7 AQUATIC ECOLOGY

7.1 INTRODUCTION

This chapter of the EIAR assesses the likely significant direct and indirect effects of the Project (**Figures 1.2a and 1.2b**) on Aquatic Biodiversity. The 'Project' refers to all elements of the application for the construction of Moanmore Lower Wind Farm (**Chapter 2: Project Description**). In accordance with Article 3(1) of the EIA Directive, this chapter will identify, describe, and assess the direct and indirect effects of a project on "(*b) biodiversity, with particular attention to species and habitats protected under [the Habitats] Directive 92/43/EEC and [the Birds] Directive 2009/147/EC*". Where likely significant effects are predicted, the chapter identifies appropriate mitigation strategies therein. The assessment will consider the potential effects during the following phases of the Project:

- Construction of the Project
- Operation of the Project
- Decommissioning of the Project

Common acronyms used throughout this EIAR can be found in **Appendix 1.4**. This chapter of the EIAR is supported by Figures provided in Volume III and the following Appendix documents provided in **Volume IV**:

- Aquatic Survey Report **Appendix 7.1**;
- Freshwater Pearl Mussel (*Margaritifera margaritifera*) Survey Report **Appendix 7.2**
- Fisheries Report in **Appendix 7.3**

A Construction and Environmental Management Plan (CEMP) is appended to the EIAR in **Appendix 2.1**. The CEMP includes all of the mitigation recommended within the EIAR. In the event that planning is granted for the Project, the CEMP will be updated prior to the commencement of construction to address the requirements of any planning conditions including any additional mitigation measures. The revised CEMP will be submitted to the planning authority for written approval as required.

7.1.1 Statement of Authority

This chapter has been written by Dr. Eddie McCormack and Aisling Hearty, M.Sc. (AQUAFACT). Dr McCormack has over 18 years in environmental consultancy specialising in freshwater and marine ecology. Aisling Hearty has over 5 years of work in environmental consultancy and has experience in multiple different areas of marine biology including taxonomy, sampling work, data analysis, and ecological report writing.

AQUAFACT is an environmental consultancy based in Galway City. It has been in operation for almost 40 years, specialising in monitoring and managing resources in marine, freshwater and terrestrial environments. In February 2022 AQUAFACT joined the APEM group. APEM was founded more than 30 years ago and is one of Europe's largest specialist environmental consultancy companies. It offers high quality scientific expertise covering the investigation, monitoring and management of water and terrestrial environments with services including aquatic & ecological consultancy, field surveys, ornithological surveys, fisheries science, laboratory services, and aerial surveys. Furthermore, APEM has helped the environment industry to identify responses to issues such as invasive non-native species, recognised the importance of the natural capital approach and river restoration. Additionally, APEM has employed technological solutions including aerial surveys and digital data collection. In Ireland the APEM Group comprises AQUAFACT, Woodrow, and Macroworks.

7.1.2 Assessment Structure

In line with the EIA Directive and Guidance on the preparation of the EIA Report (Directive 2011/92/EU as amended by 2014/52/EU) and EPA guidelines (2022) the structure of this Aquatic Ecology chapter is as follows:

- Assessment Methodology and Significance Criteria.
- Description of baseline conditions at the Site.
- Identification and assessment of significant effects to aquatic ecology associated with the Project during the Construction, Operational and Decommissioning phases of the Project.
- Identification of cumulative significant effects if and where applicable.
- Mitigation measures to avoid or reduce the significant effects identified.
- Identification and assessment of residual significant effect of the Project considering mitigation measures.
- Summary of Significant Effects and Statement of Significance.

7.1.3 Assumptions and Limitations

Some general assumptions that have been made during preparation of this EIAR are set out below:

- In undertaking cumulative assessments, consented, but as yet un-built, developments have been assumed to have been built in accordance with and within the duration permitted by the associated grant of permission;
- Information provided by third parties, including publicly available information and databases, is correct at the time of publication;

- Local Authority and An Bord Pleanála public planning registers reviewed as part of the assessment process are up-to-date; and
- Baseline conditions and assessments are accurate at the time of the surveys.

Limitations are set out in their respective sections.

7.2 Assessment Methodology and Significance Criteria

7.2.1 Assessment Methodology Aquatic Biodiversity

The general approach used for the evaluation of ecological receptors and assessment of significant likely effects for this current assessment is based on the '*Guidelines for Ecological Impact Assessment in the UK and Ireland*' (Chartered Institute of Ecology and Environmental Management, 2018 (Updated in 2022)). The evaluation of ecological receptors contained within this report uses the geographic scale and criteria defined in the *Guidelines for Assessment of Ecological Impacts of National Road Schemes* (National Roads Authority, 2009).

7.2.1.1 Desktop Study

A desktop study review was carried out of existing data and records for fish, protected aquatic species and habitats (including Annex II species and aquatic Annex I habitats), and invasive species listed under the Third Schedule of S.I No. 477 of 2011, European Communities (Birds and Natural Habitats) Regulations 2011 (as amended)) on watercourses at or hydrologically connected (*i.e.,* downstream) to the Project on the National Biodiversity Data Centre (NBDC) and National Parks and Wildlife Service (NPWS) websites.

7.2.1.2 Field Survey

Zone of Influence

The Zone of Influence (ZOI) differs for different habitats and species. Within terrestrial habitats, the ZOI may be confined to the study area, whereas for aquatic habitats, the ZOI will be more extensive, and the surveys undertaken were scoped accordingly for the proposed Project. This entailed establishing the baseline conditions in aquatic habitats at a range of points upstream and downstream in the various watercourses draining the Site, the Blade Transfer Area, the Grid Connection Route and the Turbine Delivery Route and is reflected in the range and extent of surveys undertaken. The SPR (Source-Pathway-Receptor) model was used to establish the ZOI. The source being the site and associated works, the pathway being the watercourses and the receptors being aquatic fauna downstream of the source. The ZOI for aquatic ecology followed a catchment-level approach.

All freshwater watercourses which could be affected directly or indirectly by the Project were considered with riverine sites discussed in **Section 7.3.2** targeted for detailed aquatic assessment. These sites drained the site boundary, grid connection route, and turbine delivery route (see **Figure 9.2 Local Hydrology Map**, **Figure 7-1,Figure 7-3** and **Figure 7-7**).

The surveys are summarised below and are described in more detail within the baseline survey reports (Appendix 7.1 - 7.3). These allow the assessment of any significant effects while being mindful of unrelated discharges and tributaries further downstream that may contribute pollution to or dilute any potential effects.

An **Appropriate Assessment Screening Report** and **Natura Impact Statement** (BioSphere Environmental Services, 2025) have been prepared for the proposed Project which assesses significant likely effects on European designated sites (the Natura 2000 network), two of which are hydrologically connected via surface water flow.

Aquatic Habitats

The baseline surveys focused on aquatic habitats in relation to fisheries potential (including both salmonid and lamprey habitat), white-clawed crayfish (*Austropotamobius pallipes)*, freshwater pearl mussel (*Margaritifera margaritifera*), macro-invertebrates (biological water quality), macrophytes and aquatic invasive species, and species of conservation value which may use the watercourses in the vicinity of the project. Full details of the survey methodologies are included in **Appendix 7.1** and discussed further below. Site visits were initially undertaken in July and October 2022 and again in September and October 2023 where it was confirmed that habitat conditions at the survey sites remained broadly consistent, further supporting the validity and reliability of the original survey data and findings.

The surveys identified and mapped aquatic habitats, determined fisheries value and potential, and determined presence or suitability for Annex listed species or invasive alien species. The aquatic habitat assessment conducted at all sites was based on the Environment Agency's *'River Habitat Survey in Britain and Ireland Field Survey Guidance Manual 2003, Updated in 2022*' (Environment Agency, 2022), *Guidelines for Ecological Impact Assessment in the UK and Ireland*' (Chartered Institute of Ecology and Environmental Management, 2018 (Updated in 2022)) and the Irish Heritage Council's *'A Guide to Habitats in Ireland*' (Fossitt, 2000). The EPA Biotic Index Biological River Quality Classification System (Q-value) (Toner *et al.,* 2005) (**Table 7-1**) has been used to monitor the ecological

quality of streams and rivers in Ireland since 1971. It is routinely employed by the EPA. All sites were assessed in terms of:

- Stream width, depth, and other physical characteristics
- Substrate type, listing substrate fractions in order of dominance, *i.e.*, bedrock, boulder, cobble, gravel, sand, and silt
- Flow type, listing percentage of riffle, glide, and pool in the sampling area
- In-stream macrophyte and bryophytes occurring and their percentage coverage of the stream bottom at the sampling sites
- Riparian habitats and species composition

A Biosecurity protocol was rigidly followed to avoid the potential for transfer of invasive alien species to or from the Site in accordance with guidance produced by Invasive Species Ireland and Inland Fisheries Ireland (IFI, 2010). A specific Biosecurity Method Statement was produced for the survey operation.

This Aquatic Ecology Chapter will be referring to watercourses by the local river names identified using the "Indicative Flow" layer [e.g. the Gowerhass] on EPA maps website[1] to assess potential effects on each stretch rather than the river catchment as a whole. For the Hydrology and Hydrogeology Chapter local river names have been included as well as the WFD river section ID [Moyasta_010 for example] which aligns with the overall WFD catchment or sub-catchment name.

Table 7-1: EPA Water Quality and Status Summary.

Biotic Index	Quality Status	Water Quality	WFD Ecological Status
Q5	Unpolluted	Good	High
Q4-5	Unpolluted	Fair-to-Good	High
Q4	Unpolluted	Fair	Good
Q3-4	Slightly Polluted	Doubtful-to-Fair	Moderate
Q3	Moderately Polluted	Doubtful	Poor
Q2-3	Moderately Polluted	Poor-to-Doubtful	Poor
Q2	Seriously Polluted	Poor	Bad
Q1-2	Seriously Polluted	Bad-to-Poor	Bad

[1] https://gis.epa.ie/EPAMaps/

Freshwater Pearl Mussel Survey

A section of the proposed Turbine Delivery Route (TDR) along the L6132 crosses the Tullagower River and Brisla East Stream which are part of the Doonbeg river catchment. The Tullagower River and Brisla East Stream drain into the upper reaches of the Doonbeg River catchment (Doonbeg_030). The Doonbeg_030 waterbody is classified under the EU WFD as being of Poor status. The Doonbeg_030 flows into the Doonbeg_040 at Cooraclare where the status recovers to Good (**Figure 7-5**).

These watercourse crossings are hydrologically connected to locations downstream where previous surveys of the Doonbeg river, by EirEco in 2012 & 2016, and MKO in 2014[2], identified the presence of Freshwater Pearl Mussels (*M. margaritifera*) (**Figure 7-4**).

Given the hydrological link of the location of the proposed works on the TDR to the previous surveys where Freshwater Pearl Mussels (FPM) were confirmed as being present almost 10 years ago (**Figure 7-4**), surveys were undertaken to investigate the presence of FPM in a 3km stretch of the Doonbeg River and its tributaries on the 9th and 10th of October 2023 (**Figure 7-7**) as the catchment is considered a sensitive area for the species. The survey work was carried out under licence (No. C214/2023) granted by NPWS for qualified ecologists to survey the FPM in the specified locations. Three 300m river sections (sites 1-3) and three 50-150m spot check areas (sites 4-6) were selected on the Tullagower and Brisla East for proposed FPM Stage 1 surveys, downstream of the proposed works on the TDR. Surveys took place following the standard methodology used by the NPWS (National Parks and Wildlife Service, 2004). Conditions during the surveys were clear (c. 15% cloud cover), sunny, 20°C with a light breeze. At each station, accessible sections of the proposed 300m section of riverbed were systematically searched for living mussels or mussel shells, where suitable habitat was available, giving particular attention to the immediate vicinity of suitable habitat (suitable habitat is described in detail in FPM report **Appendix 7.2** and a detailed recording Stage 1 data survey form was completed, including information on mussel numbers (including absence of mussels), describing the habitat in detail, and including any relevant observations on the state of the watercourse. The survey covered approximately 40m at site 1, 118m at site 2, and 130m at site 3 where conditions were suitable. Surveys were not possible at sites 4, 5 and 6 because they were inaccessible due to local conditions, these include insufficient water flow and narrow and shallow banks with overgrown banks (Further discussed in **Limitations** in **Section 7.3.2.3**). However additional investigations were carried out further upstream at site 6, along with 4 other locations of interest (B, C, D and E). Surveys

[2] https://www.clarecoco.ie/services/planning/publications/heritageconservation/doonbeg-pearl-mussel-survey-report-2016-24581.pdf

were carried out using bathyscope techniques and were conducted by one surveyor and a bankside manager. Additional surveys included site visits and assessment of site suitability. All of the planned survey sections, and the areas surveyed are shown in **Figure 7-7**. The study undertaken by APEM Ltd found no juvenile mussels indicating no recent recruitment in the population at the time of the survey (see **Appendix 7.2**)

Fisheries Assessment

An assessment of the Moyasta River (27M04) was carried out by Triturus Environmental Ltd to determine the fisheries value of the watercourses within the vicinity of the proposed project. A catchment-wide electro-fishing survey across 5 riverine sites in total, with locations upstream and downstream of the proposed windfarm site, was undertaken on 19th September 2023. Whilst fisheries data for the watercourses within the survey area was not available prior to this survey, the downstream connecting Shannon Estuary is known to support a wide range of transitional and marine fish species including Red-listed European eel (*Anguilla anguilla*) and smelt (*Osmerus eperlanus*) (Kelly *et al*., 2015).

