FEHILY TIMONEY

DESIGNING AND DELIVERING A SUSTAINABLE FUTURE

# ENVIRONMENTAL IMPACT ASSESSMENT REPORT (EIAR) FOR THE PROPOSED SHANCLOON WIND FARM, CO. GALWAY

## Volume 2 - MAIN EIAR

## CHAPTER 12 - HYDROLOGY AND WATER QUALITY

**Prepared for:**

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# 12. HYDROLOGY AND WATER QUALITY

## 12.1 Introduction

This chapter examines the potential effects of the proposed Shancloon Wind Farm, associated grid connection and turbine delivery route on existing hydrological conditions, which may include changes to the surface water regime or water quality. Mitigation measures to reduce or eliminate effects on hydrology and water quality are prescribed as necessary. The assessment also considers the cumulative impacts associated with other nearby developments.

The assessment of potential for effect son groundwater and hydrogeology is addressed in Chapter 11 -Land, Soils, Geology and Hydrogeology.

A full description of the Proposed Development assessed in this EIAR is provided in Chapter 2 Development Description and comprises the following elements:

- The wind farm site (referred to in this EIAR as the 'Site') which includes the turbine array and associated civil and electrical infrastructure and the on-site 110 kV substation and loop-in connection to the existing Cashla-Dalton overhead line;
- The turbine delivery route (referred to in this EIAR as the 'TDR').

The general layouts of the Site and TDR are presented in Figures 2.2 and 2.3 in Volume IV.

This EIAR assesses wind turbine specifications with a hub height of 102.5 m to 105 m and a rotor diameter of 149.1 to 155 m with a tip height of 178 m to 180 m.

Specifics of the Proposed Development which relate to hydrology are described in Section 12.7.

This Chapter is supported by Figures 12.1 – 12.3 provided in Volume IV, and should be read in conjunction with the following:

- Appendix 12.1, Volume III – Hydrology Field Assessment Observations
- Appendix 12.2, Volume III - Surface Water Management Plan
- Appendix 12.3, Volume III – Flood Risk Assessment
- Drainage Planning Drawings (100 Series) accompanying the planning application

## 12.2 Statement of Authority

This chapter has been prepared by Brian Cronin of Fehily Timoney and Company.

Brian Cronin is a Senior Environmental Scientist with a BSc in Environmental Science from University College Cork and an MSc in Environmental Engineering from Trinity College Dublin. He is member of the Institution of Engineers of Ireland (MIEI). Brian has ten years of postgraduate experience, working in contaminated land and remediation consulting, and in Environmental Impact Assessment. He has experience working on various renewable energy projects preparing chapters of the EIAR for wind farms, specialising in various disciplines including hydrology and water quality.

Pablo Delgado, a Chartered Civil Engineer, has accumulated more than eight years of professional experience in the hydraulic engineering domain. His specific area of expertise lies in the planning, design, and construction of hydraulic infrastructure projects, where he closely collaborates with Clients and Contractors. Pablo's primary focus centres around producing practical and efficient designs while proactively addressing any challenges that may arise throughout the project's execution. He possesses extensive knowledge in hydraulic design, enabling him to develop industry-leading guidelines and exhibit a high level of proficiency in drainage design, standards, and tools. Additionally, Pablo has a successful track record of delivering drainage designs within diverse project environments such as Design and Build (D&B) and Public-Private Partnership (PPP), including contributions to hydrologic and hydraulic chapters for Environmental Impact Assessments (EIA). His project portfolio encompasses engagements in the United Kingdom, Ireland, and Spain.

Field surveys were carried out by Pablo Delgado, a Chartered Civil Engineer with Fehily Timoney..

The Flood Risk Assessment was completed by Micheal O'Flatharta (BSc MSc), Project Hydrologist with IE Consulting. Micheal has over seven year's experience the preparation of site-specific flood risk assessments and hydrological assessments to inform EIAR for large scale infrastructure developments, including wind farms. He has built 1d-2d hydraulic models of river systems in both Ireland and the UK using a variety of modelling software.

## 12.3 Limitations or Technical Difficulties

No limitations or technical difficulties were encountered in the preparation of this chapter of the EIAR.

## 12.4 Study Area

The Study Area for hydrology and water quality comprises catchments, sub-catchments and sub-basins within which the Proposed Development is located, along with their associated waterbodies (refer to Figure 12.1, Volume IV). The delineation of the catchments and their waterbodies is defined by the latest "Cycle 3 2022-2027" Water Framework Directive (WFD) (Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy) reporting and can be viewed via https://www.catchments.ie/ and https://gis.epa.ie/EPAMaps/Water and is summarised below in Table 12-1. The characteristics and associated hydrological features of the catchments within which the Site and TDR are located are addressed within this Chapter and are listed in Table 12-1.

**Table 12-1: WFD delineated waterbodies along the TDR and intersecting the Site**

| Proposed Development Element | Catchment | Sub-catchment | Sub-Basin |
|---|---|---|---|
| **Site**<br><br>**(including turbine array, 110kV on-site substation and loop-in)** | Corrib catchment (Hydrometric Area 30) | Black[Shrule]_SC_010 | BLACK (SHRULE)_010 |
| **Turbine Delivery Route** | Corrib catchment (Hydrometric Area 30) | Clare[Galway]_SC_020 | CLARE (GALWAY)_040<br><br>CLARE (GALWAY)_030 |
| | | Clare[Galway]_SC_030 | CLARE (GALWAY)_040<br><br>NANNY (TUAM)_030<br><br>CLARE (GALWAY)_030 |
| | | Clare[Galway]_SC_040 | CLARE (GALWAY)_060 |
| | | Clare[Galway]_SC_050 | ABBERT_040<br><br>CLARE (GALWAY)_070 |
| | | Clare[Galway]_SC_070 | CLARE (GALWAY)_100<br><br>CLARE (GALWAY)_090<br><br>CLARE (GALWAY)_080<br><br>CLARE (GALWAY)_070 |

## 12.5 Consultation

This EIAR chapter has been compiled having regard to the comments received from consultees throughout the EIA process, the relevant elements of which are summarised hereunder and presented in detail in Chapter 5 - Scoping and Consultation.

### 12.5.1 Office of Public Works (OPW)

The Office of Public Works advised by email on 22/05/2023 that if any new culverts or bridges (or modifications to any existing culverts or bridges) are required to cross watercourses as part of the Proposed Development, the Applicant should be aware that these require consent from the Commissioners of Public Works. This is a requirement of Section 50 of the Arterial Drainage Act of 1945 as amended.

The OPW further pointed out that, in the context of seeking consent under Section 50, the current required design standard for bridges or culverts is based on the flood with an annual exceedance probability of 1% (often referred to as the 100 year flood), increased by 20% to cater for the effects of Climate Change. Bridges or culverts are required to be able to convey this design flood without significantly altering the hydraulic characteristics of the watercourse.

For cable crossing(s) of watercourses, the OPW advised that if the cable and ducting are to be buried in the road, as they cross bridges over the water courses, and there is no interference with the opening in the bridge spanning the watercourse, then there is no issue. On the other hand, if it is proposed to pass the cable in its ducting through the opening of any bridge or culvert, this would be considered to be a modification of a bridge and it would require the consent of the Commissioner sunder Section 50 as mentioned above. Similarly, if it is proposed to carry the cable in its ducting across watercourses on new support structures spanning the watercourses, these should be treated as if they are bridges, and the consent of the commissioners under Section 50 should be obtained. If the cable and ducting is to be buried under the natural bed of the watercourses being crossed, Section 50 would not apply, and the OPW would recommend that the duct be buried a sufficient distance below the natural bed to allow for erosion and mobility of the stream bed.

The OPW recommended that a flood risk assessment be carried out with regard to the Proposed Development and its construction. This should consider all sources, pathways and receptors of flood risk. This should be carried out in accordance with the principles set out in the guideline document "The Planning System and Flood Risk Management" as published by the Minister for the Environment, Heritage and Local Government and the Office of Public Works.

In terms of the preparation of an EIA, the matters referred to above principally relate to the Hydrology Section, and the Risk of Flooding on a development such as this can impact on Landscape (e.g. landslides that have been reported in recent years), Infrastructure (roads and bridges) and people and their homes, among other things. The aim of the Section 50 process, and the Flood Risk Assessment which is recommended would be to mitigate any increased risk of flooding and the consequences of same, as arising from the proposed development.

The Proposed Development lands are located within the benefitting lands associated with the Corrib Headford Arterial Drainage Scheme. A site walkover of the proposed development lands with particular focus on arterial drainage channels was conducted on 11th November 2023, with representatives from the Applicant, Fehily Timoney and the OPW all present on site. The objective of the walkover was to discuss the Proposed Development relative to the baseline flood model prepared by IE Consulting and to discuss proposed watercourse crossings (culverts and bridge) and on-site drainage proposed as part of the Proposed Development. The requirement for Section 50 applications post development consent was noted along with the need for the crossings to accommodate flood flows plus climate change.

### 12.5.2 Uisce Éireann (UÉ)

UÉ advise that they do not have the capacity to advise on scoping of individual projects. However, they would like the following aspects of Water Services to be considered in the scope of an EIAR where relevant:

1. If development impacts an UÉ Drinking Water Source the applicant provide details in ensuring no negative impact to UÉ's Drinking Water Source during construction and operational phases of the development.
2. Where the development proposed the backfilling of materials, the applicant is required to include a waste sampling strategy to ensure the material is inert.
3. Mitigations should be proposed for any potential negative impacts on any water source(s) which may be in proximity and included in the environmental management plan and incident response.
4. Any and all potential impacts on the nearby reservoir as public water supply water source(s) are assessed, including any impact on hydrogeology and any groundwater/surface water interactions.

5. Impacts of the development on the capacity of water services (i.e. do existing water services have the capacity to cater for the new development). This is confirmed by Uisce Éireann in the form of a Confirmation of Feasibility (COF). If a development requires a connection to either a public water supply or sewage collection system, the developer is advised to submit a Pre-Connection Enquiry (PCE) enquiry to Uisce Éireann to determine the feasibility of connection to the Uisce Éireann network.
6. All pre-connection enquiry forms are available from

   https://www.water.ie/connections/connection-steps/.
7. The applicant shall identify any upgrading of water services infrastructure that would be required to accommodate the proposed development.
8. In relation to a development that would discharge trade effluent – any upstream treatment or attenuation of discharges required prior to discharging to an Uisce Éireann collection network.
9. In relation to the management of surface water; the potential impact of surface water discharges to combined sewer networks and potential measures to minimise and or / stop surface waters from combined sewers.
10. Any physical impact on Uisce Éireann assets – reservoir, drinking water source, treatment works, pipes, pumping stations, discharges outfalls etc. including any relocation of assets.
11. When considering a development proposal, the applicant is advised to determine the location of public water services assets, possible connection points from the applicant's site / lands to the public network and any drinking water abstraction catchments to ensure these are included and fully assessed in any pre-planning proposals. Details, where known, can be obtained by emailing an Ordnance Survey map identifying the proposed location of the applicant's intended development to datarequests@water.ie Other indicators or methodologies for identifying infrastructure located within the applicant's lands are the presence of registered wayleave agreements, visible manholes, vent stacks, valve chambers, marker posts etc. within the proposed site.
12. Any potential impacts on the assimilative capacity of receiving waters in relation to Uisce Éireann discharge outfalls including changes in dispersion /circulation characterises. Hydrological / hydrogeological pathways between the applicant's site and receiving waters should be identified within the report.
13. Any potential impact on the contributing catchment of water sources either in terms of water abstraction for the development (and resultant potential impact on the capacity of the source) or the potential of the development to influence / present a risk to the quality of the water abstracted by Uisce Éireann for public supply should be identified within the report.
14. Where a development proposes to connect to an Uisce Éireann network and that network either abstracts water from or discharges wastewater to a "protected"/ sensitive area, consideration as to whether the integrity of the site / conservation objectives of the site would be compromised should be identified within the report.
15. Mitigation measures in relation to any of the above ensuring a zero risk to any Uisce Éireann drinking water sources (Surface and Ground water).

### 12.5.3 Inland Fisheries Ireland

Inland Fisheries Ireland (IFI) - provided an EIA scoping consultation response in August 2023, noting that the site of the Proposed Development falls within the Lough Corrib catchment which supports salmonid species. IFI emphasised the need to ensure that the Proposed Development does not have an effect on water quality or on hydromorphology of the watercourses in the catchment and that natural flow paths on site are maintained. IFI recommended retention and maintenance of settlement ponds for the operational phase. IFI raised concerns about possible effects of soil instability on watercourses and recommended specialist geotechnical assessment. They also noted the need to manage and mitigate against impacts from peat and spoil management on site. IFI requested that the use of sedimentary rocks, such as shale, in road construction should be avoided. This type of material has poor tensile strength and is liable to be crushed by heavy vehicles thereby releasing fine sediment materials into the drainage system which are difficult to precipitate. IFI noted that clear-span bridges are the preferred option for all watercourse crossings. Instream works (and works adjacent to waters) should be confined to the open season which is from 1st July to 30th of September. The EIA should include proposals for monitoring all watercourses within the development.

### 12.5.4 Geological Survey Ireland (GSI)

The GSI had no specific comment or observations to make on the Proposed Development. They recommended using and provided information on GSI's Publicly Available data sets, when completing the EIAR.

### 12.5.5 Failte Ireland

Failte Ireland's response to the scoping report issued out to them included a copy of their non-statutory guidelines for the Treatment of Tourism in an Environmental Impact Assessments (EIA). The guidelines are for use by those conducting an EIA and compiling Environmental Impact Assessment Reports (EIAR).

Failte Ireland's guidelines have been considered throughout this chapter and the entire EIAR.

## 12.6 Methodology

### 12.6.1 Desk Study

The desk-based study assessed the surface water hydrology and water quality in the catchments relevant to the Project. The desk study involved an examination of the hydrological aspects and water quality aspects using the following sources of information (last accessed April 2025):

- Ordnance Survey Ireland mapping.
- Science and Stories about Integrated Catchment Management (https://www.catchments.ie/).
- OPW Indicative Flood Maps (https://www.floodinfo.ie/map/floodplans/).
- History of flooding and status of drainage in the vicinity of the Proposed Development (available at http://www.floodinfo.ie/map/floodmaps/).
- CFRAM flood extents mapping and National Indicative Fluvial Maps (NIFM) (https://data.gov.ie/organization/office-of-public-works).Geological Survey of Ireland (www.gsi.ie).
- Environmental Protection Agency river flow data (http://www.epa.ie/hydronet).
- Met Eireann Meteorological Database (available at https://www.met.ie).

### 12.6.2 Field Assessment

The field assessment of the existing hydrological environment was undertaken to both verify desk-based assessment, record all significant hydrological features and assess the proposed crossing points along water features. Site walkover surveys were carried out by FT Engineers 18th to 21st January 2022; and again on 25th and 26th June 2024. Key tasks undertaken included;

- Identification of existing hydrological features and recording of locations for same;
- Measurements of on-site hydrological features, such as channel width, bank height and depth of water;
- Review of existing surface drainage network on and off site; and
- A photographic record of the hydrological features observed.

The key observations of surface water features are presented in Appendix 12.1, Volume III.

### 12.6.3 Relevant Legislation and Guidance

#### *12.6.3.1 Relevant EU Directives and Legislation*

***The Water Framework Directive (2000/60/EC) (as amended)***

Directive 2000/60/EC (WFD - Water Framework Directive) of the European Parliament and Council established a framework for community action in the field of water policy. The WFD requires EU member states to aim to reach good chemical and ecological status in inland and coastal waters. The WFD established a strategic framework for managing the water environment and requires a River Basin Management Plan (RBMP) to be developed every six years.

The Third Cycle River Basin Management Plan 2022-2027 was published on 3rd September 2024. The overall aim of the RBMP is to ensure that our natural waters are sustainably managed and that freshwater resources are protected so as to maintain and improve Ireland's water environment.

The WFD has been transposed into Irish law following:

- European Communities (Water Policy) Regulations, 2003 (S.I. No. 722 of 2003).
- European Union (Water Policy) Regulations 2014 (S.I. No. 350 of 2014).
- European Communities Environmental Objectives (Surface Waters) Regulations, 2009 (as amended).
- European Communities Environmental Objectives (Groundwater) Regulations, 2012 (as amended).
- European Union (Good Agricultural Practice for Protection of Waters) Regulations 2022 (as amended). (S.I. No. 113 of 2022).
- European Communities (Technical Specifications for the Chemical Analysis and Monitoring of Water Status) Regulations, 2011 (S.I. No. 489 of 2011).
- The European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations, 2009 (S.I. No. 296 of 2009).
- European Union (Drinking Water) Regulations, 2023 (S.I. No. 99 of 2023).

