.1	-26.2
M200 24hr	1200	76	0.278	0.78	3.8	0.00107	0.001	76.2	1684.9	180.3	-104.1
M200 48hr	2400	91.6	0.278	0.78	2.29	0.00107	0.001	91.8	3369.9	360.6	-268.8

Catchment	SP14	Hardstand						water discharge rate (l/s)		
Clean water natural flow								19.50		l/s/ha
1 in 200 year return	**minutes**	**Rainfall (mm)**		**C**	**i (mm/hr)**	**A (km²)**	**(m³/s)**	**Volume (m³)**	**Discharge (m³/ha)**	**Discharge (m³)**	**Residual Volume (m³)**
M200 5min	5	14.6	0.278	0.6	175.2	0.00144	0.042	12.6	5.9	0.8	11.8
M200 10min	10	20.3	0.278	0.6	121.8	0.00144	0.029	17.6	11.7	1.7	15.9
M200 15min	15	2.9	0.278	0.6	11.6	0.00144	0.003	2.5	17.6	2.5	0.0
M200 30min	30	28.5	0.278	0.6	57	0.00144	0.014	24.6	35.1	5.1	19.6
M200 60min	60	34	0.278	0.6	34	0.00144	0.008	29.4	70.2	10.1	19.3
M200 2hr	120	40.5	0.278	0.6	20.25	0.00144	0.005	35.0	140.4	20.2	14.8
M200 4hr	240	48.3	0.278	0.6	12.075	0.00144	0.003	41.8	280.8	40.4	1.3
M200 6hr	300	53.5	0.278	0.6	10.7	0.00144	0.003	55.5	421.2	60.7	-5.1
M200 12hr	600	63.8	0.278	0.6	6.38	0.00144	0.002	66.2	842.5	121.3	-55.1
M200 24hr	1200	76	0.278	0.6	3.8	0.00144	0.001	78.9	1684.9	242.6	-163.8
M200 48hr	2400	91.6	0.278	0.6	2.29	0.00144	0.001	95.0	3369.9	485.3	-390.2

Catchment	SP15	Hardstand						water discharge rate (l/s)		
Clean water natural flow								19.50		l/s/ha
1 in 200 year return	**minutes**	**Rainfall (mm)**		**C**	**i (mm/hr)**	**A (km²)**	**(m³/s)**	**Volume (m³)**	**Discharge (m³/ha)**	**Discharge (m³)**	**Residual Volume (m³)**
M200 5min	5	14.6	0.278	0.6	175.2	0.00144	0.042	12.6	5.9	0.8	11.8
M200 10min	10	20.3	0.278	0.6	121.8	0.00144	0.029	17.6	11.7	1.7	15.9
M200 15min	15	2.9	0.278	0.6	11.6	0.00144	0.003	2.5	17.6	2.5	0.0
M200 30min	30	28.5	0.278	0.6	57	0.00144	0.014	24.6	35.1	5.1	19.6
M200 60min	60	34	0.278	0.6	34	0.00144	0.008	29.4	70.2	10.1	19.3
M200 2hr	120	40.5	0.278	0.6	20.25	0.00144	0.005	35.0	140.4	20.2	14.8
M200 4hr	240	48.3	0.278	0.6	12.075	0.00144	0.003	41.8	280.8	40.4	1.3
M200 6hr	300	53.5	0.278	0.6	10.7	0.00144	0.003	55.5	421.2	60.7	-5.1
M200 12hr	600	63.8	0.278	0.6	6.38	0.00144	0.002	66.2	842.5	121.3	-55.1
M200 24hr	1200	76	0.278	0.6	3.8	0.00144	0.001	78.9	1684.9	242.6	-163.8
M200 48hr	2400	91.6	0.278	0.6	2.29	0.00144	0.001	95.0	3369.9	485.3	-390.2

Catchment	SP16	Hardstand						water discharge rate (l/s)		
Clean water natural flow								19.50		l/s/ha
1 in 200 year return	**minutes**	**Rainfall (mm)**		**C**	**i (mm/hr)**	**A (km²)**	**(m³/s)**	**Volume (m³)**	**Discharge (m³/ha)**	**Discharge (m³)**	**Residual Volume (m³)**
M200 5min	5	14.6	0.278	0.6	175.2	0.00144	0.042	12.6	5.9	0.8	11.8
M200 10min	10	20.3	0.278	0.6	121.8	0.00144	0.029	17.6	11.7	1.7	15.9
M200 15min	15	2.9	0.278	0.6	11.6	0.00144	0.003	2.5	17.6	2.5	0.0
M200 30min	30	28.5	0.278	0.6	57	0.00144	0.014	24.6	35.1	5.1	19.6
M200 60min	60	34	0.278	0.6	34	0.00144	0.008	29.4	70.2	10.1	19.3
M200 2hr	120	40.5	0.278	0.6	20.25	0.00144	0.005	35.0	140.4	20.2	14.8
M200 4hr	240	48.3	0.278	0.6	12.075	0.00144	0.003	41.8	280.8	40.4	1.3
M200 6hr	300	53.5	0.278	0.6	10.7	0.00144	0.003	55.5	421.2	60.7	-5.1
M200 12hr	600	63.8	0.278	0.6	6.38	0.00144	0.002	66.2	842.5	121.3	-55.1
M200 24hr	1200	76	0.278	0.6	3.8	0.00144	0.001	78.9	1684.9	242.6	-163.8
M200 48hr	2400	91.6	0.278	0.6	2.29	0.00144	0.001	95.0	3369.9	485.3	-390.2

Catchment	SP17	Hardstand						water discharge rate (l/s)		
Clean water natural flow								19.50		l/s/ha
1 in 200 year return	**minutes**	**Rainfall (mm)**		**C**	**i (mm/hr)**	**A (km²)**	**(m³/s)**	**Volume (m³)**	**Discharge (m³/ha)**	**Discharge (m³)**	**Residual Volume (m³)**
M200 5min	5	14.6	0.278	0.6	175.2	0.00158	0.046	13.9	5.9	0.9	12.9
M200 10min	10	20.3	0.278	0.6	121.8	0.00158	0.032	19.3	11.7	1.8	17.4
M200 15min	15	2.9	0.278	0.6	11.6	0.00158	0.003	2.8	17.6	2.8	0.0
M200 30min	30	28.5	0.278	0.6	57	0.00158	0.015	27.0	35.1	5.5	21.5
M200 60min	60	34	0.278	0.6	34	0.00158	0.009	32.3	70.2	11.1	21.2
M200 2hr	120	40.5	0.278	0.6	20.25	0.00158	0.005	38.4	140.4	22.2	16.2
M200 4hr	240	48.3	0.278	0.6	12.075	0.00158	0.003	45.8	280.8	44.4	1.5
M200 6hr	300	53.5	0.278	0.6	10.7	0.00158	0.003	60.9	421.2	66.6	-5.6
M200 12hr	600	63.8	0.278	0.6	6.38	0.00158	0.002	72.6	842.5	133.1	-60.5
M200 24hr	1200	76	0.278	0.6	3.8	0.00158	0.001	86.5	1684.9	266.2	-179.7
M200 48hr	2400	91.6	0.278	0.6	2.29	0.00158	0.001	104.3	3369.9	532.4	-428.2

Catchment	SP18	Hardstand						water discharge rate (l/s)		
Clean water natural flow								19.50		l/s/ha
1 in 200 year return	**minutes**	**Rainfall (mm)**		**C**	**i (mm/hr)**	**A (km²)**	**(m³/s)**	**Volume (m³)**	**Discharge (m³/ha)**	**Discharge (m³)**	**Residual Volume (m³)**
M200 5min	5	14.6	0.278	0.6	175.2	0.00160	0.047	14.0	5.9	0.9	13.1
M200 10min	10	20.3	0.278	0.6	121.8	0.00160	0.032	19.5	11.7	1.9	17.6
M200 15min	15	2.9	0.278	0.6	11.6	0.00160	0.003	2.8	17.6	2.8	0.0
M200 30min	30	28.5	0.278	0.6	57	0.00160	0.015	27.3	35.1	5.6	21.7
M200 60min	60	34	0.278	0.6	34	0.00160	0.009	32.6	70.2	11.2	21.4
M200 2hr	120	40.5	0.278	0.6	20.25	0.00160	0.005	38.8	140.4	22.4	16.4
M200 4hr	240	48.3	0.278	0.6	12.075	0.00160	0.003	46.3	280.8	44.8	1.5
M200 6hr	300	53.5	0.278	0.6	10.7	0.00160	0.003	61.5	421.2	67.2	-5.7
M200 12hr	600	63.8	0.278	0.6	6.38	0.00160	0.002	73.4	842.5	134.5	-61.1
M200 24hr	1200	76	0.278	0.6	3.8	0.00160	0.001	87.4	1684.9	268.9	-181.5
M200 48hr	2400	91.6	0.278	0.6	2.29	0.00160	0.001	105.3	3369.9	537.8	-432.5

Catchment			SP19	Hardstand					water discharge rate (l/s)		
Clean water natural flow									19.50		l/s/ha
1 in 200 year return	**minutes**	**Rainfall (mm)**		**C**	**i (mm/hr)**	**A (km²)**	**(m³/s)**	**Volume (m³)**	**Discharge (m³/ha)**	**Discharge (m³)**	**Residual Volume (m³)**
M200 5min	5	14.6	0.278	0.6	175.2	0.00160	0.047	14.0	5.9	0.9	13.1
M200 10min	10	20.3	0.278	0.6	121.8	0.00160	0.032	19.5	11.7	1.9	17.6
M200 15min	15	2.9	0.278	0.6	11.6	0.00160	0.003	2.8	17.6	2.8	0.0
M200 30min	30	28.5	0.278	0.6	57	0.00160	0.015	27.3	35.1	5.6	21.7
M200 60min	60	34	0.278	0.6	34	0.00160	0.009	32.6	70.2	11.2	21.4
M200 2hr	120	40.5	0.278	0.6	20.25	0.00160	0.005	38.8	140.4	22.4	16.4
M200 4hr	240	48.3	0.278	0.6	12.075	0.00160	0.003	46.3	280.8	44.8	1.5
M200 6hr	300	53.5	0.278	0.6	10.7	0.00160	0.003	61.5	421.2	67.2	-5.7
M200 12hr	600	63.8	0.278	0.6	6.38	0.00160	0.002	73.4	842.5	134.5	-61.1
M200 24hr	1200	76	0.278	0.6	3.8	0.00160	0.001	87.4	1684.9	268.9	-181.5
M200 48hr	2400	91.6	0.278	0.6	2.29	0.00160	0.001	105.3	3369.9	537.8	-432.5

Catchment			SP20	Hardstand					water discharge rate (l/s)		
Clean water natural flow									19.50		l/s/ha
1 in 200 year return	**minutes**	**Rainfall (mm)**		**C**	**i (mm/hr)**	**A (km²)**	**(m³/s)**	**Volume (m³)**	**Discharge (m³/ha)**	**Discharge (m³)**	**Residual Volume (m³)**
M200 5min	5	14.6	0.278	0.6	175.2	0.00160	0.047	14.0	5.9	0.9	13.1
M200 10min	10	20.3	0.278	0.6	121.8	0.00160	0.032	19.5	11.7	1.9	17.6
M200 15min	15	2.9	0.278	0.6	11.6	0.00160	0.003	2.8	17.6	2.8	0.0
M200 30min	30	28.5	0.278	0.6	57	0.00160	0.015	27.3	35.1	5.6	21.7
M200 60min	60	34	0.278	0.6	34	0.00160	0.009	32.6	70.2	11.2	21.4
M200 2hr	120	40.5	0.278	0.6	20.25	0.00160	0.005	38.8	140.4	22.4	16.4
M200 4hr	240	48.3	0.278	0.6	12.075	0.00160	0.003	46.3	280.8	44.8	1.5
M200 6hr	300	53.5	0.278	0.6	10.7	0.00160	0.003	61.5	421.2	67.2	-5.7
M200 12hr	600	63.8	0.278	0.6	6.38	0.00160	0.002	73.4	842.5	134.5	-61.1
M200 24hr	1200	76	0.278	0.6	3.8	0.00160	0.001	87.4	1684.9	268.9	-181.5
M200 48hr	2400	91.6	0.278	0.6	2.29	0.00160	0.001	105.3	3369.9	537.8	-432.5

Catchment			SP21	Hardstand					water discharge rate (l/s)		
Clean water natural flow									19.50		l/s/ha
1 in 200 year return	**minutes**	**Rainfall (mm)**		**C**	**i (mm/hr)**	**A (km²)**	**(m³/s)**	**Volume (m³)**	**Discharge (m³/ha)**	**Discharge (m³)**	**Residual Volume (m³)**
M200 5min	5	14.6	0.278	0.6	175.2	0.00166	0.049	14.6	5.9	1.0	13.6
M200 10min	10	20.3	0.278	0.6	121.8	0.00166	0.034	20.2	11.7	1.9	18.3
M200 15min	15	2.9	0.278	0.6	11.6	0.00166	0.003	2.9	17.6	2.9	0.0
M200 30min	30	28.5	0.278	0.6	57	0.00166	0.016	28.4	35.1	5.8	22.6
M200 60min	60	34	0.278	0.6	34	0.00166	0.009	33.9	70.2	11.7	22.2
M200 2hr	120	40.5	0.278	0.6	20.25	0.00166	0.006	40.4	140.4	23.3	17.1
M200 4hr	240	48.3	0.278	0.6	12.075	0.00166	0.003	48.1	280.8	46.6	1.5
M200 6hr	300	53.5	0.278	0.6	10.7	0.00166	0.003	64.0	421.2	69.9	-5.9
M200 12hr	600	63.8	0.278	0.6	6.38	0.00166	0.002	76.3	842.5	139.8	-63.5
M200 24hr	1200	76	0.278	0.6	3.8	0.00166	0.001	90.9	1684.9	279.7	-188.8
M200 48hr	2400	91.6	0.278	0.6	2.29	0.00166	0.001	109.6	3369.9	559.4	-449.8

