61253

Environmental Impact Assessment Report

Cummeennabuddoge Wind Farm

Chapter 11: Hydrology, Water Quality and Flood Risk

Cummeennabuddoge Wind (DAC)

September 2024

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Glossary of Terms

Term	Definition
The Applicant	Cummeennabuddoge Wind Designated Activity Company (DAC)
The Agent	Atmos Consulting Limited
Environmental Advisors and Planning Consultants	Atmos Consulting Limited
Environmental Impact Assessment	A means of carrying out, in a systematic way, an assessment of the likely significant environmental effects from a development
Environmental Impact Assessment Regulations	Schedule 6 of the Planning and Development Regulations 2001(as amended)
Environmental Impact Assessment Report	A document reporting the findings of the EIA and produced in accordance with the EIA Regulations
The Proposed Development	Cummeennabuddoge Wind Farm
The Proposed Development Site	The land enclosed by the red line shown on Figure 1-1a
The Planning Act	Directive 2011/92/EU (as amended by Directive 2014/52/EU, the EIA Directive).

List of Abbreviations

Abbreviation	Description
BOD	Biochemical Oxygen Demand
CEMP	Construction Environmental Management Plan
CIRIA	Construction Industry Research And Information Association
CSA	Critical Source Areas
DoHLGH	Department Of Housing, Planning And Local Government
DAERA	Department of Agriculture, Environment and Rural Affairs
DAFM	Department of Agriculture, Food and the Marine
DO	Dissolved Oxygen
DWS	drinking water standards
ECoW	Ecological Clerk of Works
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
EPA	Environmental Protection Agency
EQS	Environmental Quality Standards
FPM	freshwater pearl mussel
FSU	Flood Studies Update
GDSDS	Greater Dublin Strategic Drainage Study
GIS	geographic information system
GSI	Geological Survey of Ireland
GPP	Guidance on Pollution Prevention
IEL	Industrial Emissions Licensing
IPC	Integrated Pollution Control
IFI	Inland Fisheries Ireland

Abbreviation	Description
IWEA	Irish Wind Energy Association
KCC	Kerry County Council
LFL	Limited Felling Licence
MRP	Molybdate Reactive Phosphorus
MRFS	Mid-Range Future Scenario
NDP	National Development Plan
NPF	National Planning Framework
NPWS	National Parks & Wildlife Service
NHA	Natural Heritage Area
NRA	National Roads Authority
OSI	Ordnance Survey Ireland
PIP	Pollution Impact Potential
PPG	Pollution Prevention Guidance
PPP	Pollution Prevention Plan
AAR	Standard Average Annual Rainfall
SEA	Strategic Environmental Assessment
SEPA	Scottish Environment Protection Agency
SAC	Special Area of Conservation
SIS	Soil Information System
SPA	Special Protection Areas
SPR	Standard Percentage Runoff
SuDS	Sustainable Urban Drainage System
TON	Total Oxidized Nitrogen
TP	Total Phosphorous
TSS	total suspended solids
UE	Uisce Éireann
UWW	Urban Wastewater
WFD	Water Framework Directive

11 Hydrology, Water Quality and Flood Risk

11.1 Introduction

11.1.1 Terms of Reference

This chapter considers the likely significant effects on the receiving hydrological environment associated with the construction, operational, and decommissioning phases of the proposed Cummeennabuddoge (CMBG) wind farm, hereinafter referred to as the 'Proposed Development'. The Proposed Development is described in full in Chapter 4: Description of Development of this EIAR.

The effects caused by the construction, operation, and decommissioning phases of the Proposed Development are assessed, and mitigation measures are provided where required.

The assessment also identifies where hydrological features constrain the layout of the Proposed Development.

11.1.2 Supplementary Assessments

This Chapter is supported by:

- Appendix 11-1: Flood Risk Assessment;
- Appendix 11-2: Water Quality Assessment;
- Appendix 11-3: Water Quality Monitoring and Response Plan;
- Appendix 11-4: Surface Water Management Plan;
- Appendix 11-5: Consultation Records; and
- Figures 11-1 to 11-4.

Reference should be made to Chapter 1: Introduction and Background and Chapter 4: Description of Development for information regarding detailed construction proposals.

Changes to the hydrological regime may create resultant effects on ecology within hydrological / hydrogeological-dependent ecosystems. Therefore, this chapter is further supported by:

- Chapter 8: Biodiversity; and
- Chapter 10: Soils, Geology and Hydrogeology.

11.1.3 Statement of Authority

The assessment has been carried out by McCloy Consulting Ltd., an independent environmental consultancy specialising in the water environment, with specialist knowledge of hydrological and environmental assessments.

The key staff members involved in surveying the site, carrying out this assessment, and writing this chapter are as follows:

- Iain Muir MSc CEnv MIEnvSc – Senior Consultant and Chartered Environmentalist with 8 years' experience in Environmental Impact Assessment (EIA) specialising in the water environment, undertaking hydrology, water quality and flood risk assessments for major infrastructure projects in highland environments, and renewable energy projects in the UK and Ireland; and

- Kyle Somerville BEng (Hons) CEng MIEI – Director and Chartered Engineer with 19 years' experience specialising in the fields of hydrology and surface water management for wind farm developments in the UK and Ireland and has overseen outline and detailed design of surface water management for in excess of thirty onshore wind farm developments in the UK and Ireland.

11.1.4 Scope of Assessment

EIA Report Scoping

As outlined in the EIA Scope of Works Report (provided in Appendix 2-1), the Proposed Development immediately adjoins and drains directly into the River Clydagh which forms part of the Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment Special Area of Conservation (SAC). The Proposed Development is also located within a Freshwater Pearl Mussel (FPM) Sensitive Catchment. Changes in water quality may adversely affect the qualifying species and habitats associated with the SAC including aquatic invertebrates and fish.

It has been determined at Scoping stage that eutrophication of Lough Leane near Killarney (hydrologically connected to the Proposed Development site) is a long-recognised concern. Nutrients have the potential to be released from the Proposed Development site during and after felling to watercourses draining into Lough Leane.

Water Framework Directive

The EU Water Framework Directive (2000/60/EC, as amended by Directives 2008/105/EC, 2013/39/EU and 2014/101/EU) established a new integrated approach to the protection of the water environment. A fundamental requirement of the WFD is to attain good ecological water status and that deterioration in the status of water is prevented. The Environmental Impact Assessment Directive (85/337/EEC) requires likely significant environmental impacts to be identified, assessed and mitigated. Any impact that would compromise the achievement of a WFD objective or result in the deterioration in the status of waters is considered as a significant impact.

Kerry County Development Plan 2022 – 2028

The EIA Scope of Works Report was informed, in part, by the Kerry County Development Plan 2022 – 2028. The Development Plan's 'wind zoning methodology' identifies the Proposed Development site to be within and / or hydrologically connected to areas denoted as 'wind energy constraints' i.e., 'Lough Leane Catchment', 'Natura 2000', and Water Framework Directive (WFD) and Water Quality'.

The following is noted within the Development Plan regarding Lough Leane Catchment:

> 'Water quality in this catchment was subject to an algae bloom in the late 1990s...given the potential for the release of sedimentary phosphorus arising from wind development this catchment is considered to be unsuitable for wind development. There was a considerable impact on Lough Leane, and in particular Ross Bay, after the summer drought of 2018'. While this is attributed to probable lack of dilution and flushing of wastewater discharges during the summer peak, it highlights the vulnerability of Lough Leane to water quality and hydrological changes in the catchment.'

The following is noted within the Development Plan regarding Natura 2000 sites:

> 'The scale, dimensions and characteristics of wind farm projects can significantly affect the quality and integrity of natural heritage areas...Kerry County Council recognises that the Habitats and Birds Directives do not, a priori, exclude wind farm developments in or adjacent to Natura 2000 sites. These need to be assessed on a case-by-case basis.'

The following is noted within the Development Plan regarding WFD and Water Quality;

> 'The WFD Blue Dot Programme aims to protect and restore high-status waters. The scale and associated works with wind energy development pose a risk to the implementation of the River Basin Management Plans and restoration of high-status waters. In order to avoid this risk, such waters are considered to be a constraint to wind energy development.'

Cork County Development Plan 2022 – 2028

The Proposed Development includes a proposed underground 110kV grid connection cable that will be located within County Cork. Therefore, the Cork County Development Plan 2022 – 2028 also informed the EIA Scope of Works Report. With regards to the water environment and wind energy, the follow is noted within the Plan:

> 'Cork County Council developed a wind energy strategy based on a number of key policy considerations relevant to this assessment including:
>
> - The Water Framework Directive and River Basin Management Plans for the County, so that impacts on the rivers, lakes and other waterbodies of the County could be avoided; and
> - Nature conservations sites and in particular Natura 2000 sites (SPA and SAC).'
>
> 'All planning applications for wind energy development should include a comprehensive assessment of the potential impacts...on the receiving environment and landscape. The Planning Authority will require the following criteria to be covered by prospective applicants:
>
> - Site drainage, water storage and hydrological effects such as water supply and quality and watercourse crossings; management plans to deal with any potential material impact on watercourses...and flood risk including mitigation measures.'

Scope of the Hydrology, Water Quality and Flood Risk Assessment

This report will assess the effects of the Proposed Development on hydrology, surface water quality, and flood risk. The assessment covers construction (including pre-construction felling which, due to potential effects on the water environment, is deemed a necessary assessment in its own right (refer to sections 11.3.11 and 11.6.1)), operational, and decommissioning phases of the Proposed Development.

This assessment identifies the hydrological considerations within the red line boundary of the Proposed Development site, herein referred to as the 'Site' (as outlined in the Site Location Plan: Figure 1-1a), and assesses the potential effects of the Proposed Development on the following:

- Existing natural and artificial drainage patterns;
- Surface water quality;

- Surface water dependent ecosystems;
- Usage of surface water, including abstractions; and
- Surface water - groundwater interactions.

To quantifiably assess the preceding, this report:

- Outlines relevant policy relating to the water environment;
- Summarises consultations provided in response to scoping requests;
- Provides baseline information and identifies sensitive receptors;
- Identifies potential likely effects;
- Assesses the significance of any adverse effects and resulting effects based on the magnitude of the effect and the sensitivity of the receptors;
- Discusses management of design evolution and details mitigation measures;
- Provides a residual effect assessment; and
- Discusses the cumulative effects of the development in conjunction with other proposed and existing developments in the vicinity.

11.2 Methodology and Approach

11.2.1 Legislation, Planning Policy, and Guidance

Relevant environmental planning legislation and policy and industry best-practice guidance relevant to an assessment of the water environment are summarised in Table 11-1 and the following sections.

Relevant Legislation and National Planning Policy

Table 11-1: Relevant Legislation

Legislation
EU
Water Framework Directive (WFD) (2000/60/EC)
Floods Directive (2007/60/EC)
Integrated Pollution and Prevention Control Directive (2008/1/EC)
Urban Wastewater Directive (91/271/EEC)
Drinking Water Directive (98/83/EC)
Environmental Liability Directive (2004/35/EC)
Groundwater Daughter Directive to the Water Framework Directive (2006/118/EC)
Groundwater Directive (2014/80/EU)
Priority Substance Daughter Directive to the Water Framework Directive (2008/105/EC)
Nitrates Directive (91/676/EEC)
Sewage Sludge Directive (86/278/EEC)
Environmental Impact Assessment Directive 2011/92/EU as amended by 2014/52/EU
Habitats Directive (92/43/EEC)
Directive 2009/147/EC on the Conservation of Wild Birds, 1979
Ireland
S.I. No. 722/2003 - European Communities (Water Policy) Regulations 2003.
S.I. No. 122/2014 - European Union (Drinking Water) Regulations 2014.