Directive 2013/39/EU requires the identification of priority substances to set Environmental Quality Standards (EQSs) for the concentrations of the priority substances in surface waterbodies and to review periodically the list of priority substances.

The European Communities Environmental Objectives (Surface Water) Regulations 2009 as amended define the criteria and standards used for classifying surface waters in accordance with the WFD. There are five categories of surface water status: 'High', 'Good', 'Moderate', 'Poor' and 'Bad'. Additionally, the Regulations prescribe maximum allowable concentrations and annual average concentrations for priority substances used to define chemical status and required to support biological elements.

#### *12.6.3.2 Relevant Guidance*

The following guidelines were complied with in the development of this chapter to identify relevant objectives relating to hydrology and surface water quality:

- Guidelines on the information to be contained in Environmental Impact Assessment Reports, Environmental Protection Agency (EPA), May 2022;
- The Planning System and Flood Risk Management - Guidelines for Planning Authorities - Department of Environment, Heritage and Local Government (DoEHLG) and the Office of Public Works (OPW), November 2009
- Environmental good practice on site guide (fourth edition) (C741) - Construction Industry Research and Information Association (CIRIA), January 2015.
- Best Practice Guide BPGCS005 Oil Storage Guidelines (Enterprise Ireland)
- Guidelines for the Crossing of Watercourses During the Construction of National Road Schemes (National Roads Authority, 2005)
- Guidelines on Planning for Watercourses in the Urban Environment (Inland Fisheries Ireland, 2020)
- Guidelines on protection of fisheries during construction works in and adjacent to waters' to allow cable construction (Inland Fisheries Ireland, 2016)
- Good Practice During Wind Farm Construction (Scottish Natural Heritage 2019)
- The SuDS Manual (C753) - Construction Industry Research and Information Association (CIRIA), 2015
- Control of water pollution from linear construction projects (C648) – Construction Industry Research and Information Association (CIRIA), 2006;
- Control of water pollution from construction sites. Guidance for Consultants and Contractors (C532) - Construction Industry Research and Information Association (CIRIA), December 2001
- UK Guidance for Pollution Prevention (GPP):
- GPP2: Above ground oil storage tanks (Natural Resources Wales (NRW), Northern Ireland Environment Agency (NIEA), the Scottish Environment Protection Agency (SEPA), Energy Institute, Oil Care Campaign, June 2021)
- GPP4: Treatment and disposal of wastewater where there is no connection to the public foul sewer (NRW, NIEA, SEPA, November 2017)
- GPP5: Works and maintenance in or near water (NRW, NIEA, SEPA, January 2017)
- GPP8: Safe storage and disposal of used oil (NRW, NIEA, SEPA, July 2017)
- GPP21: Pollution Incident Response Plans (NRW, NIEA, SEPA, July 2017)
- GPP22: Dealing with Spills (NRW, NIEA, SEPA, October 2018)

- GPP26: Safe storage of Drums and intermediate Bulk Containers (IBCs), (NRW, NIEA, SEPA, February 2019)
- GE-INT-01203- Introduction to the NRA Design Manual for Roads and Bridges (Transport Infrastructure Ireland, December 2013)
- Coillte (2013): Forest Operations & Water Protection Guidelines.

#### *12.6.3.3 Objectives of the Galway County Development Plan 2022-2028 for Surface Water and Flooding*

The Galway County Development 2022 - 2028 sets out the strategy for the proper planning and sustainable development of the County over the plan period from 2022 to 2028. The Plan also contains development management standards, policies and objectives and references statutory guidelines which will inform decision making over the period of the Plan. In terms of surface water, the county development plan focuses on protecting, preserving, and conserving the county's water resources. This Chapter of the EIAR considers the objectives set out in the plan that relate to surface water and flooding. The key objectives are listed below:

- **WS 2 - Protection of Water Supplies** - Collaborate with Irish Water and the Group Water Federation Scheme to protect, conserve and enhance all existing and potential water resources in the County to ensure compliance with the European Union (Drinking Water) Regulations 2014 (as amended) and compliance of water supplies with the parameters identified in these Regulations.
- **WS 3 - River Basin Management Plan for Ireland 2018-2021 -** Support the implementation of the relevant recommendations and measures as outlined in the relevant River Basin Management Plan 2018-2021, and associated Programme of Measures, or any such plan that may supersede same during the lifetime of this plan.
- **WS 4 - Requirement to Liaise with Irish Water** – Water Supply Ensure that new developments are adequately serviced with a suitable quantity and quality of drinking water supply and require that all new developments intending to connect to a public water supply liaise with Irish Water with regard to the water (and wastewater) infrastructure required.
- **WS 6 - Water Framework Directive** - Support the preparation of Drinking Water Safety Plans and Source Protection Plans to protect sources of public water supply, in accordance with the requirements of the Water Framework Directive.
- **WS 7 - Water Quality -** Require that new development proposals would ensure that there would not be an unacceptable impact on water quality and quantity including surface water, ground water, designated source protection areas, river corridors and associated wetlands.
- **CWS 1 - Water Conservation with all Developments -** To ensure all developments incorporate water conservation measures such as rainwater harvesting to minimise wastage of water supply.
- **WW 7 - Sustainable Drainage Systems** - To require the use of Sustainable Drainage Systems to minimise and limit the extent of hard surfacing and paving and require the use of SuDS measures be incorporated in all new development (including extensions to existing developments). All development proposals shall be accompanied by a comprehensive SuDS assessment including run-off quantity, run off quality and impacts on habitat and water quality.
- **WW10 - Surface Water Drainage** - To require all new developments to provide a separate foul and surface water drainage system and to incorporate sustainable urban drainage systems where appropriate in new development and the public realm.
- **WM5 - Construction and Environmental Management Plans** - Construction Environment Management Plans shall be prepared…should typically provide details including:
    - Containment of all construction-related fuel and oil within specially constructed bunds to ensure that fuel spillages are fully contained (such bunds shall be roofed to exclude rainwater).

- A water and sediment management plan, providing for means to ensure that surface water runoff is controlled such that no silt or other pollutants enter local water courses or drains.

- **WR 1 - Water Resources -** Protect the water resources in the plan area, including rivers, streams, lakes, wetlands, springs, turloughs, surface water and groundwater quality, as well as surface waters, aquatic and wetland habitats and freshwater and water dependant species in accordance with the requirements and guidance in the EU Water Framework Directive 2000 (2000/60/EC), the European Union (Water Policy) Regulations 2003 (as amended), the River Basin District Management Plan 2018 – 2021 and other relevant EU Directives, including associated national legislation and policy guidance (including any superseding versions of same) and also have regard to the Freshwater Pearl Mussel Sub-Basin Management Plans.
- **WR 2 - River Basin Management Plans -** It is a policy objective of the Planning Authority to implement the programme of measures developed by the River Basin District Projects under the Water Framework Directive in relation to: Surface and groundwater interaction, Dangerous substances, Hydromorphology, Forestry, On site wastewater treatment systems, Municipal and industrial discharges, Urban pressures, Abstractions.
- **FL 2 - Flood Risk Management and Assessment -** Comply with the requirements of the DoEHLG/OPW The Planning System and Flood Risk Management Guidelines for Planning Authorities and its accompanying Technical Appendices Document 2009 (including any updated/superseding documents). To include:
  - Avoid, reduce and/or mitigate, as appropriate in accordance with the Guidelines.
  - Development proposals in areas where there is an identified or potential risk of flooding or that could give rise to a risk of flooding elsewhere will be required to carry out a Site-Specific Flood Risk Assessment, and justification test where appropriate, in accordance with the provisions of The Planning System and Flood Risk Management Guidelines 2009 (or any superseding document); Any flood risk assessment should include an assessment of the potential impacts of climate change, such as an increase in the extent or probability of flooding, and any associated measures necessary to address these impacts.
  - Development that would be subject to an inappropriate risk of flooding or that would cause or exacerbate such a risk at other locations shall not normally be permitted.
- **FL 3 - Principles of the Flood Risk Management Guidelines** - The Planning Authority shall implement the key principles of flood risk management set out in the Flood Risk Management Guidelines as follows:
  - Avoid development that will be at risk of flooding or that will increase the flooding risk elsewhere, where possible.
  - Substitute less vulnerable uses, where avoidance is not possible.
  - Mitigate and manage the risk, where avoidance and substitution are not possible. Development should only be permitted in areas at risk of flooding when there are no alternative, reasonable sites available in areas at lower risk that also meet the objectives of proper planning and sustainable development. Vulnerable development in areas which have the highest flood risk should be avoided and/or only considered in exceptional circumstances (through a prescribed Justification Test) if adequate land or sites are not available in areas which have lower flood risk.

- **FL 6 - Surface Water Drainage and Sustainable Drainage Systems (SuDs) -** Maintain and enhance, as appropriate, the existing surface water drainage system in the County. Ensure that new developments are adequately serviced with surface water drainage infrastructure and promote the use of Sustainable Drainage Systems in all new developments. Surface water run-off from development sites will be limited to predevelopment levels and planning applications for new developments will be required to provide details of surface water drainage and sustainable drainage systems proposals.
- **FL 7 - Protection of Waterbodies and Watercourses** - Protect waterbodies and watercourses within the County from inappropriate development, including rivers, streams, associated undeveloped riparian strips, wetlands and natural floodplains. This will include protection buffers in riverine, wetland and coastal areas as appropriate.
- **FL 11 - FRA and Environmental Impact Assessment (EIA) -** Flood risk may constitute a significant environmental effect of a development proposal that in certain circumstances may trigger a sub-threshold EIA. FRA should therefore be an integral part of any EIA undertaken for projects within the County.
- **FL17 - Consultation with OPW -** Consult with the OPW in relation to proposed developments in the vicinity of drainage channels and rivers for which the OPW are responsible and retain a strip on either side of such channels where required, to facilitate maintenance access thereto. In addition, promote the sustainable management and uses of water bodies and avoid culverting or realignment of these features.
- **FL 18 Inappropriate Development on Flood Zones** Where a development/land use is proposed within any area subject to this objective the development proposal will need to be accompanied by a detailed hydrological assessment and robust SUDS design which demonstrates the capacity to withstand potential flood events to maintain water quality and avoid potential effects to ecological features.
    - Any development proposals should be considered with caution and will be required to comply with The Planning System and Flood Risk Management Guidelines for Planning Authorities/Circular PL2/2014 & the associated Development Management Justification Test.
    - Climate Change should be duly considered in any development proposal.
    - Protect the riparian zones of watercourse systems throughout the plan area through a general 10 metre protection buffer from rivers within the plan area as measured from the near riverbank, (this distance may be increased and decreased on a site by site basis, as appropriate).
    - Any development proposals submitted for this site will require a detailed ecological report (s), carried out by suitably qualified personnel for the purposes of informing Appropriate Assessment Screening by Galway County Council, the competent authority.
    - The relevant lands will be outlined and flagged with a symbol on the land use zoning map and on the GIS system of Galway County Council so that staff and the public are aware of the special conditions/constraints attached.
    - A briefing will be provided to relevant staff within Galway County Council on the special conditions and constraints on relevant lands.

The layout, design and construction methodology for the Proposed Development has taken account of these objectives, while ensuring compliance with the applicable legislation. Evaluation Criteria

The significance of likely effects has been assessed in accordance with the Environmental Protection Agency (2022) Guidelines through comparison of the character of the predicted effect to the sensitivity of the receiving environment, as per **Image 12-1**.

Categories for defining the sensitivity of the receiving environment are set out in Table 12-2.

The sensitivity of a hydrological receptor is based on its vulnerability to be impacted/altered by the development, i.e. the ability of the receptor to absorb development without perceptible change.

**Table 12-2: Criteria for Determining Receptor Sensitivity**

| Sensitivity | Criteria | Typical Examples | |
|---|---|---|---|
| | | Surface Water | Hydro-ecological receptors |
| High | Receptor has a high quality and rarity on a local scale and limited potential for substitution. Receptor is generally vulnerable to impacts that may arise from the project and recoverability is slow and/or costly. | Surface water providing a regionally important drinking water resource.<br>Surface water with high WFD status objective / Blue Dot catchments.<br>Waterbodies identified as nutrient sensitive areas / waterbodies under WFD RBMP Cycle 3. | Protected under EU or Irish habitat legislation (e.g., Special Area of Conservation (SAC) or Natural Heritage Area (NHA)).<br>Designated Salmonid / Cyprinid Waters.<br>Nationally and internationally designated sites where hydrology/hydrogeology is a key factor in designation (e.g. SAC / NHA/ Special Protection Areas (SPA) sites)/ freshwater pearl mussel designated waterbodies and their associated catchments. |
| Medium | Receptor has a medium quality and rarity, local scale and limited potential for substitution/replacement or receptor with a low quality and rarity, regional or national scale and limited potential for substitution. Receptor is somewhat vulnerable to impacts that may arise from the project and/or has moderate to high recoverability. | Watercourses with designate features such as Environmental or ecological significance, Cultural or historical value, recreational purposes and Water supply or drinking water sources. Large lakes with an extension of 50ha or more and non-potable reservoirs. | Statutory designated sites where hydrology/hydrogeology is a key factor in designation (e.g. National Nature Reserves (NNR), Local Nature Reserves (LNR)). |
| Low | Receptor with a low quality and rarity, local scale and limited potential for substitution. Receptor is not generally vulnerable to impacts that may arise from the project and/or has high recoverability. | Watercourse with no designated features.<br>Non-sensitive water resources (non WFD classified e.g. small lakes, ponds, land drain).<br>Man-made feature not in hydraulic continuity (e.g. canal). | |

| Sensitivity | Criteria | Typical Examples | |
|---|---|---|---|
| | | Surface Water | Hydro-ecological receptors |
| Negligible | Attribute has a very low environmental importance and/or rarity on local scale.<br>Receptor is of negligible value, not vulnerable to impacts that may arise from the project and/or has high recoverability. | Man-made feature with no ecological importance (e.g. farm land drainage ditches). | |
| Note | Professional judgement based on the baseline condition of the receptor should be used to determine a receptor's sensitivity. | | |

The surface hydrological environment of the Proposed Development and its downstream catchments are considered to be of high sensitivity given that the site is hydrologically connected with the Lough Corrib SAC by the Black River. The SAC is approximately 1 km downstream from the site boundary. The Qualifying Interests for the SAC include salmon (highlighted by the IFI during scoping consultations) as well as eight other protected species and fifteen protected habitats. Information on the potential impacts on Biodiversity in the SAC can be found in Chapter 9 Biodiversity.

The scale of effect is determined in relation to the sensitivity of the receptor and the potential magnitude of change from baseline conditions, **Image** 12-1, presents how comparison of the magnitude of the predicted impact to the sensitivity of the receiving environment can determine the significance of the impact. Sensitivity of the receiving environment can be 'high', 'medium', 'low' or 'negligible'. Description of impact is defined by its character, magnitude, duration, probability and consequences (pre-mitigation). The magnitude of impact can be 'high', 'medium', 'low' or 'negligible'.

The conventional source-pathway-target model is applied to assess potential effects on environmental receptors resulting from the Proposed Development. The source being the activity that results in the potential effect or the potential source of pollution is described. The pathway being the route by which a potential source of effect can transfer or migrate. The receptor being a part of the natural environment that could potentially be affected, having regard to its sensitivity.