Catchment			SP22	Spoil Area					water discharge rate (l/s)		
Clean water natural flow									19.50		l/s/ha
1 in 200 year return	**minutes**	**Rainfall (mm)**		**C**	**i (mm/hr)**	**A (km²)**	**(m³/s)**	**Volume (m³)**	**Discharge (m³/ha)**	**Discharge (m³)**	**Residual Volume (m³)**
M200 5min	5	14.6	0.278	0.6	175.2	0.02246	0.656	196.9	5.9	13.1	183.8
M200 10min	10	20.3	0.278	0.6	121.8	0.02246	0.456	273.8	11.7	26.3	247.6
M200 15min	15	2.9	0.278	0.6	11.6	0.02246	0.043	39.1	17.6	39.4	-0.3
M200 30min	30	28.5	0.278	0.6	57	0.02246	0.214	384.4	35.1	78.9	305.6
M200 60min	60	34	0.278	0.6	34	0.02246	0.127	458.6	70.2	157.7	300.9
M200 2hr	120	40.5	0.278	0.6	20.25	0.02246	0.076	546.3	140.4	315.4	230.9
M200 4hr	240	48.3	0.278	0.6	12.075	0.02246	0.045	651.5	280.8	630.8	20.7
M200 6hr	300	53.5	0.278	0.6	10.7	0.02246	0.040	866.0	421.2	946.3	-80.3
M200 12hr	600	63.8	0.278	0.6	6.38	0.02246	0.024	1032.8	842.5	1892.5	-859.8
M200 24hr	1200	76	0.278	0.6	3.8	0.02246	0.014	1230.2	1684.9	3785.1	-2554.9
M200 48hr	2400	91.6	0.278	0.6	2.29	0.02246	0.009	1482.8	3369.9	7570.2	-6087.4

Appendix C

Peat and Spoil Management Plan

MOANMORE LOWER GREEN ENERGY LIMITED

MOANMORE LOWER WIND FARM, MOANMORE, CO. CLARE

CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN (CEMP)

PEAT AND SPOIL MANAGEMENT PLAN

MARCH 2025

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DOCUMENT APPROVAL

PROJECT	Moanmore Lower Wind Farm, Co. Clare	
CLIENT / JOB NO	Moanmore Lower Green Energy Limited	6778
DOCUMENT TITLE	Construction Environmental Management Plan (CEMP) Peat and Spoil Management Plan (PSMP)	

	Prepared by	**Reviewed / Approved by**
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Date April 2025	Signature Angelika Thiel Sarah Moore Padraig O' Dowd	Signature David Kiely

CONTENTS

1 INTRODUCTION

1.1 General

This plan provides an assessment of the issue of handling surplus excavated material at the proposed Moanmore Lower Wind Farm Site. The measures outlined in the plan will be monitored on Site by the appointed Ecological Clerk of Works (ECoW) and will be agreed with the contractor before works commence on Site. This plan should be read in conjunction with the Construction Environmental Management Plan (CEMP) and associated management plans.

1.2 Site Investigations

Field inspections were carried out at the site of the Site during June 2022, August 2023, March 2024 and December 2024. These works consisted of the following:

- Bedrock and mineral subsoil outcrop logging and characterisation.
- Peat depth probing if peat is present (depth to bedrock and/or competent subsoil).
- Gouge coring (peat and subsoil characterisation to BS 5930 and Von Post Humification scale).
- Site photography of significant features.

Site walk overs were carried out to assess general ground conditions including topographical characteristics, potential for peat and to observe the existing site including visual assessment of the receiving environment in terms of effects arising from the existing infrastructure and practices at the Site.

1.3 General Aims and Principals of the Peat and Spoil Management Plan

The purpose of this Peat and Spoil Management Plan is:

- To outline the proposals in relation to the management of excavated materials;
- Reduction in bare soil exposure and release of sediment;
- To make sure that the landscape is not adversely impacted as a result of the Development; and
- To promote good site management practices for the construction stage.

Any reinstatement and reprofiling proposals will consider and mitigate against all identified significant risks to environmental receptors.

Topsoil and surface vegetation excavated during the construction of the wind farm infrastructure will be used to finish reinstated surfaces around Turbine Foundations and

Turbine Hardstands. Reinstatement and reprofiling of, and around, infrastructure will be carried out during the construction phase.

Landscaping will allow for sympathetic restoration of the ground surface and ground profile to reduce the visual impact of new infrastructure, facilitate vegetation regrowth and reduce scour and erosion of bare surfaces prior to vegetation establishment. Reinstatement will be undertaken as work progresses. This work will be completed only by experienced personnel under guidance from the appointed ECoW, and they will conduct regular inspections of the work to ensure it is completed in an appropriate manner.

All areas subjected to reinstatement will be fenced with stock-proof fencing to prevent livestock disturbance until vegetation has become established.

Excavated material is used in several ways:

- All soil and subsoil types or horizons identified construction, will be treated as separate materials and arisings separated accordingly. This includes, for example acrotelm peat, catotelm peat, topsoil, clays, subsoils, weathered rock. Therefore, during reinstatement works, the soil profile can be returned to as close to baseline as possible with material in identified soil horizons.
- Excavated rock (should any be encountered) is used for Site access roads and Turbine Hardstands.
- Excavated sub-soil material will be used as fill material where suitable (e.g., back filling around and on top of Turbine Foundations).
- Excavated topsoil will be used to vegetate edges where ground profiling / grading is undertaken up to the Turbine Hardstands and for finishing off berms
- All surplus material will be stored at the permanent spoil storage area.
- Peat material excavated will be reused as backfill in areas previously excavated as much as possible, and/or for reinstatement works elsewhere on the Site. These areas include exposed areas around infrastructure such as slopes or graded ground around Site access tracks, turbine hardstands and foundations. Excavated peat will also be reinstated in degraded cutaway bog. To facilitate this, the acrotelm (living layer) and the catotelm (lower layer), will be treated as two separate materials. Catotelm peat will be used to backfill, for example in the working space around turbine foundations. Acrotelm peat will be used as a dressing on top of deposited catotelm peat in order to promote and re-establish flora and ensure the acrotelm layer becomes relatively cohesive in terms of localised peat stability (vegetated).

- While excavated bedrock is not expected on site, if it is encountered it will be re-used on site wherever possible for construction of site access tracks and/or turbine hardstands or as ballast on top of turbine foundations. Using the local bedrock as fill will ensure that effects to hydrochemistry are minimised.

1.4 Management of Excavated Material

Through the design process, the volume of peat and soil to be excavated has been minimised through the use of floating road construction throughout the Site. However, peat and soil will be excavated at the site entrance, Turbine Hardstand locations, Turbine Foundations, for the Electrical Substation and for the Wind Farm Internal Cabling circuits as detailed in **Section 2.9**.

At the commencement of works at the T02 location, the required work footprint will be identified and the area will be marked by a rope fence (using range poles or similar) and with appropriate signage. No activities will be allowed outside of this agreed work area. The ECoW will inspect the area regularly whilst works are on-going at T02. Excavated peat and other material will be removed to the approved storage area with no storage of spoil beyond the fence or in areas immediately adjoining the bog. Note peat will be handled and stored separately to spoil. The fence will remain in place until the works are fully complete.

Surplus excavated material will be stored either in the designated permanent storage area next to the Site entrance or Excavated materials during the construction phase required for reinstatement, shall in the first instance be stored on site, in an environmentally safe manner that will not result in the pollution of waters, until it is required for re-use.

A buffer of 25m from watercourses will be implemented for storage areas of excavated materials to be re-used for reinstatement works.

Excavated material will not be stored adjacent to slopes (>15 degrees gradient). This will be subject to evaluation and approval by the civil contractors' geotechnical engineer and will accommodate the Site stockpiling requirements based on earthwork calculations.

The locations chosen for temporary storage are based on gradient, geotechnical data and ground stability assessment as detailed in EIAR Appendix 8.1 Peat Stability Risk Assessment, habitat type, and the adequacy of the ground to support the surcharge material. The civil contractor will be responsible for ensuring that the removal and storage of excavated material is undertaken in accordance with the requirements of this management plan.

1.5 Reinstatement

Reinstatement works will commence at an early stage of the construction works. Such reinstatement will occur following the completion of individual sections of work such as the completion of, say, a Turbine Foundation or Turbine Hardstand. Reinstatement will include grading of any slopes left by the construction works, followed by the careful placement of topsoil which had been previously excavated from this area and temporarily stored on Site.

The BEMP (**Appendix 6.6**) has an ecological objective to minimise the area of exposed peat surface and to encourage revegetation. This will be achieved by removing suitable areas of the vegetated cutover bog surface (cut out as sods or 'turves') within the work footprint at T02 and including the section of access track over bog. This material will be stored appropriately on-site, and reused to re-instate areas around the turbine, hardstand margins and along the edges of the access track ac. It is noted that wet areas of the bog surface (such as along old drains) and/or undulating areas at old peat banks are unlikely to be suitable for the removal of peat turves (however, such surfaces will be removed and stored separately from sub-soils for later surface re-instatement works – see **Chapter 2: section 2.5.16**).

The surface turves of vegetated bog will be dug out to a minimum depth of approximately 30 cm using a dumper/digger with a bucket. Care will be taken to keep the turve as intact as possible and the vegetated side upwards (though this is not always possible). The turves will be loaded to a trailer and transported to a pre-identified storage area. The storage area will be located in an area of Site (not vegetated bog) where disturbance during the storage period will not occur. The turves will be off-loaded from the trailer and placed side by side and vegetation side upwards. They will be placed in single layers, *i.e.* not piled on top of each other. Should storage be for prolonged periods (months), the turves may need to be watered during dry spells. When ready for placement at the finished turbine/hardstand/track, they will be lifted with a dumper and bucket and taken to the destination. Here they will be off-loaded, 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 and is highly effective in reducing the potential for surface erosion. All of the above will be monitored by the ECoW.

Peat material excavated will be reused as backfill in areas previously excavated and/or for reinstatement works elsewhere on the Site. To facilitate this the acrotelm (living layer) and the catotelm (lower layer) will be treated as two separate materials. Catotelm peat will be used to backfill, for example, around Turbine Foundation pads once established. Acrotelm

peat will be used as a dressing on top of deposited catotelm peat in order to promote and re-establish flora and ensure the acrotelm layer becomes relatively cohesive in terms of localised peat stability (vegetated) and also reduces sediment release.

Natural revegetation is the preferred method of recovery. However, if required, bare material and/or reinstated soil can be secured using vegetation blankets such as Greenfix Embankment Mat2, Geojute2 or similar approved product. An appropriately pre-seeded Coir-Mesh2 would also be suitable. This may be required in patches where excavation works have excessively impacted on the ability of vegetation to recover. The Spoil Storage Area is shown in EIAR Figure 1.2a and Drawing No. 6778-JOD-MM-XX-DR-C-1401.

2 ESTIMATED EXCAVATION QUANTITIES

The environs of the Site are characterised by relatively flat topography with associated elevations ranging between c. 9 to 11 metres above datum (m AOD) throughout the Development (115.m to 15.5m in the proposed spoil area). The lowest part of the Site is at the Moyasta River on the northern part of the site. Geotechnical drawings prepared by Minerex Environmental Limited were used in conjunction with the peat depth probes to calculate the spoil volumes generated by the Development, as can be seen in **Tables 2.1** to **2.7**.

2.1 Road Construction

The minimum useful road width required for delivery of turbine components is 4.5m. **Table 2.1** tabulates the volumes of topsoil and sub-soil to be excavated for the Site Access Tracks. The majority of Site access tracks are proposed to be floated and so will not involve significant excavations.

Table 2.1 Estimated Excavation for Access Track Construction

Road Section	Length (m)	Width (m)	Area (m^2)	Depth (m)	Depth to firm Sub-soil(m)	Depth of Sub soil to be excavated (m)	Total Volume to be excavated (m^3)	Vol of peat to be excavated (m^3)	Vol of soil to be excavated (m^3)	Vol of rock to be excavated (m^3)
New & Upgraded Site Access Track (Floated)	420	4.5		-		-	-	-	-	-
New Site access track (Excavated) site entrance	1,225	4.5		0.45	0.2	0.25	2,481	1,103	1,378	0
Upgrading Existing Roads	400	4.5		0.45	0.2	0.25	810	360	450	0
Access Track (Blade Transfer Area)	160	4.5		0.45	0.2	0.25	324	144	180	0
Turning Heads (2No.)	-	-	1, 460	2	0.2	1.8	2,920	292	2,628	0
Junctions (2No.)	-	-	1,560	2	0.2	1.8	3,120	312	2,808	0
Totals							***9,655***	***2,211***	***7,444***	0

Peat probes were undertaken at proposed infrastructure locations across the Site and Blade Transfer Area. From this, the volume of peat was extrapolated and can be seen in **Table 2.1**.

2.2 Wind Turbine Foundations

The depth of excavation required for each wind Turbine Foundation will vary depending on peat depths. The diameter of the gravity Turbine Foundations will be 25.8m. Each Turbine Foundation excavation will be approximately 3.4m deep this could be extended to 4.0m depending on ground conditions. **Table 2.2** provide a breakdown of the estimated total excavation volume for the Turbine Foundations.

Table 2.2: Estimated Excavation for WTG Foundations (25.8m Diameter)

Turbine No.	Area of Foundation Excavation (m^2)	Foundation Depth (m)	Depth to suitable formation (m)	Worst Case Peat Depth	Total Excavation (m^3)	Total Peat (m^3)	Total Soil (m^3)	Total Rock (m3)
1	523	3.4	4	0.6	2,092	314	1,778	0
2	523	3.4	4	1.7	2,092	889	1,203	0
3	523	3.4	4	1	2,092	523	1,569	0
Totals					***6,276***	**1,726**	**4,550**	0

2.3 Turbine Hardstands

The depth of excavation required for each Turbine Hardstand will vary and has been calculated below. Each Turbine Hardstand will have a surface area of 4,907m^2. The main permanent Turbine Hardstand will be 2,110m^2, the temporary secondary crane hardstand will be 430m^2 and the temporary set-down will be 2,367m^2. Table **2.3** provides a breakdown of the estimated total excavation volume for the Turbine Hardstands.