Legislation
Water Services (Amendment) Act 2012
Local Government (Water Pollution) Act 1977 and amendments to 1990
SI No. 258 of 1988 Water Quality Standards for Phosphorus Regulations 1998
S.I. No. 272/2009 - European Communities Environmental Objectives (Surface Waters) Regulations 2009 and amendment (S.I. 327 of 2012).
S.I. No. 9/2010 - European Communities Environmental Objectives (Groundwater) Regulations 2010 and amendments (S.I. 389 of 2011 and S.I. 149 of 2012).
S.I. No. 684 of 2007 Waste-Water Discharge (Authorisation) Regulations, 2007, as amended (S.I 231 of 2010).
S.I. No. 489/2011 - European Communities (Technical Specifications for the Chemical Analysis and Monitoring of Water Status) Regulations, 2011.
S.I. No. 477/2011 - European Communities (Birds and Natural Habitats) Regulations 2011 and amendment S.I. No. 355/2015
S.I. No. 296/2009 - The European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009
S.I. No. 293 of 1988 Quality of Salmonid Water Regulations, resulting from EU Directive 78/659/EEC on the Quality of Fresh Waters Needing Protection or Improvement in order to Support Fish Life.
S.I. No. 349 of 1989, European Communities (Environmental Impact Assessment) Regulations, and subsequent amendments (S.I. No. 84 of 1994, S.I. No. 352 of 1998, S.I. No. 93 of 1999, S.I. No. 450 of 2000 and S.I. No. 538 of 2001).
S.I. No. 473 of 2011, European Union (Environmental Impact Assessment and Habitats) Regulations 2011.
S.I. No. 584 of 2011, European Union (Environmental Impact Assessment and Habitats) (No. 2) Regulations 2011.
Planning and Development Act 2000, as amended
S.I. No. 600/2001 - Planning and Development Regulations, 2001and subsequent amendments including, S.I. No. 364 of 2005 and S.I. 685 of 2006.
S.I. No. 350/2014 - European Union (Water Policy) Regulations 2014.
S.I. No. 278/2007 - European Communities (Drinking Water) (No. 2) Regulations 2007.
S.I. No. 122 of 2010 European Communities (Assessment and Management of Flood Risks) Regulations 2010.
S.I. No. 547 of 2008 European Communities (Environmental Liability) Regulations which bring into force the Environmental Liability Directive (2004/35/EC).
S.I. No. 261/2018 - European Union (Water Policy) (Abstractions Registration) Regulations 2018.
S.I. No. 355/2015 - European Communities (Birds and Natural Habitats) (Amendment) Regulations 2015.
S.I. No. 246/2012 - European Union (Environmental Impact Assessment and Habitats) Regulations 2012.
S.I. No. 282/2012 - European Union (Environmental Impact Assessment) (Integrated Pollution Prevention and Control) Regulations 2012.
S.I. No. 283/2012 - European Union (Environmental Impact Assessment) (Waste) Regulations 2012.
S.I. No. 410/2012 - European Union (Environmental Impact Assessment) (Aquaculture) Regulations 2012.
S.I. No. 419/2012 - European Union (Environmental Impact Assessment) (Planning and Development Act, 2000) Regulations 2012.
S.I. No. 433/2012 - European Union (Environmental Impact Assessment) (Foreshore) Regulations 2012.
S.I. No. 457/2012 - European Union (Environmental Impact Assessment) (Integrated Pollution Prevention and Control) (No. 2) Regulations 2012.

National, Regional and Local Planning Policy

The Proposed Development has been reviewed in relation to planning policy specific to the water environment.

Statutory national, regional and local planning policy frameworks and associated supplementary guidelines pertinent to this chapter and the proposed development include:

- Relevant National Plans and Programmes:
  - Project Ireland 2024 – National Planning Framework (NPF) (Department of Housing, Planning and Local Government, 2018);
  - National Development Plan (NDP) (Department of Public Expenditure and Reform, 2021);
  - Our Sustainable Future – A Framework for Sustainable Development for Ireland (Department of the Environment, Community and Local Government, 2012);
  - Ireland's Environment – An Assessment (Environmental Protection Agency, 2016);
  - Department of Environment, Heritage and Local Government (2006) Wind Energy Development Guidelines for Planning Authorities;

    Department of Housing, Planning and Local Government (2019) Draft Revised Wind Energy Development Guidelines;
  - Flood mapping and management information developed and published through the National CFRAMS Programme (Office of Public Works, 2009 to present (January 2024));
  - River Basin Management Plan for Ireland (Department of Housing, Local Government and Heritage, 2018);
  - The Planning System and Flood Risk Management: Guidelines for Planning Authorities (Department of Environment, Heritage and Local Government/Office of Public Works, 2009);
  - Construction, Replacement or Alteration of Bridges and Culverts: A Guide to Applying for Consent under Section 50 of the Arterial Drainage Act, 1945 (OPW 2022); and
  - The Greater Dublin Strategic Drainage Study (GDSDS) (Dublin City Council, 2005[1].

- Relevant Regional Plans and Programmes:
  - Strategic Environmental Assessment (SEA) Regional Spatial and Economic Strategy for the Southern Region (Southern Regional Assembly, 2020)
- Relevant Local Plans and Programmes:
  - Kerry County Development Plan 2022-2028; and
  - Cork County Development Plan 2022-2028.

Industry Guidelines

The assessment is carried out in accordance with guidance listed below:

[11] Both Cork County Council and Kerry County Council SFRAs require SuDS design to be carried out in accordance with GDSDS and CIRIA C753 (SuDS Manual).

- Environmental Protection Agency (2022) Guidelines on the Information to be Contained in Environmental Impact Assessment Reports.
- Department of Environment, Heritage and Local Government (DoHLG) (2018) Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment.
- Inland Fisheries Ireland (2016): Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters.
- National Road Authority (NRA) (2009) Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes.
- Department of Agriculture, Food and the Marine (DAFM) (2000) Forest Harvesting and the Environment Guidelines.
- Department of Agriculture, Food and the Marine (2000) Forestry and Water Quality Guidelines.
- Department of Agriculture, Food and the Marine (2018) Plan for Forests & Freshwater Pearl Mussel in Ireland.
- NatureScot (2019) Guidance - Good Practice During Wind Farm Construction.
- Department of Agriculture, Environment and Rural Affairs (DAERA) (2019) Environmental Advice for Planning Practice Guide Wind farms and Groundwater Impacts: A Guide to EIA and Planning Considerations.
- Construction Industry Research and Information Association (CIRIA) (2001) C532 - Control of Water Pollution from Construction Sites.
- CIRIA (2015) C741 - Environmental Good Practice On-Site.
- CIRIA (2015) C753 - The SuDS Manual.
- CIRIA (2019) C786 - Culverts, Screen and Outfall manual; and
- Scottish Environment Protection Agency (SEPA) & Northern Ireland Environment Agency (NIEA) (2000-2023) Guidance for Pollution Prevention (GPP) / Pollution Prevention Guidance (PPG) Series.

11.2.2 Consultation

Pre-application consultation and data gathering to form opinion and requirements with regards to the hydrological environment was sought from local and regional stakeholder organisations, including regulatory bodies who would be anticipated to be consulted by the planning authority in relation to the planning application. The consultation informed the preparation of the EIAR.

A summary of the specific data provided by, and information / concerns raised by the various stakeholders, is included in the following table. Site-specific input provided is also included in the following baseline assessment. Stakeholder responses are included in **Appendix 11-5: Consultation Records. Further comments provided by stakeholders are outlined in Chapter 2: EIA Approach and Methodology**.

Table 11-2: Consultation

Consultee	Summary of Consultee Response	Section where addressed in this Report
Environmental Protection Agency (EPA)	Provided data for the River Flesk catchment up to 2023.	**11.3.6**

Consultee	Summary of Consultee Response	Section where addressed in this Report
Kerry County Council (KCC) – Environment / Water Services Department	Noted their overriding concerns would be on the potential impact on surface water quality downstream of the Proposed Development particularly during the construction phase. Stated that attention be placed on any potential downstream impacts particularly as the Clydagh River is a tributary of the River Flesk, which in turn constitutes the main water body flowing into Lough Leane (refer to **Technical Appendix 2-2 Scoping Responses**). No information was available from KCC regarding private water supplies (PWS) or domestic discharge locations i.e., septic tanks.	11.3.18 and 11.6
Inland Fisheries Ireland (IFI)	Provided water quality data and information on protected species in the Flesk catchment. Provided summary juvenile salmonid data for the Flesk catchment based on electrofishing carried out in 2000. Advised that a detailed appraisal of available IFI and other self-service environmental resources is required to establish the status of the Proposed Development site. Advised that electrofishing of the site should be undertaken to determine species present and their densities.	11.3.13 and Appendix 8-3: Aquatic Ecology and Fish Survey
National Parks & Wildlife Service (NPWS)	Provided datasets of habitats and species within a defined areas around and downstream of the Site. Provided Site Specific Conservation Objectives for Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC (000365).	11.3.16
Uisce Éireann	Provided information on water distribution and sewer networks at, and downstream, of the Proposed Development site. Provided general considerations regarding protection of drinking water sources.	11.3.19

11.2.3 Assessment Methodology

Baseline Characterisation

This qualitative and quantitative assessment has been undertaken based on experienced professional judgement and assessment in compliance with statutory and industry guidance, including site visits for verification.

Study Area

Potential effects were considered within the 'Site' (as outlined in the Site Location Plan: Figure 1-1a), and the wider hydrological setting of the area.

The hydrological study area includes surface water catchments draining the area within the Site and the downstream river reaches affected by this area as defined by the relevant WFD catchments. The surface water catchments considered are outlined in Table 11-8 and Table 11-9, and shown on Figure 11-1.

This assessment does not include consideration to the Turbine Delivery Route, as there are no earthworks (e.g., road widening) proposed to facilitate delivery.

Desk Study

The desktop study involved collation and assessment of the relevant information from the following sources:

- Close scale Ordnance Survey Ireland (OSI) mapping in addition to aerial photography to assess land use and environs and to identify water features and watercourse catchments;
- Local authority and regulatory body consultation responses;
- EPA river quality and hydrometric data (https://gis.epa.ie/EPAMaps/Water) [Accessed 29/11/2023];
- National Park and Wildlife Service (NPWS) Designations Viewer (https://dahg.maps.arcgis.com/apps/webappviewer/index.html?id=8f7060450de3485fa1c1085536d477ba) [Accessed: 25/11/2023];
- Natural heritage datasets (Habitats Directive habitats / species) provided by NPWS during consultation;
- Office of Public Works (OPW) Flood Maps (https://www.floodinfo.ie/map/floodmaps/) [Accessed 27/11/2023];
- OPW Flood Studies Update (FSU) Web Portal data for hydrology (https://opw.hydronet.com/) [Accessed 29/11/2023];
- Met Eireann Meteorological Databases (https://www.met.ie/climate/available-data/monthly-data) [Accessed: [18/11/2023];
- Water quality and protected species information provided by Inland Fisheries Ireland (IFI) during consultation;
- Detailed site-specific topographic survey (Sintegra LiDAR data);
- Geological Survey Ireland (GSI) Spatial Resources Mapping (https://dcenr.maps.arcgis.com/apps/MapSeries/index.html?appid=a30af518e87a4c0ab2fbde2aaac3c228) [Accessed 29/11/2023]; and
- Environmental Impact Statement for Proposed Clydaghroe Wind Farm (MWP, 2010) (https://www.kerrycoco.ie/planning/online-planning-enquiry/).