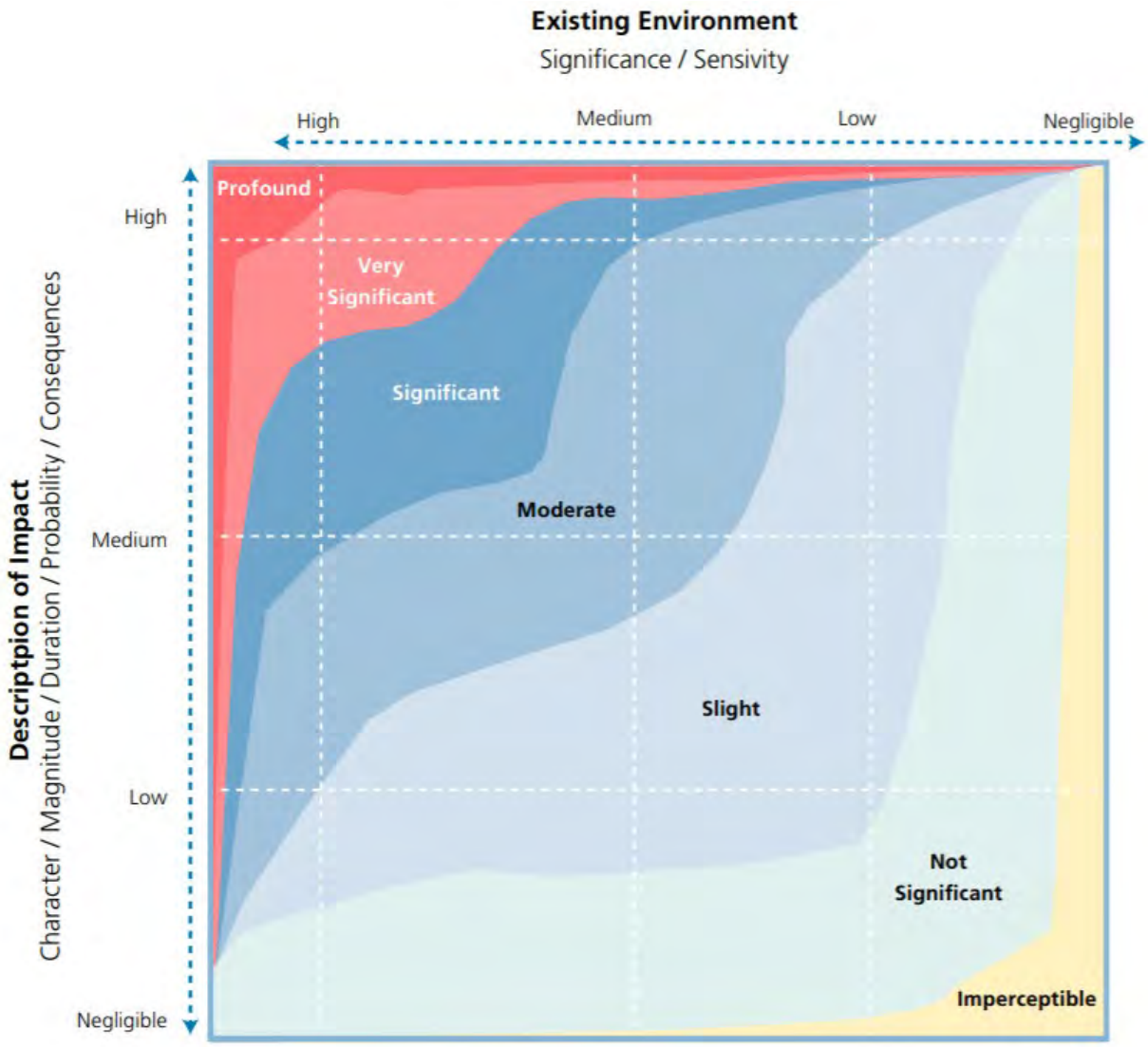


**Image 12-1: Classifications of the Significance of Impacts**

### *12.6.3.4 Assessment of Cumulative Impacts*

The assessment of cumulative effects on the water environment considers the combined potential effects of other developments (existing, approved but not yet built or operational, or proposed), with the potential to affect the water environment, within the same catchment(s) as the Proposed Development, as discussed further in Section 12.10.5.

## 12.7 Project Description

12.7.1 A full description of the Proposed Development assessed in this EIAR is provided in Chapter 2 Development. Elements of the Project pertaining to water quality and hydrology are discussed hereunder. Project Design and Flood Risk

A Flood Risk Assessment (FRA) has been carried out for the Project (see Appendix 12.3, Volume III) and is summarised in Section 12.9. The FRA was informed by a detailed Digital Terrain Model (DTM) for the site and a 1D-2D hydraulic model developed with flood extents and levels predicted for the Project site. The location of proposed turbines T01, T02, T03, T04, T05, T06, T08, T09, T10 and T11 and the substation and loop-in do not fall within a delineated predictive fluvial Flood Zone 'A' or Flood Zone 'B'.

The location of proposed turbine T07 falls within a delineated predictive fluvial Flood Zone 'A' and Flood Zone 'B'. However, no vulnerable components of the turbine will be located at ground level and will be constructed to a minimum level of 31.3m OD, which is 0.3m above the 0.1% AEP (1 in 1000 Year) fluvial flood level.

12.7.2 Drainage Design

Sustainable Drainage System measures have been incorporated into the design. Storm/surface water management and run-off design is in accordance with Sustainable Urban Drainage Systems (SuDS) standards. Surface water drainage features will be installed as part of the construction phase and retained until such time as the Project is decommissioned. Further details of proposed site drainage is included in Appendix 12.2 – Surface Water Management Plan, in Volume III of this EIAR and in the 100 series Planning Drawings.

The drainage strategy within internal areas of the Site will incorporate three main components of Sustainable Drainage Systems (SuDS):

- Interceptor drains;
- Swales; and
- Settlement Ponds

A conceptual plan of the proposed drainage regime is included as Image 12-2 below.

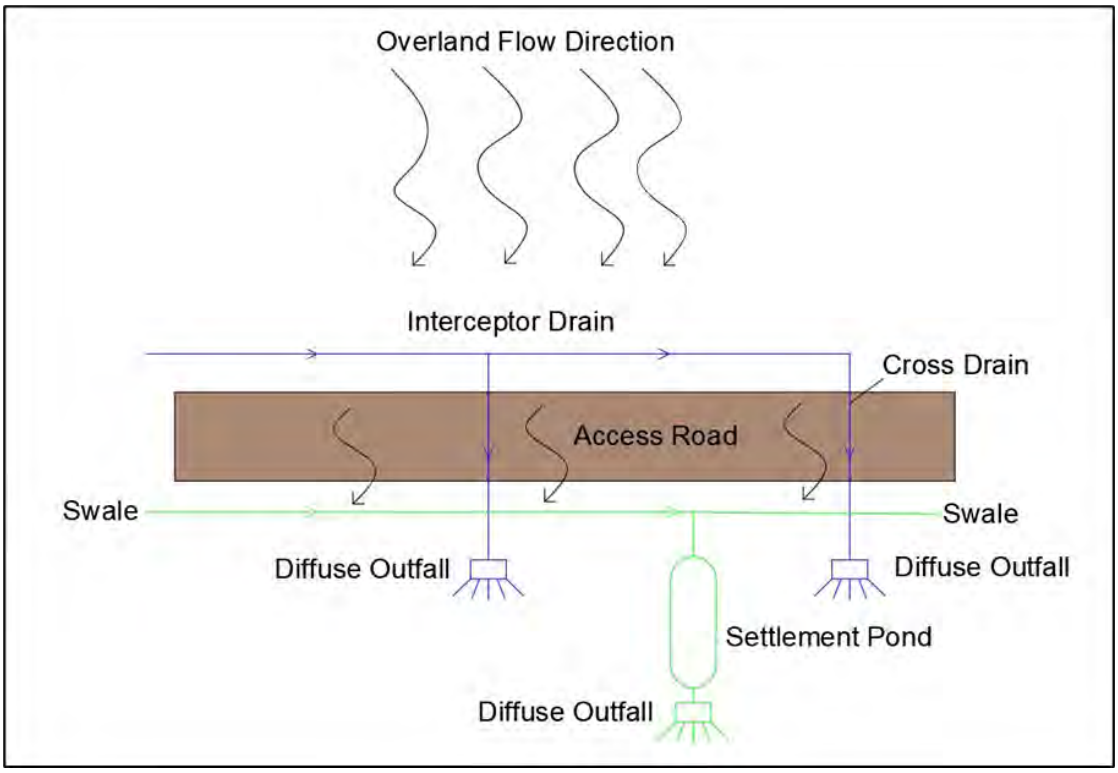


**Image 12-2: Drainage Design Principles**

### *Existing Undeveloped Areas*

Interceptor drains will be constructed upslope of areas of hardstanding and new sections of access track. These will intercept overland flows from areas of undeveloped land, preventing mixing with runoff from access tracks and hard surfaces. These channels will direct flows around areas of hardstanding and across access tracks via cross drains at appropriate intervals. Flows will then be discharged diffusely across vegetated areas to minimise erosion and encourage evapotranspiration and infiltration to ground as per the existing drainage regime at the Site. Interceptor drains will be installed as part of the construction phase, in advance of earthworks, road and hardstand construction.

Where interceptor drains have a gradient of greater than 2%, crushed rock 'check dam' structures will be installed at appropriate intervals to reduce the velocity of the flows and prevent erosion.

### *Existing Tracks*

Existing access tracks are drained by adjacent drainage ditches and swales. These drainage features will be retained and upgraded to the same standard as the proposed drainage design. Where existing tracks are widened, existing drainage will be realigned or replaced. The replacement sections of drain will have a similar gradient and width as existing channels to ensure the flow rate and capacity of the existing channel is retained and adequate for the contributing area.

All track widening will be undertaken using clean, uncrushable aggregate to allow for some dispersal of surface water runoff via infiltration and, therefore, reduce the rate of surface water runoff generated.

### *New Site Access Tracks and Hard Surfaces*

The proposed internal access tracks (whether floated or not floated) will be constructed using unbound aggregate materials which will allow a portion of surface water runoff to disperse via infiltration.

Swales will be installed adjacent to new access tracks and areas of hardstanding. These swales will be 0.5 m in depth with 1 in 1 side slopes. Swales will be installed downslope of access tracks and hardstanding areas where coincident with the topography and will provide some attenuation for the surface water runoff during storm events.

Geotextile silt traps will be installed across the swales during the construction phase to prevent the ingress of silt and will remain in place until the vegetation has been established (refer to the Surface Water Management Plan for further details).

Where swales are constructed on slopes of greater than 2%, check dams will be installed at appropriate intervals to reduce flow velocities (refer to the Surface Water Management Plan for further details). By reducing flow rates, the check dams can also provide upstream storage within the swale allowing some dispersal via infiltration close to source rather than conveying all flows to a single larger downstream drainage feature, in accordance with the principles of SuDS.

Settlement ponds will be installed as construction progresses, and will be designed in accordance with the principles of CIRIA C648 (Control of water pollution from linear construction projects) and Stoke' law approach to ensure retention of the runoff and settlement of the particles to prevent sediment pollution to the receiving waterbodies. Ponds will be less than 1.5m deep with 1 in 3 side slopes. Runoff from access tracks and hardstands to the proposed swale networks will be discharged to these ponds and will be temporarily retained to allow for the settlement of sediment and suspended solids. During the construction phase, standing water from excavations will be pumped to settlement ponds and there will be no direct discharge to the existing drainage network prior to settlement.

Settlement ponds will not discharge directly to watercourses. Settled water will be discharged diffusely via an outfall to disperse via overland flow or into natural drainage features as per the existing regime. Discharge will be restricted to a rate at or below the existing greenfield runoff rate during storm events, and the ponds will be sized to accommodate flows for all storm events up to and including the 1 in 100 year event plus 20% for climate change.

The settlement ponds will also contain surface water runoff in the event of a spill or leak, and the outflow can be closed off to retain any potential pollutants within the settlement ponds prior to any necessary treatment. Regular inspection and maintenance will be carried out to ensure the proper functioning of the settlement ponds and check dams (and timely identification of potential corrective maintenance needs). Ciria C753 SuDS manual will be adhered to, which provides guidance on the routine maintenance and inspections requirements for settlement ponds and check dams.

### *Drainage of Temporary Site Compounds*

The proposed construction compounds will be drained in a similar manner as the access tracks and hardstands, with surface water runoff from undeveloped areas intercepted and dispersed naturally, and surface water runoff from areas of hardstanding intercepted by swales and conveyed to settlement ponds. Surface water runoff from the compound area will be directed through a Class 1 Full Retention Separator Oil Interceptor (sized relative to area served) before discharge to the surface water drainage network.

There will be no discharge of foul flows from welfare units, with water retained in holding tanks and removed from site by a contractor.

### *Drainage of Substation*

The substation will be drained via an underground piped surface water drainage network. The network will also utilise linear drainage channels and filter drains.

The network will discharge overland via a Class 1 Full Retention Oil Separator at a restricted greenfield rate. Attenuation for flows exceeding this rate will be provided within an underground tank.

In accordance with SuDS best practice, a rainwater harvesting tank will be included. Rainwater will be filtered and stored within the underground tank for reuse.

There will also be no discharge of foul flows from welfare units within the substation, with water stored in tanks and removed from site by a contractor.

### 12.7.3 Watercourse Crossings

Regulation 50 of the European Communities (Assessment and Management of Flood Risks) Regulations 2010 SI 122 of 2010 requires that: "No Person, including a body corporate, will construct any new bridge or alter, reconstruct, or restore any existing bridge over any watercourse without the Consent of the Commissioners or otherwise than in accordance with plans previously approved of by the Commissioners."

The word "bridge" as defined in said Regulations includes a culvert or other like structure. The word "watercourse" as defined in said Regulations includes rivers, streams, and other natural watercourses, and also canals, drains, and other artificial watercourses.

The OPW is responsible for the implementation of the regulations and consent to construct any bridge will be sought from the OPW via their application process.

All watercourse crossings required for the Proposed Development will be subject to the requirements of Regulation 50. Prior to the commencement of any works on watercourse crossings, the developer will apply to the OPW for a consent under Regulation 50 for the watercourse crossing works as described in more detail in section 12.7.3.1 below

#### *12.7.3.1 Watercourse Crossings - Site Access Tracks*

One existing bridge crossing of the BLACK (SHRULE)_010 river (EU waterbody section code: IE_WE_30B020200) will be incorporated into the internal Site access. This bridge was constructed as part of the Corrib Headford arterial drainage scheme in the 1960's (structure ref. 9664 B2 on channel C4/13). Fehily Timoney and Company conducted a visual structural inspection of the bridge in January 2024 and determined that the bridge is in good condition overall and suitable for turbine delivery (See Appendix 2.5 – Bridge Inspection report, Volume III).

In addition to the existing bridge crossing, there will be a new single-span bridge (WC01) and 14 nr. piped culvert crossings (required for watercourse / drain crossing of the site access tracks. In addition to Regulation 50 requirements, the river crossings will be designed in accordance with Inland Fisheries Ireland (IFI) requirements for salmonid watercourses as included in their 2016 'Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters' and TII 2008 'Guidelines for the Crossing of Watercourses During the Construction of Road Schemes'.

Two watercourse crossings (bridge crossing WC01, and dual piped culvert CV14) are located on rivers (mapped as Rivers by the EPA as part of the Water Framework Directive Reporting), the remaining watercourse crossings are of land drains, involving the replacement of existing culverts or construction of new culvert crossings. The locations of watercourse crossings are shown on the 100 series Planning Drawings submitted as part of the planning application.

A cross section of the single-span bridge is shown in Planning Drawing P20-306-0300-0018. The soffit level of the bridge will provide a minimum freeboard of 300mm to allow a fluvial flood level of 1-in-100 years (+20%). The crossing will also be sized to convey the flow from 1 in 100 year (+20%) flood event unobstructed.

Piped culverts will be used at all other crossings. These will also be sized to accommodate the 1-in-100 year (+20%) flood flow.

Construction methodologies for the single-span bridge and piped culverts are provided in Chapter 2 - Development Description and in the Surface Water Management Plan.

With suitably sized culvert crossings, and a suitably-designed bridge, there will be no impact on flows within watercourses and the risk of flooding will not be increased as a result of the Proposed Development. This is detailed further in Sections 12.9 to 12.13 below.

#### *12.7.3.2 Sheet Piled Site Access Track on Cloonbar Bog Parallelling the Black(Shrule) River*

The Proposed Development includes the construction of a piled and floated road along the periphery of Cloonbar Bog. The floated road within Cloonbar Bog will be supported by a double row of sheet piles in order to ensure suitable ground stability and bearing capacity given that the road will be constructed parallel to the Black (Shrule) River (OPW arterial drainage channel reference CH4/13/7). The sheet piled road will not have an effect on the existing hydromorphology of the Black (Shrule) river at this location given that the channel is extensively channelised and straightened at this location.

The design also gives the option of either allowing or preventing the flow of shallow groundwater from the adjacent bog through the structure between the peatland to the west of the floating road and the Black River. As such the prevailing hydrogeological connectivity between the bog and the Black(Shrule) river can be accommodated through the design. (It is noted however that there is significant drying out of the bog adjacent to the river, which can be reduced through a design that inhibits hydrological movement of water from the bog into the river).

Further details on the construction methodologies for the sheet piled floated road are provided in Chapter 2-Development Description.

#### *12.7.3.3 Turbine Foundaions*

Piled turbine foundations will be used across the Site. The piled turbine foundations will be constructed using standard reinforced concrete construction techniques. Between 14 and 16 piles will be used at each piled turbine foundation. Concrete volumes required for piled foundations averages as 733 $m^3$ per foundation, which has been rounded up to 800 $m^3$ for the purpose of this impact assessment.