Table 2.3: Estimated Excavation from Turbine Hardstands

Hardstand No	Area (m^2)	Depth to suitable formation (m)	Total Excavation (m^3)	Total Peat (m^3)	Total Soil (m^3)	Total Rock (m^3)
Hardstand 1	4,907	0.6	2,944	2,944	0	0
Hardstand 2	4,907	1.7	8,342	8,342	0	0
Hardstand 3	4,907	1.0	4,907	4,907	0	0
Total			***16,193***	***16,193***	***0***	**0**

2.4 Grid Connection and Internal Cabling

The Grid Connection is an Underground Cable (UGC) single 38kV circuit from Moanmore Lower wind farm utilising sections of UGC primarily public roads and private lands to Tullabrack substation [approx. 2.76km]. The 38kV cable trench with a trefoil formation will measure 600mm wide, and 1.22m deep.

The power generated by each wind turbine will be transmitted via underground Wind Farm Internal Cabling to the new 38kV Electrical Substation also, the communications fibre optic cabling will be installed in the same trench. The trenches will measure approximately 0.6m wide and one metre (1m) in depth. There will be approximately 1,500m of Wind Farm Internal Cable trenching (giving a surface area of approximately 900m²).

Table **2.4** provides a breakdown of the estimated total excavation volume for the Grid Connection Route and Internal Cabling.

Table 2.4: Grid Connection and Internal Cabling

Description	Length (m)	Width (m)	Area (m^2)	Depth (m)	Total Volume to be excavated (m^3)	Vol of peat to be excavated (m^3)	Vol of soil to be excavated (m^3)	Vol of rock to be excavated (m^3)
Internal Cabling	1,500	0.6	900	1	900	450	450	0
Grid Connection	2,760	0.6	1,656	1.22*	2,020	0	1192	0
Totals					***2,920***	***450***	***2,470***	***0***

*0.5m Bituminous material (828m^3)

2.5 Electrical Substation and Temporary Construction Compound

The construction of the substation and related electrical components will comply with ESBN specifications. The area of the substation compound will be approximately 1,165m^2 and the foundation will be up to 0.45m in depth and will be constructed from engineered stone material, using similar construction techniques as for the Turbine Hardstands. The overall compound will be enclosed by a 2.65m high fence and will contain one building, ancillary equipment, including the transformer, switchgear, fault protection, metering, car parking and other ancillary elements necessary for the operation of the Project.

The Temporary Construction Compound will be set up upon commencement of the construction phase. The proposed location for the Temporary Construction Compound is west of the site entrance. The compound will be 1,165m^2 and approximately 0.5m in depth. Table **2.5** provides a breakdown of the estimated total excavation volume for the Electrical Substation and Temporary Construction Compound.

Table 2.5: Electrical Substation and Temporary Construction Compound

Description	Length (m)	Width (m)	Area (m^2)	Depth (m)	Total Volume to be excavated (m^3)	Vol of peat to be excavated (m^3)	Vol of soil to be excavated (m^3)	Vol of rock to be excavated (m^3)
Electrical Substation	-	-	1,650	0.45	742.5	165	577.5	0
Temporary Construction Compound	-	-	1,165	0.5	582.5	174.75	407.75	0
Totals					***1,325***	***340***	***985***	***0***

2.6 TDR Works

Road widening, verge strengthening, and vertical realignment of the L6132 along its length up to the junction with the N68 road at Derreen cross is required to facilitate the delivery of turbine components using abnormal load vehicles. Road widening along the L2036 between Tullabrack Cross and the junction with the L2034 will be carried out to accommodate increased volumes of HGV vehicles associated with the construction of the wind farm.

Vertical realignment of the L6132 will be required at one location between the N68 and the wind farm site entrance. Realignment works will involve reducing the road level by approximately 150mm at an existing crest curve to reprofile the road for abnormal vehicles, maintain axle loading and prevent grounding.

The road widening and verge strengthening are temporary works. The vertical realignment works are permanent.

Table 2.6: TDR Works

Description	Length (m)	Width (m)	Area (m^2)	Depth (m)	Total Volume to be excavated (m^3)	Vol of peat to be excavated (m^3)	Vol of soil to be excavated (m^3)	Vol of rock to be excavated (m^3)
Vertical realignment of a section of the L6132	40	3	120	0.15	18	0	18	0
Road Widening Works along L2036	-	-	3,895	0.45	1,753	0	1,753	0
Temporary Verge Strengthening (L6132)	5160	1	5,160	0.75	3,870	0	3,870	0
Temporary Road Widening (L6132)	-	-	526	0.45	237	0	237	0
Blade Transfer Area– (Townland Tullabrack East)	-	-	10,165	0.5	5,083	5,083	0	0
Temporary Road Widening (L2034)	-	-	50	0.45	23	0	23	0
Totals					**10,982**	***5,083***	***5,900***	***0***

2.7 Flood Compensation Areas

Two flood compensation areas will be developed south to south-east of T1. Excavation depth is taken at 0.65m below existing ground where the ground is below the 9.6m contour and 0.65m below the 9.6m contour where the land is higher than the 9.6m flood level. The total volume of material excavated will be 4,695m^3 of peat

2.8 Drainage

There are 22 No. stilling ponds on site with a combined area of **801**m^2 and a combined volume of **801**m^3. This material will be used to make a bank around the sides of the ponds for safety reasons to prevent anyone from falling in. Please see **Surface Water Management Plan** of the CEMP for further details.

2.9 Total Estimated Excavation at Wind Farm Site Volume Summary

As detailed in Sections 2.1 to 2.8, the total estimated excavation volume of spoil is **52,847**m³.

These quantities are detailed in **Table 2.7**.

Table 2.7: Summary of estimated excavation quantities (m³)

Description	Total Volume to be excavated (m³)	Total Volume of Peat (m³)	Total Volume of Soil (m³)
Roads	9,655	2,211	7,444
Foundations	6,276	1,726	4,550
Hardstands	16,193	16,193	0
TDR works (including Blade Transfer Area)	10,982	5,083	5,900
Electrical Substation & Temporary Construction Compound	1,325	340	985
Internal Cabling	900	450	450
Grid Connection	2,020	0	2,020
Drainage	801	801	0
Flood Compensation	4,695	4,695	0
Totals	**52,847**	**31,498**	**21,349**

3 RE-USE OF EXCAVATED MATERIAL

3.1 Site access track construction

Due to the Site access tracks being predominantly of the floating road type construction and the depth of peat across the Site, the use of roadside berms is not considered appropriate.

3.2 Turbine and Met Mast foundation excavations

The concrete foundation of each turbine will be 25.8m in diameter. Any excavated non peat subsoil material will be used as backfill to the perimeter of the Turbine Foundations where the batters for safe working will be reinstated. Topsoil will be stored in Aprons around 3.no turbine hardstand long edges. Re-use of material for landscaping purposes elsewhere - remainder of topsoil

3.3 Designated spoil storage area

Peat spoil will be stored permanently at the designated spoil storage area next to the site entrance (refer to **Figure 1.1**). This area has an area of **22,464**m^2 and it is proposed that peat spoil can be stored up to 2m high which equates to the storage of approximately **44,928**m^3 of capacity for peat storage. This area will be topped with the excavated top surface layer of acrotelm peat to encourage rapid revegetation. Cells will be created for the placement of spoil in this area. The cells will measure approximately 45m x 60m and have outfalls blocked and overflow management with the creation of drainage channels for excess water and sphagnum inoculation. More information can be found in **Chapter 6: Biodiversity**.

3.4 Grid Connection

The Grid Connection route to Tullabrack 110kV substation is estimated to result in approximately **2,020**m^3 of spoil, split between peat, soils/stone and bituminous material. The spoil generated from works within the public roads (**2,020**m^3) will be required to be taken off site and stored at a licenced waste management facility. It is proposed to take the bitumen spoil to the licenced facility at Derrynalicka, Killrush to the east of the Site, and the remainder consisting of soils and rock, to the licenced waste management facility at Derrynalicka, Killrush to the east or to the facility at Creegh to the north of the Site. The spoil generated from grid works within the site (**900**m^3) will be stored in the designated spoil storage area at the site entrance.

3.5 Turbine Delivery Route Works

The TDR works along the L6132 are estimated to result in approximately **10,982**m^3 of spoil, split between soils/stone, peat and bituminous material. It is proposed to take the bitumen spoil to the licenced facility at Derrynalicka, Killrush to the east of the Site, and the remainder

consisting of soils and rock, to the licenced waste management facility at Derrynalicka, Killrush to the east or to the facility at Creegh to the north of the Site.

3.6 Bedrock

If rock such as cobbles or boulders is encountered in the Turbine Foundations and other excavations it will be crushed and used for hardcore in the Site access tracks and Turbine Hardstands.

4 SPOIL STORAGE AREA

Prior to commencement of any works collector drains and temporary silt measures (silt fences) will be installed to mitigate against any potential run-off during construction activities from the Spoil Storage Area. These temporary silt measures will be inspected on a daily basis by the Ecological Clerk of Works (ECoW), with them being removed once the Spoil Storage Area has been capped and seeded.

Drg. No. 6778-JOD-MM-XX-DR-C-1401 (Spoil Area) shows the proposed footprint of the Spoil Storage Area. Detailed within this drawing is the cross sections of the proposed “rock berms”, which will be installed at a height of 2m.

The topsoil under the footprint of the berms will be excavated in sections. The rock berm will then be built up to the required finished design level. Note: The rock berm construction will be inspected by the design engineer to ensure compliance with design prior to material storage commencing. A Permanent Works Design Certificate will be produced by the Designer for the rock berm & Spoil Storage Area.

It is proposed that the Peat and Soil/Spoil will be stored separately. When the Peat and Soil/Spoil is placed in the Spoil Storage Area, it will be done so by working out from the rock berm towards south. The benefit of this methodology is that material disturbance will be kept to a minimum and that a shallow gradient can be maintained at all times, reducing the velocity of any run-off.

When on-site Civil works have been completed the topsoil which has been stored separately in the spoil storage area will be placed back over the Spoil Storage Area to cap it – maintaining the design slopes and drainage channels. It will then be re-seeded to ensure that from a long-term perspective, no silt will be generated from the Spoil Storage Area or material contained within.

All temporary silt measures will then be removed once the Spoil Storage Area has stabilised with vegetation.

5 RECOMMENDATION

Based on the available information, Jennings O'Donovan make the following recommendations:

- The estimated potential total volume of excavated material is **52,847**m³ (including excavated material from GCR and TDR). However, this volume will be confirmed on the results of plate-bearing tests during the construction phase.
- Excavated material along the GCR and the TDR that contains bituminous material (**2,020**m³ **and 10,982**m³) will need to be moved to a licensed facility.
- There is capacity to store **44,928**m³ of spoil on site. There will be a surplus capacity of **5,083**m³ (a conservative estimation assuming no material is reused on-site).

6 MONITORING

The appointed civil contractor will be responsible for implementing, managing, and monitoring the Plan throughout the construction stage to ensure that it conforms to the requirements herein. The appointed ECoW and geo-technical engineer shall also monitor all works associated with this Plan, and the civil contractor will be obliged to act immediately on any instruction relating to this Plan given by either the ECoW or the geo-technical engineer. The civil contractor shall appoint an on-site Environmental Manager in order to effectively manage and monitor the Plan. A Peat Stability Register will be set up for the Spoil Storage Area and regular weekly assessment will be made by the Geotechnical Engineer.

The ECoW shall report on compliance with the relevant mitigation measures as outlined in this Plan. The ECoW shall also be empowered to halt works where he/she considers that continuation of the works are likely to result in a significant pollution or siltation incident.

Management Plan D

Decommissioning Plan

MOANMORE LOWER GREEN ENERGY LIMITED

MOANMORE LOWER WIND FARM, MOANMORE, CO. CLARE

CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN (CEMP)

DECOMMISSIONING & RESTORATION PLAN

PLANNING STAGE

APRIL 2025

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DOCUMENT APPROVAL

PROJECT	Moanmore Lower Wind Farm, Co. Clare	
CLIENT / JOB NO	Moanmore Lower Green Energy Limited	6778
DOCUMENT TITLE	Construction Environmental Management Plan (CEMP) Decommissioning & Restoration Plan (D&RP)	

	Prepared by	**Reviewed / Approved by**
Document FINAL	Name Sarah Moore/ Angelika Thiel/ Padraig O' Dowd	Name David Kiely
Date April 2025	Signature	Signature

CONTENTS

1.0 INTRODUCTION

This proposed Moanmore Lower Wind Farm will consist of 3 wind turbines installed on cast in-situ below ground concrete foundations with adjacent crane hard standing areas at all turbines. A stand-alone Electrical Substation will be constructed on site and all structures shall be connected via a network of existing and proposed access tracks. Wind Farm Internal Cabling will also link the turbines to the site control building and the power generated will be exported to the National Grid by underground cables.

This Decommissioning and Restoration Plan outlines the project components to be removed from site, and how disturbed areas are to be restored within the project area on Decommissioning of the wind farm.

It is noted that any works to be completed under this Decommissioning and Restoration Plan shall be fully compliant with the methodology and practices outlined in the Environmental Impact Assessment Report (2023)[1] and any subsequent Further Environmental Information submissions of the planning application and planning appeal respectively shall also be adhered to.

In preparing this Decommissioning and Restoration Plan, cognisance has also been given to the Scottish Natural Heritage (SNH) commissioned report no 591 titled *'Research and guidance on restoration and decommissioning of onshore wind farms'* (SNH, 2013), and the guidance document titled *'Decommissioning and Repowering plans for onshore wind farm'*[3].

The SNH Guidance also notes that reinstatement proposals for a wind farm are made approximately 30 years in advance, so within the lifespan of the wind farm. Due to the efficiency of modern turbines, it is estimated that their lifespan will be 35 years. The technological advances and preferred approaches to reinstatement are likely to change in the intervening decades.

In this regard, this Decommissioning & Restoration Plan will be reviewed and updated for the written agreement of the Planning Authority prior to commencement of Decommissioning works. It will take account of the relevant conditions of the planning

[1] Good practice guidance on Strategic Environmental Assessment Available at: https://www.epa.ie/publications/monitoring--assessment/assessment/strategic-environmental-assessment/EPA-SEA-Landscape-Guidance.pdf. Accessed at: 16/09/2024

permission and current health and safety standards in accordance with the approach set out and the principles established in this document.