A single anode Smith-Root LR24 backpack (12V DC input; 300V, 100W DC output) was used to electro-fish the 5 locations. Electro-fishing was conducted in an upstream direction for a 10-minute CPUE (Matson *et al*., 2018). A total of approx. 40-75m channel length was surveyed at each site, where feasible, in order to gain a better representation of fish stock assemblages. Electro-fishing methodology followed accepted European standards (CEN, 2003) and adhered to best practice (e.g., CFB, 2008).

Water temperatures were closely monitored throughout the survey to ensure temperatures did not exceed 20°C to minimise the stress caused by low levels of oxygen on fish that were caught. A portable battery-powered aerator was also used to further reduce stress to any captured fish contained in the holding tank. Captured fish species were placed in an oxygenated container. No anaesthesia was given to the fish after capturing, to reduce stress levels. All fish were measured to the nearest millimetre and released in-situ following a suitable recovery period.

A strict biosecurity protocol following IFI (2010) and the Check-Clean-Dry approach was adhered to during surveys for all equipment and PPE used. Disinfection of all equipment and PPE before and after use with Virkon™ was conducted to prevent the transfer of pathogens or invasive propagules between survey sites. Surveys were undertaken at sites in a downstream order to minimise the risk of upstream propagule mobilisation. Any aquatic

invasive species or pathogens recorded within or adjoining the survey areas were geo-referenced.

7.2.1.3 Ecological Evaluation and Impact Assessment Methodology

The evaluation of the key ecological receptors and the criteria used to assess the significance of effects are derived from the *Guidelines for Assessment of Ecological Impacts on National Road Schemes* (National Roads Authority, June 2009), *Guidelines on the Information to be contained in Environmental Impact Assessment Reports* (Environmental Protection Agency, 2022) and the *Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal* (CIEEM, 2018).

Effects were considered to be either significant or not significant at a geographic scale equivalent to or less than the conservation importance of the ecological feature being assessed (CIEEM, 2018). The duration of significant effects is considered according to Environmental Protection Agency (EPA) guidance (EPA, 2022). The magnitude of an effect will depend on the nature and sensitivity of the ecological features and will be influenced by intensity, duration (temporary/permanent), timing, frequency, and reversibility of the significant likely effect (Chartered Institute of Ecology and Environmental Management, 2018 (Updated in 2022)).

The criteria used for assessment of the value of the ecological resources sets out the context for the determination of value on a geographic basis with a hierarchy assigned in relation to the importance of any particular receptor. The NRA (2009) guidelines provide a basis for determination of whether any particular site is of importance on a scale presented in **Table 7.2**.

Table 7-2: Valuation of Ecological Resources.

Scale of Importance	Determination of Value on a geographic basis

International Importance	• 'European Site' including Special Area of Conservation (SAC), Special Protection Area (SPA) or Site of Community Importance (SCI)
	• Proposed Special Area of Conservation
	• Proposed Special Protection Area
	• Site that fulfils the criteria for designation as a 'European Site' (see Annex III of the Habitats Directive, as amended)
	• Features essential to maintaining the coherence of the Natura 2000 Network
	• Site containing 'best examples' of the habitat types listed in Annex I of the Habitats Directive
	• Resident or regularly occurring populations (assessed to be important at the national level) of the following:
	  • Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive; and/or
	  • Species of animal and plants listed in Annex II and/or IV of the Habitats Directive.
	• Ramsar Site (Convention on Wetlands of International Importance Especially Waterfowl Habitat 1971).
	• World Heritage Site (Convention for the Protection of World Cultural & Natural Heritage, 1972)
	• Biosphere Reserve (UNESCO Man & The Biosphere Programme)
	• Site hosting significant species populations under the Bonn Convention (Convention on the Conservation of Migratory Species of Wild Animals, 1979)
	• Site hosting significant populations under the Berne Convention (Convention on the Conservation of European Wildlife and Natural Habitats, 1979)
	• Biogenetic Reserve under the Council of Europe
	• European Diploma Site under the Council of Europe
	• Salmonid water designated pursuant to the European Communities (Quality of Salmonid Waters) Regulations, 1988, (S.I. No. 293 of 1988)

National Importance	• Site designated or proposed as a Natural Heritage Area (NHA)
	• Statutory Nature Reserve
	• Refuge for Fauna and Flora protected under the Wildlife Acts
	• National Park
	• Undesignated site fulfilling the criteria for designation as a Natural Heritage Area (NHA); Statutory Nature Reserve; Refuge for Fauna and Flora protected under the Wildlife Act; and/or a National Park
	• Resident or regularly occurring populations (assessed to be important at the national level) of the following:
	  • Species protected under the Wildlife Acts; and/or
	  • Species listed on the relevant Red Data list
	• Site containing 'viable areas' of the habitat types listed in Annex I of the Habitats Directive

Scale of Importance	Determination of Value on a geographic basis

County Importance	• Area of Special Amenity
	• Area subject to a Tree Preservation Order
	• Area of High Amenity, or equivalent, designated under the County Development Plan
	• Resident or regularly occurring populations (assessed to be important at the County level) of the following:
	  • Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive;
	  • Species of animal and plants listed in Annex II and/or IV of the Habitats Directive
	  • Species protected under the Wildlife Acts; and/or
	  • Species listed on the relevant Red Data list
	• Site containing area or areas of the habitat types listed in Annex I of the Habitats Directive that do not fulfil the criteria for valuation as of International or National importance
	• County important populations of species, or viable areas of semi-natural habitats or natural heritage features identified in the National or Local BAP, if this has been prepared
	• Sites containing semi-natural habitat types with high biodiversity in a county context and a high degree of naturalness, or populations of species that are uncommon within the county
	• Sites containing habitats and species that are rare or are undergoing a decline in quality or extent at a national level

Local Importance (higher value)	• Locally important populations of priority species or habitats or natural heritage features identified in the Local BAP, if this has been prepared
	• Resident or regularly occurring populations (assessed to be important at the Local level) of the following:
	  • Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive
	  • Species of animal and plants listed in Annex II and/or IV of the Habitats Directive
	  • Species protected under the Wildlife Acts; and/or
	  • Species listed on the relevant Red Data list
	• Sites containing semi-natural habitat types with high biodiversity in a local context and a high degree of naturalness, or populations of species that are uncommon in the locality
	• Sites or features containing common or lower value habitats, including naturalised species that are nevertheless essential in maintaining links and ecological corridors between features of higher ecological value

Local Importance (lower value)	• Sites containing small areas of semi-natural habitat that are of some local importance for wildlife • Sites or features containing non-native species that are of some importance in maintaining habitat links

The Chartered Institute of Ecology and Environmental Management (CIEEM) Guidelines define a significant effect as, "a*n effect that either supports or undermines biodiversity conservation objectives for 'important ecological features'...or for biodiversity in general*". The criteria used for assessment of significant effects are as follows while the Criteria for Assessing Effect Significance are presented in **Table 7-3**:

Positive or Adverse: Positive and adverse effects should be determined according to whether the change is in accordance with nature conservation objectives and policy.

Extent: Extent should be predicted in a quantified manner and relates to the area over which the significant effect occurs.

Magnitude: Magnitude refers to size, amount, intensity and volume. It should be quantified if possible and expressed in absolute or relative terms *e.g.,* the amount of habitat lost, percentage change to habitat area, percentage decline in a species population.

Duration: Duration is intended to refer to the time during which the significant effect is predicted to continue, until recovery or re-instatement (which may be longer than the effect-causing activity). Duration should be defined in relation to ecological characteristics (such as a species' lifecycle).

Frequency and Timing: The timing of significant effects in relation to important seasonal and/or life-cycle constraints should be evaluated. Similarly, the frequency with which activities (and associated effects) would take place can be an important determinant of the effect on receptors and should also be assessed and described.

Reversibility: An irreversible effect is one from which recovery is not possible within a reasonable timescale or there is no reasonable chance of action being taken to reverse it. A reversible effect is one from which spontaneous recovery is possible or which may be counteracted by mitigation.

Likelihood:

- Certain/Near Certain: >95% chance of occurring as predicted.
- Likely: 50-95% chance as occurring as predicted.
- Unlikely: 5-50% chance as occurring as predicted.

- Extremely Unlikely: <5% chance as occurring as predicted.

Table 7-3: Criteria for Assessing Effect Significance (EPA, 2022).

Significance of Effects	Definition
Imperceptible	An effect capable of measurement but without significant consequences.
Not Significant	An effect which causes noticeable changes in the character of the environment but without significant consequences.
Slight Effects	An effect which causes noticeable changes in the character of the environment without affecting its sensitivities.
Moderate Effects	An effect that alters the character of the environment in a manner that is consistent with existing and emerging baseline trends.
Significant Effects	An effect which, by its character, magnitude, duration or intensity, alters a sensitive aspect of the environment.
Very Significant	An effect which, by its character, magnitude, duration or intensity, significantly alters most of the sensitive aspect of the environment.
Profound Effect	An effect which obliterates sensitive characteristics.

7.2.2 Relevant Guidance

- *Water Quality - Sampling of Fish with Electricity. Document* CEN (2003).
- *Methods for the Water Framework Directive. Electric Fishing in Wadeable Reaches. Central Fisheries Board.* CFB (2008).
- *Guidelines on the Information to be Contained in Environmental Impact Assessment Reports* (EPA, 2022)
- *Integrated Biodiversity Guidelines for Planning and Development* (EPA, 2022)
- *Appropriate Assessment of Plans and Projects in Ireland - Guidance for Planning Authorities (DEHLG 2009, Revised February 2010).*
- *Guidelines for Ecological Impact Assessment in the UK and Ireland – Terrestrial, Freshwater and Marine* (CIEEM, 2018)
- *Advice Note on the Lifespan of Ecological Data* (CIEEM, 2019)
- *River Habitat Survey in Britain and Ireland Field Survey Guidance Manual 2003.* (Environment Agency 2003).
- *A guide to habitats in Ireland. Heritage.* (Fossitt, J.A., 2000).
- *Managing Natura 2000 Sites: The provisions of Article 6 of the 'Habitats' Directive 92/43/EEC. Office for Official Publications of the European Communities, Luxembourg.* (European Commission 2000).

- *Guidelines for Assessment of Ecological Impacts on National Road Schemes* (National Roads Authority, June 2009)
- *Invasive Species Ireland and Inland Fisheries Ireland* (IFI, 2010)
- Site-specific Conservation Objectives and Standard Data Forms for relevant SACs/SPAs
- *Freshwater Pearl Mussel* (*Margaritifera margaritifera) Monitoring Protocol* (NPWS, 2011)
- *Draft Freshwater Pearl Mussel Regulations and Guidance* (S.I. No. 296/2009)
- Sub-basin Management Plans for Freshwater Pearl Mussel (as per Water Framework Directive)
- *Water Action Plan 2024* (DHLGH, 2024)
- *EU Habitats Directive* (92/43/EEC) *and Birds Directive* (2009/147/EC)
- *The Planning and Development Act 2000 (as amended)*
- *4th Irish Biodiversity Action Plan* (NPWS)
- *Shannon North Estuary Catchment Assessment 2010 - 2015 (HA 27).* (EPA 2018)
- *Shannon Estuary North Catchment Report (HA 27).* (EPA 2024).
- *IFI Biosecurity Protocol for Field Survey Work.* (Inland Fisheries Ireland 2010)
- *Best Practice Guidelines for the Irish Wind Energy Industry. Guidance prepared by Fehily Timoney & Company for the Irish Wind Energy Association.* IWEA (2012).

7.3 Baseline Description

7.3.1 Aquatic Environment

The wind farm Site is located within the townland of Moanmore Lower approximately 3km north-west of the village of Kilrush, Co. Clare and 6.8km south-west of Cooraclare village. It is located within an area comprised of agricultural livestock grazing farmland, bog, and scrub land. The wind farm Site is 26.84ha (hectares). The general area is comprised of agricultural grassland used for livestock grazing and cutover peatland. Land use at the wind farm Site has been verified by site walkover surveys completed by RSK and HES see **Chapter 9 Hydrology and Hydrogeology Section 9.4.2**. Watercourses within the Site have previously been modified to receive input from man-made arterial drains or culverted beneath roads.