Field Surveys

Field walkover surveys were undertaken by McCloy Consulting Ltd. on the 26th January 2021, 19th April 2021, and 20th July 2022, with the purpose of identifying / verifying existing natural and artificial drainage characteristics and hydrological features that may potentially be affected by the Proposed Development.

The walkover surveys were undertaken by Iain Muir - Senior Consultant (refer to section 11.1.3) and incorporated the lands within the Site, with particular emphasis on areas potentially affected by proposed wind turbine and access track layout and known / mapped watercourses in order to fully assess potential issues with regards to:

- Disruption to watercourses through construction of roads / hard standing etc.; and
- Likelihood of adverse effects on surface water movement / quality due to construction of the Proposed Development.

11.2.4 Determination of Sensitivity, Magnitude, Likelihood and Significance

This assessment determines the nature, scale, and significance of the effects of the Proposed Development on the baseline (current) scenario in accordance with a methodology stated within The Institute of Environmental Management and Assessment guidance (2004), and guidance documents outlined in section 11.2.1, namely EPA (2022) and NRA (2009).

The potential effect significance is defined by the combination of the sensitivity of the receptor and the magnitude of the effect. Following this, an overall effect significance is determined by considering the potential effect significance and the likelihood of the effect occurring.

The assessment of the magnitude of the predicted effect has taken into account the full range of infrastructure proposed by the application. The range of turbines proposed causes no change to work at ground level that would affect the magnitude of any effect to hydrology.

Sensitivity Criteria

The scale and sensitivity of the receiving environment (receptor) has been categorised on a scale of "Extremely High" to "Low". The sensitivity criteria used for this assessment are presented in Table 11-3 and are based on:

- Vulnerability of a receptor to a particular pressure (degree of environmental response to any particular effect); and
- The importance or 'value' of the receptor (e.g., an area of international importance) should be considered more sensitive to potential effects than an area of little or no conservation value.

Table 11-3: Evaluation of Hydrological Receptor Sensitivity Criteria (adapted from NRA, 2009)

Importance / Sensitivity of Attribute	Criteria	Definition of Criteria
Extremely High	Attribute has a high quality or value on an international scale	River, wetland or surface water body ecosystem protected by EU legislation e.g., 'European sites' (SAC, SPA) designated under the Habitats Regulations or 'Salmonid waters' designated

Importance / Sensitivity of Attribute	Criteria	Definition of Criteria
		pursuant to the European Communities (Quality of Salmonid Waters) Regulations, 1988.
Very High	Attribute has a high quality or value on a regional or national scale	• 'High' overall WFD status • River, wetland or surface water body ecosystem protected by national legislation – Natural Heritage Area (NHA) status • Regionally important potable water source supplying >2500 homes • Quality Class A (Biotic Index Q4, Q5) • Flood plain protecting more than 50 residential or commercial properties from flooding • Nationally important amenity site for wide range of leisure activities
High	Attribute has a high quality or value on a local scale	• 'Good' overall WFD status • Salmon fishery • Locally important potable water source supplying >1000 homes • Quality Class B (Biotic Index Q3-4) • Flood plain protecting between 5 and 50 residential or commercial properties from flooding • Locally important amenity site for wide range of leisure activities
Medium	Attribute has a medium quality or value on a local scale	• 'Moderate' overall WFD status • Coarse fishery • Local potable water source supplying >50 homes • Quality Class C (Biotic Index Q3, Q2-3) • Flood plain protecting between 1 and 5 residential or commercial properties from flooding • Amenity site / utility used by large numbers of local people
Low	Attribute has a low quality or value on a local scale	• 'Poor / Bad' overall WFD status • Locally important amenity site for small range of leisure activities • Local potable water source supplying <50 homes • Quality Class D (Biotic Index Q2, Q1) • Flood plain protecting 1 residential or commercial property from flooding • Amenity site / utility used by small numbers of local people

Magnitude of Effect

The magnitude of change / effect is influenced by the timing, scale, size, and duration of the effect; magnitude has been categorised on a scale of "Large Adverse" to "Large Beneficial"; defined in Table 11-4.

Magnitude of Effect criteria include criteria as set out in Box 5.2 of the NRA guidance (2009) but provides additional criteria / examples to better allow assignation of magnitude of potential effects. Additional examples have been developed through practice experience specific to onshore windfarm development in Ireland and elsewhere, and are routinely accepted in practice.

Table 11-4: Evaluation of Magnitude of Effect Criteria (adapted from NRA, 2009)

Magnitude of Effect	Criteria	Definition of Criteria / Typical Examples
Large Adverse	Results in loss of attribute and /or quality and integrity of attribute	• Loss or extensive change to a waterbody or water dependent habitat / species • Increase in predicted peak flood level >100mm • Extensive loss of fishery (commercial and / or angling) • Extensive reduction in amenity value / utility function • Potential high risk of pollution to surface water changing water quality status • Loss of local water supply or change in quality with respect to drinking water standards (DWS) • Significant and permanent change over large scale i.e. Large changes in erosion and deposition regimes
Moderate Adverse	Results in moderate effect on integrity of attribute or loss of part of attribute	• Increase in predicted peak flood level >50mm • Partial loss of fishery (commercial and / or angling) • Partial reduction in amenity value / utility function • Potential medium risk of pollution to surface water, changing water quality status • Temporary loss of local water supply or minor change in quality of supply with respect to drinking water standards • Detectable change to river morphology / fluvial geomorphology over a small scale i.e. some changes in erosion and deposition regimes
Small Adverse	Results in minor effect on integrity of attribute or loss of small part of attribute	• Increase in predicted peak flood level >10mm • Minor loss of fishery (commercial and / or angling) • Slight reduction in amenity value / utility function • Minor deterioration in water quality unlikely to affect the most sensitive receptor or insignificant change in water quality conditions not exceeding those expected due to naturally occurring fluctuations • No change in pressure or flow to local water supply or minor change in quality of supply with respect to drinking water standards • Minor change to river morphology / fluvial

Magnitude of Effect	Criteria	Definition of Criteria / Typical Examples
		geomorphology
Negligible	Results in an effect on attribute but of insufficient magnitude to affect either use or integrity	• No perceptible changes to baseline conditions. No measurable change in water quality. No change in the water feature's capacity to dilute pollutants and waste products • Negligible change in predicted peak flood level • Negligible reduction in amenity value / utility function • No measurable change to a surface water dependent ecosystem or fishery (commercial and / or angling) • Unquantifiable or unqualifiable change to river morphology / fluvial geomorphology
Small Beneficial	Results in minor improvement of attribute quality	• Reduction in predicted peak flood level >10mm • Minor improvement over baseline water quality conditions • Partial improvement to sediment processes at the reach scale, including reduction in siltation and localised recovery of sediment transport processes • Partial improvements including enhancements to in-channel habitat, riparian zone and morphological diversity of the bed and / or banks • Slight improvement on baseline conditions with potential to improve flow processes at the reach scale
Moderate Beneficial	Results in moderate improvement of attribute quality	• Reduction in predicted peak flood level >50mm • Moderate improvement over baseline water quality conditions • Reduction in siltation and recovery of sediment transport processes at the reach or multiple reach scale • Partial creation of both in-channel and vegetated riparian habitat. Improvement in morphological diversity of the bed and / or banks at the reach or multiple reach scale. Includes partial or complete removal of structures and/or artificial materials • Notable improvements on baseline conditions and recovery of fluvial processes at the reach or multiple reach scale
Large Beneficial	Results in major improvement of attribute quality	• Reduction in predicted peak flood level >100mm • Major improvement over baseline water quality conditions • Improvement to sediment processes at the catchment scale, including recovery of sediment supply and transport processes

Magnitude of Effect	Criteria	Definition of Criteria / Typical Examples
		• Extensive creation of both in-channel habitat and riparian zone. Morphological diversity of the bed and/ or banks is restored, such as natural planform, varied natural cross-sectional profiles, recovery of fluvial features (e.g. cascades, pools, riffles, bars) expected for river type. Removal of modifications, structures, and artificial materials • Substantial improvement on baseline conditions at catchment scale. Recovery of flow and sediment regime

The significance of a potential effect on the water feature is a product of the sensitivity of the water feature and the magnitude of the potential effect. Values can range from 'High' to 'Negligible' ('Imperceptible' to 'Profound') and effects may be considered 'Adverse' or 'Beneficial' depending on the sensitivity of the attribute and the magnitude of effect associated with the proposed development.

Effect Significance Criteria

The magnitude of effect and receptor sensitivity are combined to evaluate and qualify if an effect is of profound, significant, moderate, slight, or imperceptible as outlined in Table 11-5.

Table 11-5: Evaluation of Potential Effect Significance (adapted from NRA, 2009)

Scale / Sensitivity of the Environment (Receptor)	Magnitude of Effect (Adverse or Beneficial)			
	Negligible	Small	Moderate	Large
Extremely High	Imperceptible	Significant	Profound	Profound
Very High	Imperceptible	Significant / Moderate	Profound / Significant	Profound
High	Imperceptible	Moderate / Slight	Significant / Moderate	Profound / Significant
Medium	Imperceptible	Slight	Moderate	Significant
Low	Imperceptible	Imperceptible	Slight	Slight / Moderate

Likelihood of Occurrence Criteria

The likelihood of the potential effects occurring is assessed based on historical data, quantitative analysis and professional judgement based on relevant experience as shown in Table 11-6.

Table 11-6: Evaluation of Likelihood of Occurrence

Likelihood of occurrence	Criteria
Certain	Likely consequential effect in medium term and inevitable in long term (within the life of the development).
Likely	Possible consequential effect in the medium term and likely but not inevitable in the long term.

Likelihood of occurrence	Criteria
Unlikely	Unlikely that any consequential effect would arise within the lifetime of the development.
Rare	It is unlikely that any consequence would ever arise.

Determination of Overall Effect Significance

Potential Effect Significance (Table 11-5) and Likelihood of Occurrence (Table 11-6) are combined to determine an Overall Effect Significance as shown in the matrix in Table 11-7.

Table 11-7: Evaluation of Overall Significance

Potential Significance	Likelihood of Occurrence			
	Rare	Unlikely	Likely	Certain
Profound / Significant	Minor	**Moderate**	**Major**	**Major**
Moderate	Minor	Minor	**Moderate**	**Major**
Slight	Not Significant	Minor	Minor	**Moderate**
Imperceptible	Not Significant	Not Significant	Minor	**Moderate**

In accordance with EPA EIAR Guidelines (2022), significance is determined by a combination of scientific and subjective concerns. This requires professional judgement of competent experts which can lead to differences in opinion where assessment is, to an extent, of a subjective nature. EIAR lays out the varying degrees of significance attributed to differing factors to provide clarity to the determination of effects.

Effects predicted to be of major or moderate significance are considered to be 'significant' in accordance with the EPA Guidance 2022 and are highlighted in bold on the above table.