2.0 WIND FARM INFRASTRUCTURE

The following items will make up the wind farm infrastructure once construction is completed:

- Erection of 3 no. 4-5MW wind turbines with an overall ground to blade tip height of 150m. The candidate wind turbine will have a rotor diameter of 136m and a hub height of 82m.
- Construction of site access tracks, Turbine Hardstand areas and Turbine Foundations.
- Construction of 1 no. new site entrance with access onto the adjoining local road network (L2034).
- Construction of 1. no new site entrance with access onto the adjoining local road network (L6132).
- Construction of 1 no. Temporary Construction Compound with associated temporary site offices, parking areas and security fencing
- Construction of new internal site access tracks and upgrade of existing site track, to include all associated drainage.
- Development of a site drainage network.
- Construction of 1 no. Electrical Substation.
- 1 no. permanent spoil storage areas.
- All Wind Farm Internal Cabling connecting the wind turbines to the Electrical Substation.
- All works associated to facilitate the permanent connection of the wind farm to the national electricity grid comprising a 38kV underground cable in permanent cable ducts from the proposed, permanent, on-site substation and to the existing Tullabrack 110kV ESBN Substation.
- 2 no. flood compensation areas.
- Vertical realignment of an existing crest curve on the L6132 local road in order to prevent grounding of abnormal load vehicles during delivery of turbine components.
- Construction of a Blade Transfer Area.

All access roads and hardstanding areas forming part of a site roadway network which are required by wind farm operation and maintenance staff for ongoing forestry operations will be left in situ for future use. The Electrical Substation and Grid Connection are permanent features. The vertical realignment of the L6132 will left in situ.

It is intended that all above ground components and underground cabling (ducting left in-situ) will be removed from the Site as part of the Decommissioning of the Development. The approach proposed for Decommissioning is one of minimal intervention.

The following elements are included in the Decommissioning phase:

- Decommissioning works will be limited to action necessary to remove the wind farm structures, i.e., removal of turbines and cabling.
- Roads and associated drainage systems will remain in place to serve agriculture activity.[2]
- Hardstanding areas will be allowed to revegetate naturally.
- Turbine plinths will be removed, and the hardcore covering Turbine Foundations will be allowed to revegetate naturally.[3]
- Soil disturbance will be avoided.
- Importing soil is not a preferred option. If this is to be considered, it will be as a last resort only. If it is nonetheless considered necessary to import soil, it will be peat soil.[4] Mineral soil will not be brought into the Site. Any decision to import peat soil will need to carefully balance any benefits of doing so against the ecological and hydrological impacts of excavating it elsewhere.

3.0 TARGETS AND OBJECTIVES

The key targets are as follows:

- Ensure Decommissioning works and activities are completed in accordance

[2] Scottish Nature Agency. Good practice during wind farm construction: For a wind farm where the roads are not to be retained, natural revegetation is preferred to reprofiling, or the importation of soil. Available at: https://www.nature.scot/doc/good-practice-during-wind-farm-construction. Accessed at 16/09/2024

[3] The covering of turbine foundations with soil material was discussed, and discounted. Instead, the possibility was discussed of roughening the surface of the concrete foundation, to assist in the initiation and subsequent growth and coalescence of flora. However, the foundations will in fact be covered with hardcore, so this step is unnecessary.

[4] This is because mineral soil will have different properties and different seed banks to peat soil and will not be suitable for transplantation to a bog environment. Natural colonisation of hardcore by local flora is expected to occur quite easily. This is seen from experience at existing wind farms, where regular maintenance is required to keep hardstandings and road verges free from growth.

with mitigation and best practice approach presented in the accompanying Environmental Impact Assessment Report (EIAR) and associated planning documentation.

- Ensure Decommissioning works and activities have minimal impact/disturbance to local landowners and the local community. This will relate to transport, particularly of material off Site with noise and dust also impacting on receptors at time of Decommissioning to a lesser extent.
- Ensure Decommissioning works and activities have minimal impact on the natural environment. Disturbance to habitats will be avoided and the use of existing infrastructure and drainage will ensure silt does not enter waterways.
- Adopt a sustainable approach to Decommissioning. This means comparing alternative methods for turbine disassembly and taking the approach with the least impact on the natural environment; and,
- Provide toolbox talks, environmental training and awareness of sensitive receptors and waste management within the Site for all project personnel.

The key site objectives are as follows:

- Ensure sustainable sources where possible. This means using sources which have derived from resources that can maintain current operations without jeopardising the energy needs or climate of future generations and implementing the waste hierarchy.
- Avoidance of any pollution incident or near miss as a result of working around or close to existing watercourses and have emergency measures in place, in accordance with the Emergency Response Plan. Similar mitigation measures to the construction phase will be implemented. Please refer to Section 5 for more details.
- Avoidance of vandalism.
- Keeping all watercourses free from obstruction and debris.
- Sustainable drainage system/drainage design principles will be maintained and monitored to ensure efficiency.
- Keep impact of Decommissioning works to a minimum on the local environment, namely watercourses, and wildlife through the use of defences such as buffers and silt fences.
- Correct fuel storage and refuelling procedures to be followed.
- Good waste management and housekeeping to be implemented.

- Air and noise pollution prevention to be implemented.
- Monitoring of the works and any adverse effects that it may have on the environment.

4.0 WIND FARM DECOMMISSIONING PLAN

Prior to the commencement of any Decommissioning works on site, a comprehensive Health and Safety Risk Assessment, complete with method statements, shall be developed by the appointed contractor. These risk assessments and method statements will take on board all updated health and safety legislation and policies which are appropriate to the time in question. A similar review of the EIAR and any Request for Further Information (RFI) responses shall be completed to ensure that all environmental legislation, best practice guidance, etc., which may have been introduced in the intervening years are adopted into the specific construction method statements.

The main components of the wind farm infrastructure are itemised hereunder and addressed individually.

4.1 Wind Turbine Generators

The key wind turbine generator components to be considered in Decommissioning include:

Key Element	Components	Constituents
Turbines	i. Blades	Resin / fibre glass (12 No.)
	ii. Blade hub & nose cone	Cast iron, resin, fibre glass (4No.)
	iii. Nacelle, incl. generator & gearbox if appropriate	Iron, steel, copper, resin, silica (4 No.)
	iv. Tower	Steel (12 No.)
	v. Transformer	Electrical components (4 No.)
	vi. Other	power cabinets, turbine cabling, i.e. Alu tower cables, gearbox Oil

Prior to any works being undertaken on wind turbines, they will be disconnected from the grid by the site operator in conjunction with ESB Networks and EirGrid. Once a Health and Safety Risk Assessment has been completed and the turbines have been isolated electrically, they will be systematically disassembled and disconnected from

their concrete bases, and subsequently removed from site on similar transport vehicles to those which were used to deliver the turbines to Site. The main components of the wind turbines (the tower, the nacelle, blades, etc.) are modular items that allow for ease of construction and disassembly. It is noted that wind turbine components have a significant recycle value in the form of steel, aluminum, copper, etc., (in some instances wind turbines can be refurbished and sold as second-hand turbines), therefore an incentive will always exist to carefully and diligently remove these structures from a non-operating wind farm site.

Suitable cranes, similar to those used for the installation works, shall be required for this operation. All components (if not reusable) removed from Site will be sent to a licensed waste management firm and or recycling facility and disposed of in accordance with European Union (Waste Electrical and Electronic Equipment) Regulations 2014 and EU (Environmental Impact Assessment) Waste Regulations 2013 or other applicable legislation which may be in force at the time of Decommissioning. As outlined above, it is anticipated that the waste steel turbine towers will be re-cycled and potentially used again for manufacturing and that the generator components will be broken down into their respective components and re-cycled as appropriate (if not reusable).

The transport of disassembled turbines from the site will be undertaken in accordance with a Transport Management Plan (TMP) which will be issued to and agreed with the competent authority at that time as part of a permit application for the delivery of abnormal loads using the local roads under the Road Traffic (Special Permits for Particular Vehicles) Regulations 2007. The TMP will provide for all necessary safety measures, including a convoy and Garda escort as required, off-peak turning/reversing movements and any necessary safety controls.

4.2 Wind Turbine Foundations

The key Turbine Foundation components to be considered in Decommissioning include:

Key Element	Components	Constituents
Turbine Foundation	i. Backfill above & around base	Suitable engineering fill / crushed rock
	ii. Concrete Foundations	Concrete / steel reinforcement
	iii. Concrete piles	Concrete / steel reinforcement

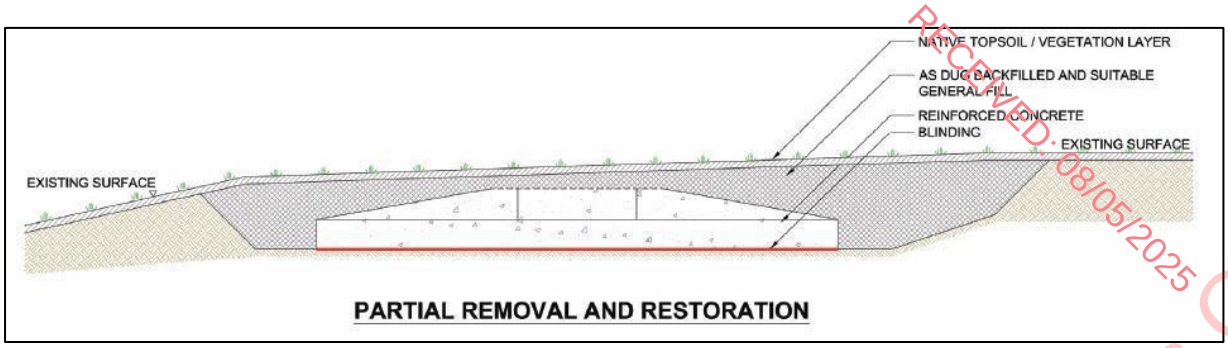
Each wind turbine will have a reinforced concrete foundation comprising of a concrete base slab (c.25.8m in diameter, and c3.5m deep) lying on either bedrock, competent substrata, or concrete piles, with a concrete central upstand column (measuring c.6m in diameter and c.650mm tall) which sits c.100mm above finished ground level and connects to the bottom turbine tower fixing section.

In order to keep the ground disturbances to a minimum, it is proposed that Turbine Foundations will not be removed in their entirety from the ground, with the concrete demolition works being confined to the central upstand column of the turbine foundation (plinth). This shall typically be broken out by mechanical rock hammers and reinforcing steel cut level with the broken concrete which will terminate approximately 300mm below finished ground level. It is envisaged that this work would be completed with a 30 tonne 360^{o} Tracked Excavator with a suitable sized hydraulic hammer. Oxyacetylene cutting equipment will be used for cutting reinforcing steel. The broken-down rock is loaded into a mobile crusher using a wheeled loading shovel machine and crushed down into the correct grade for use in the civil construction of site access tracks and Turbine Hardstands.

The remaining concrete base slab will be c.3.5m below finished ground level and shall be covered over with peat material as appropriate from the Site. The reinstatement of topsoil and the restoration of vegetation will be kept consistent and compatible with surrounding vegetation.

The methodology of all restoration works shall first be agreed with the site Environmental Manager and the Manager shall monitor and supervise the entire restoration works programme.

It is noted that the SNH Commissioned Report no 591 concludes that *'there is a relatively low environmental risk associated with reinforced concrete that is left in situ (The Concrete Society pers comm. 2013), and the noise, ground disturbance and cost (excavation/breaking/processing/transporting), along with associated carbon emissions, may create a larger environmental impact than leaving such concrete in situ on the site'.'*
The following figure which is extracted from the SNH commissioned report, shows a typical cross section of a restored turbine foundation.



PARTIAL REMOVAL AND RESTORATION

4.3 Turbine Hardstand Areas

The key Turbine Hardstand components to be considered in Decommissioning include:

Key Element	Components	Constituents
Turbine Hardstand	i. Hard-standing Area Approx 3,060m^2/ Turbine	Crushed rock / geogrid reinforcement. Re compacted rock to support cranes.
	ii. Soils	In-situ soils

In order to reduce the potential impact of excavating and removing the entirety of the Turbine Hardstand areas, it is proposed that the majority of the stone structure of the individual Turbine Hardstands will be left in place, with topsoil and or peat being spread on top of the hardstand to form a vegetated surface layer. The top layer of the Turbine Hardstand areas will have the rock/stone dug out and be left to revegetate naturally. Any reinstatement of topsoil and the restoration of vegetation will be kept consistent and compatible with surrounding vegetation and shall be agreed with the Environmental Manager in advance of commencement. The Environmental Manager shall also supervise the restoration works on Site.

By minimising the excavation of stone, and geo-grid etc., which over the lifetime of the windfarm may have become vegetated, the risk of creating sedimentation of watercourses etc. is kept to a minimum.

4.4 Site Tracks

The key site track components to be considered in Decommissioning include:

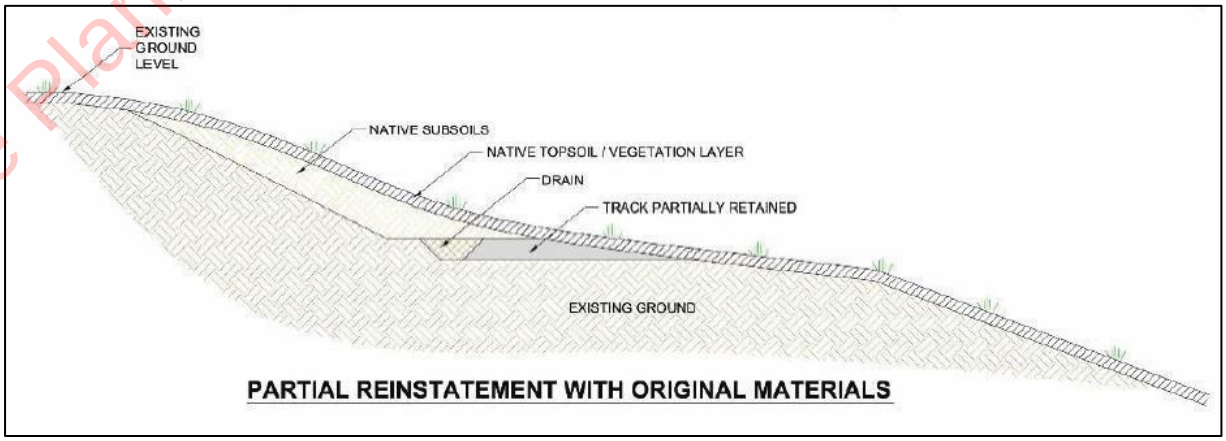
Key Element	Components	Constituents
Site tracks	i. Wind farm spec roads (majority floating roads)	Crushed rock / geotextile separators / geogrid reinforcement. Weathered & possibly vegetated.