The permanent spoil storage area is located to the east of the wind farm Site along the L2034 and has a total area of 4.04ha. It is situated in the townland of Moanmore South and is comprised of agricultural land (pastures). The spoil storage area will be surrounded by a rock berm and silt fences as shown in Drawings No. 6778-JOD-MM-XX-DR-C-1401.

Construction of a new site entrance with access onto the adjoining local road network (L6132) and the Blade Transfer Area are located in the townland of Tullabrack East. The Blade Transfer Area site is (3.85ha).

The proposed wind farm is not within or bordering any Natura 2000 sites. The closest Natura 2000 sites are the Lower River Shannon SAC (site code: 00216) and the River Shannon and River Fergus Estuaries SPA (site code: 004007). There is ecological connectivity between these Natura sites and Moanmore Lower wind farm via the Moyasta river (EPA Code: 27M04). By river the SAC is approximately 2.5 km downstream of the proposed site. The Moyasta at this point drains into Poulnasherry Bay which is a designated shellfish water body under the Quality of Shellfish Water Regulations (S.I 208 of 2008). Three river locations were chosen to survey for macroinvertebrate biodiversity, one downstream, one bordering on the northern side of the site, near T1, and one upstream of the proposed site. (**Figure 7-1**). There is one watercourse draining the proposed Site i.e., the Moyasta (EPA Code: 27M04) located in the Moyasta_010 WFD river sub-basin.

Water Crossings

No new watercourse crossings are required over any EPA mapped watercourse. Existing land drains have been consolidated on Site to reduce the number of water crossings. There are eight (No. 8) watercourse crossings of historic drains and mapped drains required for the construction of Access Tracks and Hardstands within the Site. These water crossings will be constructed using pre-cast concrete or pre-formed plastic pipes.

The preferred grid connection route (GCR) is also located in the Moyasta_010 WFD river sub-basin and in the Wood River sub-catchment (Wood_SC_010). It involves the shortest distance, with one water crossing and therefore has the least potential environmental effects. It will connect the proposed Project to the existing Tullabrack 110kV Substation along a 2.76km route. The GCR can be summarised as follows: underground cable (UGC) single 38kV circuit from the proposed Moanmore Lower wind farm to Tullabrack substation utilising primarily public roads and private lands (within the Site),

The one existing watercourse crossing for the preferred GCR, is over the Moyasta river (EPA Code: 27M04), (WC01), which is outlined in **Chapter 9: Hydrology and Hydrogeology - Figure 9.2**. The cabling for the GCR will be laid in the carriage of the bridge or will be installed using HDD.

A second watercourse is mapped in close proximity to the GCR in the vicinity of the existing Tullabrack 110kV substation. This watercourse is a tributary of the Moyasta River, referred to by the EPA as the Moanmore South stream (EPA Code: 27M14).

All watercourses draining the GCR discharge into the Moyasta River which connects to the Mouth of the Shannon coastal waterbody further downstream.

An alternative GCR (Option 2) was assessed and is discussed in detail within **Chapter 3 Alternatives Considered** and **Appendix 3.1**.

The Turbine Delivery Route (TDR) has a total of 3 existing crossings (WC02-WC04) over EPA mapped watercourses along the L6132 where temporary verge strengthening is proposed (**Figure 7-4**). These existing watercourses cross at these 3 no. locations over the Gowerhass Stream in the Shannon Estuary North catchment and the Tullagower River (EPA Code: 28T01) and the Brisla East Stream (EPA Code: 28B08) in the Mal Bay catchment outlined in **Chapter 9: Hydrology and Hydrogeology - Figure 9.2**. In the Mal Bay catchment, the proposed works along the TDR are located in the Doonbeg River sub-catchment (Doonbeg_SC_010) and the Doonbeg_030 WFD river sub-basin. At these three locations steel plates will be placed on the verge for 10m each side of watercourse crossings. This will avoid excavation and disturbance of the existing ground.

The Blade Transfer Area (at which there will be felling) and the proposed road widening are both located in the Shannon Estuary North catchment. Within the Shannon Estuary North catchment, the Blade Transfer Area, and the other temporary TDR works are located in the Wood River sub-catchment (Wood_SC_010) and the Moyasta_010 WFD river sub-basin.

The stream and rivers draining the TDR work areas discharge into the Doonbeg River and Doonbeg Estuary in the Mal Bay Catchment and into the Moyasta River and Mouth of the Shannon coastal waterbody in the Shannon Estuary North catchment.

Regional and local hydrology maps are presented in **Chapter 9 Hydrology**, **Figure 9.1** and **Figure 9.2**.

In order to assess any potential effect on downstream aquatic receptors crossed by the GCR and TDR a fisheries assessment, aquatic habitat assessment and FPM surveys were carried out by APEM Ireland over the period July 2022 to October 2023.

7.3.2 Aquatic Habitat Assessment

Table 7-4 presents a list of the watercourses and the three sampling locations(M1-M3). EPA watercourse names, EPA codes and EPA segment codes are also presented. Sampling locations are presented in **Figure 7-1**.

7.3.2.1 Macroinvertebrate diversity assessment

As outlined above, there is one watercourse draining the proposed Site i.e., the Moyasta (EPA Code: 27M04) located in the Moyasta_010 WFD river sub-basin which has been straightened and deepened historically and averages 7-8m wide and 0.2-0.4m deep with localised deeper areas to 1m. The three sample stations were chosen for the Site and are illustrated in **Figure 7-1**.The area surrounding the three sample sites is mainly agricultural land, with peaty soils and some scattered forestry.

The sampling location M1 is located upstream from the Site, M2 is along the north of the redline boundary and M3 is located downstream of the Site. Station M1 is located at the section of the Moyasta crossed by the GCR. The sampling locations are all classified as FW2 depositing/lowland rivers under the Fossitt (2000) classification system. All three sampling locations were small shallow streams about 3 to 4m wide, with steep thickly vegetated banks. The riverbed at all sampling locations was a mix of cobbles and fine gravel with a moderate level of siltation. There were slightly heavier siltation levels at M3. Siltation was reduced during the autumn sampling event due to the flood conditions but still present. There was a high level of shading at all stations, particularly station M3. The land immediately adjacent to the stream was pasture and cattle had open access at station M1 and M2. Due to the dry conditions water levels and flow in the stream was very low in summer. The discharge and volume of the stream was significantly higher in winter. The water had a slight peaty colour. There was evidence of eutrophication in the river with high abundance of filamentous algae particularly at station M1 during summer. These results of these surveys are further discussed in **Section 7.3.2.4 - Table 7-6** and **Table 7-7**.

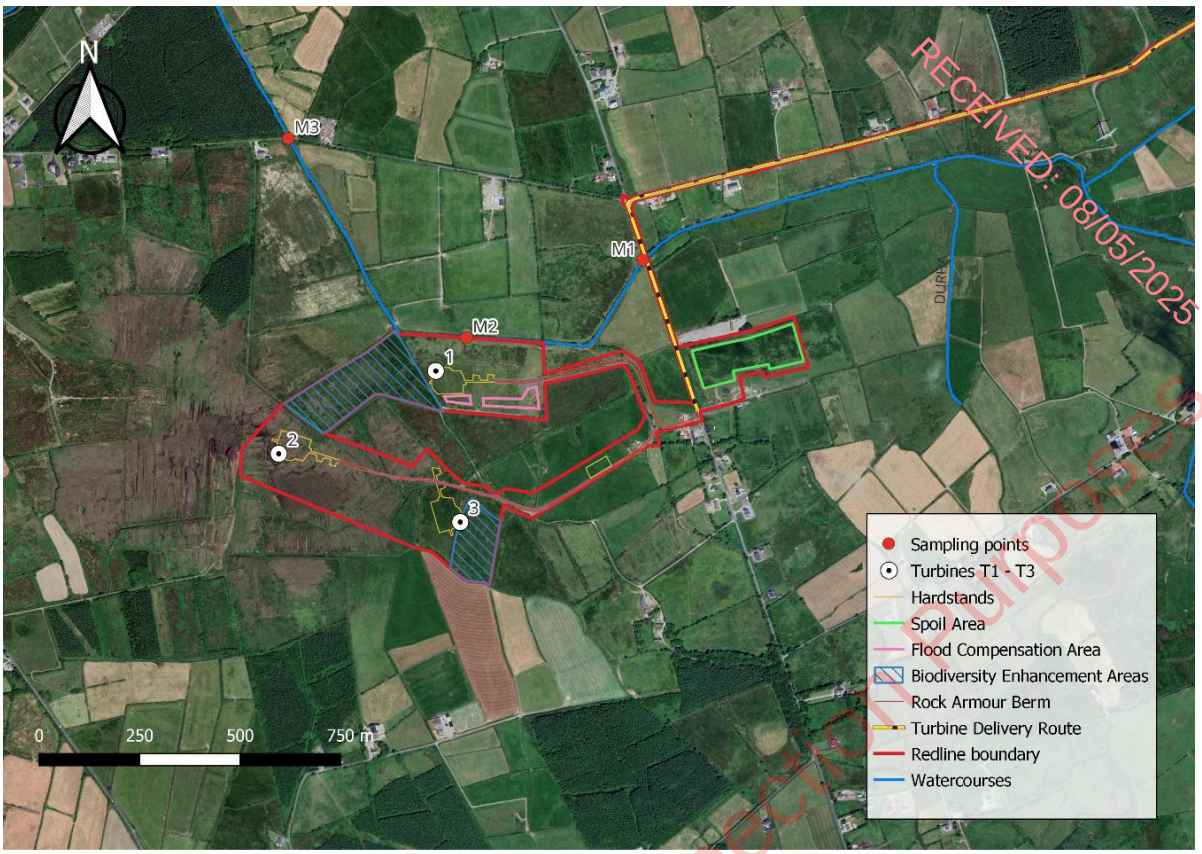


Figure 7-1: Location of the three water sampling locations, in proximity to the proposed turbine locations.

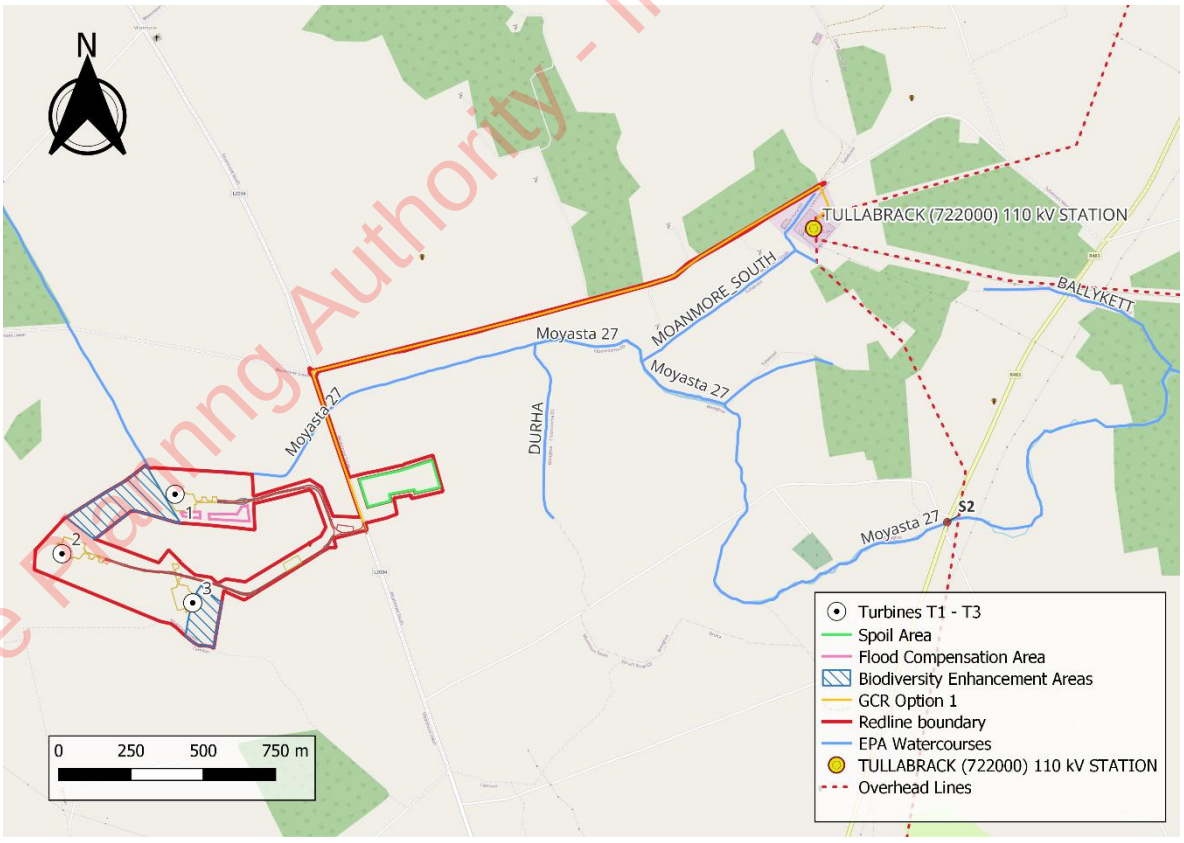
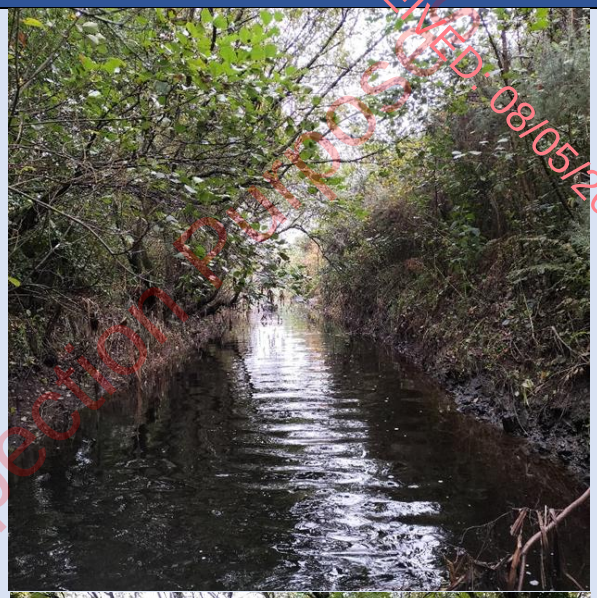


Figure 7-2: Grid Connection Route from the proposed Project to the existing Tullabrack 110Kv sub-station.