11.3 Baseline Conditions

11.3.1 Site Description

The Proposed Development lies within existing Coillte commercial forestry, located on land at Clydaghroe and Cummeennabuddoge, Clonkeen, predominantly within County Kerry, although the majority of the 110kV grid connection infrastructure is proposed within County Cork. The nearest settlements are Ballyvourney and Millstreet (both in County Cork) located approximately 5 km south and 7 km north-east of the site, respectively.

The Proposed Development is approximately centred on Grid Reference 519914, 583144 and occupies an area of approximately 709 ha.

11.3.2 Topography

The topography within the Site typically slopes down from the southern boundary (maximum approximately 520 m OD) to the northern boundary (at approximately 300 m OD) with the Lackabaun and Mullaghanish mountain peaks located to the south.

The majority of the central section within the Site is located between 300 - 400 m OD, and the watercourses flowing within have created a ridge and shallow valley system.

Lower elevations are observed in the west of the Site where the access track join from the N22, which is at approximately 270 m OD. The tracks within 1.5 km of the N22 are steep, climbing from an elevation of 270 m OD to approximately 380 m OD (Figure 1-1a).

11.3.3 Land Cover and Soils

The land within the Site comprises existing commercial forestry comprised of 'compartments' scheduled for commercial felling, access tracks into and throughout the forest, and the Garrow 110 kV substation adjacent to the east of the Site

The Irish Soil Information System (SIS) mapping and National Soils Hydrology Map indicate the site is underlain by peat. Alluvium / till (Diamicton) is noted along the route of the Clydagh River. Further information on soils and geological conditions within the Site is provided in Chapter 10: Soils, Geology and Hydrogeology.

11.3.4 Meteorological Data Summary

The Standard Percentage Runoff (SPR) is a parameter used in runoff and flood estimation, which represents the percentage of total rainfall likely to contribute to direct runoff and storm flow.

Rainfall data from the Cork Airport climate station (approx. 46 km south-east from the Proposed Development) records an annual average rainfall total of 1227 mm during the 1981 – 2010 climatic period. Standard Average Annual Rainfall (SAAR) data from the Flood Studies Update (FSU) catchment descriptors for the areas of Proposed Development indicates an annual figure of 1819 mm. Based on Met Eireann banding of annual average rainfall, rainfall in the vicinity of the site is within the third highest of eight bands (1600 – 2000 mm) and is typical for high elevation regions in the west of Ireland.

11.3.5 Catchment Hydrology

Surface Water Bodies – At Proposed Development Site

Environmental Protection Agency (EPA) WFD dataset boundaries indicate that the majority of the Site lies within the Flesk [Kerry]_SC_010 WFD river sub-catchment (SC) (part of the larger Laune-Maine-Dingle Bay catchment), flowing westward from the Proposed Development and ultimately discharging to Lough Leane at Killarney approximately 24 km further downstream.

The majority of the 110kV grid connection route (approximately 3.1 km) is located within the Foherish_SC_010 river sub-catchment (part of the larger Lee, Cork Harbour and Youghal Bay catchment), flowing south-east then south from the Proposed Development.

An approximately 500 m long section (equivalent to c. 14% of the total) of the 110kV grid connection route is located within the Blackwater [Munster]_SC_040 river sub-catchment (part of the Blackwater (Munster) catchment), flowing north-east then north from the Proposed Development.

For the purposes of WFD classification and assessment, the Flesk [Kerry]_SC_010 WFD, Foherish_SC_010, and Blackwater [Munster]_SC_040 river sub-catchments are further

delineated into river 'sub-basins' (Figure 11-1). The Proposed Development is located within the river sub-basins outlined in Table 11-8:

Table 11-8: Sub-Catchments and Sub-Basins at the Proposed Development

River Waterbody (Sub-Catchment)	River Waterbody (Sub-Basin)
Flesk [Kerry]_SC_010	Flesk (Kerry)_010
	Flesk (Kerry)_020
	Flesk (Kerry)_030
Foherish_SC_010	Garrane (Lee)_010
	Keel_010)
Blackwater [Munster]_SC_040	Finnow (Blackwater)_010

Surface Water Bodies – Downstream of the Proposed Development Site

Though no development is proposed outside the sub-basins listed above, due to the sensitivity of the wider River Flesk / Lough Leane catchment in terms of nutrient sensitivity, drinking water, and designated sites (refer to sections 11.3.11, 11.3.14 and 11.3.16, respectively), and its hydrological connectivity to the Proposed Development, information on those sub-basins located downstream from the Proposed Development within the Flesk / Leane catchment are also considered within this assessment.

For the purposes of WFD classification and assessment, the wider River Flesk / Leane catchment hydrologically connected to the Proposed Development includes the downstream river sub-catchments and sub-basins outlined in Table 11-9.

Table 11-9: Sub-Catchments and Sub-Basins Downstream of the Proposed Development

River Waterbody (Sub-Catchment)	River Waterbody (Sub-Basin)
Flesk [Kerry]_SC_010	River Flesk - Flesk (Kerry)_040
Flesk [Kerry]_SC_020	River Flesk - Flesk (Kerry)_050
	River Flesk - Flesk (Kerry)_060
Laune_SC_010	River Flesk - Laune_010
	Lough Leane - Laune_010

Internal Site Drainage

Field survey observations (refer to section 11.2.3) identified the current hydrology within the Site consists of several natural source watercourses and streams, the majority of which, discharge to the River Clydagh. Internal site drainage on elevated parts within the Site comprises headwaters of minor drains, forestry drainage, peat drainage, and artificial trackside drains.

For purposes of differentiation of effects and consistency with associated assessments (i.e., Chapter 8: Biodiversity and Appendix 8.3: Aquatic Ecology), internal site hydrology within the Site where works are proposed can be delineated by the WFD sub-basins in which they are located. The main water features within and adjacent to the Site , including those not hydrologically connected the Proposed Development, are listed in the Table 11-10 below and shown on Figure 11-2.

Table 11-10: Internal Site Drainage Watercourses River Water Body Status

Reference	Name / Location Description	Reference	Name / Location Description
1	River Clydagh (located outside Site but is the main watercourse receiving runoff from the Proposed Development and the proposed access route to the west. It is hydrologically connected to the Proposed Development)	12	River Clydagh Tributary – 7 (drains section of Proposed Development where site access is proposed within Flesk (Kerry)_020 sub-basin and discharges into the River Clydagh. It is hydrologically connected to the Proposed Development)
2	River Clydagh Tributary – 1 (drains easternmost section of the Proposed Development (excluding the 110kV grid connection) within Flesk (Kerry)_010 sub-basin and discharges into the River Clydagh. It is hydrologically connected to the Proposed Development)	13	River Clydagh Tributary – 8 (drains section of Proposed Development where site access is proposed within Flesk (Kerry)_030 sub-basin and discharges into the River Clydagh. It is hydrologically connected to the Proposed Development)
3	Mullaghanish Stream Tributary (drains eastern section of the Proposed Development within Flesk (Kerry)_010 sub-basin. Confluence with 'Mullaghanish Stream' located c. 580 m upstream of discharge point into the River Clydagh. It is hydrologically connected to the Proposed Development)	14	Foherish River Tributary – 1 (drains section of Proposed Development where with the 110kV grid connection route is proposed within Garrane (Lee)_010 sub-basin and discharges into the Foherish River. It is hydrologically connected to the Proposed Development)
4	Mullaghanish Stream (drains eastern section of the Proposed Development within Flesk (Kerry)_010 sub-basin. Confluence with 'Mullaghanish Stream Tributary' located c. 580 m upstream of discharge point into the River Clydagh. It is hydrologically connected to the Proposed Development)	15	Foherish River Tributary – 2 (drains section of Proposed Development where the 110kV grid connection route is proposed within Keel_010 sub-basin and discharges into the Foherish River. It is hydrologically connected to the Proposed Development)
5	Clydaghroe Stream (drains central section of the Proposed Development within Flesk (Kerry)_010 sub-basin and discharges into the River Clydagh. It is hydrologically connected to the Proposed Development)	16	Finnow River Tributary (drains section of Proposed Development where the 110kV grid connection route is proposed within Finnow (Blackwateer)_010 sub-basin and discharges into the Finnow River. It is hydrologically connected to the Proposed Development)
6	River Clydagh Tributary – 2 (drains central section of the Proposed Development within Flesk (Kerry)_010 sub-basin and discharges into the River Clydagh. It is hydrologically connected to	17	Lough Gal (located within the Flesk (Kerry)_020 sub-basin. Whilst it shares a catchment with, and is hydrologically connected to, the Proposed Development, it is

Reference	Name / Location Description	Reference	Name / Location Description
	the Proposed Development)		located upstream and would not be affected by works associated with the Proposed Development)
7	River Clydagh Tributary – 3 (drains western section of the Proposed Development within Flesk (Kerry)_020 sub-basin and discharges into the River Clydagh. It is hydrologically connected to the Proposed Development)	18	Lough Carrignafurark (located beyond the watershed to the south of the Site and, therefore, is not hydrologically connected to the Proposed Development)
8	River Clydagh Tributary – 4 (drains westernmost section of the Proposed Development (excluding site access route) within Flesk (Kerry)_020 sub-basin. Confluence with Glashacormick' located c. 80 m upstream of discharge point into the River Clydagh. It is hydrologically connected to the Proposed Development)	19	Lough Carrignamork (located beyond the watershed to the south of the Site and, therefore, is not hydrologically connected to the Proposed Development)
9	Glashacormick* (drains westernmost section of the Proposed Development (excluding site access route) within Flesk (Kerry)_020 sub-basin. Confluence with 'River Clydagh Tributary – 4' located c. 80 m upstream of discharge point into the River Clydagh. It is hydrologically connected to the Proposed Development)	20	Lough Duff (located in the Flesk (Kerry)_020 catchment and upstream from 'River Clydagh Tributary – 7'. It is hydrologically connected to the Proposed Development)
10	River Clydagh Tributary – 5 (drains section of Proposed Development where site access is proposed within Flesk (Kerry)_020 sub-basin and discharges into the River Clydagh. It is hydrologically connected to the Proposed Development)	21	Unnamed Lough (Flesk (Kerry) Catchment) (located in the upper Flesk (Kerry)_030 catchment and upstream from 'River Clydagh Tributary – 8'. It is hydrologically connected to the Proposed Development)
11	River Clydagh Tributary – 6 (drains section of Proposed Development where site access is proposed within Flesk (Kerry)_020 sub-basin and discharges into the River Clydagh. It is hydrologically connected to the Proposed Development)		

*For the purposes of this assessment, this unnamed watercourse is referred to as 'Glashacormick' as it forms the boundary between the Glashacormick and Clydaghroe townlands.

11.3.6 Surface Water Quality

Following the publication of the European Communities (Water Policy) Regulations 2003 (S.I. No. 722 of 2003), waterbodies are given a classification based on annual average / percentile results from several individual monitoring stations.

The WFD classification is a combination of chemical, biological and hydromorphological elements; whereby, the overall status is the lowest of the combined constituents. The EPA also use the current water quality and trends to highlight waterbodies that are 'At Risk' of failing to meet their WFD objectives by 2027.

The WFD status of the receiving river sub-catchment waterbodies outlined in section 11.3.5 are summarised in the Table 11-11.