Approximately 2.05km of new and upgraded site access tracks will be constructed as part of the project.

It is proposed that the site access tracks will be left in situ for use by the landowners. Any localised sections of track which will be required to be reinstated will have a covering layer of topsoil or peat (depending on adjacent vegetation) being placed on top of the track surface, with vegetated sods used where available. These works will also be in accordance with the requirements of the EIAR, and as per all other works on site will be first agreed with and supervised by the appointed Environmental Manager.

The SNH commissioned report no. 591 notes that the *'risks associated with leaving tracks in situ are relatively low. If the tracks are not required to be re-used, then localised grading of the road to suit the ground profile followed by reinstatement of topsoil/vegetation layer would be a low-risk activity. Consideration and sensitive management of the movement of groundwater and surface water would be important. Similarly, the underlying track, once covered, may drain water from the overlying topsoil and vegetation, and therefore reinstatement may not achieve the desired outcome. This can be managed and engineered to mitigate these risks.'*

The following figure is extracted from this SNH report and provides a cross-section example of the proposed restoration works.



4.5 Control Building and Compound

The Control Building and Compound will be owned and operated by the ESBN once operational and so will not be Decommissioned as part of the works, unless required by ESBN.

4.6 Wind Farm Internal Cabling

The key underground cable components to be considered in decommissioning include:

Key Element	Components	Constituents
Wind Farm Internal cabling	i. Underground cables, including electrical, earthing, and fibre optic	Copper, aluminium, fibre optic, plastic and rubber sheaths, HDPE ducting

All internal underground cables installed as part of the wind farm development shall be extracted from the ground and disposed of to a licensed recycling facility.

The associated ground disturbance with the removal of the underground cables should be minimal, however these works, like all others, shall be approved and supervised by the appointed Environmental Manager. The ducts will remain in-situ.

5.0 ENVIRONMENTAL CONTROLS

5.1 Site Drainage

Prior to any Decommissioning or restoration works commencing on Site, the Site drainage network shall be inspected by a SuDS hydrologist, and any necessary repairs to settlement ponds, check dams, etc., shall all be completed to ensure the drainage system is working adequately prior to ground works commencing.

As Turbine Foundations, Turbine Hardstand areas, access tracks, etc. are being restored, the respective drainage features shall all be filled in and or blocked, in order to prevent any unnecessary dewatering of the restored area. These works shall all be completed under guidance from the site hydrologist and the appointed Environmental Manager.

5.2 Refuelling; Fuel and Hazardous Materials Storage

The plant and equipment used during Decommissioning will require refuelling during the works. Appropriate management of fuels will be required to ensure that incidents relating to refuelling are avoided. The following mitigation measures, which are the same as those proposed for the construction phase, are proposed to avoid release of hydrocarbons at the Site:

- Road-going vehicles will be refuelled off site wherever possible.
- On-site refuelling will be carried out at a designated refuelling area on the Site. Machinery such as cranes will be refuelled directly by a mobile fuel truck that will come to site as required. Drip trays will be used in such circumstances.
- 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 volumes stored on Site will be minimised. The fuel storage areas will be bunded to 110% of the storage volume.
- The plant used will be regularly inspected for leaks and fitness for purpose.
- An emergency plan for the Decommissioning phase to deal with accidental spillages will be developed. Spill kits will be available to deal with an accidental spillage in and outside the refuelling area.
- A programme for the regular inspection of plant and equipment for leaks and fitness for purpose will be developed at the outset of the Decommissioning phase.

5.3 Dust Control

Dust is unlikely to be generated in significant amounts from on-site activities during Decommissioning. The extent of dust generation will depend on the type of activity undertaken, the proximity of activities to receptors and the nature of the dust, i.e., soil, and the weather. In addition, dust dispersion is influenced by external factors such as wind speed and direction and/or, periods of dry weather. Site traffic movements also have the potential to generate dust as they travel along the Construction Haul Routes.

Proposed measures, which are the same as those proposed for the construction phase, to control dust include:

- Any site roads with the potential to give rise to dust will be regularly dampened down, as appropriate, during dry and/or windy conditions.
- The designated public roads outside the site and along the main transport routes to the site will be inspected daily by the Site Manager for cleanliness and cleaned if deposits are found.
- Material handling systems and material storage areas influenced by convenience and ease of handling, and safety in terms of peat slippage
- Water misting or sprays will be used in dry and windy conditions if particularly dusty activities are necessary during dry or windy periods.
- The transport of soils or other material, which has significant potential to generate dust, will be undertaken in tarpaulin-covered vehicles.
- Daily inspection of the site to examine dust measures and their effectiveness.
- When in dry and/or windy weather and dirt is visible on the roads, sections of the Construction Haul Routes will be swept using a truck mounted vacuum sweeper.

5.4 Noise Control

The operation of plant and machinery, including site vehicles, is a source of potential impact that will require mitigation at all locations within the Site. Proposed measures, which are the same as those proposed for the construction phase, to control noise include:

- Diesel generators will be enclosed in sound proofed containers to minimise the potential for noise impacts.
- Plant and machinery with low inherent potential for generation of noise and/or vibration will be selected. All plant and equipment to be used on-site will be modern equipment and will comply with the S.I. No. 359/1996 - European

Communities (Construction Plant and Equipment) (Permissible Noise Levels) (Amendment) Regulations.

- Regular maintenance of plant will be carried out in order to minimise noise emissions. Particular attention will be paid to the lubrication of bearings and the integrity of silencers.
- All vehicles and mechanical plant will be fitted with effective exhaust silencers and maintained in good working order for the duration of the works.
- Compressors will be of the "sound reduced" models fitted with properly lined and sealed acoustic covers which will be kept closed whenever the machines are in use and all ancillary pneumatic tools shall be fitted with suitable silencers.
- Machines, which are used intermittently, will be shut down during those periods when they are not in use.
- Toolbox talks will include will be provided to drivers prior to construction commencing to ensure smooth machinery operation/driving, and to minimise unnecessary noise generation.
- Local areas of the Construction Haul Routes will be condition monitored and maintained, if necessary.

5.5 Invasive Species Management

Prior to Decommissioning, a suitably qualified ecologist will complete an invasive species survey of the wind farm site to identify invasive species where any minor excavation will be required. Any invasive species encountered will be removed based on the advice of the ecologist.

5.6 Traffic Management

A Traffic Management Plan will be prepared in advance of any Decommissioning works. The traffic management arrangements for the removal of turbines although similar to those that will be implemented for construction materials delivery as outlined in the EIAR, will be agreed in advance of Decommissioning with the competent authority.

The Traffic Management Plan for the Decommissioning phase will also include provision for the removal of Wind Farm Internal Cabling from the underground ducts within the Site. Cables in public roads will be left in-situ as they will be in ownership and the responsibility of ESB Networks.

5.7 Waste Management Plan

This waste management plan outlines the best practice procedures during the Decommissioning of the Development. The Waste Management Plan will outline the methods of waste prevention and minimisation by recycling, recovery and reuse at each stage of Decommissioning. Disposal of waste will be a last resort.

5.7.1 Legislation

The Waste Management Act 1996 as amended requires that any waste related activity has to have all necessary licenses and authorisations. It will be the duty of the Waste Manager on the Site of the Moanmore Lower Wind Farm development to provide that all waste removed from Site will be subject to an appropriate waste collection permit. It will then be necessary to see that the waste is delivered to a licensed or permitted waste facility. The hired waste contractors and subsequent receiving facilities must adhere to the conditions set out in their respective permits and authorisations. Waste removal-related traffic volumes during the Decommissioning phase, will be similar or less than those anticipated and assessed for the construction phase.

The Department of the Environment provides a document titled, 'Best Practice Guidelines on the Preparation of Waste Management Plans for Construction and Demolition Projects' (2021).[5]

5.7.2 Waste Management Hierarchy

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

1. **Prevention and Minimisation:**
   The primary aim of the Waste Management Plan will be to prevent and thereby reduce the amount of waste generated.
2. **Reuse of Waste:**
   No material is likely to be reused on site during the Decommissioning phase. Materials such as cabling will be reused off-site.
3. **Recycling of Waste:**
   There are several established markets available for the beneficial use of Construction and Demolition waste such as using waste concrete as fill for new roads.

[5] Best Practice Guidelines – Construction & Demolision Projects. Available at: https://www.epa.ie/publications/circular-economy/resources/CDWasteGuidelines.pdf. Accessed at: 16/09/2024

4. Disposal of Waste to Landfill

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

5.7.3 Waste Arising from Decommissioning

The relevant components will be removed from site for re-use, recycling or waste disposal. Any structural elements that are not suitable for recycling will be disposed of in an appropriate manner. All lubrication fluids will be drained down and put aside for appropriate collection, storage, transport and disposal. Any materials which cannot be re-used or recycled will be disposed of by an appropriately licenced contractor.

The waste types arising from the Decommissioning of the Development are outlined in the table below.

Principal Waste Types Arising during the Decommissioning Phase

Material Type	Example	EWC Code
Cables	Electrical wiring	17 04 11.
Metals	Copper, aluminium, lead and iron	17 04 07.
Fibreglass	Turbine blade component	10 11 03.
Hydrocarbons	Oils and lubricants drained from the turbines	13 01 01, 13 02 04.

5.7.4 Reuse

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

- Electrical wiring can be reused on similar wind energy projects
- Elements of the turbine components can be reused but this will be determined by the condition that they are in.

5.7.5 Recycling

If a certain type of material cannot be reused, then recycling is the most suitable option. The opportunity for recycling during Decommissioning will be limited and restricted to components of the wind turbines.

All wastes will be sorted and segregated on-site during the time of Decommissioning.

The anticipated volume of all waste material to be generated at the Moanmore Lower Wind Farm development is low, which provides the justification for adopting small containers as a method of waste storage.

5.7.6 Environmental Monitoring

In advance of any Decommissioning and Restoration works commencing on Site, an Environmental Manager shall be appointed to assist with the preparation of all Method Statements associated with the works to occur at the Site. The Environmental Manager shall be retained throughout the site works, providing guidance and instruction throughout, and independently supervising the works to ensure they are being completed in an environmentally sensitive manner.

Following the completion of the Decommissioning and Restoration works the Environmental Manager will survey the entire Site and produce a snag list of outstanding items, all of which will be completed by the appointed contractor under the supervision of the Environmental Manager.

6.0 PROGRAMME FOR DECOMMISSIONING AND RESTORATION

The following is a proposed Decommissioning and Restoration Programme:

- Mobilisation and preparation work — 4 weeks
- 3 no. wind turbine generators — 4 Weeks
- 3 no. wind turbine foundations — 4 Weeks
- 3 no. hardstand areas & access tracks — 2 Weeks
- Underground cabling — 3 Weeks
- Final works including removal of plant from Site — 3 Weeks

Decommissioning and restoration works shall commence following the expiration of a period of 40 years from the commencement of electricity generation, or upon the expiration of a period of 12 months following the cessation of electricity generation at the Site.

7.0 DECOMMISSIONING & RESTORATION PLAN REVIEW PERIOD

The Decommissioning & Restoration Plan shall be reviewed prior to the commencement of any Decommissioning and Restoration works to ensure that all applicable best practice guidance, which may have been introduced in the intervening period, has been considered.

Management Plan E

Biodiversity Enhancement Management Plan

PROPOSED WIND FARM
AT MOANMORE LOWER, CO. CLARE

BIODIVERSITY ENHANCEMENT
AND MANAGEMENT PLAN

APRIL 2025

Prepared for

Moanmore Lower Green Energy Ltd.

by

BIOSPHERE ENVIRONMENTAL SERVICES
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BES

CONTENTS

1.0 INTRODUCTION

1.1 Background

This Biodiversity Enhancement and Management Plan (BEMP) has been prepared in support of the Environmental Impact Assessment Report (EIAR) produced for the proposed Moanmore Lower Wind Farm, Co. Clare. Full details of the Development are given in **Chapter 2** of the EIAR.

As part of the Development, an area of cutover bog (0.8 ha), which is part of an extensive area of bog that includes a remnant area of uncut raised bog (see EIAR **Chapter 6: Sections 6.3.3.4 & 6.3.3.5**), will be directly impacted as a result of the construction of Turbine T2 and its associated access track. As the bog complex in its entirety is rated of County Importance, mitigation is being provided to off-set the habitat loss through the implementation of a Biodiversity Enhancement and Management Plan (BEMP), as described in this report.

Mitigation is also required to offset the loss of a small area of Molinia meadow (estimated at 200 m^2) (see EIAR **Section 6.3.3.2**), an Annex I listed habitat, as a result of the construction of Turbine T3. The mitigation will enhance the main area of this habitat (c.1.78 ha) within the site and will also focus on increasing the suitability of the habitat for the Annex II listed marsh fritillary (while not recorded in the baseline survey, part of the Molinia meadow habitat was rated as 'suitable').

While hedgerows are not a significant feature of the Moanmore Lower site, there will be a loss of an estimate 20 m due to new access tracks and a loss of 70 m at the location for the proposed blade set-down area. In addition, an estimated 175 m of hedging will be removed to provide a bat buffer around T1 (the other two turbines do not require hedge removal). Mitigation for loss of hedging will be provided by a replanting programme which forms part of the BEMP.

The areas for the BEMP are within the Redline Boundary for the Development (see **Figure 1**).