Gravity foundations will be used where confirmatory investigations show that suitable founding strata are located at shallow depths above the water table (or where ground water can be comfortably controlled by conventional pumping). Gravity foundation will comprise a reinforced concrete base designed to distribute the loads to the ground directly. Foundation bases will consist of circular concrete base which will be 24 m in diameter and 5 m in depth with a central circular raised plinth which will be used to anchor the turbine tower at its base. Concrete (nominally 800 m3 per foundation) would typically be in two pours, the first pour being the main base, which is approximately 90% of the foundation; the second and remaining 10% forming the plinth section which sits on the top of the main base.

Further details on the construction methodologies for turbine foundations are provided in Chapter 2-Development Description.

#### *12.7.3.4 River Crossing for 33 kV Cable Circuit*

Horizontal Direction Drilling (HDD) will be employed to pass the 33 kV cable circuits under the riverbed of the Togher River (see Figure 2.2, Volume IV for HDD location and Planning Drawing 051021-DR-308 for HDD crossing detail).

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

A competent specialist HDD contractor will be appointed for the proposed works. The HDD Contractor will conduct the drilling works in a safe and controlled manner with due regard for site constraints including environmental issues. The Contractor will be required to ensure that their proposed works do not adversely affect, existing services / utilities, groundwater / aquifers. The HDD drilling methodology is set out in detail in Chapter 2 – Development Description.

#### *12.7.3.5 River Crossing - TDR*

The turbine delivery route includes the need to traverse several existing watercourse crossings along the road network. However, no accommodation works are required at these watercourse crossing locations (I.e. the existing road crossing is adequate), which are as follows:

- Abbert River (ABBERT_040) on an M17 bridge crossing
- Grange River (CLARE[GALWAY]_060) on an M17 bridge crossing
- The unnamed stream with EPA river waterbody code IE_WE_30C010800, segment code 30_2639, on an M17 culvert crossing
- The Killeelaun River (CLARE[GALWAY]_060) on an M17 culvert crossing
- The River Nanny (NANNY[TUAM]_030) on an M17 bridge crossing
- The Clare River (CLARE[GALWAY]_030) on an R332 bridge crossing
- The Airgloony River (CLARE[GALWAY]_040) on an R332 culvert crossing
- The unnamed stream with EPA river waterbody code IE_WE_30B020200, segment code 30_2500, on an R332 culvert crossing

One temporary drain crossing will be required to facilitate turbine delivery (accommodation works ref. PoI16).

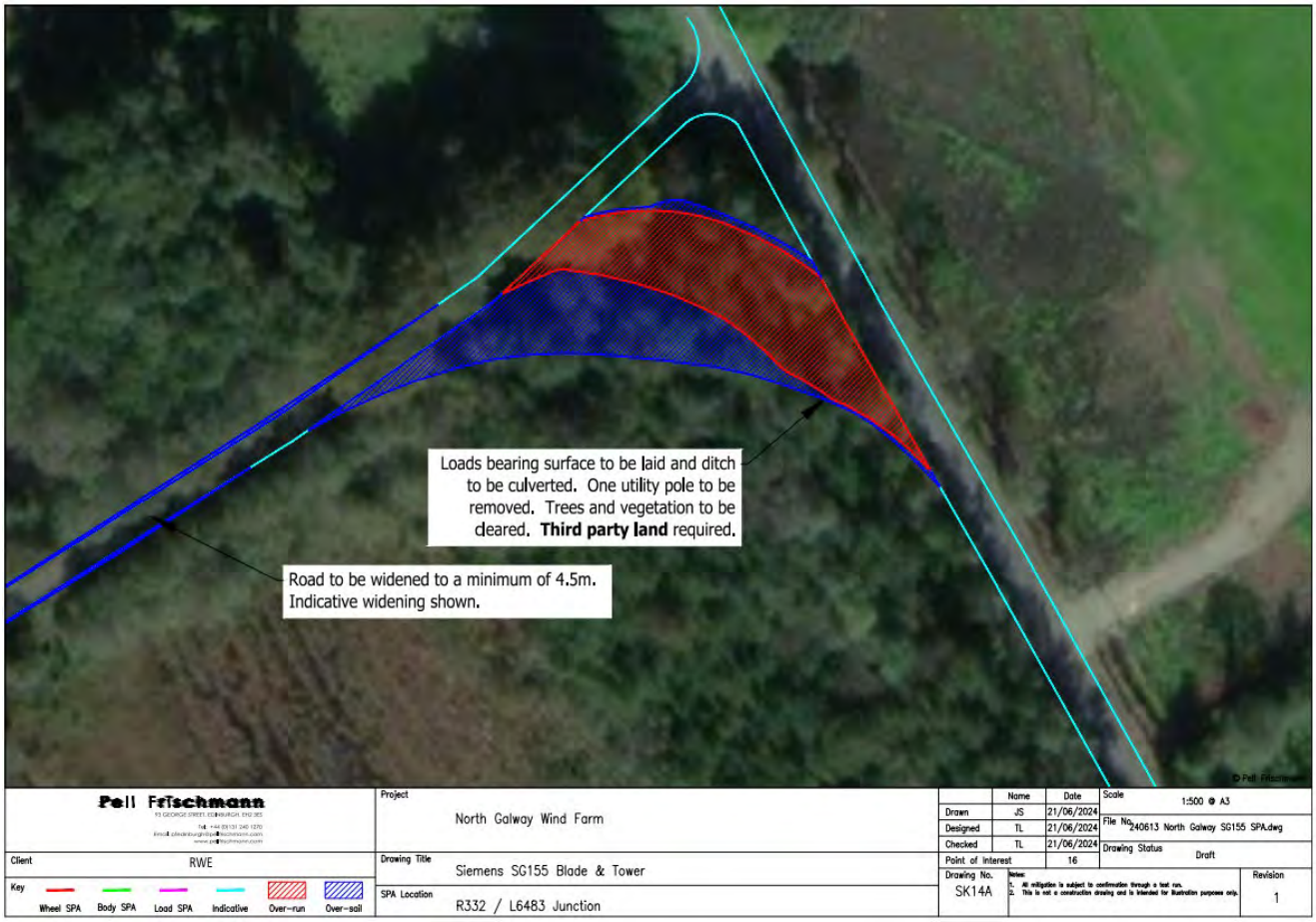


**Image 12-3: PoI 16 - Extract from Abnormal Indivisible Load Route Survey (Pell Frischmann, June 2024)**

## 12.8 Existing Environment

### 12.8.1 Description of the Waterbody Catchments

This section describes the waterbody catchment characteristics of the Site and the TDR.

Within the region, the surface water drainage and hydrology are delineated into three levels of hierarchy under the WFD: catchment, sub-catchment and sub-basin. Table 12-3 summarises the hydrology within the Site.

The Site is located within one waterbody catchment: the Corrib catchment (Hydrometric Area 30). The Site is highly channelised, characterised by an extensive network of field drains, ditches and first-order streams which have been straightened and deepened in places through land management practices, including through arterial drainage. Site topography is relatively flat, resulting in generally smooth, laminar flow. There are no naturally occurring lakes or reservoirs within the Site. There are heavily modified surface waterbodies within the Site.

Tailte Éireann land cover mapping identifies the following land cover types within the Site: bare peat and cutover bog, wet grassland, improved (agricultural) grassland, broadleaf forest, artificial surfaces (tracks), rivers and streams, scrub, transitional forest, raised bog, hedgerows and treelines. Agricultural grassland and wet grassland dominate the Site. Of particular note in the context of hydrology is the extent of cutover bog at the Site, which is characterised by an extensive network of field drains. Much of the study area has been channelised, with the BLACK(SHRULE)_010 identified as channel CH4/13 under the OPW's arterial drainage scheme.

The Site is located within the Black[SHRULE]_010 sub-basin. The Site drains to the Togher River and its tributaries, which generally drain in a westerly direction. The Togher River drains into the Black River at the western extent of the Site. The Black River in turn drains in a south-westerly direction, until its terminus at Lough Corrib, approximately 10 km southwest of the Site boundary.

All of the wind turbines (turbine foundation and hardstanding) are located a minimum of 50 m away from all watercourses. There are three temporary construction compounds proposed for the Proposed Development. The main temporary construction compound is to be located in the northeast of the Site, at the Site access and will be located approximately 100 m east of an unnamed stream, with EPA River Waterbody Code IE_WE_30B020200 and Segment Code 30_3579, which is a tributary of the Togher River. The second temporary construction compound is located towards the southwest of the site between turbines T1, T3 and T4; approximately 380 m west of the Togher River. The temporary compound for the substation is to be located approximately 370 m south of the Togher River.

As described in Section 12.7.3.2, the 33 kV cable circuit crosses the Togher River, approximately 250 m upstream of the confluence with the Black River. The TDR crosses several rivers and streams as detailed above in 12.7.3.3.

**Table 12-3: WFD delineated waterbodies – Site (Wind Farm and Grid Connection)**

| Catchment | Sub-catchment | Sub-Basin |
|---|---|---|
| Corrib Catchment (Hydrometric Area 30) | Black[Shrule]_SC_010 | BLACK(SHRULE)_010 |

**Table 12-4: WFD delineated waterbodies - TDR**

| Catchment | Sub-catchment | Sub-Basin |
|---|---|---|
| Galway Bay South East Catchment (Hydrometric Area 29) | CARROWMONEASH[Oranmore]_SC_010 | CARROWMONEASH (Oranmore)_010 |
| Corrib catchment (Hydrometric Area 30) | Clare[Galway]_SC_020 | CLARE (GALWAY)_040<br>CLARE (GALWAY)_030 |
| | Clare[Galway]_SC_030 | CLARE (GALWAY)_040<br>NANNY (TUAM)_030<br>CLARE (GALWAY)_030 |
| | Clare[Galway]_SC_040 | CLARE (GALWAY)_060 |
| | Clare[Galway]_SC_050 | ABBERT_040<br>CLARE (GALWAY)_070 |
| | Clare[Galway]_SC_070 | CLARE (GALWAY)_100<br>CLARE (GALWAY)_090<br>CLARE (GALWAY)_080<br>CLARE (GALWAY)_070 |
| | Black[Shrule]_SC_010 | BLACK (SHRULE)_010 |

The Inland Fisheries Ireland (IFI) in their National Barrier Programme has not identified any potential barriers to fish passage within the Site.

### 12.8.2 Existing Land Drainage

As stated in Chapter 2 - Development Description, the proposed wind farm Site has several manmade drains throughout with runoff dispersing via a combination of infiltration, evapotranspiration and overland flow. Watercourses within the Site are modified and channelised and there are many extensive deeply cut land drains.

Arterial Drainage

The OPW has carried out several arterial drainage schemes on catchments in Ireland under the Arterial Drainage Act, 1945 to improve land for agriculture and to mitigate flooding. The Proposed Development is located within the OPW's Corrib-Headford arterial drainage scheme. The arterial drainage channels associated with the scheme relevant to the Site are shown in Figure 2.2, Volume IV. Ongoing arterial drainage maintenance measures (typically on a cycle of four to six years) carried out by or on behalf of the OPW under the arterial drainage scheme (see Ryan Hanley 2020[2] for details) includes:

- Silt and vegetation management
- Aquatic vegetation cutting
- Bank protection
- Bush cutting/Branch trimming
- Tree cutting
- Mulching embankment
- Mowing embankment
- Gate installation
- Sluice maintenance
- Bridge maintenance
- Spraying with herbicide

The Proposed Development includes proposals for several culvert crossings and one bridge crossing of arterial drainage channels (some of which are also WFD classified watercourses). The Proposed Development has been designed so as to maintain access for arterial drainage maintenance, and all proposed crossings will be subject to the requirements of Regulation 50 of the Arterial Drainage Act of 1945.

### 12.8.3 Rainfall

Rainfall data from Met Éireann was analysed which was recorded at:

- Milltown, Co. Galway weather station which is c. 9 km northeast of the Site and associated infrastructure
- Headford OPW weather station, Co. Galway, which is c. 7 km south-west of the Site and associated infrastructure

[2] Ryan Hanley (2020) Arterial Drainage Maintenance Works: Corrib Arterial Drainage Scheme 2020 - 2024 Natura Impact Statement.

The rainfall data is presented in Table 12-5 (source https://www.met.ie/climate/available-data/monthly-data).

The 30-year annual average rainfall at this location from 1994-2024 was calculated to be 1264.8 mm at Headford OPW weather station.

The M5-60 predicted rainfall value (a sixty minute storm that will occur with a frequency of once every five years) at the development location is 16.5 mm according to the Met Éireann rainfall data, as shown in Table 12-5.

**Table 12-5: Met Eireann Return Period Rainfall Depths (mm)**

| | Years | | |
|---|---|---|---|
| **Duration** | **1** | **5** | **100** |
| **1 hours** | 11.8 | 16.5 | 28.9 |
| **25 days** | 215.4 | 261.2 | 366.7 |

**Table 12-6: Met Eireann Rainfall data**

| Total rainfall in millimetres for Milltown, Co. Galway weather station | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Year | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Annual |
| 2024 | 112.3 | 141.9 | 143.8 | 107.4 | - | - | - | - | - | - | - | - | - |
| 2023 | 132.3 | 26.1 | 163.8 | 79.3 | 56.6 | 48.4 | 159.6 | 117.8 | 115.6 | 167 | 111 | 208.4 | 115.5 |
| 2022 | 65.2 | 161.8 | 46.2 | 54.5 | 64 | 87.4 | 58.5 | 45.6 | 94.3 | 215.4 | 196.3 | 151 | 103.4 |
| 2021 | 154.2 | 115.1 | 115.1 | 30.3 | 111.3 | 34.9 | 63 | 112.1 | 119.8 | 161.3 | 72.2 | 104.1 | 99.5 |
| 2020 | 118.4 | 242.6 | 97.4 | 18 | 35.9 | 118 | 128.8 | 121 | 87.7 | 177.1 | 168.9 | 176.7 | 124.2 |
| 2019 | 76.5 | 84.8 | 157.9 | 97.1 | 36.2 | 74.7 | 105.8 | 263.1 | 125.5 | 114.3 | 119.8 | 112.4 | 114.0 |

| Total rainfall in millimetres for Headford OPW weather station, Co. Galway weather station | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Year | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Annual |
| 2024 | 109.7 | 145.9 | 127.4 | 103.2 | - | - | - | - | - | - | - | - | - |
| 2023 | 106.2 | 26.8 | 185.9 | 87.5 | 41 | 69.2 | 160.1 | 109.7 | 121.3 | 153.7 | 112 | 234.8 | 117.4 |
| 2022 | 55 | 170.1 | 53.7 | 44.6 | 64.2 | 91.3 | 58.5 | 41.8 | 103.3 | 169.8 | 206.3 | 143.3 | 100.2 |
| 2021 | 136.9 | 132.6 | 103.8 | 21.1 | 109.6 | 31.2 | 42.7 | 91.9 | 97 | 164.3 | 67.9 | - | 90.8 |
| 2020 | 138.8 | 291.2 | 128.7 | 32.7 | - | - | - | - | - | 172.5 | 154.4 | 168 | - |

### 12.8.4 Historical Flooding

The OPW Flood Info Website (www.floodinfo.ie) was consulted in relation to available historical or anecdotal information on any flooding incidences or occurrences recorded in the vicinity of the site of the proposed wind farm development. One flood event (ID-646) identified near Shrule, 1.6km west of the proposed wind farm development occurred in 1999 and one flood event (ID-1823) occurred 2km north of the Site in 2005. Further details are presented in Appendix 12.3 – Flood Risk Assessment in Volume III.

### 12.8.5 Surface Water Quality

WFD water quality status (2016-2021) and river waterbody risk for the Togher River and the Black River are provided in Table 12-7.

Within the Black(Shrule)_SC_010 sub-catchment, the WFD ecological status is assigned as ‘Poor’ for the largest waterbody - the BLACK(SHRULE)_10. The assigned status is based upon an assessment of 'Poor' Fish Status, as per the one-out-all-out rule. All other monitored conditions (hydromorphological, invertebrate and supporting chemical conditions) are identified as representing at least 'Moderate' status.

The status improves downstream along the Black River, with the BLACK(SHRULE)_020 classed as 'Moderate' status' where the assigned status is driven by a moderate invertebrate status; and further downstream the BLACK(SHRULE)_030 classed as 'Good' status, before the river terminates at Lough Corrib.