Table 11-11: River Water Body Status

River Waterbody (Sub-basin)	2016-2021 Status	High Status Objective*	WFD Risk 3rd Cycle**
Clydagh River (Flesk (Kerry)_010)	Good	No	Not at risk
Clydagh River (Flesk (Kerry)_020)	Good	Yes	At risk
Clydagh River (Flesk (Kerry)_030)	High	Yes	Not at risk
Garrane (Lee)_010	Good	No	Not at risk
Keel_010	Good	No	Under review
Finnow (Blackwater)_010	High	No	Not at risk
River Flesk (Flesk (Kerry)_040)	Good	Yes	At risk
River Flesk (Flesk (Kerry)_050)	High	Yes	Under review
River Flesk (Flesk (Kerry)_060)	Good	No	Not at risk
River Flesk (Laune_010)	Poor	No	At risk
Lough Leane (Laune_010)	Good	No	Not at risk

* Waterbodies that have a High-Status Objective under the Water Framework Directive.
** Waterbody at risk of failing to meet their Water Framework Directive (WFD) objectives by 2027.

11.3.7 Significant Pressures

EPA water quality mapping provides datasets that outline existing significant pressures on waterbodies (https://gis.epa.ie/EPAMaps/Water). The pressures are categorised into the following categories; abstractions, agriculture, anthropogenic, atmospheric, domestic wastewater, extractive industry, forestry, historically polluted sites, hydromorphology, industry, invasive species, water treatment, waste, urban wastewater, urban runoff, and 'other' anthropogenic.

Watercourses draining the Proposed Development and the downstream water environment were screened against these datasets.

The significant river pressures associated with the river sub-basin catchments identified as being 'At Risk' are outline in Table 11-12.

Table 11-12: Significant River Pressures

River Waterbody (Sub-Basin)	Pressure
Flesk (Kerry)_020	Hydromorphology
Flesk (Kerry)_040	Hydromorphology
Laune_010	Anthropogenic

Hydromorphology pressures include sediment / siltation pollution and alteration to the physical environment. Significant pressures may be subcategorised into channelization, embankment, dams, barriers, weirs, locks, culverts, land drainage, overgrazing and bank erosion.

Anthropogenic pressures include nutrient, organic and sediment pollution as well as chemical, and microbiological.

Specific locations of pressures identified within these river sub-basins are currently unknown; therefore, a conservative assessment assumes all watercourses within the sub-basin have been / are subject to these pressures.

Within Lough Leane, urban wastewater and urban runoff pressures were identified via EPA datasets (https://gis.epa.ie/EPAMaps/Water). However, these were noted to be within the Ross Bay area of the lough, south-west of Killarney and not at the location where the River Flesk discharges into the lough.

11.3.8 Pollution Impact Potential

EPA online mapping provides datasets and guidance notes of Pollution Impact Potential (PIP) for nitrate and phosphorous: 'PIP-N' and 'PIP-P', respectively (https://gis.epa.ie/EPAMaps/Water). The datasets identify critical source areas (CSA) where there exists potential sources of nitrogen and phosphorous from agricultural areas. Guidance notes indicate that 'High' pollution impact potential is typically due to the presence of poorly draining soils (for P) or freely draining soils (for N).

Given that forestry is the primary land use within the Site, no land parcels ranked as having 'High' pollution impact potential from agriculture are present at the Proposed Development.

11.3.9 Licenced Activities

Datasets of EPA licenced activities including Integrated Pollution Control (IPC) sites, Industrial Emissions Licensing (IEL) facilities, and waste facilities within catchments hydrologically connected to the Proposed Development were screened as part of the assessment. The only with direct hydrological connection is the 'Macroom Civic Amenity Site' Waste Facility (Licence Number: W0142-01) is located on the River Sullane (into which the Foherish River discharges) approximately 15 km downstream from the Proposed Development.

Given the distance between the waste facility and the Proposed Development, hazardous pollutants would not feasibly be transmitted between them. Therefore, no licenced activities are likely to affect, or be affected by, the Proposed Development.

11.3.10 Urban Wastewater

Datasets of EPA Urban Wastewater (UWW) licenced activities within catchments hydrologically connected to the Proposed Development were screened as part of the assessment. A sewage treatment works (< 500 population equivalent (pe)) and associated primary discharge point is located on the River Owneykeagh (a tributary of the River Flesk) at Barraduff, and a sewage treatment (>500pe) and primary discharge point is located in the west of Killarney in the vicinity of Lough Leane.

Storm water overflow discharge points are also located at the Killarney UWW plant. Two others are located on the lower reach of the River Flesk south of Killarney. The lower reaches of the River Flesk are identified as being subject to anthropogenic pressures (refer to section 11.3.7). The locations of the sewage treatment works, UWW plants, and UWW emissions points are further described and locations shown within Appendix 11-2: Water Quality Assessment.

11.3.11 Nutrient Sensitive Areas

EPA datasets of nutrient sensitive areas for rivers, lakes and estuaries hydrologically connected to the Proposed Development were screened as part of the assessment. Lough Leane is identified as an Urban Wastewater Treatment Directive Sensitive Area.

The lough is also known to have been subject to eutrophication and algal blooms. One such occurrence in 1997 raised concerns over anthropogenic pressures within the upstream catchments discharging to the lough. A study (EPA, 2003) was commissioned to investigate the potential causes, sources and drivers of this bloom and overall degradation of water quality. The study indicated that septic tanks were calculated to contribute 12% of total phosphorous, while agriculture contributed 47%. By comparison, 3% of the total phosphorous loading was attributable to the forestry sector.

No other EPA-assigned nutrient sensitive areas were found to be hydrologically connected to the Proposed Development.

11.3.12 Eco-Hydrology & Water Dependent Habitats / Species

Consideration has been given to local surface water and groundwater dependent ecosystems and habitats dependent on, or prone to change due to variation in surface water and groundwater patterns on the Site within Chapter 8: Biodiversity. Therefore, those aspects are not assessed further within this chapter.

11.3.13 Fisheries

Inland Fisheries Ireland (IFI) provided information with regards to fisheries interests and protected species in the River Flesk catchment. They noted that the Flesk / Laune complex is one of the most productive commercial and recreational angling salmon catchments in Ireland.

IFI also noted that Lough Leane is one of the best brown trout fisheries in Ireland, as well as supporting a unique population of shad (the Killarney shad), which is highly

protected. Both salmon and Killarney shad are listed under Annex 2 of the Habitats Directive.

Detailed consideration has been given to fisheries at and downstream of the Site in the Flesk (Kerry) sub-catchments within Chapter 8: Biodiversity and Appendix 8-3: Aquatic Ecology.

The criteria by which that chapter / appendix assigns sensitivity / importance of receptors is not as per those outlined in Table 11-3 of this chapter. Therefore, the criteria provided in Appendix 8-3 should be consulted to provide context on the points listed below (note that Appendix 8-3 monitoring site reference numbers are provided below in brackets). That assessment, when considering watercourses at the Proposed Development site, has determined that:

- River Clydagh (upstream 2): is unpolluted with a corresponding WFD 'High' status;
- River Clydagh (downstream 10): is unpolluted with a corresponding WFD 'High' status;
- River Clydagh Tributary - 1 (1): is unpolluted with a corresponding WFD 'Good' status;
- Mullaghanish Stream Tributary (3): is unpolluted with a corresponding WFD 'High' status;
- Mullaghanish Stream (4): is slightly polluted with a corresponding WFD 'Moderate' status;
- River Clydagh Tributary - 2: (5): is moderately polluted with a corresponding WFD 'Poor' status;
- Clydaghroe Stream (6): is unpolluted with a corresponding WFD 'High' status;
- River Clydagh Tributary - 3: (7&8): is unpolluted with a corresponding WFD 'Good' status; and
- Confluence of River Clydagh Tributary – 4 & Glashacormick (9): is unpolluted with a corresponding WFD 'Good' status.

The watercourses at the Proposed Development site are noted to have spawning habitats graded 2-4 and nursery habitats graded 1-4. Further details, including classification criteria specific to fisheries, figures of watercourses and aquatic ecology monitoring sites, are included in Chapter 8: Biodiversity and associated appendices.

11.3.14 Drinking Water

Drinking water datasets available from the EPA identified a section of the River Flesk (Flesk (Kerry)_040) approximately 5 km downstream from the Proposed Development as a drinking water source (Article 7 Abstraction for Drinking Water). No other waterbodies designated as drinking water sources (including Group Scheme Source Protection Areas or Public Supply Source Protection Areas) were found to be hydrologically connected to the Proposed Development.

11.3.15 Bathing Waters

No bathing waters were identified from EPA datasets at, or downstream from, the Proposed Development.

11.3.16 Designated Sites

Designated sites such as Special Areas of Conservation (SAC), Special Protected Areas (SPA), Ramsar sites, and similarly designated environmental receptors hydrologically connected to the Proposed Development, have been identified as part of this assessment.

Sites were identified utilising the datasets made available by the National Parks & Wildlife Service (NPWS) in consultation and available on the NPWS Designations Viewer, and were screened to identify hydrological sites with sensitivities to the water environment that are connected to the Proposed Development, i.e. sites which lie in the upstream catchment of, or are on downstream streamlines of, the watercourses draining the Site. Only sites meeting these criteria are discussed further in this assessment (refer to Table 11-13).

Terrestrial sites with ground or surface water-dependent habitats are considered in Chapter 8: Biodiversity. Terrestrial sites with water-related reliance for birds are not considered further within this assessment and are considered in Chapter 9: Ornithology.

Table 11-13: Initial Screening of Designated Sites

Name	Designation	Reason for designation and qualifying features relevant to this assessment	Distance from Site at Nearest Point (km)	Considered further and rationale.
Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment	SAC	• Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*) • Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or *Isoeto-Nanojuncetea* • Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation • Blanket bogs • *Margaritifera margaritifera* (Freshwater Pearl Mussel) • *Petromyzon marinus* (Sea Lamprey) • *Lampetra planeri* (Brook Lamprey) • *Lampetra fluviatilis* (River Lamprey) • *Salmo salar* (Salmon) • *Lutra lutra* (Otter) • *Alosa fallax killarnensis* (Killarney Shad) [5046]	Adjacent to the northern boundary (and downstream) of the Site.	Yes: The designated site is hydrologically connected to the Proposed Development. The River Clydagh is located immediately adjacent / downstream of, and receives runoff from, the Proposed Development, and forms part of the SAC.
Mullaghanish Bog	SAC	Blanket bog	0.4 km	No: Whilst adjacent to the designated site, areas where development are proposed are significantly (>100 m) downgradient of the designated site. As such, any proposed works associated with the Proposed Development (excavations or similar) are sufficiently lower in gradient that they cannot have any drainage or similar effect that would affect the integrity of the qualifying features and, therefore, are discounted from further consideration. Borrow pit excavations are of limited depths of 5m into the bedrock material. The borrow pits have been designed with

Name	Designation	Reason for designation and qualifying features relevant to this assessment	Distance from Site at Nearest Point (km)	Considered further and rationale.
				due consideration to adjacent watercourses and water course buffers, located greater than 100m from the mapped water courses, greatly exceeding the potential zone of hydrogeological connectivity and any influence by excavation or dewatering.

11.3.17 Project Specific Water Quality Monitoring

In addition to a review of water quality data held by statutory bodies (refer to section 11.3.6), independent water quality monitoring has been undertaken as part of this assessment to provide baseline water quality standards of water features within, and downstream from, the Site prior to any development.

The baseline assessment collected and assessed representative water samples from watercourses draining the Proposed Development during commercial forestry operations for a range of physio-chemical parameters.