The programme described in this report will be implemented in accordance with published guidance and best practice, namely:

- SNH (now NatureScot) "Planning for development: What to consider and include in Habitat Management Plan – Guidance" (Version 2, March 2016).
- CIEEM (2023) Briefing Paper on 'Biodiversity Enhancement for New Developments in Ireland', (the "CIEEM Guidance")

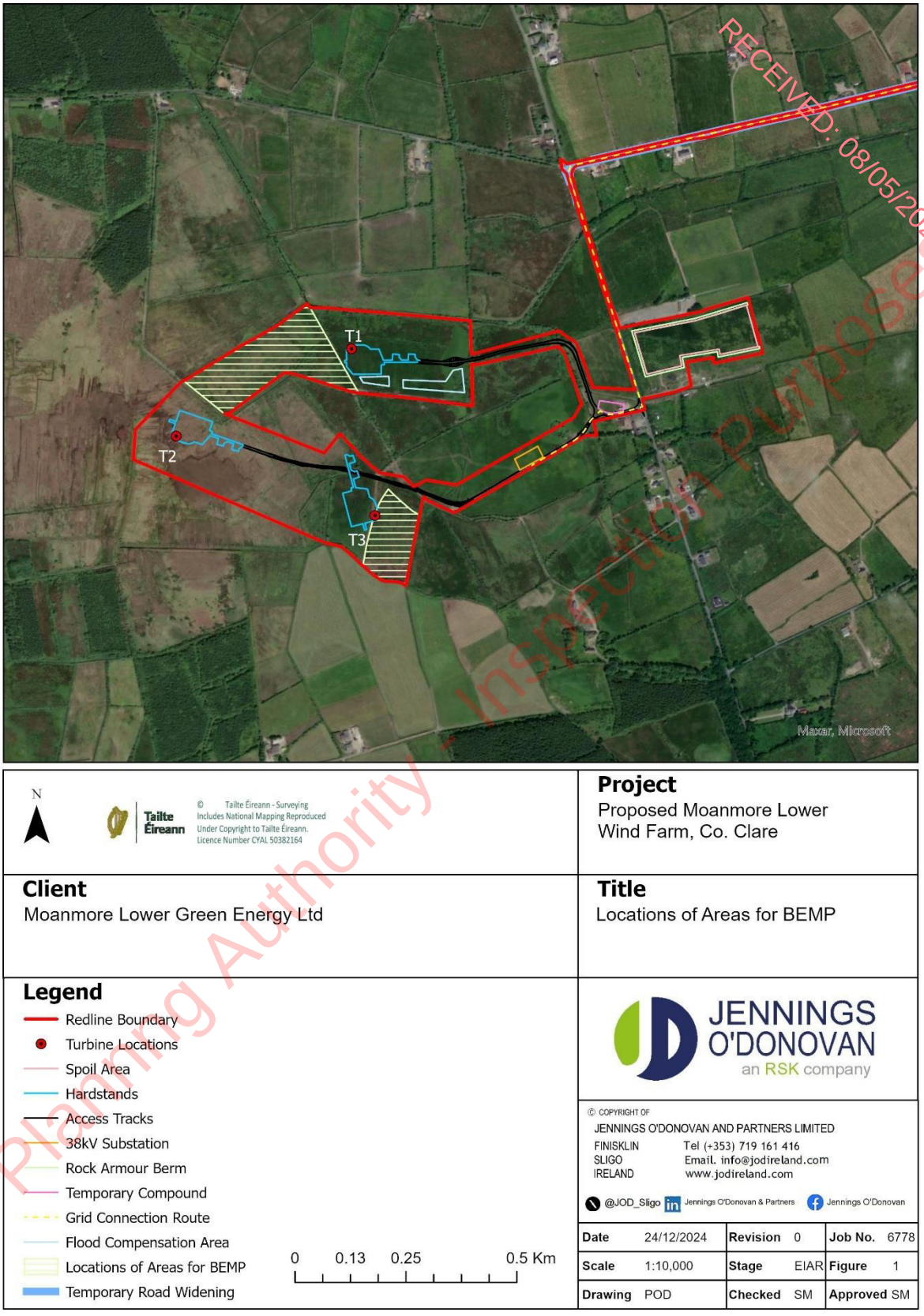

Figure 1. Locations of areas for the BEMP (shown by hatched lines).

1.2 Outline Description of Proposed Wind Farm Site

The wind farm Site, as shown in **Figure 1 above**, is located in south-west county Clare, 3 km northwest of the town of Kilrush and 6.8 km southwest of Cooraclare village. The wind farm Site is located within the townland of Moanmore Lower.

The proposed Development is situated within a landscape dominated by agricultural land (mainly used for livestock grazing) and with scattered stands of commercial conifer plantation. Remnant raised bogs, now almost entirely cut, are a feature of the area. There are a number of operational wind farms in the area, including Moanmore Wind Farm, located c. 1.7 km to the northeast and Tullabrack Wind Farm, located c. 2.16 km to the east of the Site.

From a conservation perspective, the River Shannon system is the dominant feature of the local area, with Poulnasherry Bay located just over 1 km to the west of the Site. Various small lakes and wetlands occur in the hinterland of the Site, including Tullaher Lough, Tullabrack Lough, Gower Lough and Moanmore Lough.

The mapped geological formation underlying the Site and GCR is the Gull Island Formation, which is a grey SILTSTONE with up to 20% sandstone towards the base decreasing upwards (see **EIAR Chapter 8** for details). Much of the Site is covered in peat, particularly in the western sector. Peat depths at survey points (266 no.) ranged from 0.00 m to 5.1 m, though generally depths were very shallow to moderately deep. Deepest peats occurred south of T2 and south / southwest of T3.

The wind farm Site is characterised by relatively flat lying topography with associated elevations ranging between 8 to 16 m AOD and an average slope of 2.5°.

The proposed wind farm Site and Grid Connection Route to the Tullabrack 110kV substation are situated within the Shannon Estuary North catchment (ID: 27, Area: c.1,651.27 km²) (for details see **EIAR Chapter 9: Hydrology and Hydrogeology**). The Site and its surroundings have indirect hydraulic connectivity to the Shannon estuary via natural and artificial drainage that connect to the Moyasta River, which drains the Site. A section of the river flows along the northern boundary of the site, and continues in a westward direction before draining to Poulnasherry Bay and into the Shannon Estuary. In addition to the Moyasta River, there are numerous drainage ditches located within the proposed Site and its surrounds.

Ecologically, the Site for the proposed wind farm can be described as being dominated by Wet grassland (GS4) (semi-improved to varying extents) and Cutover bog (PB4), with a small area of Raised bog (PB1). The bog type is former raised bog of the 'Western' category. In a detail evaluation of raised bogs in Ireland, Cross (1990) refers to Co. Clare and writes "*Raised bogs*

occurred in two areas; small bogs in the undulating lowlands east of Tulla and an extensive tract near Kilrush at the mouth of the Shannon (Monmore Bog). All bogs have been largely cut away leaving a few very small remnants behind." A full ecological description of the site is given in **Chapter 6** of the EIAR.

1.3 Objectives of the BEMP

Objective no. 1

To enhance an existing area of cutover bog that has been improved for grazing and is now largely dominated by wet grassland with frequent rushes.

Objective no. 2

To enhance an area of Molinia meadow (Annex I listed) which has been degraded by over-grazing and which has potential to provide habitat suitable for marsh fritillary (Annex II listed).

Objective no. 3

To offset the loss of hedgerows by a replanting programme.

1.4 Statement of Authority

This BEMP has been prepared by Brian Madden, with expertise on the marsh fritillary component provided by Ryan Mitchell.

Brian Madden BA Mod. (Hons.), PhD, MCIEEM

Brian graduated in Natural Sciences from the University of Dublin in 1984 and earned a Ph.D degree from the National University of Ireland for his research on ecosystem processes in raised bogs. Since 1994, Brian has been the principal ecologist with BioSphere Environmental Services.

Brian has carried out botanical surveys and habitat assessments for most terrestrial habitats which occur on the island of Ireland. He is also an experienced ornithologist, with particular interest in birds of peatland and wetland habitats.

BioSphere Environmental Services has been involved in energy related projects, and particularly wind farms, since the 1990s. Many of the projects have included Biodiversity Enhancement and Management Plans, including Castlepook Wind Farm, Co. Cork, Oweninny Wind Farm, Co. Mayo and Eglish Wind Farm, Co. Tyrone.

Ryan Mitchell, B.Sc. – Senior Ecologist & Marsh Fritillary expert

Ryan is a senior Environmental Scientist / Ecologist working at Jennings O'Donovan & Partners Ltd. He is an experienced entomologist, with specialisation in pollinator insects and Diptera (True flies). Ryan has much experience of working on large scale renewable energy projects (onshore wind & solar) as a Marsh Fritillary surveyor both in planning and construction stages. He has also carried out invertebrate monitoring surveys for NPWS within various Natura 2000 sites. He has published numerous papers in peer reviewed journals on terrestrial invertebrates in Britain and Ireland.

Examples of energy projects requiring lepidoptera studies that Ryan has worked on include: Derrinlough Wind Farm, Co. Offaly; Carrickatane Wind Farm, Co. Tyrone, Clooncunny Wind Farm, Co. Sligo, Timahoe North Solar Farm, Co. Kildare.

2.0 PLAN DETAILS: OBJECTIVE 1 – CUTOVER BOG ENHANCEMENT

2.1 Background

The enhancement plot, which measures approximately 4.04 ha, lies to the west of the location for turbine T1 (see **Figure 1**) (separated by a distance of 35.4m). It is essentially used as a field, demarcated by drains, for rough grazing of cattle. The area is shown as bog on the OS 6 inch and 25 inch historical maps, and even then drains demarcated much of the boundary. The north-east tip of the plot extends to the Moyasta River. There is one main internal drain which separates the south-eastern sector (triangular shaped plot) from the main sector (rectangular shaped). Main drains occur along the western, southern and eastern boundaries, with a minor drain along the northern boundary. In general, the eastern part of the plot is more improved and drier.

The present land use is grazing by cattle which appears to be at a low to moderate level and on a seasonal basis. Some localised areas of poaching were evident in the wet grassland areas at the time of survey (September 2023).

Vegetation description

The area comprises a mix of cutover bog and wet grassland habitat on peat soil (**Figure 2**). The western half of the area is dominated by a revegetated cutover bog surface, which is characterized by varying proportions of *Molinia caerulea, Juncus effusus* and *Juncus acutiflorus* and with frequent *Carex panicea, Erica tetralix, Succisa pratensis, Calluna vulgaris* and *Potentilla erecta*. Sphagnum moss is locally frequent (**Plate 1**), with *Sphagnum capillifolium* and *Sphagnum papillosum* the main species present. Another common moss species is *Aulocomium palustris*, which is typical of wet bog habitat. The cutover bog habitat present has not been subject to peat cutting for a considerable time. Areas of bare peat are absent and there is no evidence of recent cutting activity.

The eastern half of the enhancement area is generally dominated by wet grassland vegetation which has a high cover of soft rush *Juncus effusus* (**Plate 2**) with bog species either absent or present at a low cover. Frequent species occurring, in addition to *Juncus effusus,* include *Juncus acutiflorus, Ranunculus repens, Succisa pratensis, Cirsium palustre* and *Holcus lanatus* with *Rhytidiadelphus squarrosus* the main moss species seen.

In places the cutover bog and wet grassland habitats intermix and form a habitat mosaic.

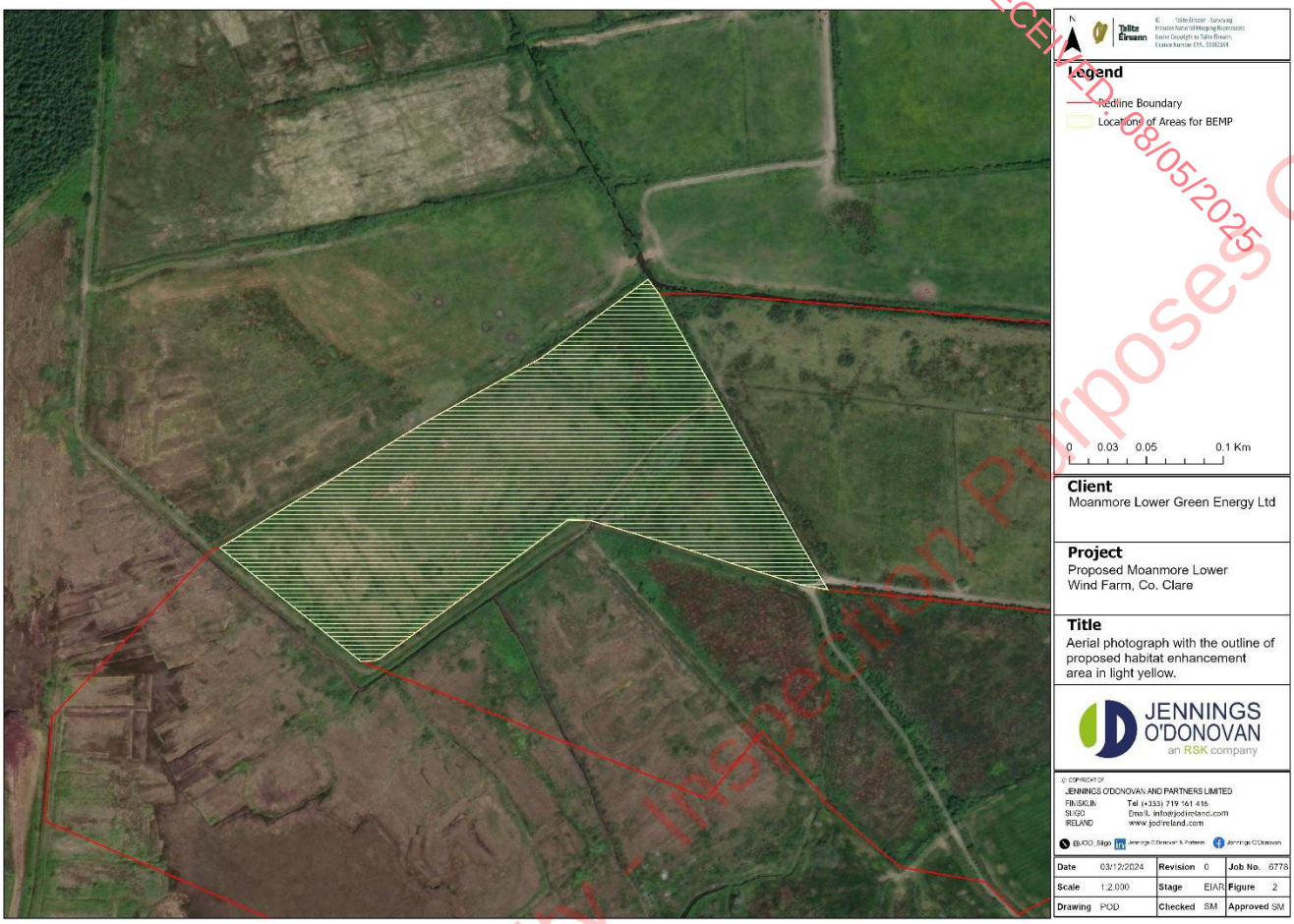

Figure 2. Aerial photograph with the outline of proposed habitat enhancement area in yellow.