Table 7-4: List of watercourses in proximity to the Site and crossed by the GCR and TDR (including survey sampling locations and watercourse names)

Site Survey Stations	EPA Name	EPA Code	EPA Watercourse Segment Code	
M1	MOYASTA 27	27M04	27_952	 

Site Survey Stations	EPA Name	EPA Code	EPA Watercourse Segment Code	
M2	MOYASTA 27	27M04	27_952	

Site Survey Stations	EPA Name	EPA Code	EPA Watercourse Segment Code	
M3	MOYASTA 27	27M04	27_952	 

7.3.2.2 Fisheries Assessment

Five sites (M1 to M5) were selected for survey, upstream and downstream of the site (see **Figure 7-3**). The survey sites were located along the Moyasta River (EPA code: 27M04) which flows to the north of the windfarm site, and a minor tributary further upstream of the site, the Moanmore South River (27M14). Sites M1, M2, and M3 overlap with those surveyed for macroinvertebrate biodiversity. Site selection followed guidance set out in the CEN Standard EN 14011:2003 (Water Quality – Sampling of Fish with Electricity), ensuring that surveys targeted wadeable river sections with adequate flow and depth for effective sampling.

Additionally, priority was given to locations with accessible riverbanks, diverse microhabitats (e.g. pools, riffles, and glides), and proximity to macroinvertebrate monitoring points, allowing for integrated ecological assessment. The inclusion of the Moyasta River and its tributary, the Moanmore South River, was based on their hydrological linkage to the development area and their role as potential fish migration corridors. Consideration was also given to the downstream connectivity of these watercourses with Poulnasherry Bay, a sensitive transitional habitat within the Lower River Shannon SAC (002165) and River Shannon and River Fergus Estuaries SPA (00407), highlighting the importance of understanding potential pathways for indirect impacts on designated sites. The full fisheries assessment is supplied in **Appendix 7.3**.

It was noted that despite previous modifications and environmental pressures, such as forestry and agriculture, the Moyasta River had a healthy brown trout (*Salmo trutta*) population present, with low densities of sea trout (*Salmo trutta trutta*), lamprey (*Lampetra* sp.) and three spined stickleback (*Gasterosteus aculeatus*).

Station M4 which was located downstream of the site and towards the mouth of the Moyasta flowing into Poulnasherry Bay had the European eel (*Anguilla anguilla*) which is Red-listed and common transitional species such as sand goby and flounder were present. Fish density (m²) at each site is recorded in **Table 7-5 below**.

Site M1 was composed of compacted cobble with frequent boulder and localised areas of sand and mixed gravels. Moderate levels of siltation were recorded and macrophyte growth was sparse. Brown trout (*n*=44) and sea trout (*n*=1) were the only fish species recorded at this site.

Site M2 was composed of compacted cobble with scattered boulder and locally frequent patches of sand and mixed gravels. Soft sediment accumulations were noted as present along the margins of the stream. Moderate levels of siltation were recorded and macrophyte growth was sparse. Brown trout (*n*=33), lamprey (*n*=2) and three-spined stickleback (*n*=1) were recorded at this site. *Lampetra* sp. ammocoetes were noted as present in marginal soft sediment accumulations although densities were low (1 per m^2).

Site M3 was composed of compacted cobble and mixed gravels with localised accumulations of sand. Compacted silt was noted on the steep marginal slopes, the presence of boulders was rare. Occasional occurrences of macrophytes were recorded. Brown trout (*n*=12) and sea trout (*n*=1) were the only fish species recorded at the site.

Site M4 was composed of a mix of bedded cobble, gravels and estuarine muds. Macrophytes were not recorded due to the modified environment. European eel (*Anguilla anguilla*) (*n*=4), flounder (*Platichthys flesus*) (*n*=15), sand goby (*Pomatoschistus minutus*) (*n*=16) and three-spined stickleback (*n*=2) were recorded at the site.

Site M5 was composed of compacted gravels and cobble with abundant silt deposits. Several recently excavated/cleared field drains adjoined the river and were contributing to the silt load. Macrophyte growth was sparse. Brown trout (*n*=2) and three-spined stickleback (*n*=7) were the only fish species recorded at this site.

Good quality spawning and nursery habitat was identified at sites M1 and M2 while M3 provided a high value holding habitat for migratory and resident adult fish due to the deep glide and pool. Site M5 was located at the Moanmore South River which is a tributary of the Moyasta River that is heavily modified and with high levels of siltation; this site had poor quality salmonid habitat and only a small number of brown trout were recorded present. Therefore, the most likely explanation for salmonids being present at this location is due to its connection downstream of the Moyasta.

European eel were only recorded at site M4 at the tidal reaches. Such transitional sites are invariably of high value as eel nurseries and typically support greater eel numbers compared with upstream catchments (primarily due to superior prey resources). On both a global and Irish scale, the European eel is listed as 'critically endangered' (Pike *et al*., 2020; King *et al*., 2011).

M2 had recorded presences of Lamprey ammocoetes (likely brook lamprey, *Lampetra planeri*) the localised soft sediment accumulations provided some sub-optimal suitability for larval burial.

The Moyasta, and its tributary the Moanmore South River, at which site M5 is located, are small, historically modified upland channels prone to spate and relatively high flow rates and are thus not conducive to the deposition of organic-rich soft sediment required by juvenile lamprey. Although present, densities of *Lampetra* sp. are likely low within the Moyasta River given the inherent spate nature of the watercourse.

Limitations

Whilst fisheries data for the watercourses within the survey area was not available prior to this survey, the downstream connecting Shannon Estuary is known to support a wide range of transitional and marine fish species including Red-listed European eel (*Anguilla anguilla*) and smelt (*Osmerus eperlanus*) (Kelly *et al*., 2015).

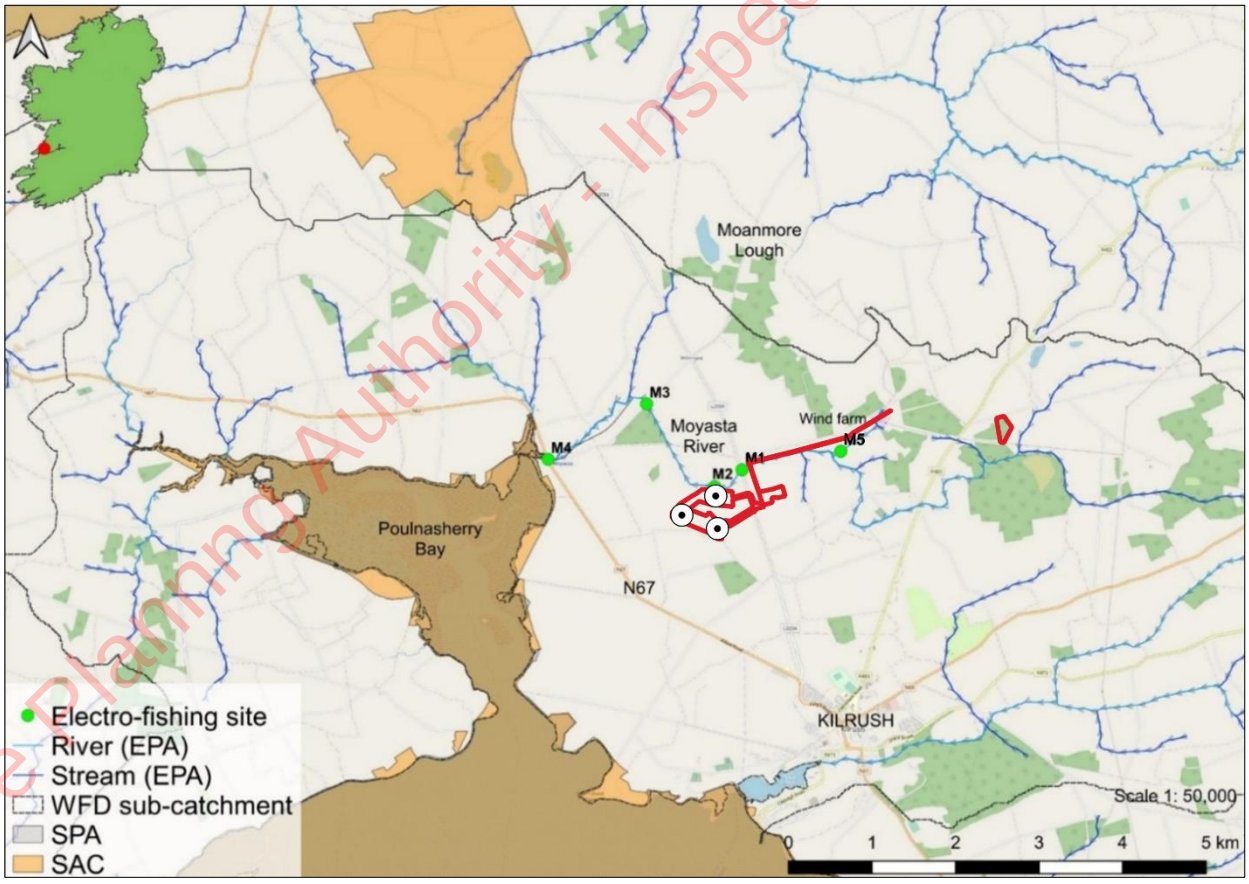


Figure 7-3: Sites surveyed for fisheries assessment.

Table 7-5: Fish densities at sampling stations.

				Fish density (no. per m^2)						
Site	**Watercourse**	**CPUE (elapsed time)**	**Approx. area fished (m^2)**	**Brown trout**	**Sea trout**	***Lampetra* sp.**	**European eel**	**Three-spined stickleback**	**Flounder**	**Sand goby**
M1	Moyasta River	10	280	0.157 (*n*=44)	0.004 (*n*=1)	0.000	0.000	0.000	0.000	0.000
M2	Moyasta River	10	270	0.122 (*n*=33)	0.000	1 per m^2 (*n*=1)	0.000	0.004 (*n*=2)	0.000	0.000
M3	Moyasta River	5	140	0.086 (*n*=12)	0.007 (*n*=1)	0.000	0.000	0.000	0.000	0.000
M4	Moyasta River	10	150	0.000	0.000	0.000	0.027 (*n*=4)	0.013 (*n*=2)	0.100 (*n*=15)	0.107 (*n*=6)
M5	Moanmore South River	5	50	0.040 (*n*=2)	0.000	0.000	0.000	0.140 (*n*=7)	0.000	0.000

7.3.2.3 Freshwater Pearl Mussel Survey

As stated earlier, the TDR includes three existing water crossings, two of which are part of the Doonbeg River catchment (Tullagower River and Brisla East Stream). The Doonbeg River and its tributaries lie within a FPM sensitive area.

There are previous records of FPM from the Doonbeg River (Clare County Council, 2016)[3]. The locations of the FPM surveys from 2016 are shown in **Figure 7-4**.

As the most recent surveys are nearly 10 years old, a detailed survey of the Doonbeg and its tributaries around and downstream of the proposed TDR works was included in this assessment and was undertaken by APEM Ireland on October 9th &10th 2023 (see **Appendix 7.2)**.

The watercourses crossed by the TDR are the (i) GOWERHASS (EPA code: 27G13) an order 1 watercourse, (ii) the TULLAGOWER river (EPA Code: 28T01) an order 1 watercourse, (iii) BRISLA_EAST, an order 1 watercourse and a small tributary of the main Tullagower stream with limited to no flow (**Figure 7-6**). Further pictures of the crossings can be seen in the FPM report in **Appendix 7.2**.