Monitoring Locations and Rationale

Surface water monitoring locations were positioned at strategic points on watercourses that will receive runoff from the Proposed Development where earthworks will be undertaken.

Samples were also obtained at incremental points downstream from the Proposed Development between the Site and Lough Leane. Samples were also obtained at locations hydrologically discrete from the Proposed Development (within the Bheenagh_010 and Owneykeagh_010 river sub-basins) in order to characterise water quality from an adjacent catchment also discharging into the River Flesk / Lough Leane.

Project-specific baseline water quality monitoring was limited to catchments within Co. Kerry due to concerns raised by Kerry County Council regarding potential water quality pressures in the River Flesk catchment / Lough Leane

For the purposes of this assessment, it was deemed appropriate / sufficient to assess water quality of watercourses within Co. Cork associated with the 110kV grid connection by utilising existing datasets available from the EPA. The WQMRP (Technical Appendix 11-3) will be implemented which includes a programme of further confirmatory baseline water quality monitoring immediately prior to commencement of construction works at the Proposed Development. As provided for in the WQMRP, watercourses within Co. Cork will be included in the pre-construction monitoring programme.

Monitoring locations are shown on Figure 11-3.

Sampling Frequency

In order to capture a representative overview of seasonal variance in water quality across a representative range of climatic conditions (i.e., temperature and precipitation), samples were collected throughout the year, including winter storm events characterised by prolonged periods of precipitation, and short intense convective downpours during summer months.

Sampling consisted of one summer monitoring round and one winter monitoring round across an extended spatial range that included watercourses within the Proposed Development and the wider River Flesk catchment. This included points hydrologically discrete from the Proposed Development to act as control locations to establish any pre-existing pressures outside the River Clydagh catchment.

These were supplemented by four intermediate monitoring rounds (one per season) comprising of a reduced number of sampling locations at incremental points on the

River Clydagh / River Flesk to further establish any trends as water passes downstream through various adjacent land uses within the catchment.

Sampling was carried out between February and October 2021 and the sampling schedule is outlined in Table 11-14 with monitoring locations shown on Figure 11-3.

While the completion of the baseline monitoring (2021) pre-dates the finalising of this chapter (2024), there has been no significant change to land use or other development that would cause a significant change to baseline conditions in the intervening period.

To ensure water quality data is current prior to works commencing at site, the WQMRP (Technical Appendix 11-3) will be implemented, which includes a programme of further baseline water quality monitoring immediately prior to commencement of the construction phase at the Proposed Development. This data shall inform the water quality thresholds as detailed in Technical Appendix 11-3 WQMRP.

Table 11-14: Baseline Water Quality Sampling Schedule

Sampling Locations	Winter Sampling – 1	Winter Sampling – 2	Spring Sampling	Summer Sampling – 1	Summer Sampling – 2	Autumn Sampling
Date	02/02/2021	03/02/2021	14/04/2021	27/07/2021	13/08/2021	12/10/2021
SW01	✓			✓		
SW01C	✓	✓	✓	✓	✓	✓
SW02	✓			✓		
SW03	✓			✓		
SW04	✓			✓		
SW05	✓			✓		
SW05C	✓			✓		
SW06	✓	✓	✓	✓	✓	✓
SW07	✓	✓	✓	✓	✓	✓
SW08	✓	✓	✓	✓	✓	✓
SW09	✓	✓	✓	✓	✓	✓
SW10	✓			✓		
SW11	✓			✓		
SW12	✓			✓		

During the baseline sampling, commercial forestry operations continued within the Proposed Development site with 14 no. compartments, equating to approximately 107 ha, felled during 2021.

The following Table 11-15 provides a summary of on-site observations and weather conditions made during each of the baseline sampling rounds. Further information including in-situ results, visual inspections, weather conditions, and full results reports (including photographs) for the baseline monitoring rounds are included in Appendix 11-2: Water Quality Assessment.

Table 11-15: Baseline Water Quality Monitoring Site Observations

Sampling Round / Date	Preceding Weather Conditions	Monitoring Location	Temperature Range & Total Precipitation During Day of Sampling	Weather Observations During Sampling	Flow Rate	Relative Water Level / Depth vs Bank Full Conditions	Turbidity (Score 1 – 5)
Winter Sampling – 1 (02/02/2021)	Total rainfall for the area in the week prior to sampling was measured at 113 mm. The maximum rainfall in any one day during this period occurred the day prior to sampling (28.2 mm). Temperatures for the region in the week preceding sampling ranged from a minimum of 3.9 °C to a maximum of 10.9 °C.	SW01	5.5 – 9.9 °C - 7 mm	Overcast dry	Stream in fast flow	Full	4
		SW01C		Overcast dry	Stream in fast flow	Full	4
		SW02		Overcast dry	Stream in fast flow	Full	4
		SW03		Overcast dry	Stream in fast flow	Full	4
		SW04		Overcast dry	Stream in fast flow	Full	4
		SW05		Overcast dry	Stream in fast flow	Full	4
		SW05C		Overcast dry	Stream in fast flow	Full	4
		SW06		Overcast dry	River in fast flow	Full, not over river bank	4
		SW07		Light rain	River in fast flow	Full, not over river bank	4
		SW08		Overcast dry	River in very fast flow	Full, close to river bank level	4

Sampling Round / Date	Preceding Weather Conditions	Monitoring Location	Temperature Range & Total Precipitation During Day of Sampling	Weather Observations During Sampling	Flow Rate	Relative Water Level / Depth vs Bank Full Conditions	Turbidity (Score 1 – 5)
		SW09		Overcast dry	River in fast flow	Full, close to river bank level	3
		SW10		Overcast dry	River in fast flow	Full, close to river bank level	3
		SW11		Overcast dry	River in fast flow	Full, close to river bank level	3
		SW12		Overcast dry	River in fast flow	Full, close to river bank level	3
Winter Sampling - 2 (03/02/2021)	Total rainfall for the area in the week prior to sampling was measured at 118 mm. The maximum rainfall in any one day during this period occurred two days prior to sampling (28.2 mm). Temperatures for the region in the week preceding sampling ranged from a minimum of 3.9 °C to a maximum of 10.9 °C.	SW01C	1.5 – 9.2 °C - 6.6 mm	Rain	River in moderate flow	Full, below river bank	3
		SW06		Overcast dry	River in moderate flow	Full, below river bank	3
		SW07		Overcast dry	River in moderate flow	Full, below river bank	3
		SW08		Overcast dry	River in moderate to fast flow	Full, below river bank	3
		SW09		Overcast dry	River in moderate flow	Full, below river bank	3
Spring Sampling (14/04/2021)	Total rainfall for the area in the week prior to	SW01C	3.6 – 11.5 °C -	Sunny / overcast	River in calm / steady flow	Low, below riverbank	1

Sampling Round / Date	Preceding Weather Conditions	Monitoring Location	Temperature Range & Total Precipitation During Day of Sampling	Weather Observations During Sampling	Flow Rate	Relative Water Level / Depth vs Bank Full Conditions	Turbidity (Score 1 – 5)
	sampling was measured at 7.2 mm. The maximum rainfall in any one day during this period occurred six days prior to sampling (2.5mm). Temperatures for the region in the week preceding sampling ranged from a minimum of -0.5 °C to a maximum of 11.9 °C.	SW06	0 mm	Sunny	River in steady flow	Low, below riverbank	1
		SW07		Sunny / overcast	River in steady flow	Low, below riverbank	2
		SW08		Sunny	River in steady flow	Low, below riverbank	2
		SW09		Sunny	River in steady flow	Low, below riverbank	2
Summer Sampling – 1 (27/07/2021)	Total rainfall for the area in the week prior to sampling was measured at 22.5 mm, all of which fell the day prior to sampling, Temperatures for the region in the week preceding sampling ranged from a minimum of 13 °C to a maximum of 25.7 °C.	SW01C	11.8 – 19.2 °C - 1.2 mm	Sunny / overcast	River in steady to low flow	Low, below riverbank	1
		SW06		Sunny	Stream in low flow	Low, below riverbank	1
		SW07		Sunny	River in low flow	Low, below riverbank	1
		SW08		Sunny	River in low flow	Low, below riverbank	1
		SW09		Sunny	River in low flow	Low, below riverbank	1
Summer Sampling – 2	Total rainfall for the area in the week prior to sampling was measured	SW01	11.1 – 19.7 °C -	Sunny	Stream in moderate to strong flow	Almost full	4

Sampling Round / Date	Preceding Weather Conditions	Monitoring Location	Temperature Range & Total Precipitation During Day of Sampling	Weather Observations During Sampling	Flow Rate	Relative Water Level / Depth vs Bank Full Conditions	Turbidity (Score 1 – 5)
(13/08/2021)	at 59.9 mm. The maximum rainfall in any one day during this period occurred one week (seven days) prior to sampling (26.4mm). Temperatures for the region in the week preceding sampling ranged from a minimum of 10.2 °C to a maximum of 19.5 °C.	SW01C	1.4 mm	Sunny	Stream in moderate flow	Moderately full	4
		SW02		Sunny	Stream in moderate to strong flow	Almost full	4
		SW03		Sunny	Stream in moderate flow	Moderately full	4
		SW04		Sunny	Stream in moderate flow	Moderately full	3 or 4
		SW05		Sunny	Stream in moderate flow	Moderately full	4
		SW05C		Sunny	Stream in moderate flow	Moderately to low	4
		SW06		Sunny	River in moderate flow	Moderately full	4
		SW07		Sunny	River in moderate flow	Moderately to low	3 or 4
		SW08		Sunny	River in moderate flow	Moderately to low	3 or 4
		SW09		Sunny	River in moderate flow	Moderately to low	3

Sampling Round / Date	Preceding Weather Conditions	Monitoring Location	Temperature Range & Total Precipitation During Day of Sampling	Weather Observations During Sampling	Flow Rate	Relative Water Level / Depth vs Bank Full Conditions	Turbidity (Score 1 – 5)
		SW10		Sunny	River in moderate flow	Moderately to low	3
		SW11		Sunny	River in moderate flow	Moderately to low	3
		SW12		Sunny	River in moderate flow	Moderately to low	3
Autumn Sampling (12/10/2021)	Total rainfall for the area in the week prior to sampling was measured at 56.2 mm. The maximum rainfall in any one day during this period occurred five days prior to sampling (26.3mm). Temperatures for the region in the week preceding sampling ranged from a minimum of 6.5 °C to a maximum of 17.6 °C.	SW01C	6.9 – 14.1 °C - 0 mm	Overcast, dry	Stream in moderate to fast flow	Moderately Full	4
		SW06		Overcast, dry	River in moderate to fast flow	Moderately Full	4
		SW07		Overcast, dry	River in moderate to fast flow	Moderately Full	4
		SW08		Overcast, dry	River in moderate to fast flow	Moderately Full	4
		SW09		Overcast, dry	River in moderate to fast flow	Moderately Full	4

Baseline Water Quality

Water quality results were assessed for compliance against key parameter limits outlined in the relevant legislation and expected natural ranges (refer to Table 11-16 and Table 11-17).

Ambient background levels of other key water quality parameters were also assessed. As the construction phase (which includes pre-construction felling) poses the greatest risk to the water environment in terms of mobilisation of sediments and silts, total suspended solids (TSS) and turbidity were monitored across all sampling sites in relation to thresholds pertinent to qualifying interests of the adjacent Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment Special Area of Conservation (SAC) e.g., Atlantic salmon and freshwater pearl mussels (refer to section 11.3.16).