Plate 1: View of cutover bog vegetation in the west of the area, showing *Sphagnum capillifolium* growing along with various sedges and grasses (September 2023).

Plate 2: General view of wet grassland habitat in the eastern half of the plot (September 2023).

2.2 Proposed Management Methodology

The principal aim is to maximise over the lifetime of the Plan the amount of cutover bog within the Plot. This will off-set the loss of cutover bog as a result of the Project and will also enhance the quality of habitat for important bird species such as hen harrier, snipe and meadow pipit.

This aim will be achieved through reducing the amount of rush cover (mainly soft rush) throughout the plot by sensitive mowing/cutting and an appropriate level of grazing. However, in areas dominated by wet grassland and perhaps less likely to revert fully back to bog, increasing the diversity of wetland plant species within the grassland sward will be desirable.

The closure of internal drains will be undertaken in conjunction with the project ecologist and hydrologist so as to maximise the wetness of the surface.

The initial task in Year 1 of the BEMP will be a detailed vegetation review of the plot and the setting out of an appropriate programme of works for the first 5 Years of the Plan

It is noted that during the lifetime of the Plan, there will be no spreading of fertilisers within the Plot.

2.2.1 Measure no. 1: Survey and review of work programme

During the year prior to construction, a detailed vegetation survey of the Plot will be carried out during the summer period which will aim to map in detail the distribution of the bog and wet grassland habitats. The areas which are identified as predominantly existing cutover bog will be marked out (using bamboo canes or similar) as these will be excluded from subsequent mowing to minimise disturbance.

In conjunction with the project hydrologist and ecologist, any internal drains to be blocked will be marked out so as to increase the wetness of the surface layer.

Following this review, a suitable programme of works will be identified for the first 5 Years of the Plan.

Outlines of the likely approaches for the work programmes are given in the following.

2.2.2 Measure no. 2: Control of rushes by cutting

Much of the plot has a moderate to high coverage of rushes, mostly soft rush *Juncus effusus*. This species forms tussocks which can occur densely and outcompete other species. While some rushes will always be present in disturbed bog habitats and wet grassland, coverage of more than 30% is undesirable.

Rushes will be controlled by a combination of mowing/cutting and an appropriate level of stock grazing (see next section). [It is not proposed to use herbicides during the operation of the Plan to control rushes or weed species.] It is proposed that in Year 1 of Plan, the entire Plot will be mowed,

with the exclusion of the areas identified as predominantly existing cutover bog. This will be done either in early spring (prior to start of bird nesting season) or, more likely, in September (after bird nesting season). Mowing in Year 1 will be done using a low ground pressure tractor suitable for use on peat bogs. The cutting should be as low to the ground as possible and will be done by a machine mounted flail or brush-cutter. The cut rushes will be collected and removed from site so as to reduce soil fertility. Grazing will then be allowed in period September to end of October to assist in control of rushes.

In Year 2, an inspection will be made at start of February to consider whether another early full or even partial (say 50%) cut of Plot by tractor and mower would be useful. If ground is too wet, this will be delayed until autumn (as above).

After 1-3 years of above approach, it may be desirable to continue cutting, at least in some parts of the Plot, by a hand method using a flail or similar tool so as to reduce disturbance to the surface.

With annual cutting, the vigour of the rushes will be reduced (in combination with appropriate grazing). However, it is anticipated that some cutting will be required in each Year of the Plan.

The mowing works will be carried out by an experienced operator under the guidance of the project ecologist.

2.2.3 Measure no. 3: Grazing

An appropriate level of grazing is required to control and reduce the cover of rushes and other robust plant species.

A level of 1 livestock unit per hectare per year (1 LU/ha/yr) is considered appropriate for the first three to five years of the Plan (after which the level will be reviewed). While this level is higher than would be recommended for uncut bog, it is appropriate for semi-natural grassland or in this case cutover bog with rushes. On this basis, 4 cattle will be allowed within the Plot for grazing.

Grazing will be on a seasonal basis being limited to the periods (i) March to mid-May (say 15th), and (ii) September and October.

The avoidance of the summer period mid-May to end of August will facilitate the flowering and seed production of the flora in the summer months.

The avoidance of the winter period November to February (inclusive) will prevent poaching.

The use of ring feeders for supplementary feeding can cause damaging enrichment of bog and poaching. If supplementary feeding is necessary, this will be discussed with the project ecologist and the most suitable area will be selected.

2.2.4 Measure no. 4: Drain blocking

A walk-over survey in September 2023 suggested that there are few active internal drains within the management plot.

However, as part of Measure no. 1, a detailed inspection will take place in the pre-construction year by an ecologist and hydrologist to determine where blocking of drains would be feasible and be beneficial to increasing the wetness of the surface (see **Chapter 9; Hydrology & Hydrogeology, section 9.6.2.12**).

Identified drains will be blocked by hand using either wooden or recycled plastic dams (see **Plate 3**) which are hammered into place with a mallet. Procedure for drain blocking in raised bogs is described in detail in Mackin *et al*. (2017).

The ultimate purpose of blocking drains is to raise water levels and encourage peat-forming vegetation and especially the growth of Sphagnum mosses.

Plate 3. An example of a recycled plastic dam used to block functioning drains on a raised bog site.

2.3 Monitoring

To confirm that the objectives of the Plan are being achieved, the area of enhancement will be monitored during the lifetime of the wind project. SNH (2016) note that a Habitat Management Plan should be a live document, which may be altered following monitoring results, unexpected events or

evolving guidance. Any alterations would only occur following approval by the relevant stake-holding parties, in this case Clare County Council and NPWS.

2.3.1 Monitoring for cutover bog enhancement

After the baseline survey at the commencement of the Plan, a series of permanent quadrats will be set up for the purpose of monitoring of vegetation change over time. The location of these quadrats will be marked using wooden pegs and the grid reference will be recorded using GPS. It is expected that up to ten quadrats will be described. These will be of an appropriate size, probably 2 m x 2 m, to take into account the scale of the plan area. The occurrence and cover of vascular plant and moss species will be recorded in these quadrats along with a number of other important parameters such as the height of vegetation, cover of bare peat, flowering of plant species etc. This survey will take place in the late summer/autumn period of each monitoring year. Photographs of the quadrats will also be taken on deployment and subsequently during the following years of monitoring.

Monitoring will take place during the wind farm Operational Years 1, 2, 3 & 5 of the Plan implementation, with Year 1 being the base year at the time the works are carried out. After Year 5, a review of the progress will be conducted in light of the Plan objectives, and a programme will be developed for the next 5-Year period of the Plan (and so on for the lifetime of the project).

From the monitoring results in each year, an assessment will be made by the project ecologist on whether modifications are required in either the mowing or grazing regimes in place.

Peat water level monitoring, by means proposed standpipe installations, will also be carried out to monitor the effectiveness of the bog re-wetting, i.e. blocking of drains. The monitoring will continue through the lifetime of the Project (see **Chapter 9: section 9.7.2.13**).

2.4 Time Period for Plan Implementation

Year 1 of the Plan will include the baseline survey, the first mowing of rushes, and the establishment of the grazing programme. The site will be assessed by the project hydrologist and ecologist and internal drains marked where blocking will occur to raise water levels in the peat soils. Where this is required, such works will be undertaken within Year 1 of the Plan.

Year 1 will coincide with the completion of wind farm construction works.

Year 2 to Year 5

Throughout the lifetime of the Plan there is a need to ensure that the mowing and grazing measures are carried out in each year in accordance with the outline descriptions within the present document. This will be achieved through 1-2 site visits (one at time of mowing operations) each year. The monitoring of quadrats will be an additional visit focused on the state of the vegetation. Drain blocking

will be visually inspected to ensure that the dam is operating as required and does not require adjusting (should water be escaping) and water levels measured.

Year 5 onwards

As noted, a review of the Plan progress will be made after Year 5. At that stage, it will be apparent how successful the works are in achieving the objective of enhancing the distribution of cutover bog within the Plot. Modifications to the mowing and grazing programmes may be made for the next 5-Year period.

3.0 PLAN DETAILS: OBJECTIVE 2 – MOLINIA MEADOW ENHANCEMENT AND MARSH FRITILLARY

3.1 Background

The baseline botanical assessment identified one field where the Annex I listed habitat Molinia meadow (code 6410) was dominant (see **EIAR Chapter 6: section 6.3.3.2**). This is located east of turbine T3, with the turbine positioned on the western margin of the field (see **Figure 1**). The sward has developed in an area of cutover bog where a residual peat soil occurs (see **Plate 4**). As the sward has been degraded in parts by recent heavy grazing, it was rated as of Local Importance (higher value). The field has an area of 1.78 ha.

Due to the frequency within the sward of the foodplant of the marsh fritillary butterfly (Annex II listed), devil's-bit scabious *Succisa pratensis,* a survey of the field for larval webs of marsh fritillary was carried out in September 2023 (see **EIAR Appendix 6.3**) (see **Figure 3**).

While no larval webs were discovered on site, habitat suitability assessments were undertaken and concluded that the field contains 'suitable' habitat for marsh fritillary. The area was assessed as '*Suitable (Over-grazed) Habitat'* for Marsh Fritillary. The overall habitat has a relatively species-rich sward ranging in average height of 25 cm tall. There was extensive evidence of heavy grazing across the entire survey area. The devil's-bit scabious cover was dense in many places (>10 plants per m^2), with the distribution widespread and reasonably consistent across the survey area. Where devil's-bit scabious occurred, the sward height was mostly 12 cm. However, there were only a few small pockets of '*Good Habitat Condition*' for marsh fritillary throughout the site.

In addition, the desktop study indicated that there is a total of 34 NBDC records of marsh fritillary within a 5 km radius of the Site, and hence it can be considered as being relatively widespread in the wider area of Moanmore Lower.

As the wind farm project will encroach slightly into an area dominated by an Annex I listed habitat, and considering that there is good potential for the Annex II listed marsh fritillary, management and enhancement of this plot is proposed as part of this BEMP.

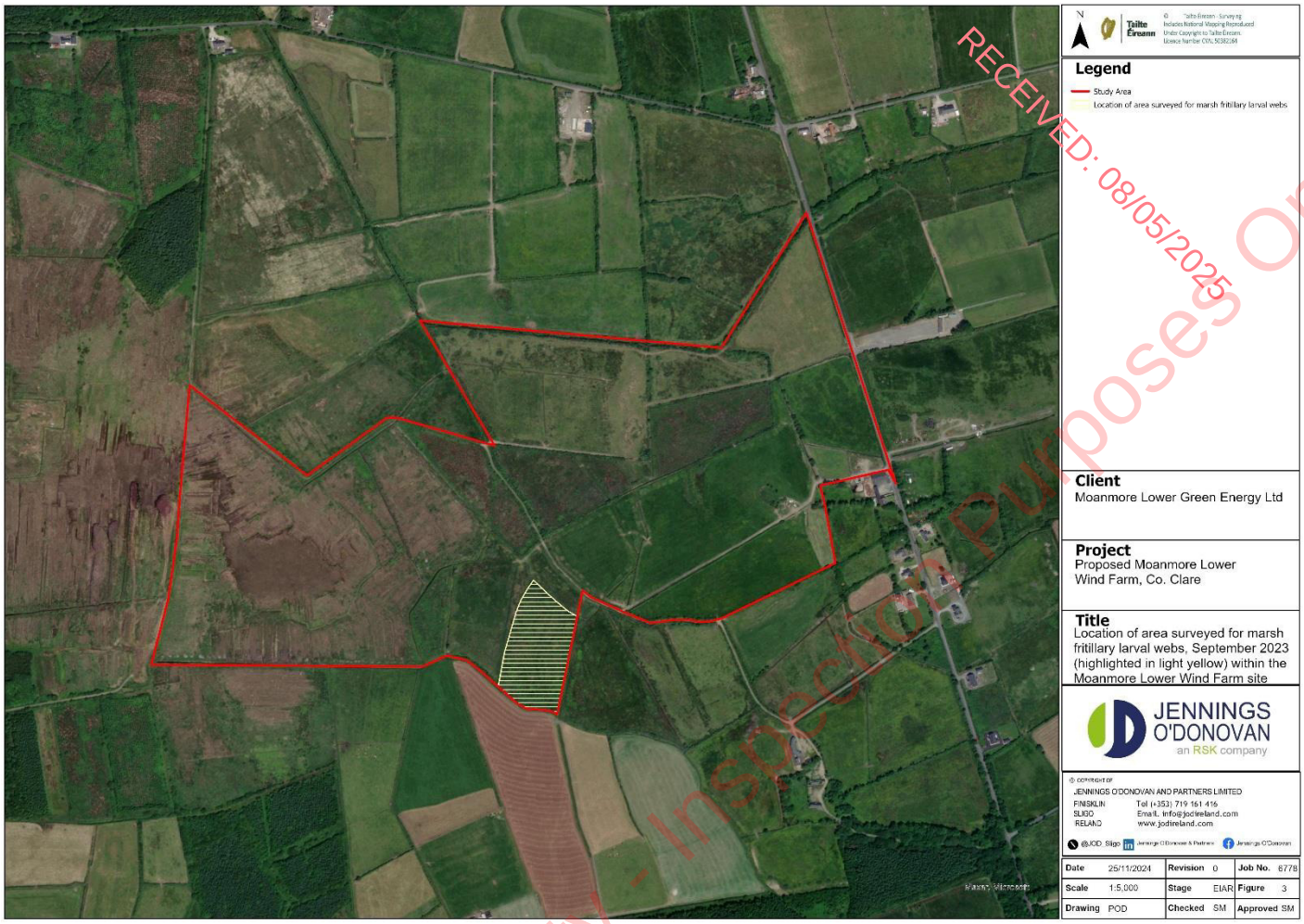

Figure 3: Location of area surveyed for marsh fritillary larval webs, September 2023 within the Moanmore wind farm Site.