The upstream sections of the Black River (BLACK[SHRULE]_010 and BLACK[SHRULE]_020) are identified as being 'At Risk' from agricultural pressures and hydromorphology. The further upstream section (BLACK[SHRULE]_010) is also 'At Risk' from extractive industry; which the BLACK[SHRULE]_020 is also 'At Risk' from domestic wastewater.

The MOCORHA_010 is classed as 'Good'; the BOADAUN_010 and the BEAGH BEG_010 are both classed as 'Moderate' but the status for these three waterbodies have been modelled and is noted by the EPA has having 'Low Confidence'. Full details are presented in Table 12-7. In terms of pressures, the MOCORHA_010 is 'Not At Risk'; while the risk status of the BOADAUN_010 and the BEAGH BEG_010 is under review.

As the Proposed Development does not involve agricultural practices, the production of domestic wastewater, extractive industry, or any channelising or other significant hydromorphological works; it is not anticipated that the Proposed Development would contribute to the main existing pressures on the river waterbodies within the Study Area.

**Table 12-7: WFD River Status and River Waterbody Risk**

| Watercourse | Waterbody | River Status | Waterbody Risk | Reason for Waterbody Risk |
|---|---|---|---|---|
| Beagh Beg | BEAGH BEG_010 | Moderate | Review | N/A |
| Black River | BLACK(SHRULE)_010 | Poor | At Risk | Agricultural pressures, extractive industry, hydromorphology |
| Black River | BLACK(SHRULE)_020 | Moderate | At risk | Agricultural pressures, domestic wastewater, hydromorphology |
| Black River | BLACK(SHRULE)_030 | Good | Not at risk | N/A |
| Boadaun | BOADAUN_010 | Moderate | Review | N/A |
| Mocorha | MOCORHA_010 | Good | Not at risk | N/A |

The Black River was given a Biological Quality Rating of Q4-5 2021 as shown in Table 12-8.

**Table 12-8: EPA Biological Water Quality Rating**

| Sub-Basin | Station ID | Station Location | 1977 | 1980 | 1984 | 1987 | 1989 | 1994 | 1997 | 2000 | 2003 | 2006 | 2009 | 2012 | 2015 | 2018 | 2021 | 2023 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Black[Shrule]_010 | RS30B020100 | Bridge at Kilshanvy | | 3-4 | 3-4 | 3-4 | 3-4 | 3-4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | |
| Black[Shrule]_010 | RS30B020120 | Bridge West of Carrabaun | | | | | 4 | | | | | | | | | | | |
| Black[Shrule]_010 | RS30B020200 | Bridge in Shrule | 4-5 | 4-5 | 4 | | 4-5 | 4-5 | 4-5 | 4 | 4-5 | 4 | 4-5 | 4 | 4 | 4-5 | 4-5 | |
| Black[Shrule]_020 | RS30B020280 | Near Old Castle, East of Toorard | | | | | 4 | | | | | | | | | | | |
| Black[Shrule]_020 | RS30B020300 | | 4-5 | 4-5 | 3 | | 3-4 | 3-4 | 4 | 4 | 3-4 | 4 | 4 | 3-4 | 3-4 | 4-5 | 4 | 4 |
| Black[Shrule]_030 | RS30B020400 | Bridge Northwest of Ower House | | | | | | | 4 | | | | | | | | | |
| Black[Shrule]_030 | RS30B020500 | Second Bridge Upstream of Lough Corrib | 5 | 5 | 4 | | 4-5 | | | | | | | | | | | |
| Black[Shrule]_030 | RS30B020600 | First Bridge Upstream of Lough Corrib | | | 4 | | 4 | 4 | | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | |

### 12.8.6 Water Dependent Protected Areas

The EPA in 2018, to inform the WFD River Basin Management Plan, identified Special Areas of Conservation and Special Protection Areas that have protected water dependent habitats or species. While the Site is not located within any of these protected areas, the waterbody sub-catchment in which the Site is located (Black[Shrule]_SC_010) overlaps with such protected areas as follows:

- Shrule Turlough SAC - 2.5 km west of the western boundary of the Site. According to a Site Synopsis by the Department of Arts, Heritage and the Gaeltacht, Shrule Turlough has a high level of physical and vegetation diversity, and supports a large number of plant communities. Fen vegetation is especially well-developed. However, the turlough has a small catchment area and is largely uninfluenced by the surrounding land uses and human activity.
- Lough Corrib SAC - approximately 1 km downstream from the site boundary. The Qualifying Interests for the SAC include salmon (highlighted by the IFI during scoping consultations) as well as eight other protected species and fifteen protected habitats.

Further information is provided on protected sites in the Biodiversity Chapter 9.

## 12.9 Flood Risk Identification and Assessment

### 12.9.1 Local Planning Policy and Guidelines

The Strategic Flood Risk Assessment for Galway County Development Plan 2022-2028 (SFRA) (CAAS Ltd, 2021) provides a broad assessment of all types of flood risk to inform strategic land-use planning decisions within County Galway. The SFRA contains flood mapping, a Flood Risk Management Plan, and advice on zoning and land use proposals within settlements.

The Development Management Standards prescribed in Chapter 15 of the Galway County Development Plan requires that "*where developments/land uses are proposed that are considered inappropriate to the Flood Zone, then a Development Management Justification Test and site-specific Flood Risk Assessment will be required*".

These flood zones are based on the 'Planning System and Flood Risk Management Guidelines' (DOEHLG, 2009 and are assigned into three flood zones categories based on the probability of flooding:

- Zone A (High Risk): a probability of greater than 1 in 100 (1% Annual Exceedance Probability) for river flooding or 1 in 200 (0.5% AEP) for coastal flooding;
- Zone B (Moderate Risk): a probability of between 1 in 1000 and 1 in 120 (0.1% - 1.0% AEP) for river flooding and 1 in 1200 and 1 in 200 (0.1% - 0.5% AEP) for coastal flooding; and
- Zone C (Low Risk): a probability of less than 1 in 1000 (0.1% AEP) for both river and coastal flooding.

Structural and non-structural risk management measures are prescribed in the Development Management Standards for vulnerable infrastructure proposed in Flood Vulnerable Zones .

### 12.9.2 Site-specific Flood Risk Assessment and Justification Test

A site-specific flood risk assessment (FRA) including justification test has been prepared for the Project in accordance with the 'Planning System and Flood Risk Management Guidelines' (DOEHLG, 2009) and Departmental Circular PL2/2014 and is provided in Appendix 12.3, Volume III of this EIAR.

The primary flood risk to the proposed site can be attributed to a fluvial flood event in the Togher River, the Cloonbar River, the Beagh Beg River, the Shancloon River, and/or the Black River. The screening assessment undertaken as part of this SSFRA indicates that the site is not at risk of pluvial or groundwater flooding.

The assessment and analysis undertaken has determined that the location of the proposed substation and the grid connection route and loop-in do not fall within a delineated predictive fluvial Flood Vulnerable Zones Flood Zone 'A' or Flood Zone 'B'. The location of the proposed sub-station and grid connection route therefore fall within Flood Zone 'C'.

The location of proposed turbines T01, T02, T03, T04, T05, T06, T08, T09, T10 and T11 do not fall within a delineated predictive fluvial Flood Zone 'A' or Flood Zone 'B'. The location of these proposed turbines therefore fall within Flood Zone 'C'.

The location of proposed turbine T07 falls within a delineated predictive fluvial Flood Zone 'A' and Flood Zone 'B'.

The consequences of flooding depend on the hazards caused by flooding (e.g. depth of water, speed of flow, rate of onset and water quality) and the vulnerability of the receptor. Table 3.1 of the Guidelines, reproduced as Table 12-9 below, outlines the three vulnerability classifications and examples of the types of development included.

**Table 12-9: Vulnerability Class and Development Types**

| Vulnerability Class | Example Land Use and Types of Development |
|---|---|
| Highly Vulnerable Development (including Essential Infrastructure) | • Garda, ambulance and fire stations and command centres required to be operational during flooding;<br>• Hospitals;<br>• Dwellings, student halls of residence, hostels, residential institutions (care homes, children's homes and social services homes), dwellings designed/constructed/adapted for the elderly or people with impaired mobility;<br>• Caravans and mobile home parks;<br>• Essential infrastructure including primary transport and utilities distribution, electricity generating power stations and sub-stations, water and sewage treatment, and potential significant sources of pollution in the event of flooding. |
| Less Vulnerable Development | • Buildings used for retail, leisure, warehousing, commercial, industrial and non-residential institutions<br>• Land and buildings used for holiday or short-let caravans and camping (subject to specific warning and evacuation plans)<br>• Land and buildings used for agriculture and forestry<br>• Waste treatment (except landfill and hazardous waste)<br>• Mineral working and processing<br>• Local transport infrastructure |

| Vulnerability Class | Example Land Use and Types of Development |
|---|---|
| Water-Compatible Development | • Flood control infrastructure<br>• Docks, marinas and wharves<br>• Water-based recreation and tourism<br>• Amenity open space, outdoor sports and recreation and essential facilities |

Table 3.2 of the Guidelines, reproduced in Table 12-10 below, states what types of development would be appropriate within each Flood Zone and those that would be required to meet the criteria of the Justification Test.

**Table 12-10: Appropriate Development within Flood Zones**

| Vulnerability | Flood Zone A | Flood Zone B | Flood Zone C |
|---|---|---|---|
| Highly Vulnerable development (Including Essential Infrastructure) | Justification Test | Justification Test | Appropriate |
| Less Vulnerable Development | Justification Test | Appropriate | Appropriate |
| Water-Compatible Development | Appropriate | Appropriate | Appropriate |

The type and form of development proposed at T7 is classified as 'Less Vulnerable Development' as per the 'Planning System and Flood Risk Management Guidelines' and the location of proposed Turbine T07 falls within a delineated Flood Zone 'A' and Flood Zone 'B'. Therefore the development as proposed at the location of proposed Turbine T07 is subject to the requirements of the 'Justification Test'.

Justification Test

The Justification Test is described in Box 5.1 of the 'Planning System and Flood Risk Management Guidelines'. Each of the criteria listed in Box 5.1 is considered as follows:

**Table 12-11: Justification Test**

| Ref. | Criteria | Response |
|---|---|---|
| 1 | The subject lands have been zoned or otherwise designated for the particular use or form of development in an operative development plan, which has been adopted or varied taking account of these Guidelines. | The subject lands in which T7 is proposed is zoned Wind Development Potential designation as *'Open to Consideration'* as per the Galway County Development Plan. |
| 2(i) | The development proposed will not increase flood risk elsewhere and, if practicable, will reduce overall flood risk; | The development proposal has been subject to a detailed Site Specific Flood Risk Assessment in accordance with the guidelines.<br><br>The assessment, analysis and hydraulic modelling undertaken as part of this Site Specific Flood Risk Assessment indicates that the proposed wind farm development is not predicted to result in an adverse impact to the hydrological regime of the area or increase fluvial flood risk elsewhere |

| Ref. | Criteria | Response |
|---|---|---|
| 2(ii) | The development proposal includes measures to minimise flood risk to people, property, the economy and the environment as far as reasonably possible | The proposed wind farm will not introduce a significant amount of additional personnel to the area. The site is located in a rural setting and is not surrounded by existing high density development. Flood risk to or from the proposed development is not expected to have any adverse impact to the economy in the area. |
| 2(iii) | The development proposed includes measures to ensure that residual risks to the area and/or development can be managed to an acceptable level as regards the adequacy of existing flood protection measures or the design, implementation and funding of any future flood risk management measures and provisions for emergency services access; | The proposed turbine is not expected to result in a residual flood risk. The development as proposed will not require any flood protection or flood risk management measures to be implemented. The development as proposed does not depend on any existing flood protection measures or on the design, implementation and funding of any future flood risk management measures. Access for any emergency services would not be impeded or restricted due to the proposed turbine. |
| 2(iv) | The development proposed addresses the above in a manner that is compatible with the achievement of wider planning objectives in relation to development of good urban design and vibrant and active streetscapes | Not applicable to this development proposal given its location. |

Structural and Non-Structural Risk Management Measures

The following measures have been built in to the design of the wind farm in order to manage against flood risk and to ensure a robust and sustainable development:

- The finished floor level of the proposed substation will be constructed to a minimum level of 0.5m above the predictive peak 0.1% AEP flood level at cross sectional location C13 – i.e. 26.94m OD + 0.5m = 27.44m OD.
- Any vulnerable elements of Proposed Turbine T01 shall be constructed to a minimum level of 0.3m above the peak 0.1% AEP (1 in 1000 year) flood level at cross section C5 - i.e. 28.15m OD + 0.3m = 28.45m OD.
- Any vulnerable elements of Proposed Turbine T05 shall be constructed to a minimum level of 0.3m above the peak 0.1% AEP (1 in 1000 year) flood level at cross section C1 - i.e. 28.55m OD + 0.3m = 28.85m OD.
- The base of proposed turbine T07 will be sealed to prevent water ingress. No vulnerable components of the turbine will be located at ground level and will be constructed to a minimum level of 31.3m OD, which is 0.3m above the 0.1% AEP (1 in 1000 Year) fluvial flood level at this location (31.0m OD + 0.3m = 31.3m OD).

## 12.10 Assessment of Effects on Hydrology and Water Quality

### 12.10.1 Do-Nothing Scenario

The likely evolution of the baseline environment in the absence of the Proposed Development is considered. Land use within the Site will likely remain as per the current scenario for the foreseeable future, i.e. agriculture, with smaller pockets of commercial forestry also present along the periphery, and much of the land scarred from historic peat extraction. A slight increase in commercial forestry may occur in the wider catchment area in line with national policy (Ireland Forestry Strategy 2023- 2030).

Residential property density in the area is low with ribbon development and one-off housing dominating. As such, surface water drainage will continue as it is occurring currently, with pressures on the river waterbodies continuing with regard to agriculture and domestic wastewater as detailed in Table 12-7.

Much of the study area has been channelised, with the BLACK(SHRULE)_010 (channel CH4/13) under the OPW's arterial drainage scheme. It is likely that the arterial drainage scheme will continue to be maintained by the OPW in accordance with their rolling maintenance programme requiring measures every 4-6 years will continue. It is noted that as detailed in Table 12-7, catchment pressures include hydromorphological pressure which is likely related to channel straightening and land drainage associated with peat extraction and arterial drainage.

The existing agricultural, turbary and forestry operations are likely to continue into the future.

### 12.10.2 Potential Effects During Construction

Potential construction phase effects, in the absence of mitigation, of the Proposed Development on Hydrology and Water Quality are set out hereunder.

#### *12.10.2.1 Potential Effects on Surface Water WFD Status/Water Quality*

WFD Ecological Status for inland surface waterbodies is determined based on biological quality elements and supporting physico-chemical and hydromorphological quality elements.

Effects on WFD biological quality elements are addressed in Chapter 9 - Biodiversity. The potential for significant effects on hydromorphology and physico-chemical conditions is discussed hereunder.

##### 12.10.2.1.1 Potential for Effects on Hydrology / Hydromorphology (Including Flood Risk)

Hydromorphology is the physical and hydrological condition of surface water bodies which comprises the habitats and natural processes that support and maintain healthy aquatic ecosystems. Potential significant effects to hydromorphology can be caused by changes in the physical habitat or flow conditions of a waterbody.

***Temporary Structures On/Over Water***

There will be a requirement for a temporary road drain crossing to accommodate turbine delivery (PoI 16). This will be achieved through the placement of a temporary load bearing surface which will be removed following turbine delivery. The crossing will have no implications for catchment hydrology.

The Proposed Development includes the installation of one new 18.5 m watercourse bridge crossing (WC01) over the Togher River. The Proposed Development includes new piped culvert crossings (some of which are replacements to existing culverts). These watercourse crossings will require temporary in-stream works to accommodate the construction, however these temporary works will be sized appropriately to accommodate flows and will not alter watercourse hydrology.

**The potential effects on the alteration of surface water flow / changes in hydromorphology (associated with installation of temporary watercourse crossings) are considered unlikely and not significant.**

#### 12.10.2.1.2Potential for Effects on Water Quality / Physico-chemical Conditions

The European Communities Environmental Objectives (Surface Waters) Regulations 2009 (as amended) prescribe physico-chemical conditions for surface waters which are necessary to maintain / achieve Good or High Status. These relate to water temperature, oxygen conditions, pH, and nutrient conditions. Notably the Regulations are mute on the sedimentation conditions required to support biology. As such, reference is made to the European Communities (Quality of Salmonid Waters) Regulations, 1988 which required an average concentration of <25mg/l of suspended solids (measured monthly over a period of 12 months) in order to support salmonid fish species. The Surface Water Regulations also prescribe environmental quality standards for priority substances and priority hazardous substances and requires the progressive reduction / phasing out these substances in waterbody catchments.