Analysis of the most recent Q-values from 2018 and 2021, as seen in in the Cycle 3 Mal Bay Catchment Report, May 2024, of sections of the Tullagower in close proximity to the TDR strengthening works, show a poor water quality score (Q3). The western crossing of the Tullagower stream by the TDR occurs downstream of a quarry/ recycling centre and commercial forestry identified by LAWPRO[4] as the potential source of sedimentation contributing to the poor water quality of this watercourse. **Figure 7-5** illustrates the current Water Framework Directive (WFD) status[5] of the Doonbeg Catchment in the vicinity of the TDR (i.e. Tullagower stream) as well as the locations of the most recent EPA Q-value assessments.

Freshwater Pearl Mussels require clean, fast-flowing water with water depths of 0.3–0.4 m, optimum current velocities of 0.25–0.75 ms^{-1} with boulder-stabilised refugia, which contain enough sand for burrowing. Adults can tolerate silty or muddy conditions for unknown lengths of time, but juveniles have not yet been reported in this type of habitat. Boulders are important as they usually prevent significant bed scour during

[3] Freshwater Pearl Mussel Survey of the Doonbeg,Annageeragh and Creegh Rivers, Co. Clare (October 2016)
[4] https://lawaters.ie/app/uploads/2022/03/Doonbeg-PAA-Desk-Study-F2.pdf

[5] (https://gis.epa.ie/EPAMaps/)

major floods (Hastie *et al.,* 2000, Gittings *et al.*, 1998). The most suitable areas to search during a stage 1 survey is in the immediate vicinity of boulders and under overhanging trees in suitable marginal areas because channel shading is extremely important. **Figure 7-7** below illustrates the areas surveyed for FPM by AFEM Ireland in October 2023.

Where the channels were suitable for surveying for FPM, no mussels were found. When surveying the sites for the FPM there was a significant difference noted in the flow within the Tullagower River between sites 1-3 and sites 4-6 (**Figure 7-7**). As a result of this, further sites along the river system were visited for investigation. At site B there is an unmapped forestry drain which is flowing from site B east towards site E. The majority of the flow from the Tullagower River sites upstream of site B is flowing east here rather than along the mapped channel (EPA Maps). The mapped watercourse of Tullagower River which flowed directly north of site B towards the confluence with the Doonbeg River at site A is dry or marshy in parts as it flows though this boggy landscape. Most of the Tullagower river flows between Site B and Site E where it joins the Doonbeg River system.

Appendix 7.2 - **Figure 2** illustrates the altered watercourse of the Tullagower river.

There are previous records of FPM in the Doonbeg River[26], and although no FPM[7] were recorded at the surveyed sites, and the watercourses at crossings along the TDR contain unsuitable habitat for FPM, it is important to consider the protection of this species and their presence in the wider Doonbeg system downstream of the confluence with the Tullagower River, particularly with respect to potential discharge of silt laden run off during the construction phase of the proposed Project.

While FPM are known to exist in the middle reaches of the Doonbeg catchment below Cooraclare, none were recorded in the upper catchment during the surveys undertaken to inform this EIAR. Notwithstanding the results from the Tullagower River and Brisla stream, the surface water system must be treated as FPM potential habitat and therefore appropriate mitigation will be adhered to in order to prevent any further deterioration in water quality.

[6] Freshwater Pearl Mussel Survey of the Doonbeg, Annageeragh and Creegh Rivers, Co. Clare (October 2016)
[7] Listed under Annex II and V of the Habitats Directive [92/42/EEC].

None of the watercourses surveyed as part of the FPM survey were identified as containing suitable habitats for Annex II or Annex V listed species or species of high conservation value i.e., river lamprey (*Lampetra fluviatilis*) or white-clawed crayfish (*Austropotamobius pallipes*).

Limitations

While Freshwater Pearl Mussel (FPM) surveys were initially planned at six locations, three of these were found to be unsuitable due to physical constraints including insufficient water flow, shallow or narrow channels, and dense riparian vegetation that limited accessibility and visibility. To address this, five additional sites within the catchment were identified and visited in an effort to expand the survey area and ensure comprehensive coverage. However, these supplementary locations also presented similar limitations and were deemed unsuitable for effective FPM survey due to poor habitat quality and access constraints.

Despite these challenges, the overall survey strategy remained robust. The accessible areas that were surveyed provided a representative overview of the habitat conditions across the study area. Surveys were carried out by experienced personnel following best-practice methodologies in accordance with relevant guidelines. Particular attention was paid to identifying suitable FPM habitat, including the presence of clean, well-oxygenated gravel substrates and appropriate water quality—both of which were largely absent across the sites.

Given the extensive field effort, combined with the lack of suitable habitat characteristics and the absence of any FPM indicators (e.g., live individuals or shell remains), the survey effort is considered sufficient to confidently conclude that Freshwater Pearl Mussel is not present within the proposed survey area.

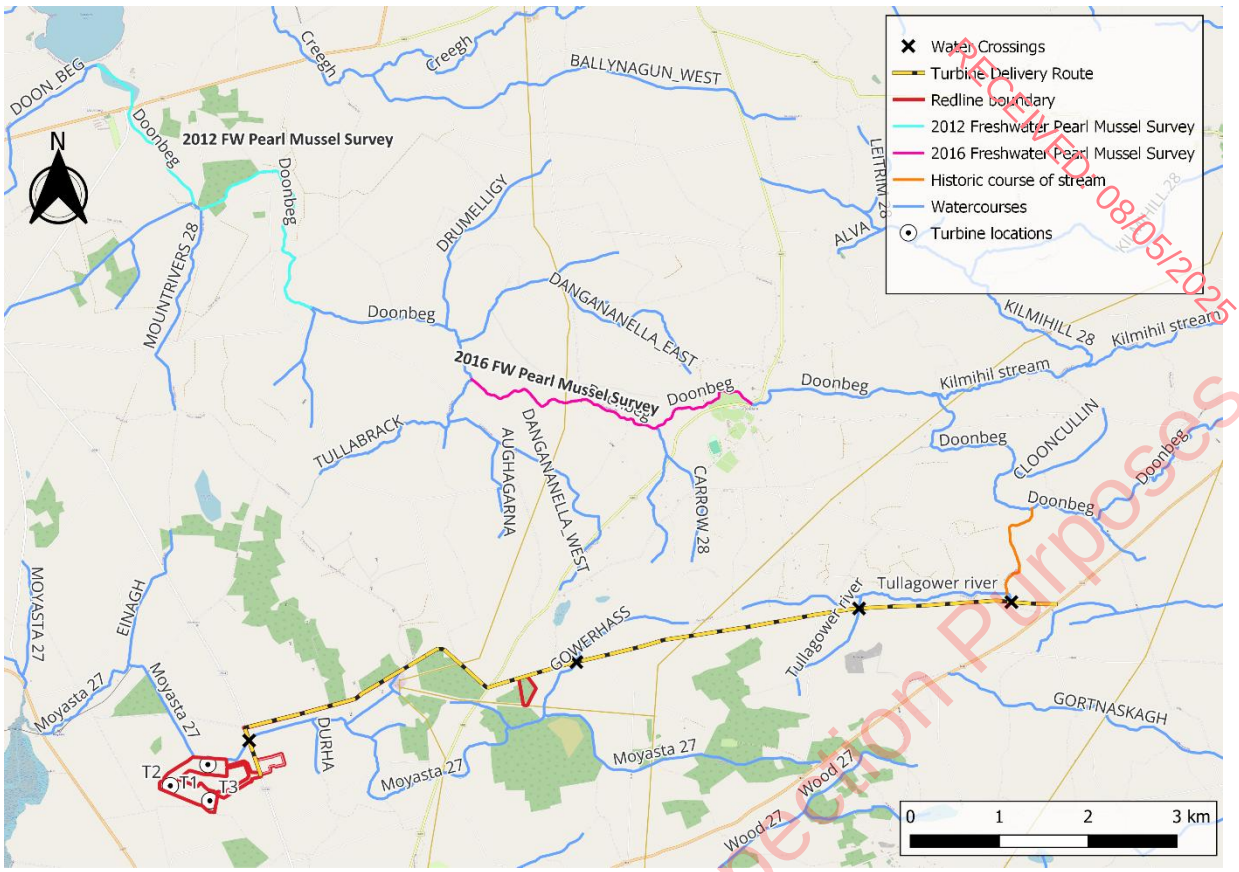


Figure 7-4: Turbine delivery route and locations of historical Freshwater Pearl Mussel surveys highlighted

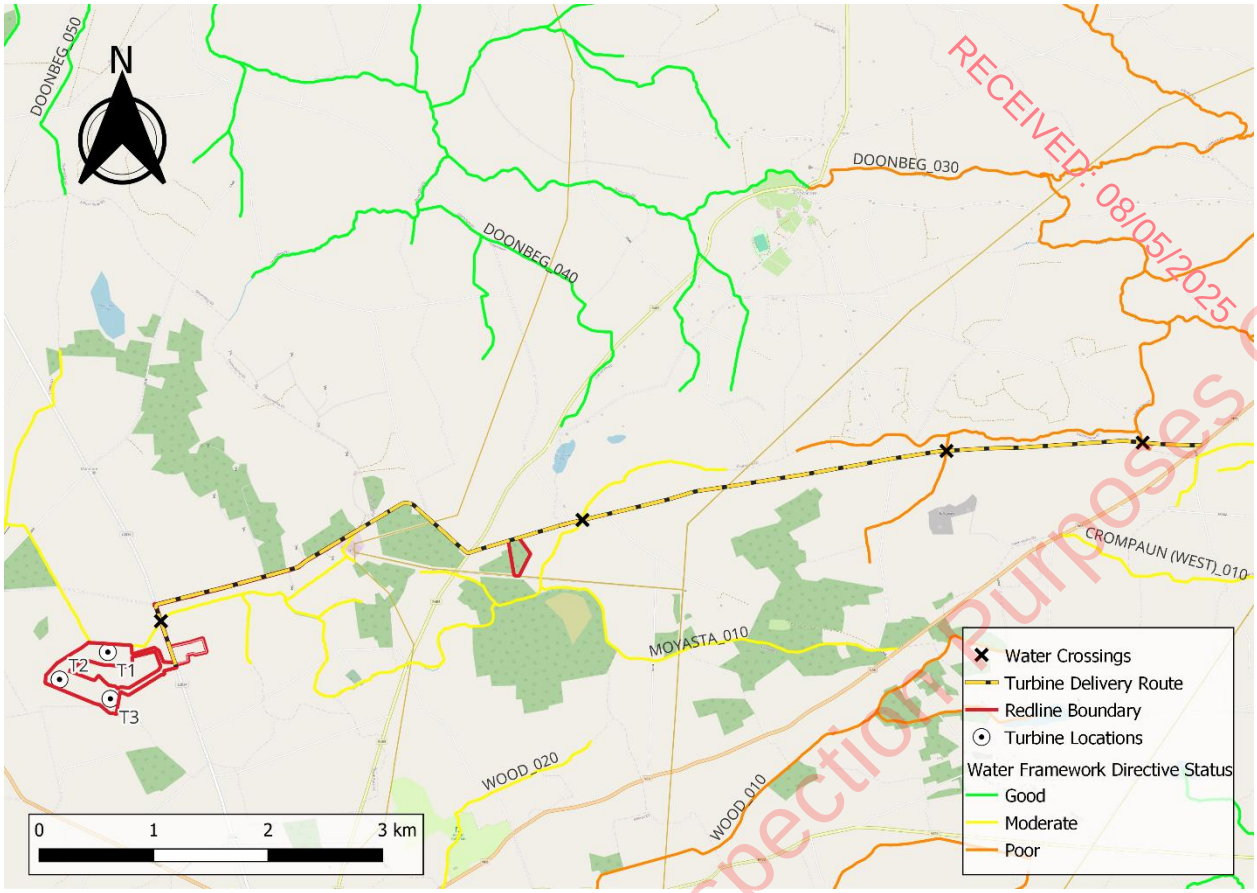


Figure 7-5: Doonbeg River sub catchment and Wood River sub-catchment WFD Water Quality Status.

Figure 7-6: View of the Brisla-East watercourse crossing.