Vegetation description

As noted, habitat classified as the EU Annex I habitat Molinia meadows has developed in an area of cutover bog. The main species in the relatively species-rich vegetation are purple moor-grass *Molinia caerulea*, marsh bird's-foot trefoil *Lotus uliginosus* and sweet vernal grass *Anthoxathum odoratum,* with tormentil *Potentilla erecta*, soft rush *Juncus effusus*, sharp-flowered rush *Juncus acutiflorus*, carnation sedge *Carex panicea* and ling heather *Calluna vulgaris* also locally frequent. Moss cover is mainly provided by *Pleurozium schreberi* and *Rhytidadelphus squarrosus*.

In 2023, the field had been subject to apparent heavy grazing pressures and the sward was classified as being in a somewhat degraded state.

Plate 4: General view of Molinia wet grassland in the south of the survey area (September 2023).

3.2 Proposed Management Methodology

The principal aim is to enhance the habitat, both from the perspective of the Annex I habitat itself and the potential for marsh fritillary, by maintaining an appropriate level of grazing during the lifetime of the Plan. This will be achieved by following best guidance for the creation of suitable habitat for the butterfly.

While the management will be focused on grazing levels, no other land use activities will be allowed within the plot, such as insertion of new drains or tracks, or the planting of trees.

It is noted that the enhancement of this plot will also benefit bird species which already occur in the general area, such as foraging hen harrier and kestrel, breeding meadow pipit and skylark, and wintering snipe. Other invertebrate species will also benefit.

3.2.1 Measure no. 1: Grazing

Best practice management of grasslands for marsh fritillary is detailed in the following:

> Byrne, D. & Moran J. (2018). Best practice guidelines from managing lowland species-rich grasslands and marsh fritillary grassland habitat in north-west Ireland. Report prepared for the European Commission, DG Environment, Agreement No. 07.027722/2014/697042/SUB/B2. (https://www.researchgate.net/publication/334277108_RBAPS_Lowland_Species-Rich_Grassland_Marsh_Fritillary_Grassland_Habitat_Best_Practice_Guidelines)

A detailed plan for the management of the Plot will be compiled by an ecologist with experience of marsh fritillary at the commencement of the wind farm construction. As several years will have passed since the 2023 baseline survey, a resurvey of the condition of the Molinia meadow in the context of habitat suitability for the butterfly will be undertaken prior to the commencement of works on site (pre-construction year)

For management of wet grassland (inc. Molinia meadow) for marsh fritillary, Byrne and Moran note the following:

> *Grazing is needed to provide a patchwork of vegetation heights for the different life cycles of the butterfly. Ideally, grasslands should have areas with vegetation height ranging from 5 to 60 cm during summer and autumn. If over that period, the majority of the grassland is grazed lower than 5cm, it would be advisable to remove livestock to give it a chance to recover and be of use for the butterfly.*
>
> *Stocking levels on the wet grasslands suitable for marsh fritillary are usually low (0.5 LU/ha or less), which reduces potential for over poaching and trampling of the larval webs. Depending on the grassland condition, and farm practices, livestock may graze in spring to summer or it may be beneficial to outwinter livestock, particularly if this has been done traditionally, as they will break down plant litter and reduce purple moor-grass cover. If overwintering, supplementary feed the livestock with concentrates designed to meet their minimum nutritional conditions as this will minimize excess nutrients in the grassland system.*
>
> *Extensive grazing will also result in some areas that look under-grazed and may have dead plant litter - these areas are used for basking by adult butterflies. However, keep an eye on these areas as they can be prone to invading scrub.*
>
> *Avoid mowing grassland suitable for marsh fritillary as this removes the different sward heights—however mowing small areas of tussocky grass / rushes annually might be useful in restoring habitat for the butterfly.*

On the basis of a recommended stocking rate of 0.5 LU/ha, it is likely that only 1-2 cattle will be allowed access to the Plot and on a seasonal basis.

In addition to optimising the stocking level for the Plot, measures may need to be taken to reduce dense patches of rushes and encroaching scrub (as noted, such features will be assessed in the resurvey at the time of construction). However, it is likely that such control and removal would be localised and could be done by hand to minimise disturbance to the surface.

3.3 Monitoring

To confirm that the objectives of the Plan are being achieved, the area of enhancement will be monitored during the lifetime of the wind project.

Monitoring on an annual basis in the first five years of the Plan would be required to assess the structure of the vegetation in the context of its suitability as habitat for marsh fritillary. This would be done in late summer/early autumn period during optimal weather conditions by an ecologist with experience of the habitat requirements of marsh fritillary. Search for larval webs would also be conducted.

After Year 5, a review of the Plan progress will be made. At that stage, it will be apparent how successful the works are in achieving the objective of enhancing the Molinia meadow and of providing suitable habitat for marsh fritillary. Modifications to the grazing programme may be made for the next 5-Year period.

3.4 Time Period for Plan Implementation

Year 1 of the Plan will include the baseline survey and the compilation of a detailed management programme for grazing.

If necessary, scrub (often dominated by dense bramble and gorse) and rushes may be cut back, as considered necessary, in the autumn period.

Year 1 will coincide with the completion of wind farm construction works.

Year 2 to Year 5

Site surveys to assess the state of the vegetation for marsh fritillary suitability, and to check for presence of larval webs, will be carried out. If required, modifications may be made to the grazing regime.

Year 5 onwards

As noted, a review of the Plan progress will be made after Year 5. At that stage, it will be apparent how successful the works are in achieving the objective of enhancing the Molinia meadow grassland and providing suitable habitat for marsh fritillary. Modifications to the grazing programme may be made for the next 5-Year period.

4.0 PLAN DETAILS: OBJECTIVE 3 – OFFSETTING THE LOSS OF HEDGEROWS

4.1 Background and Management Approach

While hedgerows are not a prominent feature of the Moanmore Lower wind farm site, hedgerows are of biodiversity importance in a local context for a range of wildlife.

The main permanent losses occur where the new access track leading to turbine T3 breaches a hedge along the existing farm track (c.20m) and also at the blade set-down area where a strip of approximately 70 m of former hedge (now a scrubby willow strip) along the northern margin of the plantation will be removed to allow access from the local road.

It is noted that the main track upgrade from the site entrance leading to the T3 area has hedging only along the southern side and the upgrade works will leave this hedgerow in situ.

Hedge removal is required at turbine T1 to provide a bat buffer around the turbine (see **Chapter 6: Section 6.5.5.1**). This amounts to removal of 175 m of low hedging dominated by gorse.

The total loss of hedging amounts to 265 m, including the 175 m bat buffer.

Additional hedgerow habitat will be created to offset the loss following best practice. The new plantings, which will be a total length of 880 m, will comprise native hawthorn *Crataegus monogyna* and willow (*Salix aurita* and/or *Salix cinerea* subsp. *oleifolia).* Hazel *Corylus avellana* and holly *Ilex aquilifolium* will be include as secondary species. All plantings will be of certified Irish genetic stock.

Planting will be along the boundaries of fields within the Redline Boundary of the wind farm Site where there is either no existing hedging (usually just a drainage ditch with perhaps a bramble strip) or where there is an existing hedge that is poorly grown with gaps and would be improved through bolstering. The exact locations will be selected during the construction phase, with options shown on **Figure 4.** (It is noted that the areas shown are outside of the buffer zones for bats)

Planting will take place in the first appropriate season (autumn/winter) after construction commences and will be by a contractor with experience of laying new hedgerows.

4.2 Monitoring

The contractor will carry out an annual inspection for failed plantings and will replace same at the earliest opportunity. This will be done for as long as it takes the hedging to become fully established.

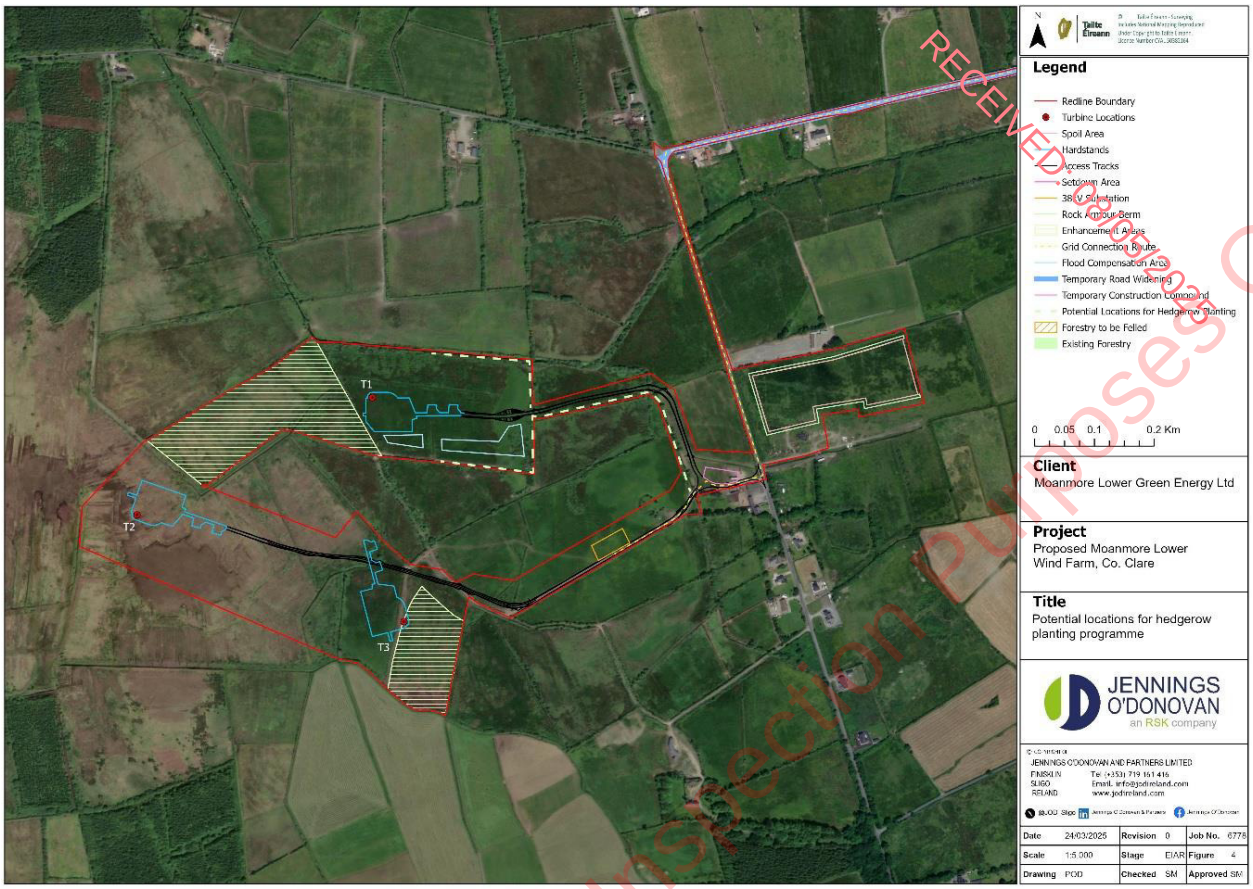

Figure 4. Potential locations for hedgerow planting programme.

5.0 REPORTING

Reports detailing the monitoring works carried out, the results obtained and a review of their success along with any suggestions for amendments to the BEMP will be prepared in years 1, 2, 3, 4, 5 and submitted to Clare County Council and the NPWS yearly for review. After Year 5 monitoring intervals will be increased to Years 10, 15, 20, 25, 30 and 35 subject to agreement. The BEMP should be considered as a live document to be reviewed and modified as required, pending submission to and approval by Clare County Council and the NPWS.

Implementing and managing the plan will be the responsibility of the wind farm operator. It is the wind farm operator's obligation to uphold the objectives included in this management plan, to be accountable for the maintenance of the habitats that will be created and monitoring of the species as specified.

Monitoring and reporting on the measures will be undertaken by independent, suitably experienced and qualified ecologists and hydrologists employed by the wind farm operator, with reporting submitted to Clare County Council and the NPWS on behalf of the wind farm operator.

6.0 CONCLUSION

The BEMP for the Moanmore Lower Wind Farm project will enhance an area (4.04 ha) of cutover bog that has been used for grazing and is largely dominated by rushes. This will offset the loss of a relatively small area of cutover bog (c.0.8 ha) as a result of the Development. By including a large area of bog within the Plan compared to the relatively small loss as a result of the Development, the Plan recognises and highlights the importance of this habitat.

The BEMP will also manage sensitively an area of Annex I listed Molinia meadow (1.78 ha), of which a small part (c.200m^2) is being affected by the Development. The meadow, which has been somewhat degraded through over-grazing, will be managed with a particular focus on providing suitable habitat for the marsh fritillary butterfly (Annex II listed species).

The BEMP will also offset the loss of hedgerows as a result of the Development by a hedgerow replanting programme within the Site.

The total area covered by the BEMP is 5.82 ha.

The success of these measures will be evaluated through a detailed monitoring and reporting programme, which will be submitted to Clare County Council and the NPWS every monitoring year as evidence of compliance.

It is anticipated that with the implementation of the BEMP, the overall ecological value of the Site will increase over time, with benefits not just for habitats and marsh fritillary, but also birds, mammals and invertebrates.

The objectives for the Plan are achievable, as the methods to be used are straightforward and have been implemented at many other sites throughout Ireland.

It is noted that the Plan will allow for remediations and/or modifications to ensure that the objectives are being achieved throughout the lifetime of the Proposed Development

7.0 REFERENCES

Fossitt, J. (2000) *A Guide to Habitats in Ireland*. Heritage Council, Kilkenny.

Mackin, F., Barr, A., Rath, P., Eakin, M., Ryan, J., Jeffrey, R. & Fernandez Valverde, F. (2017) *Best practice in raised bog restoration in Ireland.* Irish Wildlife Manuals, No. 99. National Parks and Wildlife Service, Department of Culture, Heritage and the Gaeltacht, Ireland.

SNH (now NatureScot) "Planning for development: What to consider and include in Habitat Management Plan – Guidance" (Version 2, March 2016).