As Lough Leane has been subject to eutrophication / excessive nutrient-loading resulting in the formation of toxic algal blooms (refer to section 11.3.11), ambient background levels of the key water quality parameters primarily responsible for eutrophication (i.e., nitrogen and phosphorous) were also monitored.

In terms of the key indicators of water quality and / or pre-existing pollutants, maximum values recorded during the monitoring period for each of the chemical results obtained are provided in Table 11-16 and Table 11-17. Values noted to be outside expected natural range / established thresholds are highlighted. All baseline monitoring results are included in Appendix 11-2: Water Quality Assessment.

Table 11-16: Baseline Water Quality Sampling Schedule (SW01 to SW05C)

Parameter	Water Quality Legislation	Target Levels / Expected Natural Range		Minium & Maximum Recorded Values	Sampling Locations & Results						
					SW01	SW01C	SW02	SW03	SW04	SW05	SW05C
pH	Environmental Objectives Surface Water Regulations 2009	Soft Water*	4.5< pH < 9.0	Min	5.46	5.76	4.91	4.53	5.97	5.37	4.55
		Hard Water**	6.0< pH < 9.0	Max	6.97	6.92	6.72	5.91	7.1	7.23	6.99
DO (% Saturation)	Environmental Objectives Surface Water Regulations 2009	Lower limit	>80% saturation	Min	90.5	94.3	91.9	84.8	88.5	87.5	89.8
		Upper limit	<120% saturation	Max	97.1	102.5	98.6	91.8	100.8	93.7	100.0
Alkalinity (mg/l $CaCO_3$)	Environmental Objectives Surface Water Regulations 2009	Soft Water	≤ 100 mg/1 $CaCO_3$	Min	2.0	3.1	1.3	<1.0	<1.0	<1.0	<1.0
		Hard Water	> 100 mg/1 $CaCO_3$	Max	7.1	22.3	7.6	2.0	7.4	14.2	11.4
Molybdate Reactive Phosphorus (MRP) (mg/l P)	Environmental Objectives Surface Water Regulations 2009	High	≤0.025 (mean) or ≤0.045 (95%ile)	Min	0.004	0.008	0.011	0.010	0.003	0.004	0.025
		Good	≤0.035 (mean) or ≤0.075 (95%ile)	Max	0.014	0.05	0.029	0.014	0.003	0.009	0.028

Parameter	Water Quality Legislation	Target Levels / Expected Natural Range		Minium & Maximum Recorded Values	Sampling Locations & Results						
					SW01	SW01C	SW02	SW03	SW04	SW05	SW05C
Total Phosphorous (TP) (mg/l P)	Freshwater Fish Directive (78/659 EEC) for salmonid waters	0.2		Min	0.011	0.02	0.022	0.033	0.007	0.011	0.056
				Max	0.024	0.101	0.042	0.17	0.01	0.024	0.058
Ammonia (mg/l NH_4)	Environmental Objectives Surface Water Regulations 2009	High	≤0.040 (mean) or ≤0.090 (95%ile)	Min	0.019	0.018	0.027	0.017	0.013	0.015	0.048
		Good	≤0.065 (mean) or ≤0.140 (95%ile)	Max	0.026	0.06	0.044	0.063	0.021	0.035	0.049
Biochemical Oxygen Demand (BOD) (mg/l O2)	Environmental Objectives Surface Water Regulations 2009	High	≤ 1.3 (mean) or ≤ 2.2 (95%ile)	Min	0.8	0.3	0.6	1.3	0.7	0.9	1.6
		Good	≤ 1.5 (mean) or ≤ 2.6 (95%ile)	Max	1.8	2.9	1.2	1.8	1.3	1.1	1.9
Total Suspended Solids (mg/l)	Salmonid Water Regulations, 1988	25		Min	0.7	0.7	0.7	1	0.7	1.3	2
	EC (Quality of Surface Water Intended for The Abstraction of Drinking Water) Regulations, 1989	50		Max	1.5	5.5	0.7	46.4	1.3	1.8	4.3
Turbidity (NTU)	-	< 10 to protect fish life		Min	0.77	1.5	0.66	2.35	0.8	1.8	2.68

Parameter	Water Quality Legislation	Target Levels / Expected Natural Range	Minium & Maximum Recorded Values	Sampling Locations & Results						
				SW01	SW01C	SW02	SW03	SW04	SW05	SW05C
		(may be higher during rainfall events)	Max	1.4	5.5	1.3	37.8	0.85	3.57	4.3
Nitrate (mg/l N)	Surface Water Regulations, 1989	11.3	Min	0.054	0.039	0.019	0.015	0.009	0.014	0.041
	Surrogate Nitrate EQS for 'High' WFD status as defined by EPA***	0.9	Max	0.094	0.10	0.052	0.038	0.013	0.020	0.066
Total Oxidized Nitrogen (TON) (mg/l N)	-	0.9	Min	0.055	0.045	0.020	0.018	0.011	0.018	0.049
			Max	0.097	0.10	0.055	0.044	0.016	0.023	0.071

* Water hardness ≤ 100 mg/1 $CaCO_3$

** Water hardness > 100 mg/1 $CaCO_3$

*** The critical limit for nitrate is specified under the Surface Water Regulations, 1989 as 11.3 mg/l N. However, the EPA has defined a surrogate nitrate EQS limit to achieve 'High' WFD status in Irish river waterbodies as 0.9 mg/l N (EPA, "Integrated Water Quality Assessment, 2013. North Western & Neagh Bann River Basin.", 2014). Refer to Appendix 11-2: Water Quality Assessment for further detail on target levels.

Table 11-17: Baseline Water Quality Sampling Schedule (SW06 to SW12)

	Water Quality Legislation	Target Levels / Expected Natural Range		Minium & Maximum Recorded Values	Sampling Locations & Results						
					SW06	SW07	SW08	SW09	SW10	SW11	SW12
pH	Environmental Objectives Surface Water Regulations 2009	Soft Water*	4.5< pH < 9.0	Min	5.86	6.09	6.05	6.27	6.82	6.78	6.79
		Hard Water**	6.0< pH < 9.0	Max	7.93	7.77	7.83	7.36	7.30	7.32	7.58

	Water Quality Legislation	Target Levels / Expected Natural Range		Minium & Maximum Recorded Values	Sampling Locations & Results						
					SW06	SW07	SW08	SW09	SW10	SW11	SW12
DO (% Saturation)	Environmental Objectives Surface Water Regulations 2009	Lower limit	>80% saturation	Min	94.2	94.9	90.2	89.9	89.8	93.7	82.0
		Upper limit	<120% saturation	Max	103.7	103.4	113.2	103.5	98.5	98.2	93.4
Alkalinity (mg/l $CaCO_3$)	Environmental Objectives Surface Water Regulations 2009	Soft Water	≤ 100 mg/1 $CaCO_3$	Min	1.1	1	1.5	5	13.9	13.3	11.3
		Hard Water	> 100 mg/1 $CaCO_3$	Max	24.1	23.6	23.7	25.5	20.3	18.4	28.1
Molybdate Reactive Phosphorus (MRP) (mg/l P)	Environmental Objectives Surface Water Regulations 2009	High	≤0.025 (mean) or ≤0.045 (95%ile)	Min	0.002	0.002	0.001	0.001	0.016	0.015	0.006
		Good	≤0.035 (mean) or ≤0.075 (95%ile)	Max	0.009	0.006	0.009	0.004	0.029	0.026	0.013
Total Phosphorous (TP) (mg/l P)	Freshwater Fish Directive (78/659 EEC) for salmonid waters	0.2		Min	0.004	0.005	0.004	0.004	0.034	0.05	0.03
				Max	0.032	0.03	0.033	0.022	0.048	0.057	0.031
Ammonia (mg/l NH_4)	Environmental Objectives Surface Water Regulations 2009	High	≤0.040 (mean) or ≤0.090 (95%ile)	Min	0.01	0.013	0.01	0.012	0.031	0.036	0.026

	Water Quality Legislation	Target Levels / Expected Natural Range		Minium & Maximum Recorded Values	Sampling Locations & Results						
					SW06	SW07	SW08	SW09	SW10	SW11	SW12
		Good	≤0.065 (mean) or ≤0.140 (95%ile)	Max	0.026	0.028	0.027	0.023	0.042	0.062	0.027
Biochemical Oxygen Demand (BOD) (mg/l O_2)		High	≤ 1.3 (mean) or ≤ 2.2 (95%ile)	Min	0.1	0.5	0.3	0.7	0.7	0.9	0.7
		Good	≤ 1.5 (mean) or ≤ 2.6 (95%ile)	Max	1.6	2.1	2	1.5	1.2	1.6	1.3
Total Suspended Solids (mg/l)	Salmonid Water Regulations, 1988	25		Min	0.7	0.2	0.7	0.4	1.7	2.7	4.5
	EC (Quality of Surface Water Intended for The Abstraction of Drinking Water) Regulations, 1989	50		Max	6	7	5	5.2	2.5	5.8	6.8
Turbidity (NTU)	-	< 10 to protect fish life (may be higher during rainfall events)		Min	1.01	0.85	0.68	0.56	1.01	3.85	4.2
				Max	5.3	5.4	5.38	3.73	2.3	5.7	6.28
Nitrate (mg/l N)	Surface Water Regulations, 1989	11.3		Min	0.011	0.008	0.017	0.07	0.596	0.432	0.359
	Surrogate Nitrate EQS for 'High' WFD status as defined by EPA***	0.9		Max	0.061	0.066	0.092	0.15	0.758	0.64	0.39
Total Oxidized Nitrogen (TON) (mg/l N)	-	0.9		Min	0.001	0.009	0.01	0.068	0.599	0.437	0.362
				Max	0.064	0.069	0.095	0.155	0.765	0.649	0.393

Water Quality Legislation	Target Levels / Expected Natural Range	Minium & Maximum Recorded Values	Sampling Locations & Results						
			SW06	SW07	SW08	SW09	SW10	SW11	SW12
* Water hardness ≤ 100 mg/1 $CaCO_3$ ** Water hardness > 100 mg/1 $CaCO_3$ *** The critical limit for nitrate is specified under the Surface Water Regulations, 1989 as 11.3 mg/l N. However, the EPA has defined a surrogate nitrate EQS limit to achieve 'High' WFD status in Irish river waterbodies as 0.9 mg/l N (EPA, "Integrated Water Quality Assessment, 2013. North Western & Neagh Bann River Basin.", 2014). Refer to Appendix 11-2: Water Quality Assessment for further detail on target levels.								