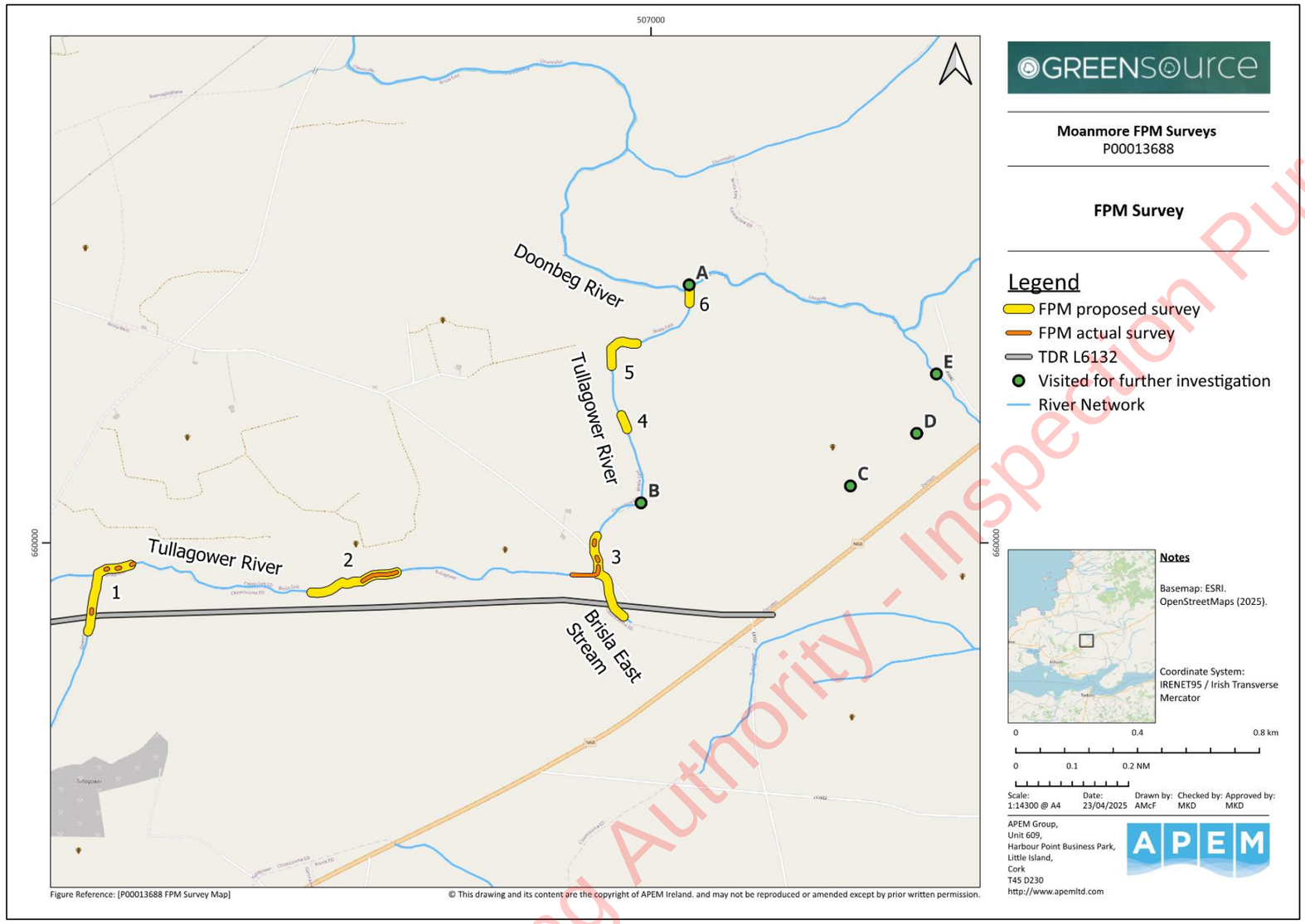


Figure 7-7: Freshwater Pearl Mussel survey sites, undertaken by APEM Ireland in October 2023.

7.3.2.4 Biotic Index (Q Value) Macro-invertebrate Assessment

Water quality was assessed using the Q-Value biotic index system. The Biological River Quality Classification System (Q-Scheme) has been in use in Ireland since 1971. The guidance used for this assessment is the EPA Biotic Index Biological River Quality Classification System (Q-value) (Toner *et al.,* 2005). For the purpose of this assessment, benthic invertebrates have been divided into five indicator groups according to the tolerance of pollution, particularly organic pollution.

In order to determine the biological quality of the river, the Q-scheme index is used whereby the analyst assigns a Biotic Index value (Q-Value) based on macroinvertebrate results. The Biotic Index is a quality measurement for freshwater bodies that range from Q1 – Q5 with Q1 being of poorest quality and Q5 being pristine/unpolluted (see **Table 7-6** below).

The most recent Q-values and WFD status available for the watercourses surveyed by APEM Ltd were taken from the EPA website[1] in November 2024 and are listed below in **Table 7-7** .

Table 7-6: Water Quality Assessment of Sites M1 to M3 surveyed as part of the baseline aquatic assessment (Q Value and WFD Ecological Status).

Site No.	Q Value July	Q Value October	WFD Ecological Status	Macrophytes	Comments	Latest EPA Q Value
M1	Q3	Q3-4	POOR/ MODERATE	Abundant	Stream with steep thickly vegetated banks, riverbed mix of cobbles and fine gravel with siltation. High level of shading present. Pastoral land adjacent to stream with open access to cattle. Particularly high abundance of filamentous algae indicating eutrophication. Hydrobiidae was the dominant species group that was present in July and Gammaridae in October.	Q3 (1991)
M2	Q3	Q3-4	POOR/ MODERATE	Abundant	Stream with steep thickly vegetated banks, riverbed mix of cobbles and fine gravel with siltation. High level of shading present. Pastoral land adjacent to stream with open access to cattle. Abundance of filamentous algae indicating eutrophication. Gammaridae was the dominant species group that was present in July and in October.	N/A
M3	Q3	Q3	POOR	Abundant	Stream with steep thickly vegetated banks, riverbed mix of cobbles and fine gravel with heavy siltation. High level of shading present. Abundance of filamentous algae indicating eutrophication. *Leuctra sp.* was the dominant species group that was present in July and Ceratopoginidae and Hydrobiidae in October	N/A

Table 7-7: Water Quality Assessment of Sites Surveyed for FPM

Site No.	WFD Ecological Status	Comments	Latest EPA Q Value and WFD Status
1	POOR	Largely overgrown channel which had signs of previous modification throughout. High banks and field drains were present throughout this stretch along with overhanging brambles and vegetation. Shading and substrate were unsuitable for FPM and none were found to be present.	Q3 POOR (last surveyed 2021)
2	POOR	Channel between 1-2 m width with an average depth of ca. 70 cm where surveyed. Signs of previous channel modification were present throughout with high steep banks and field drains present. High amount of instream vegetation including *Nasturtium officinale, Callitriche stagnalis, Sparganium* sp., and *Lolium* sp. No FPM found to be present and some stretches were unsuitable for survey because the channel was >1 m depth and very soft. The river bed could not be seen even with the use of a torch.	N/A
3	POOR	Channel was up to 2 m wide with an average depth of 30 cm. Largely overgrown with brambles and ferns, conifers from the bordering forestry and inaccessible in many areas due to this vegetation. Evidence of previous channel modification and field drains at this site. Instream vegetation consisting of *Lolium* sp. and *Stachys palustris.* Approx. 130m of the Tullagower River at this site was surveyed. No FPM found to be present Survey was not possible on the Brisla East Stream, due to heavy vegetation. Japanese knotweed (*Fallopia japonica*) was also noted upstream of the road crossing at this Site.	Q3 POOR (last surveyed 2018)
4	POOR	Located within an area of cutover bog. No water body present at this location, and thus no FPM surveys were conducted at this location. Bog drains, field drains, and forestry drains are present in the surrounding areas	N/A
5	POOR	No FPM surveys were conducted due lack of access to the channel at this site. The channel here was narrow and shallow with high overgrown banks making it unsuitable to survey. Stagnant instream vegetation present.	N/A
6	POOR	No FPM surveys were conducted due to channel access at this site. The channel here was narrow and shallow with high overgrown banks making it unsuitable to survey. Stagnant instream vegetation present.	N/A

7.4 Assessment of Likely Significant Environmental Effects

A more in-depth discussion of water quality is provided in **Chapter 9: Hydrology and Hydrogeology**. This section is focused on the effects on aquatic species and ecology. Groundwater pathways are not considered an issue at the Site on account of the underlying geology, and the area is mapped as low vulnerability by the EPA (EPA Maps).

7.4.1 The 'Do-Nothing' Impact

If the Project does not proceed, lands at and in the vicinity of the Site will continue to be used for forestry and agricultural purposes. This 'do-nothing' scenario would result in no significant change to aquatic ecology and habitats within or downstream of the Site Blade set down area, GCR, and TDR, subject to the continuation of current activities and practices. It should be noted however, that current forestry and agricultural activities (incl. drainage works) along with quarry and waste recycling activity are having some effects on water quality within the catchment as evidenced by the results of the surveys undertaken. However, the forestry at the Blade Transfer Area is a commercial forestry and would be removed within ten years.

If the Project were not to proceed, the opportunity to generate renewable energy and electrical supply to the national grid would be lost, as would the opportunity to further contribute to meeting Government and EU targets for the production and consumption of electricity from renewable sources and the reduction of greenhouse gas emissions and compliance with the Climate Change and Low Carbon Emissions Act 2015-21 would be impeded.

7.4.2 Construction Phase Potential Effects

A full description of the Project is given in **Chapter 2: Project Description**. An in-depth assessment of water quality during the construction phased is discussed in Chapter 9 Hydrology and Hydrogeology **Section 9.6.2**. A summary of potential sources of significant effects on aquatic ecology during the Construction Phase are:

- Clearance of vegetation, soil and rock for widening and construction of access roads, hardstand, and turbine bases causing the release of suspended solids/nutrients, dissolved substances, concrete, and hydrocarbons into the drainage network and site run-off, resulting in adverse effects on water quality within the watercourses onsite and downstream
- Temporary stockpiles and permanent spoil storage area
- Pollution from debris caused by vehicles during the turbine delivery

crossing watercourses in proximity to the site access track

- Adverse effects as a result of the clear-fell of conifers (0.85 ha) on water quality as a result of sediment and nutrient release into water courses
- Potential for accidental spillage of hydrocarbons and other pollutants including concrete laitance
- Overdosing of chemical agents associated with the use of Siltbuster causing an impact to water quality
- Potential indirect impacts from runoff during the proposed HDD works at the no. 1 watercourse crossing on the GCR impacting on water quality
- The loss of natural watercourses or physical changes in the aquatic habitat due to watercourse crossings and the placement of culverts
- Potential for peat slippage or failure leading to deposits in watercourses which can lead to eutrophication. This is discussed further in **Appendix 8.1** "Moanmore Lower Wind Farm, Site Investigation by Peat Probing and Peat Stability Risk Assessment Report"
- Pollution of watercourses upstream of the Doonbeg catchment for sensitive FPM, crossed twice by the TDR, from debris loosened from verges creating sedimentation in the water

The principal potential construction phase effects of the Project relates to the release of sediments into the drainage network arising from construction related Site works including the access track network, turbine foundations and associated hardstands, electrical sub-station building, temporary compound and spoil storage areas. These are considered to be short-term and localised to the zone of Influence (ZOI). The pre-mitigation potential effect on the downstream surface water quality, and thus the aquatic ecology, is negative, indirect, short-term, and likely and is considered to be significant.

No felling of forestry is proposed at the Site or along the GCR. It is proposed to permanently fell ~0.85ha of forestry. The felling area proposed is the minimum necessary to construct the windfarm. There is a low risk of nutrient release from the clear-felling of conifers required for the construction of the Blade Transfer Area; however, this is of a minor scale in comparison to the normal forestry activities taking place in the area. The pre-mitigation potential effect on the downstream surface water quality, and thus the aquatic ecology, is negative, indirect, short-term, and likely and is considered to be significant.

Due to the scale of the proposed project comprising solely of a 3no. turbine wind farm along with a short GCR and small scale works along the TDR, the scale of earthworks and the volume of spoil to be generated is relatively small in comparison to other renewable energy developments. It is estimated that construction works will generate ~ 52,847m^3 of spoil materials. There will be 39,845m^3 reused/stored on site and 13,002m^3 will be disposed of at a licensed waste facility. This could cause a significant potential source of sediment laden water.

The watercourses in proximity to the project have moderate to poor status under the WFD, most likely due to anthropogenic activities such as land drainage and forestry. Further water quality degradation in surface water from siltation or other forms of pollutants causing potential decrease in biodiversity of flora and fauna in the area, especially regarding the more sensitive species present, is the main result of the potential effects listed above. Release of suspended solids into watercourses can result in eutrophication and reduced oxygen levels due to minerals and nutrients such as phosphorus and nitrogen, which can adversely affect the local ecosystem.

The proposed project could potentially result in a significant effect on salmonids with European eel also occurring. European eel were recorded at site M4 at the tidal reaches. Such transitional sites are invariably of high value as eel nurseries and typically support greater eel numbers compared with upstream catchments (primarily due to superior prey resources). On both a global and Irish scale, the European eel is listed as 'critically endangered' (Pike *et al*., 2020; King *et al*., 2011). Potential impacts on water quality and ensuing impact on fish populations in the absence of mitigation are considered unlikely, short-term, significant, negative and dependent on species sensitivity and utilisation of watercourses in the context of the proposed project.

Given the inherent spate nature of the Moyasta River draining the proposed project site, the proposed project is unlikely to result in a significant effect on lamprey at a local level.