Construction phase activities will require earthworks and use of materials that have potential to negatively impact the physico-chemical conditions for surface waters.

***Release of Construction or Cementitious Materials***

To facilitate the Proposed Development, the incorporation of concrete structures is necessary at turbine foundations, substation foundation, loop in tower foundations, and meteorological mast foundation. Additionally, concrete will be required as blinding for culvert and joint bay installations and also as part of the bridge crossing structure (WC01).

The use of cementitious materials like concrete, cement, or lean mix can lead to changes in soil and water pH, as well as increased concentrations of sulphates and other constituents found in concrete, which can further impact water quality. Concrete and other cement-based products are highly alkaline and corrosive and can have significant negative impacts on water quality. They can generate very fine, highly alkaline silt (pH 11.5) that can alter water chemistry. A pH range of between 6-9 is set in the Surface Waters Regulations (for hard water) as the standard required to support Good / High WFD Status. Inland Fisheries Ireland (2016) 'Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters' prescribe that artificial variations in waters must not be in excess of ±0.5 of a pH units.

All of the wind turbine foundations are located a minimum of 50 m away from any all watercourses and as such it is unlikely that surface water runoff from these installations would enter watercourses. Where land drains are traversed by the development infrastructure these will be intercepted by clean water interceptor drains and carried as needed by cross drains. This drainage separation of clean water channels from dirty water sources will be in place in advance of the works and as such it is unlikely that concrete runoff would enter the clean surface water drainage. The footings of the new bridge crossing are setback 2.5m landward from the riverbank to retain riverbank integrity. Given the proximity of the bridge to the river, it is likely that pre-mitigation concrete runoff could enter the waterbody.

Other foundation works, i.e. for joint bays, substation and met mast are not located within 50m of any watercourse. Given setback, it is unlikely that surface water runoff from these installations would enter watercourses.

New culvert crossings will require in stream works on the Togher River and along land drains. Pre-mitigation, release of concrete to the aquatic environment is likely.

During the construction phase of the Development, the utilization of plant, equipment and vehicles for excavation, material transport, and construction activities introduces the potential for hydrocarbon spillages and leaks which might enter the aquatic environment, especially during regular refuelling procedures. If hydrocarbons are accidentally introduced into the environment, they are expected to be intercepted by the drainage and surface water networks that will be constructed as part of the Proposed Development in accordance with the surface water management plan. However, areas of particular risk of water pollution are where works will be carried out in stream or on the riverbank i.e. for culvert and bridge construction.

***Release of Suspended Solids***

The construction phase of the Proposed Development will invariably involve earthworks including: removal of vegetation cover, construction of roads, forestry felling etc. to facilitate the installation of wind farm infrastructure, temporary stockpiling of subsoils (including peat) and bedrock, construction and removal of temporary works e.g. construction compounds, TDR accommodation works and HDD temporary access roads.

Throughout the excavation, storage, and reuse of materials in the Proposed Development, suspended solids could be carried by surface water runoff and into the surface water networks. This likelihood is particularly high during sustained rainfall events. Water dewatered from excavations for foundations and roads can become contaminated whereby soil or water from areas of potential contamination are drawn down. If not properly controlled, such contaminated water can enter the aquatic environment. If the rate of dewatering is not effectively managed, the drainage and attenuation features designed to handle the water could become overwhelmed by a sudden influx of water containing high concentrations of suspended solids, and potentially resulting in runoff into nearby surface waters.

The development will inevitably bring about alterations in the drainage patterns at the site. If not effectively managed, these alterations have the potential to create new pathways for runoff, potentially causing erosion of soils and construction materials, as well as the entrainment of solids in the runoff process.

Extensive ground investigation for the Proposed Development has been carried out and a peat slippage risk assessment prepared for the Site (see Appendix 11.1). The findings, which involved a stability analysis of over 80 locations, show that the Site has an acceptable margin of safety and is suitable for the proposed wind farm project. Slope inclinations at the infrastructure locations range from 1 to 2 degrees with the average being 2 degrees. The relatively flat topography/nature of the terrain on site reflects the low risk of peat failure. The purpose of the stability analysis was to determine the stability i.e. Factor of Safety (FoS), of the peat slopes. The FoS provides a direct measure of the degree of stability of a peat slope. A FoS of less than 1.0 indicates that a slope is unstable; a FoS of greater than 1.0 indicates a stable slope. An acceptable FoS for slopes is generally taken as a minimum of 1.3. The stability analysis for this project, which analysed the turbine locations, access roads and substation, resulted in FoS above the minimum acceptable value of 1.3 and hence the site has a satisfactory margin of safety. As such, peat slippage at the Site is unlikely. Notwithstanding, a peat and spoil management plan has been prepared for the Site (see Appendix 11.4).

***Horizontal Directional Drilling (HDD)***

HDD will be employed at one location to cross the Togher River, as described in Section 12.7.3.4.

The operation will be carried out by an experienced HDD specialist and is expected to take place in a single day.

The process will involve setting up a small, tracked drilling rig on one side of the surface water feature. A pilot hole will be bored as per the agreed alignment and will be tracked and controlled using a transmitter in the drill head. By tracking the depth, position and pitch of the drill head the operator can accurately steer the line of the drilling operation. The drilling operation will be lubricated using a fluid (typically a mixture of water and additives like bentonite or polymers, designed to facilitate drilling, stabilize boreholes, and remove cuttings). When the pilot hole has been drilled to the correct profile, its diameter is increased, if necessary, to match the external diameter if the cable duct. The flexible plastic ducting is then pulled through the pre-drilled hole and sealed at each end until required for cable installation.

If not properly managed, there is potential for frac-out to occur during the HDD drilling process. A frac out occurs when the pressure of the drilling fluid in a borehole exceeds the strength of the surrounding soil, causing the soil to fracture and the fluid to escape to the surface. The HDD location will be within alluvium soils underlain by firm tills and Dinantian Pure Bedded Limestones.

**Pre-mitigation, the likely effects on water quality (from accidental release of pollutants HDD drilling fluids, cement material, and hydrocarbons) at the proposed wind farm site are considered negative, direct/indirect, short term, moderate.**

**Potential effects on water quality from peat slippage or sediment runoff are deemed unlikely.**

#### *12.10.2.2 Potential Effects on Surface Water Dependent Designated Sites*

None of the elements of the Proposed Development are located within the boundaries of any Nationally or European designated sites.

The drains and watercourses within the Site flow to the BLACK (SHRULE) river which, downstream, is part of the Lough Corrib SAC. Any potential negative change to the existing WFD status of the waterbody supporting this SAC or any activity that might impede the achievement of the objective WFD status for such waterbody could have an effect on the attributes (structure and function) required to support the water dependent habitats and species of the designated site. However, having regard to Section 12.10.2.1.2, it is determined that, with the exception of in-stream and riparian works, effects on water quality are unlikely.

The Shrule Turlough SAC (000525) is hydrologically connected to the Lough Corrib SAC via arterial drainage channels which connect to Lough Lee and then to the BLACK (SHRULE)_020 river upstream of Shrule village. This turlough does not however share a waterbody catchment with the Proposed Development and the arterial drainage channel tributary which forms the hydrological connection between the turlough and the BLACK (SHRULE)_020 is downstream of the Proposed Development (with flow direction away from the turlough). As such there is no tangible hydrological connection between the Shrule Turlough SAC and the Proposed Development.

**Pre-mitigation, the likely effects on the water dependent designated site Lough Corrib SAC due to potential effects on water quality are considered negative, indirect, short term and significant.**

## 12.10.3 Potential Effects During Operation and Maintenance

### *12.10.3.1 Potential for Effects on Hydrology / Hydromorphology (Including Flood Risk)*

#### *Alteration of Runoff Rates*

The Proposed Development will require the excavation and removal of vegetation cover and soil, and replacement with less permeable surfaces with a resulting potential to contribute to the increase in rate and volume of rainfall runoff from the Site.

Any alteration in the existing drainage regime / hydrology of the Site can impact on the volume of surface water which drains to the local streams and watercourses or to the rate at which such drainage occurs. This in turn can have an effect on hydromorphology through, for example, an increase in erosion and sediment transport, increase flow velocity, alteration of flood regime.

The proposed windfarm is located within the BLACK (SHRULE)_010 waterbody sub-basin. The increase in impermeable area caused by the wind farm footprint can directly influence the volume and velocity of runoff. As the footprint expands, there is a larger proportion of lower permeability surfaces compared to natural or vegetated areas. This alteration can disrupt the natural hydrological cycle, reducing the amount of water that can infiltrate the soil and increasing the amount of runoff generated.

As shown in Table 12-12 the increase of the lower permeability area due to the Proposed Development is minimal in comparison with the area of the sub-basin where it is located, increasing by only 0.044%.

**Table 12-12: Impermeable footprint increase ratio**

| Increase of impermeable area to Black(SHRULE)_010 | Existing | Post Development |
|---|---|---|
| Sub-Basin Overall Catchment Area (ha) | 12,658 | 12,658 |
| New Hardstanding, Earthworks, Compound and Substation Area (ha) | 0 | 11.23 |
| Run-off Coefficent of the New Hardstanding - Type 1 Granular Material | 0.50 | 0.50 |
| Increase of net impermeable Area (ha) | 0 | 5.62 |
| Total increase of impermeable area within the catchment in percentage | 0% | 0.044% |

#### *Potential Effect on Flood Risk*

Infrastructure development can increase the risk of flooding. A flood risk assessment was prepared as supported by a detailed hydraulic model of the catchment informed by detailed Digital Terrain Model (DTM) and surveyed watercourse cross sectional data from the catchment. The model has determined that the Proposed Development will not increase flood risk elsewhere within the catchment.

While the location of proposed turbine T07 falls within a delineated predictive fluvial Flood Zone 'A' and Flood Zone 'B', the model has predicted that during the occurrence of the 1% AEP (1 in 100 year), 1% AEP + CC (1% AEP + CC (1 in 100 Year Plus Climate Change) and 0.1% AEP (1 in 1000 year) fluvial flood events, the predicted flood extents (in a constructed development scenario) are identical to the baseline scenario. The footprint area of proposed turbine (T07) will therefore not result in any adverse impact on the existing fluvial flood extents, depths, or flow paths when compared to the existing undeveloped baseline scenario.

***Structures On/Over Water***

The Proposed Development includes the installation of one new watercourse 18.5 m bridge crossing. The bridge structure (WC01) over the Togher river will be a clear span type structure with a minimum abutment setback from the river banks of 2.5m. The bridge deck will be located above the 1:100-year flow plus climate. As such the bridge will not interfere with river flow velocity or regime.

The Proposed Development includes new piped culvert crossings (some of which are replacements to existing culverts). Proposed culverts CV03, CV04, CV05, CV06 and CV08 are located on land drains which are part of the Corrib-Headford arterial drainage system. Culverts CV01, CV02, CV07, CV09, CV10, CV11, CV12 and CV13 are required for crossing of bog drains, while CV14 is located on the head of the Black(Shrule) river channel. Culvert crossings have the potential to negatively alter water flows if not properly installed. Conversely, the replacement of existing culverts with appropriately sized structures which accord to the requirements of Regulation 50 has the potential to positively improve hydromorphology within the catchment. However, it is noted that the replacement culverts are located on land drains as opposed to WFD watercourses. Additionally, the IFI has not identified any morphology barriers within the catchment under their Barriers Programme.

**The Proposed Development will have a direct, long-term and not significant effect on alteration of surface water flow and flood extents.**

#### *12.10.3.2 Potential for Effects on Water Quality / Physico-chemical Conditions*

During the operational phase, accidental pollution from spills and leaks of fuel, oil and chemicals from vehicles and maintenance works may occur. Additionally, transformer oil will be used in cooling the transformers associated with the sub-station which creates potential for oil spills during any oil replacement activity or leaks during the operational phase, although the likelihood of this is low. Additionally, permanent drains and settlement ponds will be installed and maintained across the Site as per 100 and 500 series planning drawings. These will act to attenuate any accidental spills such that they can be controlled and managed in a timely manner.

There is no significant risk of sediment release to cause increase suspended solids in surface waters during the operational phase as vegetation will not be disturbed during this phase. Additionally, as per IFI requirements, sedimentary rocks, such as shale, will not be used for road and hardstanding construction. This type of material has poor tensile strength and is liable to be crushed by heavy vehicles thereby releasing fine sediment materials into the drainage system which are difficult to precipitate.

**The significance of the effect of the release of the hydrocarbons into the receiving waters is Slight due to the low likelihood and low quantities involved.**

### 12.10.4 Potential Effects During Decommissioning

As described in Chapter 2, wind turbines will be deconstructed by unbolting the components and disassembling using cranes. The hardstanding and foundation pedestals of the turbines will be covered over (with soil that was stripped during construction) and allowed to re-vegetate. This is less disruptive to the environment than removing the hardstanding and foundations.

Infrastructure that will be left in-situ following decommissioning includes: internal site access tracks, the on-site substation and ancillary electrical equipment.

In the event of decommissioning of the Wind Farm site, similar activities to the construction phase are carried out. Potential impacts would be similar to the construction phase but to a lesser degree.

#### *12.10.4.1 Potential for Effects on Hydrology / Hydromorphology (Including Flood Risk)*

The removal of permanent infrastructure and covering with soil could result in a very slight increase in surface water runoff until such time as vegetation has established. However, the settlement ponds on site will be maintained and operated during decommissioning, which will act to control the flow.

**The Proposed Development will have a direct, temporary not significant effect on alteration of surface water flow and flood extents during decommissioning.**

#### *12.10.4.2 Potential for Effects on Water Quality / Physico-chemical Conditions*

As the hard standing infrastructure will remain in place the sediment disturbance is not significant during the disassembly. Potential impacts are similar to the construction phase but less significant as there is no invasive works breaking ground and it is mainly associated with the dis-assembly of the above ground components of the turbines. The potential receptors are the same as the construction phase. No concrete works are required and roads will be left in situ with only hardstandings being covered over with soil. All hardstandings are located greater than 50m from any watercourse and as such the potential for direct runoff is limited. The settlement ponds on site will be maintained and operated during decommissioning, which will act to control site runoff.

**The Proposed Development will have a direct, temporarym not significant effect on water quality during decommissioning**

### 12.10.5 Potential Cumulative Effects

Cumulative effects of the proposed project with other developments in the region are presented here in relation to potential significant effects on hydrology and water quality.

It is accepted best practice that developments within the same catchment and at the construction stage need to be taken into consideration when assessing the potential for cumulative effects. According to Entec's 2008 report "it is conceivable that two or more wind farms (or indeed other developments) in the catchment of a water receptor could result in combined runoff impacts to water quality, which then exceed Environmental Quality Standard thresholds. It is generally the case that in such circumstances any such effect is only likely to have the potential to be significant during the construction period. Once operational, any effects are likely to be restricted to high rainfall events when the level of dilution of impact is proportionately increased by higher flow levels that can be anticipated under these circumstances. Despite this theoretical potential impact, it is possible to control construction effects by good management techniques and therefore in practice significant effects, either individually or cumulatively, will rarely occur. Where such impacts occur other regulation provides additional controls. Due to the existing regulation over water environment there are absolute controls on the manner in which developments are constructed and operated in respect of the water environment which result in any potential effect being designed out. In this way it is unlikely that any cumulative effect would be significant."[3]

Therefore, only other developments that lie in the same catchment(s) as the Proposed Development that have the potential to have their construction stage overlap with the Proposed Development's construction stage are considered.

[3] Entec UK Limited (2008) Review of Guidance on the Assessment of Cumulative Impacts of Onshore Windfarms: Phase 1 Report

Wind Farms

There are no proposed or consented wind farm developments that share the sub-catchment or subbasin with the Proposed Development (as per Galway County Council and An Bord Pleanála planning data, accessed March 2025).

Other Developments

Appendix 2.4, Volume III of the EIAR lists the projects considered in the cumulative assessment. All potential cumulative projects within the shared Proposed Development waterbody catchments relate to small scale residential and rural developments of single dwellings, house extensions, or farm buildings. None of these consented projects are located within 50m of any watercourse and as such, and given their small-scale nature, there is no potential for them to act cumulatively with the Proposed Development to cause a significant effect on water quality or hydrology.

The OPW will continue to maintain the Corrib Headford Arterial Drainage Scheme on a 4-6 year rolling basis. In-stream works associated with the Proposed Development has potential to act cumulatively with arterial drainage works through sedimentation and risk of accidental pollution.

Forestry and Turbary

Turbary turf cutting and forestry activities occur in the vicinity of the Proposed Development and within a shared waterbody catchment. These activities can result in sedimentation of the local drains and watercourses and may be contributary to the existing Poor/Moderate surface water status in the Black(Shrile) river. While potential effects on water quality from peat slippage or sediment runoff form the Proposed Development are deemed unlikely, there is potential for accidental runoff from the Site to act cumulatively with forestry and turbary activities if not properly mitigated.

## 12.11 Risk of Major Accidents and Disasters

This section assesses the potential significant adverse effects of the proposed project on the hydrology and water quality deriving from its vulnerability to Major Accidents and/or Natural Disasters, as well as the potential of the proposed project itself to cause potential Major Accidents and/or Natural Disasters during the construction, operation and decommissioning phases which might have an effect on water quality or hydrology.

***Potential vulnerability to risks***

Flood Risk

With the exception of turbine T7, the site infrastructure does not fall within a predictive 1% AEP (1 in 100 Year), 1% AEP + CC (1 in 100 Year Plus Climate Change), or 0.1% AEP (1 in 1000 Year) fluvial flood zone. All vulnerable elements of the proposed turbines shall be constructed a minimum of 0.3m above existing ground levels and the new bridge crossing slab will be constructed above the 1% AEP + CC (1 in 100 Year Plus Climate Change).

***Potential to cause accidents and / or disasters***

Peat Stability

Extensive ground investigation for the Proposed Development has been carried out and a peat slippage risk assessment prepared for the Site (see Appendix 11.1). The stability analysis determined that the Site has a satisfactory margin of safety. As such, peat slippage into local watercourses at the Site is unlikely. Notwithstanding, a peat and spoil management plan has been prepared for the Site (see Appendix 11.4). Additionally, contingency measures / emergency response measures are set out in the CEMP in Appendix 2.1 of the EIAR.

Water Contamination

Severe weather may cause increased mobilisation of sediment. However, this will be controlled via the project surface water design. Additionally, mitigation measures to protect water quality are fully set out in this Chapter as well as procedures and measures described in the Construction and Environmental Management Plan (CEMP). These will ensure that the risk od water contamination is low.

Flood Risk

A flood risk assessment was prepared as supported by a detailed hydraulic model of the catchment informed by detailed Digital Terrain Model (DTM) and surveyed watercourse cross sectional data from the catchment. The model has determined that the Proposed Development will not increase flood risk elsewhere within the catchment.

## 12.12 Mitigation Measures

### 12.12.1 Mitigation By Avoidance

A process of 'mitigation by avoidance', as informed by constraints assessment and consultation, was undertaken by the EIA team during the design of the wind farm layout and selection of grid connection (refer to Chapter 3 - Site Selection and Alternatives for further detail) with the objective of avoiding / minimising the potential for significant effects on water quality and hydrology. The Site layout and drainage infrastructure has been designed such that it is sympathetic to the existing topography and aims to maintain the existing hydrological regime of the Site such that it does not create a changed hydrological response to precipitation. The design has been informed by a detailed flood risk assessment for the Site.

The infrastructure has been located such that it is set back as far as reasonably practicable from hydrological features, with an ethos of ensuring a minimum setback of 50 m between mapped surface waters and wind farm infrastructure, and a minimum setback of 10 m from non-mapped streams and drainage features with the exception of HDD locations and watercourse crossings. Objective FL18 of the Galway County Development Plan 2022-2028 requires that a riparian buffer zone of at least 10 m is maintained between the development works and the top of the riverbank. The design of the Proposed Development meets the objective of the Development Plan, noting that there are a number of watercourse crossings included in the Proposed Development.

A Surface Water Management Plan for the construction, operation and decommissioning stages of the Proposed Development is contained Appendix 12.2 in Volume III. The proposed drainage design will:

- Collect surface water runoff upgradient of the Proposed Development via interceptor drains and will redistribute this 'clean' collected runoff downgradient of the Proposed Development by means of cross drains which will release via diffuse outfalls to vegetated areas (within the same catchment) or will divert the runoff back into the existing network serving the catchment. This drainage design maintains the hydrological regime at the Site.

- Collect surface water runoff from the footprint of the Proposed Development (during construction, operation and decommissioning) and discharge diffusely to adjacent vegetated areas via settlement ponds, such that a deterioration in water quality does not occur.

***Attenuation and Flood Risk***

The Proposed Development will increase the impermeable area within the Site, however as per Table 12-12 this is noted to be negligible in terms of potential to cause a significant change in runoff rates. Notwithstanding, mitigation measures to address surface water runoff and drainage are proposed for this project as set out in Chapter 2, in the Surface Water Management Plan, and in the planning drawings in order to maintain the baseline hydrological regime and to provide attenuation at greenfield run-off rates.

All access tracks will be constructed from aggregate which will allow a portion of rainfall to infiltrate and, therefore, reduce surface water runoff. Adjacent swales will also intercept and retain surface water runoff allowing this to disperse naturally via infiltration and evapotranspiration. Where swales are installed on sloped ground, check dam structures will be used within the channels to provide attenuation, allowing a portion of the flows to disperse naturally.

Swales and drainage channels will discharge runoff from access roads and areas of hardstanding to settlement ponds. These will be suitably sized to accommodate flows from storm events up to and including the 1 in 100-year storm event.

Settlement ponds will not discharge directly to any drain or watercourse. Rather, flows from the ponds will be dispersed diffusely over land to allow natural overland flow and percolation within the catchment.

Watercourse crossings will be designed and suitably sized to accommodate peak, or storm discharge rates so as not to cause risk of impeding flows during extreme storm events and causing flooding upstream of the crossing. All drain and watercourse crossings will be designed in accordance with the requirements of Regulation 50 of the European Communities (Assessment and Management of Flood Risks) Regulations 2010 SI 122 of 2010. The channel width will be maintained and the crossings will be designed so as not to cause an impediment to the passage of woody debris or sediment transport. Appropriate freeboard will be provided to OPW requirements.

The cable trenches will be excavated in dry weather where possible and infilled and revegetated if required to prevent soil erosion or generation of silt pollution of nearby surface water.

The Flood Risk Assessment for the Proposed Development (Appendix 12.3) has identified that the Proposed Development will not result in an increased flood risk to the locality. Additionally, the drainage design at the Site will ensure that there will be no increase in the risk of surface water runoff as a result of the windfarm development.

### 12.12.2 Monitoring

An Environmental / Ecological Clerk of Works (EnCoW / ECoW) will be appointed by the Developer with responsibility for monitoring at the Site during the construction phase of the Development. The Clerk of Works will have the authority to temporarily stop works to prevent negative effects on hydrology or to ensure corrective action is taken to mitigate adverse effects.

A Surface Water Quality Monitoring Programme will be established which will commence 12 months prior to construction in order to confirm the baseline physio-chemical conditions and hydromorphological conditions of the watercourses within the Site and will continue throughout construction and for three months post-commissioning phase of the Proposed Development.

Monthly water quality grab samples will be taken from the Togher River (Black[Shrule]_010) at locations approximately 10m downstream of the proposed watercourse crossings. Water quality sampling will be undertaken in accordance with BS EN ISO 5667 - Water Quality Sampling. The samples will be checked in situ for:

- pH;
- Temperature;
- Turbidity;
- Conductivity; and
- Dissolved Oxygen.

using a fully calibrated portable pH/temperature/conductivity meter (with pH resolution of 0.01 pH), turbidity probe and a flow impellor.

The samples will then be submitted to an appropriately certified laboratory (ILAB or similar) in accordance with the laboratory custody protocol for assessment of the following parameters:

i. Biological Oxygen Demand;
ii. Chemical Oxygen Demand;
iii. Total Hardness;
iv. Total Suspended Solids;
v. Total Dissolved Solids;
vi. Nitrate;
vii. Nitrite;
viii. Ammoniacal Nitrogen;
ix. Molybdate Reactive Phosphorus;
x. Total Coliforms; and
xi. Faecal Coliforms (E.coli).

A record of monthly meteorological conditions (as a minimum precipitation and temperature) will be maintained.

Biological water quality assessment using the EPA Q-value methodology will be carried out once prior to the commencement of construction and on a six month basis during the monitoring period.

The hydromorphological baseline at the proposed watercourse crossings within the Site will be reconfirmed pre-construction using the River Hydromorphology Assessment Technique (RHAT). Annual RHAT assessments will be carried out which will be compared against the baseline. The Design and Construction of the bridge crossing and culverts will minimise upstream afflux, avoid turbulence and minimise loss of the natural channel bed due to the culvert or structure in order to ensure that hydromorphology is not affected. The Design will ensure that the baseline river Hydromorphological Condition Score derived from the initial RHAT assessment is not altered such that it would impact the derived WFD hydromorphology classification.

The Contractor will ensure that the daily visual monitoring of the surface water network for visible signs of construction impact is carried out on a daily basis for example, riparian vegetation loss, evidence of oil/fuel slick, sediment plumes, fish kill.

During the construction and commissioning phase, water quality monitoring results will be recorded and compared against baseline data and where there is a deviation beyond the 95%ile, the Contractor will investigate and as necessary sample further upstream and determine if elevated concentrations are coming from the Site, in which case the Contractor will ensure that emergency control measures (set out in the Surface Water Management Plan and CEMP) are put in place to return the levels to the baseline. Similarly, the Contractor will compare results of water quality monitoring with the 95%ile High Status Environmental Quality Standards arising from the European Union Environmental Objectives (Surface Waters) Regulations 2009 as amended. Any deviation beyond these standards will be investigated and the findings will be report to the Community Water Officer, South East Region.

During the construction and commissioning phase, daily inspection of environmental protection measures e.g. silt traps, check dams, ponds and outfalls and drainage channels will be carried out and any improvement works carried out within a timely manner.

### 12.12.3 Mitigation Measures for the Construction Stage

The mitigation measures prescribed are aimed at ensuring no deterioration in WFD status waterbodies within the catchments of the Project. Strict mitigation measures in relation to maintaining a high quality of surface water runoff from the Proposed Development will ensure that the status of surface waterbodies are not affected.

Best practice construction methods will be used to avoid potential for effects on water quality and hydrology following the documents and guidelines listed below:

- Water Run-Off from Construction Sites - SEPA - (WAT-SG-75)
- The SUDS Manual - CIRIA C753.
- Site Handbook for the Construction of SUDS - CIRIA C698 ISBN 0 86017 698 3.
- Works and maintenance in or near water - PPG5 - (October 2007)
- Environmental good practice on site guide (fourth edition) (C741)
- Guidance for Pollution Prevention, dealing with spills: GPP 22-(October 2018)
- Temporary Construction Methods - SEPA -(WAT-SG-29)
- Guidelines on protection of Fisheries During Construction Works in and Adjacent to Waters - Inland Fisheries Ireland - (IFI 2016)
- Guidelines for the Crossing of Watercourses During the Construction of National Road Schemes - TII Publications (2008)

Further environmental best practice measures for key parts of the construction phase are outlined in more detail in the Construction Environmental Management Plan CEMP (Appendix 2.1, Volume III), and reproduced below for ease of reference.

### *Control of Accidental Spills and Leaks*

Regarding good practice associated with mitigating the risk of hydrocarbon release during construction, as stated in the SWMP, construction vehicles will be refuelled off-site, wherever possible. This will primarily be the case for road vehicles such as vans and trucks. Refuelling of mobile plant during construction will be carried out by mobile fuel tanks equipped with pressure relief valves, built-in vents, handles for easy transportation, pumps, hoses and meters to facilitate fuel transfer operations. Any additional fuel containers and for smaller equipment (such as generators, lights etc.) used on site will be positioned on appropriately sized plant nappy/bund and stored within additional secondary containment e.g. bund for static tanks or drip trays for smaller mobile containers. Taps/nozzles for fuels and storage containers for oils will be fitted with locks to ensure their use is controlled. Only designated trained and competent operatives will be authorised to refuel plant on site.

All tank and drum storage areas will, as a minimum, be bunded, either locally or remotely, to a volume not less than the greater of the following:

- 110% of the capacity of the largest tank or drum within the bunded area; or
- 25% of the aggregate volume of all other substance which could be stored within the bunded area.
- The purpose of this requirement is to ensure that any potential leaks, spills, or other releases from tanks or drums are effectively contained within the bunded area, preventing any environmental contamination or harm. The bunded area acts as a secondary containment system, providing an additional layer of protection against accidental releases and facilitating proper clean-up and mitigation measures.
- All plant and equipment will be in good working order, checked regularly and maintained when necessary and a maintenance log maintained.
- Fuels, lubricants and hydraulic fluids will be carefully handled to avoid spillage, properly secured and provided with appropriate type of spill containment kits in case of incident.
- All spill-kits will be inspected on a weekly basis by the EnCoW to ensure they are maintained as fit for purpose.
- Welfare / hygiene facilities will be located within the construction compounds only.
- All water from vehicle wheel washes will be removed from site and disposed of in line with Waste Legislation.

### *Control of Concrete Runoff*

Precast concrete will be used wherever possible for the structural elements of watercourse crossings (single span / piped crossings) as well as cable joint bays. However, ready mix and lean mix concrete will be required during the construction phase for piled turbine foundations, as blinding works for joint bay pits, culverts and cross drains, for concrete pads for bottomless culvert and clear span bridge foundations. On-site batching will not be permitted. Concrete will instead be transported to the Site by concrete truck.

The risk of concrete runoff from turbine foundation works areas will be minimal given that all turbine foundations are located a minimum of 50m from any watercourse. The potential effects associated with wet concrete being introduced below ground level in the form of piled foundations is dealt with in Chapter 11. Additionally, the formwork and site preparation works will contain the concrete in an enclosed, excavated area. For watercourse crossings requiring concrete works, these works will be carried out under dry works conditions, as discussed further below in relation to 'Works in or Adjacent to Waters'.

The acquisition, transport and use of concrete will be planned fully in advance of commencing works such that volumes are minimised, the route to and through the Site is predetermined so as to aim to avoid drains and watercourses, and wash down areas are appropriately located. Additionally, all concrete works will be supervised at all times by the Developer's appointed Environmental / Ecological Clerk of Works.

No surplus concrete will be stored or deposited anywhere on site. Such material will be returned to the source location or disposed of off-site appropriately.

Concrete trucks will not be washed out on Site. Where chutes, hoppers/skips and equipment (e.g. vibrating wands) associated with concrete works need to be washed down this will be done into a sealed mortar bin / skip with the appropriate capacity and which has been examined in advance for any defects. The location of wash down areas will be set back as far as practically possible from any drain or watercourse, and a minimum of 50m. This requirement will be communicated to all on-site personnel and to each concrete truck driver prior to entering into the works area. Washout areas / mortar bins will be sized such that they are capable of withstanding an unexpected heavy rainfall event without overtopping and they will be covered when not in use.

Concrete washing will be contained and managed. Waste concrete slurry, washings and supernatant will be allowed to settle/dry and will be taken to a licensed waste facility for disposal.

Any shuttering / formwork installed to contain the concrete during pouring will be installed to a high standard with minimal potential for leaks. Additional measures will be taken to ensure this, for example the use of plastic sheeting, foams or other sealing products at joints.

Pouring of concrete into standing water within excavations will not be undertaken. Excavations will be prepared before pouring of concrete by pumping standing water out of excavations to the treatment train and buffered surface water discharge systems in place. Where the isolated working area requires constant dewatering to maintain a dry works area, pumps will be turned off during the concrete pour, and remain off until it can be ensured that the discharge will not result in a change in pH of +/-0.5 units for any nearby watercourse or drain. Alternatively, any dewatering from these areas during the concrete pour will be taken off site for disposal at a licensed waste facility for disposal. Once concrete has cured the pH of any water required to be dewatered will be checked and none of that water allowed to enter the environment unless it is back to within the normal baseline range of the local network.

Concrete works will be scheduled during dry weather conditions to reduce the elevated risk of runoff and will avoid foreseen sustained rainfall (any event longer than 4-hour duration) and/or any foreseen intense rainfall event (>3mm/hour), and do not proceed during any yellow (or worse) rainfall warning issued by Met Éireann.

It will be ensured that suitably sized covers are available for freshly poured concrete to avoid wash off in the event of rain.

The EnCoW / ECoW will continually monitor the pH of any watercourse during concrete works in or adjacent to a watercourse or drain. Should any change in pH +/-0.5 be detected, concrete works will immediately be ceased. Steps will then be taken to identify the entry point to the drain or watercourse and appropriate measures will be implemented to prevent further escape to the environment. The ECoW should consult CIRIA C532 to consider the most appropriate measure.

Spill kits will be readily available at the location of concrete works and will be appropriate for the containment and control of concrete spills and/or runoff.