The proposed development could potentially cause further reduction in water quality and therefore increase ecological pressures on aquatic macroinvertebrate diversity. Potential impacts on water quality and ensuing impacts on macroinvertebrates in the absence of mitigation are considered short-term, negative, and unlikely. In the absence of mitigation the proposed project could result in a significant effect on pollution sensitive taxa at a local level.

Effects on FPM are dependent on their occurrence. The Doonbeg catchment is recognised as a FPM sensitive area, whereas the Wood catchment has not been assigned this status. Potential impacts on FPM if present in downstream reaches of the Doonbeg catchment are regarded as short-term, negative, unlikely and significant, prior to the implementation of mitigation measures.

Due to the absence of FPM during the survey, and the lack of records suggesting their presence in this stretch of the Doonbeg river catchment, it is concluded that they are highly unlikely to occur there. Given the conclusion that FPM are highly unlikely to occur in the Tullagower River and in the upper reaches of the Doonbeg River_030, the potential for significant effects is minimal. Furthermore, the distance between the proposed temporary accommodation requirements at each watercourse crossing (which avoid excavation and disturbance of the existing ground) along the TDR and the Doonbeg_040 reach (where FPM were historically recorded in 2012 and 2016), supports the assessment that, in the absence of mitigation, the proposed development is highly unlikely to result in a significant effect on FPM at either a local or county level.

With regard to potential effects on hydrologically connected designated sites, the Site, the GCR and the proposed work areas along the TDR are hydrologically connected with the following designated sites and protected areas:

- The Lower River Shannon SAC.
- The River Shannon and River Fergus Estuaries SPA.
- The Poulnasherry Bay pNHA.
- The West Shannon Poulnasherry Bay designated shellfish waters are located approximately 3.7km downstream of the Site.

The Site is connected with these designed sites via the Moyasta River and the length of the hydrological flowpath is approximately 2.7 km to the SAC/SPA/pNHA. Meanwhile, the length of the hydrological flowpath between the Site and the designated shellfish waters is approximately 3.7 km.

Even in the absence of mitigation measures, there is limited potential for effects associated with the Project where the Moyasta River discharges into the Mouth of the Shannon coastal waterbody due to the large volumes of saline waters which provide a greater dilution effect within the coastal waterbody. Note that the Project does not in any way rely upon dilution or the assimilative capacity of any downstream receiving waterbody and the mitigation measures detailed in **Chapter 9: Hydrology and**

Hydrogeology, Section 9.7, **Section 7.5.2 below and Chapter 2: Project Description**, are the primary water quality protection methods designed to protect those watercourses in the immediate vicinity of the proposed works and downstream.

Within the Mal Bay catchment, the Tullagower River is identified as the watercourse with the greatest potential for impacts to water quality arising from the mechanisms outlined in this section (e.g. sediment release, hydrocarbon contamination, nutrient input). Consequently, this river also presents the highest sensitivity in terms of potential adverse effects on aquatic ecology. Without mitigation in place there would be a negative, short-term, likely, significant effect due to works associated with the TDR.

7.4.3 Operational Phase Likely Significant Effects

The applicant is applying for a 40-year operational lifespan for the proposed Project. An in-depth assessment of water quality during the construction phased is discussed in **Chapter 9: Hydrology and Hydrogeology Section 9.6.3.** A summary of potential sources of significant effects on aquatic ecology during the Operational Phase can be described as follows:

- Downstream flood risk
- Runoff resulting in contamination of surface waters
- Wastewater contamination

It should be noted that the main potential effects on the receiving aquatic environment and sensitive aquatic receptors downstream will occur during the construction phase as detailed above.

A Stage 2 flood risk assessment (**Appendix 9.1**) was carried out for the Site that determined the proposed location for T1 along with its access tracks and hardstand are within the 100-year fluvial flood zone that was mapped out. This could lead to a potential increase in flood risk arising from floodplain storage reduction and alteration of natural drainage patterns as a result of construction activities. Without mitigation, flooding has the potential to cause a significant effect to aquatic ecology by causing habitat loss or degradation due to erosion, sedimentation causing water quality issues and disruption of species movement due to changes in flow and physical obstructions. As noted within Chapter 9 Hydrology and Chapter 8 Soils, 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. Pre-mitigation potential downstream flood risk could cause a negative, significant, direct, long term, likely effect to aquatic ecology.

Overall, peat stability is recorded as 'good' within the PSRA (**Appendix 8.1**). The risk of significant peat landslide events occurring at the Site is low given the nature, namely the shallow peat and generally flat topography at the Site.

During the operational phase, the risk of silt-laden runoff is greatly reduced, as ground disturbance will have ceased, and permanent drainage controls will be in place. Occasional, small-scale maintenance works, such as upkeep of site entrances, internal roads, and hardstands, may still occur, but these are infrequent and unlikely to cause significant impact. Minor releases of suspended solids could temporarily increase turbidity in downstream water bodies, with potential effects on macroinvertebrates and fish stocks. A low risk of hydrocarbon release from site vehicles exists, though no on-site refuelling will take place. All works will remain within the Site boundaries, with no activities along the GCR or TDR. Pre-mitigation potential run-off could result in negative, slight, indirect, temporary, unlikely effect on downstream aquatic ecology.

Effluent discharge from welfare facilities located at the substation compound poses a potential risk to surface water quality, particularly if site conditions are not conducive to the proper functioning of an on-site percolation system. Inadequate percolation could lead to the accumulation or uncontrolled release of wastewater, resulting in nutrient and contaminant inputs into nearby water bodies. This could, in turn, degrade water quality, elevate nutrient levels, and contribute to eutrophication. Such changes in water chemistry may have an impact on aquatic ecosystems, including reduced oxygen levels and increased turbidity, which can negatively impact sensitive fish and aquatic species downstream. Pre-mitigation potential wastewater contamination could result in negative, significant, indirect, temporary, unlikely effect on aquatic ecology.

7.4.4 Decommissioning Phase Likely Significant Effects

The Decommissioning phase poses similar risks of potential significant effects on the aquatic environment as listed above in the construction phase, with the risk of pollution in the waterways causing a reduction in biodiversity of flora and fauna, especially the more sensitive species. Though in view of the presence of the access track network and associated infrastructure, the resultant scale of effects is considered to be much lower.

After 40 years the site will be revegetated and natural drainage management will be resumed, it is not expected that the Decommissioning phase will disturb this. In the absence of mitigation, the potential effect on the aquatic environment is considered much the same as the construction phase, due to the same potential sources to cause a significant short-term adverse effect at the local scale.

7.4.5 Effects on Natura 2000 Sites

Effects of the construction, operational and decommissioning phases on Natura 2000 sites within the ZOI are outlined in the accompanying NIS document. These are based on the connection of the Site to the Natura 2000 sites via watercourses.

On the basis of geographical separation, there is no potential for direct effects, such as disturbance of habitats and/or species, on these European sites during any of the phases of the proposed Project.

The potential indirect effects on European Sites as referenced in the accompanying NIS are listed below.

Construction Phase

- Release of suspended solids during excavation and earthworks (e.g. turbine bases, access tracks, spoil storage), potentially impacting water quality downstream in the Moyasta River and ultimately Poulnasherry Bay.
- Pollution from cementitious materials, particularly during concrete pouring at turbine bases and the substation, may cause localised pH elevation and toxicity to aquatic fauna.
- Hydrocarbon contamination from refuelling or leaks/spills from plant and machinery, posing a serious risk to aquatic life in both freshwater and estuarine systems.
- Peat sediment mobilisation from blade set-down area and any accidental peat instability, potentially causing high sediment loading in the receiving watercourses.
- Risk of drilling fluid (bentonite/polymer) release during Horizontal Directional Drilling (HDD) at the Moyasta River crossing, including the low-probability risk of blowout.
- Clear-felling of conifer plantation (0.89 ha) draining to the Moyasta River may cause temporary sediment and nutrient loading.

Relevance to European Sites

- Estuarine and mudflat habitats (QIs) and intertidal food sources for waterbirds (SCIs) are sensitive to siltation and eutrophication.

- Migratory fish species (e.g. salmon, lamprey) are vulnerable to water quality degradation and physical barriers or changes to river flow.

Operational Phase

- Residual sediment runoff during heavy rain from areas disturbed during construction (tracks, roadsides, hardstands).
- Peat instability risk remains (though low), especially in deeper peat areas near site drainage features.
- Minor hydrocarbon leakage from vehicles during infrequent maintenance activities.
- Long-term chemical storage risk (if fuels or lubricants are stored improperly).

Relevance to European Sites

- Chronic or cumulative water quality degradation could affect sensitive estuarine habitats and benthic invertebrates important to bird foraging.

Decommissioning Phase

- Soil and sediment disturbance during removal of infrastructure and reinstatement of ground.
- Potential reactivation of peat instability risks during ground disturbance, especially near watercourses.
- Hydrocarbon risk from machinery during decommissioning activities.
- Legacy erosion from exposed or poorly reinstated surfaces.

Relevance to European Sites

- Re-entry of pollutants and sediments into the Moyasta River could affect estuarine QIs and SCIs if mitigation is not maintained.

Even in the absence of mitigation measures, there is limited potential for effects on downstream designated sites due to the length of the hydrological flowpaths and the large volume of saline waters within the Shannon Estuary North surface water catchment.

Conclusion

In conclusion, while the pre-mitigation potential for negative, indirect, short-term and significant effects is acknowledged, particularly during construction, the combination of project scale, site characteristics, and the comprehensive suite of mitigation measures proposed in **Section 7.5**, is expected to substantially minimise the risk of significant

long-term or residual ecological effects on aquatic ecosystems and downstream designated sites. Effective implementation, monitoring, and adaptive management will be critical to ensuring the protection of both local and regional aquatic ecological integrity throughout the life cycle of the project.

7.5 Mitigation Measures

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.

7.5.1 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 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.

7.5.2 Construction Phase Mitigation

7.5.2.1 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.

7.5.2.2 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 into a Construction and Environmental Management Plan (CEMP) (**Appendix 2.1**). The 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 the 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 **Chapter 9: Hydrology and Hydrogeology 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) outlined in **Section 7.3**. 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.

7.5.2.3 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 Proposed 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 the CEMP (Appendix 2.1) The accompanying NIS deals with the hydrologically linked Natura 2000 sites.

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** of the CEMP) and **Chapter 9 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 the CEMP(see **Appendix .2.1**)
- The storage of hydrocarbons etc., will be undertaken in accordance with current best practice and detailed within **Section 9.7.2.4, Chapter 9: Hydrology and Hydrogeology.**
- 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: Hydrology and Hydrogeology, 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 the 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: Project Description, Section 2.5.10.2** & **Appendix 2.1**, as well as in **Chapter 9: Hydrology and Hydrogeology, 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: Section 9.7.2.7**.

Clear felling

The Proposed Development requires clear felling (0.845 ha) to facilitate the construction of the blade set-down area (see **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.

7.5.3 Operational Phase Mitigation

During the operational phase, the potential for silt-laden runoff is much reduced compared to the construction phase. The following measures will be implemented during the operational phase to ensure the ongoing protection of watercourses and water quality at the Site and in downstream reaches in regards to the potential operational phase effects (downstream flood risk, runoff resulting in contamination of surface waters and wastewater contamination):

- Stilling ponds will be designed to provide attenuation to greenfield run-off rates.
- Monitoring of high-risk areas, including spoil storge area, flood compensation areas, on-site drainage and silt containment infrastructure
- The spoil material at the permanent storage area will need to dry out over a number of years to increase the shear strength. Therefore, the permanent spoil storage area will require additional monitoring, including restricted access following the construction phase until the storage area is deemed to be stable.
- The base level of turbine T1 will be set at an elevation of 9.6 mOD, which includes a 0.3-meter freeboard above the 1 in 100-year plus climate change flood level. This freeboard ensures that the turbine is not inundated during a 1 in 100-year flood event, even with climate change considerations factored in. It also ensures that the turbine can be accessed for essential maintenance during flood events if necessary.
- Flood compensation areas will replace the lost flood zone capacity to ensure there is no displacement of floodwaters or increased downstream flood risk.
- Culverts will maintain floodwater flow routes and prevent the blockage of natural flow paths during flood events.
- The SWMP ensures effective management of surface water runoff to avoid exacerbating flooding risks.
- Some of the construction phase drainage will be permanent for the lifetime of the Development, and will be attenuated for greenfield run-off.

As there is no direct discharge from the Project to downstream receiving waters. Mitigation for the protection of surface water during the operational phase will ensure the qualitative status of the receiving SWBs will not be altered by the Project.

7.5.4 Decommissioning Phase Mitigation

Decommissioning of the Project will be scheduled to take place after the proposed 40-year lifespan has expired. Decommissioning phase effects for the Project are likely to be broadly similar to construction phase effects, in terms of potential surface water quality effects from ground disturbance, refuelling and the storage of potentially hazardous materials onsite. Mitigation measures to avoid contamination by accidental fuel leakage and disturbance of soil during the decommissioning process will be implemented as per the construction phase mitigation measures. A Site-specific **Decommissioning Management Plan (DMP)** (**Appendix D)** has been developed and will be amended prior to the commencement of any Decommissioning activities. The implementation of all mitigation measures detailed for the construction phase will be adopted in full during the Decommissioning phase to ensure all such significant effects are avoided.