The Community Water Officer for the Western Region, National Parks and Wildlife Services and Inland Fisheries Ireland will be notified immediately of any concrete spills / runoff into a watercourse.

### *Control of Sediment Runoff*

The drainage, attenuation and surface water management systems proposed for the Site as set out in the SWMP and 100 and 500-Series planning application drawings will be installed concurrent with the main construction activities in order to control increased runoff and associated suspended solids loads.

Waters arising from dewatering during excavation works will be diverted into the surface water management system such that it is captured in settlement ponds and discharged diffusely over land. Where sediment loading from dewatering works is high, the flow will first pass through settlement tank(s) e.g. Silt Buster or similar. For smaller areas of dewatering it may be sufficient to dewater onto adjacent lands within the Planning Boundary via filter bags, filter mats or natural vegetation. This will be determined by the EnCoW / ECoW. Water quality in the nearby downstream drains and watercourses will be monitored in real time for turbidity. Where turbidity equals or exceeds 28 Nephelometric Turbidity Units (NTU) the works will be stopped and an investigation into cause carried out and measures taken as appropriate.

A Peat and Spoil Management Plan will be implemented throughout the construction, operation and decommissioning of the Proposed Development and is included in in Volume III of this EIAR.

No permanent stockpile will remain on the site during the construction or operational phase of the Proposed Development. Excavated material will be either reused as fill / landscaping material within the Site or will be stored temporarily as stockpiles (in accordance with waste legislation) adjacent to the area of excavation and subsequently removed from the site in accordance with waste legislation. Stockpiles will be covered with plastic sheeting.

The on-site cabling and grid connection will require excavation of cable trenches in existing roadways as well as within a small area of private lands where HDD works will be carried out. All spoil from trenches in public roadways will be removed form Site as it is excavated and transported to a licenced waste facility. Spoil from HDD entry and exit pits will be treated as above. Road surfacing materials will be stored in a skip for recycling.

Earthworks will be scheduled during dry weather conditions where feasible to reduce the elevated risk of runoff and will avoid any foreseen intense rainfall event (>3mm/hour), and will not proceed during any yellow (or worse) rainfall warning issued by Met Éireann.

Silt fences will be established downslope along the perimeter of source areas of contaminated runoff. Silt fences will be installed close to source (as opposed to close to receptor). Silt fences will be constructed using a permeable filter fabric (e.g. Hy Tex Terrastop Premium silt fence or similar) and not a mesh or terram. The base of the silt fence will be bedded at least 15- 30 cm into the ground. Once installed the silt fence will be inspected regularly, daily during the proposed works, weekly on completion of the works for at least one month, but particularly after heavy rains and periodically thereafter. The integrity of the silt fencing will be checked daily by the EnCoW and after poor weather conditions (rain or wind) and any failures rectified immediately. Any build-up of sediment along the fence will be removed as deemed necessary by the EnCoW and in accordance with manufacturers requirements. The silt fencing will be left in place until the works are completed (which includes removal of any temporary ground treatment). Silt fences will not be removed during heavy rainfall. The silt fence will not be pulled from the ground but cutaway at ground level and posts removed. A record of when it was installed, inspected and removed will be maintained by the EnCoW.

### *Works in or Adjacent to Waters*

In-stream works will be required at new culvert new bridge crossings.

All works within and adjacent to watercourses will be carried out in accordance with Inland Fisheries Ireland Biosecurity Protocols: https://www.fisheriesireland.ie/Biosecurity/biosecurity.html.

All in-stream works will be carried out under dry works conditions i.e. the works area will be isolated from the river/stream/drain flow by means of temporarily overpumping (in the case of the culverts) or fluming the flow (in the case of the clear-span bridge). The measures employed at the sheet piled floated road through Cloonbar Bog may be a combination of fluming and overpumping. Further construction details are presented in the Surface Water Management Plan.

The diversion of flow by overpumping / fluming will be into the same waterbody i.e. flows will not be diverted from one watercourse to another. The flume pipe and / or the pumps will be sized appropriate to watercourse flow and will have capacity to accommodate storm flows. Fluming is the preferred option for fishery watercourses and must be such that fish passage is maintained. Where overpumping is proposed, screening will be put in place to ensure that fish do not become entrained in the pump. Additionally, a gravel-lined sump will be provided to reduce sedimentation caused by pumping.

In order to create a dry works area, an upstream barrier will be installed using aquadam or sandbags (which will be double bagged and tied). Straw bales will not be permitted. Flows will either be overpumped or flumed downstream of the works area. A downstream barrier will then be installed and the works area dewatered. Direct dewatering into the watercourse will not be permitted as it will increase the risk of sedimentation. Instead dewatering will be via filter bag, sediment tank, filter mats or natural vegetation adjacent to the watercourse. Discharging of construction water (trade effluent) directly to surface waters is a licenced activity. No extracted or pumped or treated construction water from the isolated construction area will be discharged directly to a drain or watercourse (This is in accordance with Local Government (Water Pollution) Act, 1977 as amended).

Any watercourses requiring a dry works area will require a fish salvage exercise which must firstly be authorised under Section 14 of the Fisheries (Consolidation) Act 1959. Fish salvage by electrofishing will not be carried out where water temperature exceeds 20ºC. Fish salvage operations can only be conducted by qualified ecologists under said licence. A detailed method statement will be required as part of the licence application. The work will have regard to the following general guidelines for electrical fishing include Beaumount et al., (2002) “Guidelines for Electric Fishing Best Practice” and Scottish Fisheries Coordination Centre (2007) “Electrofishing team leader training manual” and Central Fisheries Board (2008) Methods for the Water Framework Directive Electric Fishing in wadable reaches”.

No in-stream works will be carried out in any WFD mapped watercourse or associated riparian area during the salmonid spawning season (which is October to May inclusive).

If it is necessary to sling concrete in a skip/hopper for the works or to pump concrete into the works area, the pump and/or hopper/skip will be moved only within or above the isolated works area and will not be allowed to operate above the watercourse.

Provided the construction water within the isolation area is managed in accordance with the measures described above and in the Surface Water Management Plan, overpumping / fluming of the surface water features does not pose a significant risk to surface water quality downstream of the watercourse crossings.

The EnCoW / ECoW will monitor the pH, temperature, DO, turbidity and conductivity of the watercourse upstream and downstream of the isolated works area. The works will be immediately stopped and an investigation of cause carried out and mitigated in the event of the following:

- any change in pH +/-0.5 detected between upstream and downstream monitoring locations;
- downstream turbidity exceed 28 NTU
- DO drops below 80% saturation

### *Horizontal Directional Drilling*

HDD will be employed at one location along the 33 kV cable circuit in accordance with the following methodology:

- A specialist contractor will be appointed to prepare Method Statements of works.
- Fuels, lubricants and hydraulic fluids for equipment use on Site will be carefully handled to avoid spillage, properly secured and provided with spill containment kits in case of incident.
- The depth of the bore will be at least 3m below the level of the stream bed so as not to conflict with the watercourse;
- Fluid return lines used in HDD process will be tested for leaks prior to use to check their reliability;
- Inert, biodegradable drilling fluid will be used;
- A comprehensive monitoring system will be established to closely oversee any procedures involving bentonite, encompassing the careful observation of pumping pressure, the precise formulation of drilling mud (including drilling fluid volume), and the accurate measurement of mud returns.

### 12.12.4 Proposed Mitigation Measures for Operation and Maintenance Stage

The Surface Water Management Plan will ensure that there is no effect on water quality as a result of operation of the Proposed Development. The proposed drainage system will provide several stages of treatment to surface water runoff from constructed areas, which follows the concept of a multi-stage SuDS 'treatment train'.

Interceptor drains installed upslope of access tracks and areas of hardstanding will divert surface water runoff from undeveloped land around the constructed areas to disperse naturally within open ground without mixing with the construction drainage.

The proposed swales will intercept surface water runoff from access tracks and areas of hardstanding. The grass within the swales will provide some filtration to remove a portion of silt and suspended solids. Silt traps will be provided upstream of outfalls from roadside swales.

The settlement ponds will be designed to provide sufficient retention time and a low velocity environment to allow suspended solids of a very small particle size to fall out of suspension prior to discharge. Additional treatment will be provided upstream of the settlement pond with the use of drainage stone at the inlet to provide filtration. In an emergency, the outfall from a settlement pond will be blocked to provide a temporary holding area for accidental spillages on site.

As stated in the SWMP, to adhere to CIRIA C753, the operational phase maintenance routine will involve the regular inspection of the following: drains, check-dams, cross-drains and culverts for blockages; outfalls to existing field drains and watercourses, existing roadside swales for obstructions; progress of re-vegetation.

### 12.12.5 Proposed Mitigation Measure for Decommissioning Stage

The access tracks will remain in situ for land management purposes, after the end of the operational period. Additionally, the turbine foundations and hardstanding will remain in situ and be covered over with soil from the site to re-vegetate naturally. Silt protection procedures, similar to during construction (as described in Section 12.13.3) will be employed for decommissioning..

## 12.13 Residual Effects

### 12.13.1 Residual Effects during Construction Stage

Effects on hydrology and water quality will be mitigated with measures outlined in Section 12.12. This will ensure that the residual impacts of the construction stage are Not significant and there will be no perceivable impact on the Black River and the downstream Lough Corrib SAC which is a highly sensitive receptor that is hydrologically connected to the Site. Furthermore, the Proposed Development will not result in the deterioration of the status of any waterbody under the WFD or jeopardise the achievement of waterbody objectives (good / high status) of any such waterbody.

### 12.13.2 Residual Effects during Operation and Maintenance Stage

The unmitigated potential effects during the operational phase of the site was not significant. Visual monitoring and water quality monitoring at appropriate intervals will be undertaken as precautionary measures to inform any required contingency mitigation measures during operation. The main risk to surface water is the release of hydrocarbons, such as fuel into surface waterbodies via runoff. The residual risk is Not Significant.

### 12.13.3 Residual Effects during Decommissioning Stage

The potential residual effects associated with decommissioning will be similar to those associated with construction but of reduced magnitude.

Turbine bases and hardstanding areas will be covered with soil to encourage vegetation growth and reduce run-off and sedimentation.

Mitigated with measures outlined in Section 12.12 will ensure that the residual impacts of the decommissioning stage are Not significant and there will be no perceivable effect on the Black River and downstream water bodies.

## 12.14 References

Beaumont, W.R.C., Dudley, R.G., and Welton, J.S., 2002. "Guidelines for Electric Fishing Best Practice".

Central Fisheries Board, 2008. Methods for the Water Framework Directive Electric Fishing in wadable reaches.

CIRIA, 2001. Control of water pollution from construction sites. Guidance for Consultants and Contractors (C532). London: CIRIA.

CIRIA, 2006. Control of water pollution from linear construction projects (C648). London: CIRIA.

CIRIA, 2015. Environmental good practice on site guide (fourth edition) (C741). London: CIRIA.

CIRIA, 2015. The SuDS Manual (C753). London: CIRIA.

CIRIA, 2007 Site Handbook for the Construction of SUDS - CIRIA C698. London: CIRIA.

Coillte, 2013. Forest Operations & Water Protection Guidelines.

Department of Environment, Heritage and Local Government (DoEHLG) and Office of Public Works (OPW), 2009. The Planning System and Flood Risk Management - Guidelines for Planning Authorities. Dublin: DoEHLG/OPW.

Department of Housing, Local Government, and Heritage, National Planning Application Database. Available at:

https://housinggovie.maps.arcgis.com/apps/webappviewer/index.html?id=9cf2a09799d74d8e9316a3d3a4d3a8de

Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water. Water Framework Directive.

Directive 2013/39/EU of the European Parliament and of the Council of 12 August 2013 amending Directives 2000/60/EC and 2008/105/EC as regards priority substances in the field of water policy.

Entec UK Limited, 2008. Review of Guidance on the Assessment of Cumulative Impacts of Onshore Windfarms: Phase 1 Report.

Enterprise Ireland, Best Practice Guide BPGCS005 Oil Storage Guidelines.

Environmental Protection Agency (EPA), 2022. Guidelines on the information to be contained in Environmental Impact Assessment Reports. Wexford: EPA.

Environmental Protection Agency (EPA), EPA map viewer. Available at: https://gis.epa.ie/EPAMaps/

EPA Catchments Unit (2024) Third Cycle Draft River Basin Management Plan 2022-2027 RBMP (3rd cycle).

European Communities (Assessment and Management of Flood Risks) Regulations 2010 (S.I. No. 122 of 2010).

European Communities (Good Agricultural Practice for Protection of Waters) Regulations 2012 (S.I. No. 612113 of 2012).

European Communities (Quality of Salmonid Waters) Regulations, 1988 (S.I. No. 293 of 1988).

European Communities (Technical Specifications for the Chemical Analysis and Monitoring of Water Status) Regulations, 2011 (S.I. No. 489 of 2011).

European Communities (Water Policy) Regulations, 2003 (S.I. No. 722 of 2003).

European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations, 2009 (S.I. No. 296 of 2009).

European Communities Environmental Objectives (Groundwater) Regulations, 2012 (as amended).

European Communities Environmental Objectives (Surface Waters) Regulations, 2009 (as amended).

European Communities Environmental Objectives (Surface Water) Regulations 2009.

European Union (Drinking Water) Regulations, 2014 (S.I. No. 12299 of 2014).

European Union (Good Agricultural Practice for Protection of Waters) Regulations 2022 (as amended).

European Union (Water Policy) Regulations 2014 (S.I. No. 350 of 2014).

Flood Risk Management Climate Change Sectoral Adoption Plan for Flood Risk Management in 2015 (updated in 2022).

Galway County Council, Galway County Council Planning Search.

Galway County Council, Galway County Development Plan 2022-2028.

Inland Fisheries Ireland, 2016. Guidelines on protection of fisheries during construction works in and adjacent to waters.

Inland Fisheries Ireland, 2020. Guidelines on Planning for Watercourses in the Urban Environment.

Inland Fisheries Ireland, 2016. Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters.

Irish Independent, 2024 Work on Long-delayed Galway Ring Road to Start in 2026. Available at:

independent.ie, https://www.independent.ie/business/irish/work-on-long-delayed-galway-ring-road-to-start-in-2026/a1121375295.html

Local Government (Water Pollution) Act, 1977 (as amended).

Met Éireann, Met Éireann database.

National Roads Authority, 2005. Guidelines for the Crossing of Watercourses During the Construction of National Road Schemes. Dublin: NRA.

Natural Resources Wales (NRW), Northern Ireland Environment Agency (NIEA), Scottish Environment Protection Agency (SEPA), Energy Institute, and Oil Care Campaign, 2021. GPP2: Above ground oil storage tanks.

Natural Resources Wales (NRW), Northern Ireland Environment Agency (NIEA), Scottish Environment Protection Agency (SEPA), 2017. GPP4: Treatment and disposal of wastewater where there is no connection to the public foul sewer.

Natural Resources Wales (NRW), Northern Ireland Environment Agency (NIEA), Scottish Environment Protection Agency (SEPA), 2017. GPP5: Works and maintenance in or near water.

Natural Resources Wales (NRW), Northern Ireland Environment Agency (NIEA), Scottish Environment Protection Agency (SEPA), 2017. GPP8: Safe storage and disposal of used oil.

Natural Resources Wales (NRW), Northern Ireland Environment Agency (NIEA), Scottish Environment Protection Agency (SEPA), 2017. GPP21: Pollution Incident Response Plans.

Natural Resources Wales (NRW), Northern Ireland Environment Agency (NIEA), Scottish Environment Protection Agency (SEPA), 2018. GPP22: Dealing with Spills.

Natural Resources Wales (NRW), Northern Ireland Environment Agency (NIEA), Scottish Environment Protection Agency (SEPA), 2019. GPP26: Safe storage of Drums and intermediate Bulk Containers (IBCs).

Office of Public Works (OPW), OPW flood maps. Available at: floodinfo.ie

Ordnance Survey Ireland (OSI), OSI mapping. Available at: geohive.ie

Planning System and Flood Risk Management Guidelines for Planning Authorities (OPW 2009).

Scottish Fisheries Coordination Centre, 2007. “Electrofishing team leader training manual”.

Scottish Natural Heritage, 2019. Good Practice During Wind Farm Construction.

SEPA, Water Run-Off from Construction Sites - SEPA - (WAT-SG-75).

SEPA, Temporary Construction Methods - SEPA -(WAT-SG-29).

Transport Infrastructure Ireland (TII), 2008. Guidelines for the Crossing of Watercourses During the Construction of Road Schemes.

Transport Infrastructure Ireland (TII), 2013. GE-INT-01203- Introduction to the NRA Design Manual for Roads and Bridges.

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