As a minimum measure during Decommissioning, areas where freshly placed soil material as part of Turbine Foundation reinstatement work will be surrounded by silt fencing if deemed necessary until the area has naturally revegetated.

Restoration of the Site following Decommissioning of infrastructure will require the prior establishment of the new baseline conditions at the Site which will have developed over the intervening 40-year life of the Project.

These studies will inform any modification or additional sensitivities that may need to be factored in restoration and site-specific measures.

7.6 Residual Effects of the Project

The approach to the Project design, the use of SuDS drainage and the suite of comprehensive measures to avoid, reduce or remedy all potential significant effects on water quality will ensure that the receiving water bodies in the catchment of the Project do not suffer any deterioration in water quality, either during construction, operation, or Decommissioning.

Steel plates placed along the turbine delivery route will be removed after deliveries are complete, leaving no residual effect.

A comprehensive assessment of potential residual effects to water quality is carried out in **Chapter 9: Hydrology and Hydrogeology, Section 9.8**.

With the appropriate mitigation in place there is expected to be no adverse residual effect on any aquatic species, habitat or on water quality at a local or catchment level as a result of the Project.

7.7 Monitoring

In order to verify the efficacy of pollution prevention and mitigation works during construction, water quality monitoring will be undertaken prior to, during and post completion of construction works. Monitoring will be undertaken in watercourses within the catchment as outlined in the CEMP, and in compliance with any potential conditions of planning consent. Monitoring will be overseen by a qualified and experienced Environmental Manager or Ecological Clerk of Works.

The specific monitoring requirements including frequency and parameters, are detailed in the **Chapter 9: Hydrogeology and Hydrology Section 9.7.5**.

Monitoring will be undertaken at the baseline monitoring locations on a quarterly basis, or in the event of prolonged adverse weather conditions, to assess any deviation from baseline conditions at the Site and will be repeated periodically *i.e.*, before, during and after construction phase.

7.7.1 Construction Phase Monitoring

- During the construction phase daily inspection of silt traps, settlement ponds, buffered outfalls and drainage channels will be undertaken. Routine measurement of total suspended solids, electrical conductivity, pH, and water temperature at selected water monitoring locations at the Site will be carried out. Monitoring of locations where excavations are being dewatered (likely high in solids) will be done in real time.
- Daily monitoring of excavations by the Geotechnical Engineer will occur during the construction phase. If high levels of seepage inflow occur, excavation work will immediately be stopped, and a geotechnical assessment undertaken.
- During the construction phase of the project, the development areas will be monitored daily for evidence of groundwater seepage, water ponding and wetting of previously dry spots, and visual monitoring of the effectiveness of the constructed drainage and attenuation system so that it does not become blocked, eroded or damaged during the construction process.
- An Ecological Clerk of Works ("ECoW") / Environmental Officer with an appropriate level of experience relevant to aquatic ecology will be present to supervise the water

crossings during the strengthening works along the turbine delivery route. This approach for crossing the Tullagower stream at this part of the Doonbeg catchment for turbine delivery will not make any direct or indirect contact with the watercourses and potential for effects on the freshwater pearl mussels in the lower Doonbeg catchment are considered to be negligible. Similarly, an ECoW will be present to supervise the GCR works at the No. 1 watercourse crossing over the Moyasta River.

- Monitoring after heavy rain /prolonged rain events required on major points (including spoil storage area and flood compensation area, and drainage swales around the site to assess the ongoing efficacy of the instream mitigation measures)

7.7.2 Post-construction phase monitoring

- During the operational phase of the project the stilling ponds and buffered outfalls will be periodically inspected during maintenance visits to the Site.
- Water monitoring on nearby natural watercourses will be undertaken during and post construction to determine if any pollution has migrated off-site, and if so, measures will be implemented to rectify the impact, as agreed with relevant statutory agencies (e.g. Inland Fisheries Ireland (IFI)).
- The spoil material at the permanent storage will need to dry out over a number of years to increase the shear strength. Therefore, ongoing monitoring of spoil storage area and associated drainage, flood compensation area and drainage swales will be undertaken until the storage area is deemed to be stable.

7.8 Cumulative or In-Combination Effects

The Habitats Directive requires competent authorities to make an Appropriate Assessment of any plan or project which is likely to have a significant effect alone or in-combination with other plans and projects.

7.8.1 Potential Cumulative Effects with Agriculture and Forestry

The cumulative study area is primarily agricultural. Agriculture is the leading pressure on water quality in Ireland (EPA, 2024) due to soil disturbance and nutrient runoff. Without mitigation, the Project could potentially contribute to downstream water quality degradation through increased suspended solids and nutrients. However, with the robust mitigation measures outlined in **Section 7.5** in place for all phases of the Project, no significant cumulative effects with agricultural activities are anticipated.

The cumulative study area also includes several areas of coniferous forestry plantation. Forestry-related pressures on water quality commonly arise from sediment and nutrient

runoff, acidification, and altered hydrological regimes due to drainage associated with forestry operations, particularly clear-felling.

Although some coniferous blocks are located in proximity to the Site and within the Moyasta River catchment, it is important to note that no forestry felling is proposed within the Site itself. The only area of proposed felling is limited to a small area at the Blade Transfer Area, required for construction purposes.

The mitigation measures detailed in **Section 7.5** will ensure the protection of surface water quality from the Project's activities and avoid any significant interaction with existing forestry pressures.

Therefore, when considered alongside best practice mitigation and the limited scope of proposed felling, it is concluded that the Project will not result in significant cumulative effects on water quality in conjunction with surrounding forestry activities.

7.8.2 Potential Cumulative Effects with Other Wind Farm Developments and Grid Connections

There are currently 16 operational and proposed wind farms within a 20 km radius of the Site (see Appendix 1.2). The closest wind farms in operation are Moanmore Wind Farm (7 turbines), located approximately 1.7 km to the northeast of the Site and Tullabrack Wind Farm (6 turbines), located approximately 2.16 km east of the Site. The closest proposed windfarm is Ballykett, with 4 proposed wind turbines, located 0.96 km from the Site. The remaining 13 wind farms are located at distances ranging from 7.36 km to 18.31 km from the Site.

A study was completed to identify any grid connection routes associated with other proposed wind farm development which overlap with the GCR. The greatest potential for cumulative effects to occur would be if the construction phase of these permitted and/or proposed wind farms and the construction phase of the Project overlapped. In an unmitigated scenario, there may be potential for some cumulative effects on downstream watercourses.

However, the Moanmore and Tullabrack wind farms are already operational and therefore the construction phase of these wind farms cannot overlap with that of the Project. The greatest potential for cumulative effects associated with these wind farms would be associated with the operational and decommissioning phases. However, the

EIARs for the above wind farm developments detail potential hydrological and hydrogeological issues relating to the operation and decommissioning phases of these developments and propose a suite of best practice mitigation measures designed to ensure that the developments do not in any way have a negative effect on downstream surface water quality and quantity and therefore aquatic ecology. Similarly, the mitigation and best practice measures proposed in this EIAR chapter will ensure that the Project does not have the potential to result in significant effects on the aquatic ecology.

No significant overlap occurs between the GCR and the proposed grid options for Ballykett Wind Farm. Whilst Grid Route Option 1 for Ballykett Wind Farm joins the existing Tullabrack 110kV Substation, this route approaches the substation from the east. Therefore, the only overlap with the GCR will occur within the Tullabrack 110kV Substation compound. Practicalities will make it highly unlikely that the construction phase of the grid connections in the vicinity of Tullabrack 110kV Substation would occur at the same time as this would result in road closures (two trenches being excavated at the same time).

Furthermore, the EIARs for Ballykett Wind Farm and the EIAR for the current Project detail strict mitigation measures for the protection of surface water and groundwater quality during the construction of the grid connections. Therefore, with the implementation of the prescribed mitigation measures there will be no cumulative effects on the aquatic ecology.

Sceirde Rocks offshore wind farm submitted a planning application to An Bord Pleanála in January 2025 (Planning Ref 321697). Although the proposed wind turbines are located over 100km north-west of the Project a section (934m) of their proposed onshore grid connection along the L2034 going to Moneypoint substation is located within the Red-Line Boundary of the proposed Project. The EIAR for Sceirde Rocks Wind Farm details strict mitigation measures for the protection of surface water quality during the construction of the grid connections. Therefore, with the implementation of the prescribed mitigation measures there will be no cumulative effects.

7.8.3 Potential Cumulative Effects on Water Quality

The Moyasta River is ecologically connected to two Natura 2000 sites, The Lower River Shannon SAC (site code: IE002165) and the River Shannon and River Fergus Estuaries SPA (site code: IE004077). The Moyasta river is also classified as 'Moderate'

status under the Water Framework Directive (WFD). The potential for indirect adverse effects to the downstream Natura 2000 sites, or a reduction in water quality in the Moyasta river is most likely limited to the construction phase of the project and can be managed by implementing the proposed mitigation measures.

The Project has the potential to add to the cumulative nature of adverse effects within the watercourses in the area. The EPA's latest Water Framework Directive status categorised the surface waters in the area as 'Moderate' and the potential for adverse cumulative effects could occur at each stage of the Project without mitigation in place. If pollution from contaminants were to occur during the Project, there is a potential to temporarily affect surface waterbodies in the catchment on a cumulative level. However, the mitigation measures outlined above and detailed in **Chapter 9** and within the CEMP (**Appendix 2.1**) of this EIAR, can reduce any potential effect to imperceptible levels. Therefore, the proposed Project is considered unlikely to significantly contribute to cumulative effects in terms of water quality.

7.8.4 Potential Cumulative Effects with Other Developments

Other significant developments or proposed developments (larger than a one-off house) within 10 km of the Site are listed in EIAR Chapter 2: Table 2.2. (relating to period 2017 to 2022). These projects (granted or awaiting decisions) include agricultural facilities (no. 3), a solar energy development, water storage tanks within the Moneypoint power station complex, a wastewater treatment works & a sewerage scheme (Kilrush), amenity facilities (inc. a 9-hole pitch and putt course) and an apartment development in an existing convent structure. Given the limited scale and dispersed nature of these projects, along with the short duration of associated construction activities, the potential for overlapping impacts is minimal. Furthermore, when considered alongside the robust mitigation measures detailed throughout this report for the protection of the water environment, it is concluded that the proposed Projectacross its construction, operational, and decommissioning phases—will not contribute to any significant cumulative effects in combination with other ongoing or planned developments in the area.

7.8.5 Potential Cumulative Effects with Section 4 Discharges

There are no Section 4 licensed discharges to the Moyasta River, and as such, there is no potential for cumulative effects arising from the construction of the proposed wind farm and GCR. While there is an existing Section 4 discharge to the Tullagower River from Tullagower Quarries, the only aspect of the Project that drains to this river involves

limited works along the TDR. Given the minor and short-term nature of these works, combined with the application of established best practice mitigation measures aimed at protecting surface water quality, the potential for any significant cumulative effects in this context is considered negligible.

7.9 Summary of Significant Effects

The sources for potential adverse significant short-term environmental effects of the construction, operational and decommissioning phases have been identified as listed above in **Section 7.4.** These sources have the potential to lead to a decrease in local biodiversity of flora and fauna in the watercourses surveyed, especially with respect to sensitive species present in the absence of mitigation there is also a potential for morphological changes to natural watercourses associated with increased sedimentation however, total loss of natural watercourses is considered to be very unlikely. The proposed wind farm Project is likely to cause significant, adverse, short-term effects on the aquatic environment at the local scale in the absence of mitigation. However, with mitigation in place no significant effects on the aquatic ecology will occur as a result of the Project.

Additionally with mitigation measures, outlined in **Section 7.5** and **Chapter 9: Hydrology and Hydrogeology, Section 9.7**, in place along the turbine delivery route, significant effects on the watercourses to be crossed upstream of Doonbeg FPM sites are unlikely, this is also true for the water crossing on the Moyasta and its fish species and fisheries habitats. Any direct, in-direct, cumulative or in-combination effects to Natura 2000 sites within the ZOI, have been ruled out with the proposed mitigation in place, in the accompanying NIS.

7.10 Statement of Significance

In the absence of mitigation measures, appropriately designed, implemented and managed, there is deemed to be a potential for adverse significant short-term environmental effects from the Project, as listed above. However, it is considered that with the proposed mitigation (outlined in **Section 7.5** and the accompanying **Chapters 2** & **9** of the EIAR) successfully implemented, the proposed wind farm Project will result in an overall negligible residual effect (and therefore no likely significant effects) upon the aquatic ecological features that lie within the Zone of Influence for the duration of the construction, operational, and decommissioning phases.

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