In terms of the key indicators of water quality and / or pre-existing pollutants, the following summary is provided:

- pH values were found to be within the expected natural range for soft water at all monitoring locations;
- Dissolved Oxygen (DO) (% saturation) values were found to be within the expected natural range at all monitoring locations;
- Alkalinity concentrations were found to be within the expected range under normal conditions;
- Molybdate Reactive Phosphorus (MPR) values were the equivalent of 'Good' or 'High' status at all monitoring locations;
- Ammonia (NH_4) values were the equivalent of 'Good' or 'High' status at all monitoring locations;
- Biochemical Oxygen Demand (BOD) values were found to be the equivalent of 'Good' or 'High' status at the majority of monitoring locations. One location (SW01C) recorded the highest values across all monitoring sites (2.9 mg/l). This value is within the limit conducive to freshwater fisheries i.e., < 3 mg/l;
- Total Suspended Solids (TSS) values were found to be within the expected natural range at all monitoring locations. The highest value recorded across all monitoring site was noted at SW03 during winter sampling (46.4 mg/l) consistent with a spike in turbidity also noted at this location during that round of sampling. TSS values often naturally increase in response to rainfall events;
- Turbidity values were found to be within the expected natural range at all monitoring locations. The highest value recorded across all monitoring site was noted at SW03 during winter sampling (37.8 NTU) consistent with a spike in TSS also noted at this location during that round of sampling. Turbidity values often naturally increase in response to rainfall events; and
- Total Oxidized Nitrogen (TON) values were found to be within the expected natural range at all monitoring locations. The highest values recorded were noted at the sampling locations SW10 and SW11 located in the Bheenagh_010 and Owneykeagh_010 river sub-basins (hydrologically discrete from the Proposed Development). Elevated levels were also noted at the downstream extent of the River Flesk (SW12) compared to the upper reaches of the catchment.

Water quality data was obtained during baseline sampling while pre-existing commercial forestry operations were ongoing on the site of the Proposed Development and on adjacent land. This is relevant whereby the likely effect of felling which is necessary as part of the Proposed Development is captured within the existing baseline.

No exceedances of established water quality thresholds were identified within the baseline dataset that suggest deterioration attributable to on-going commercial forestry operations. The maximum TSS and turbidity values recorded are reflective of natural seasonal wet conditions, coinciding with the winter sampling immediately after a period of heavy rainfall (refer to Table 11-15 for details).

The water quality data for watercourses draining the Proposed Development site and in the wider River Flesk catchment is consistent with the WFD statuses for the downstream waterbodies outlined in Table 11-11. Therefore, preservation of the baseline water quality results is important at a local level to preserve the downstream WFD classifications.

11.3.18 Surface Water Abstractions

In order to assess the potential for construction work associated with the Proposed Development to affect surface water abstractions in downstream catchments, an information request was issued to the EPA and Kerry County Council (KCC) pertaining to abstractions and known private water supplies.

The Proposed Development located within County Cork is limited to the 110kV grid connection route i.e., cable buried in a shallow (approximately 1.3 m deep) trench in an access track, where the construction work associated is sufficiently small-scale that potential effects to watercourses in that area is screened as not significant, and that there can be no significant effect to abstractions in that area. There was, therefore, deemed no requirement to consult Cork County Council specifically in relation to abstraction data.

The EPA provided a copy of their abstraction register in August 2022. KCC advised no information was available.

A screening review of the EPA data found 2 no. river abstractions within 5 km of the Site; however, each is located in catchments discrete from, and therefore, not hydrologically connected to the Proposed Development.

In addition to identification of potential abstractions from records, and in order to ensure a robust assessment and overcome potential uncertainty around the completeness of the record of abstractions, a screening assessment has been undertaken to identify properties potentially served by local, unrecorded water abstractions within catchments hydrologically connected to the Proposed Development based on property and occupancy information as detailed in Chapter 5.

In the absence of equivalent guidance in Ireland, guidance relevant in similar adjacent jurisdictions has been adopted. DAERA (2019) recommends a 250 m buffer between proposed wind farm development and any potential drinking water (public or private) supply. A conservative 250 m buffer was applied to the Site boundary rather than proposed infrastructure to provide a larger screening extent.

The screening exercise identified 1 no. property within the buffer, located on the opposite bank of the River Clydagh approximately 530 m north-east of turbine T13. No infrastructure is proposed within 250 m of the property and the property is hydrologically separated from the development by the River Clydagh and, therefore, cannot be affected by the Proposed Development.

11.3.19 Uisce Éireann Infrastructure

Uisce Éireann (UE) were contacted with regards to their assets located within, or in proximity to, the Proposed Development that may potentially be affected by changes in water quality / quantity (i.e., reservoirs / abstraction points).

Review of the datasets provided by UE found the nearest asset (Inch Foildown Reservoir) to be located 6 km west of the Proposed Development.

In total, 3 no. reservoirs / abstraction points were identified within the River Flesk catchment:

- Inch Foildown Reservoir in the Flesk (Kerry)_040 sub-basin;
- Carrigeencullia Reservoir in the Flesk (Kerry)_050 sub-basin; and
- Sheheree Reservoir in the Flesk (Kerry)_060 sub-basin.

None of the reservoirs / abstraction points in the River Flesk catchment have a direct hydrological connection to the Site and, therefore, would not be affected by potential changes to water quality / quantity that may occur as a result of works associated with the Proposed Development.

One river intake was identified on the River Sullane in Co. Cork (into which the Foherish River discharges), approximately 15 km downstream from the Proposed Development.

Given the nature of the works associated with the 110kV grid connection route and the distance between the Site and the intake, the intake would not be affected by potential changes to water quality / quantity that may occur as a result of the Proposed Development.

11.3.20 Flood Risk

The Proposed Development was assessed in relation to OPW Flood Maps which provide an indication of predicted Low, Medium, and High probability fluvial flood extents and information on past flood events.

Further information regarding flood risk from various sources is outlined in Appendix 11-1: Flood Risk Assessment and is summarised in the following sections.

In response to the Scope of Works Report (refer to section 11.1.4 and Chapter 2), OPW confirmed the Proposed Development had no interaction with any OPW arterial drainage schemes.

Fluvial Flooding

OPW flood mapping indicates that parts of the Proposed Development site are affected by fluvial flooding from the River Clydagh and its tributaries.

However, all proposed infrastructure is sited in Flood Zone C (defined in OPW guidelines (2009) as where the probability of flooding from rivers is low i.e., less than 0.1% or 1 in 1000), with the exception of where 4 no. proposed access tracks cross watercourses where clear-span structures will be provided. Flood extents relative to proposed infrastructure are outlined in figures included in Appendix 11-1: Flood Risk Assessment).

Pluvial Flooding

OPW PFRA flood mapping indicates that the Proposed Development site is not in an area at risk of pluvial flooding. The Proposed Development site will cause an increase in impermeable area (i.e., roads, hardstanding), meaning it has the potential to cause an increase in flood risk elsewhere if surface water discharge is not adequately managed as set out in Appendix 11-4: Surface Water Management Plan.

Historical Flood Extents

OPW 'Past Flood Event' mapping (available through floodmaps.ie) does not identify any past flood events within or immediately downstream from the Proposed Development site. The nearest event is shown to have occurred on the River Clydagh (ref: L7058 Clydagh Valley) in July 2005 approximately 6 km downstream from the Site. The flooding is reported to have caused a section of the L7058 road, 50m long, to be washed away as a result of a localised flash flood attributed to heavy rainfall/runoff and upland high velocities in the Clydagh River.

Reservoir Flooding

There are no impoundments or reservoirs in proximity to, or that drain towards, the Proposed Development site that may introduce flooding from this source. Uisce Éireann datasets indicates the nearest impoundment to the Proposed Development site is the Inch Foildown Reservoir located approximately 6.5 km to the west (downstream) from the Proposed Development site.

Summary

The Proposed Development is not located in areas identified as being at risk of flooding. All elements of the Proposed Development are located in Flood Zone C with the exception of where access tracks are proposed to cross watercourses. Details of design for watercourse crossings (in line with Section 50 requirements of the Arterial Drainage Act 1945) and to ensure flood resilience of infrastructure) and surface water management is provided in in Appendix 11-1: Flood Risk Assessment and Appendix 11-4: Surface Water Management Plan.

11.3.21 Baseline Summary and Receptor Sensitivities

The baseline assessment identified the receptors which have the potential to demonstrate a sensitivity to the Proposed Development; the receptors and their scale / sensitivity value are summarised in Table 11-18. Sensitivity is based on the baseline assessment and determined in accordance with the rationale previously described in Table 11-3.

Table 11-18: Receptor Sensitivity

Type	Receptor	Scale / Sensitivity	Rationale
Hydrological	Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC – including River Clydagh and River Flesk	Extremely High	Designated site with national and international importance hydrologically connected to the Proposed Development. Upper reaches of the River Clydagh (Flesk (Kerry)_010 has WFD status of 'Good'.
	Lough Leane	High	Waterbody into which the River Flesk ultimately discharges. Waterbody has a WFD status of 'Good'. It is a locally important amenity site for wide range of leisure activities but is denoted as a nutrient sensitive area.
	Major watercourses draining the Proposed Development where earthworks are proposed.	High	Tributaries of the River Clydagh within these river sub-basins have a WFD status of 'Good'. It is also noted that there is good nursery or spawning habitat in the majority of the watercourses within the Site.
	Minor drainage / watercourses draining the Proposed Development where earthworks are	Low	All other on-site watercourses are generally characterised by forestry drainage channel / ditches, vegetated overgrown field drains / cut peat drainage / trackside drainage. These features have low

Type	Receptor	Scale / Sensitivity	Rationale
	proposed.		fisheries and other ecological potential and have no other use of significant value.
	Watercourses draining the section of the Proposed Development where site access is proposed.	Very High	Tributaries of the River Clydagh within these river sub-basins have a WFD status of 'Good' to 'High'. The Flesk (Kerry)_020 is also noted to be 'At Risk' from hydromorphological pressures.
	Watercourses draining the section of the Proposed Development where the 110kV grid connection route is proposed.	High	Watercourses within the Foherish and Blackwater [Munster] sub-catchments have a WFD status of 'Good'.
	Off-site major watercourses (downstream Clydagh / Flesk catchment).	Very High	River Clydagh and River Flesk downstream from the Proposed Development site have WFD statuses ranging from 'Poor' (Laune_010) to 'High' (Flesk (Kerry)_030 & 050). Flesk (Kerry)_040 is noted as a drinking water source river. The Flesk (Kerry)_040 and Laune_010 are noted to be 'At Risk' from hydromorphological and anthropogenic pressures, respectively.
Terrestrial	The Proposed Development	Low	Proposed infrastructure prone to damage including potential for water damage of electrical infrastructure in a flood event; potential for structural damage of access infrastructure in the event of hydraulic incapacity

11.4 Predicted Environmental Effects

11.4.1 Do-Nothing Scenario

If the Proposed Development was not constructed, there would be no changes to existing land-use i.e., commercial forestry operations within the Cummeennabuddoge Coillte Estate would continue. On-going operations include felling of mature trees per felling 'sub-compartment' with replanting of coniferous trees in vacated sub-compartments.

On-going felling operations are managed as per the felling licence(s) granted by the Minister for Agriculture, Food & the Marine under the Forestry Act 2014. Refer to Appendix 4-2: Forestry Management Report for further detail on existing forestry within the Cummeennabuddoge Coillte Estate.

Any existing potential effects on the water environment from on-going commercial forestry operations at the Site would remain unchanged in a Do-Nothing scenario.

11.4.2 Baseline Evolution

The baseline conditions of the water environment will change over time. Changes may occur with or without the Proposed Development due to either natural variability and / or other factors such as nearby developments or changes in land use.

Hydrology and Flood Risk

The principal factor concerning the likely evolution of baseline conditions in relation to hydrology and flood risk is climate change. The baseline has been assessed with regards to present day rainfall and fluvial flows but predicted effects of climate change have also been considered using the Mid-Range Future Scenario (MRFS) which allows +20% for extreme rainfall and +20% for peak fluvial flood flows.

The MRFS represents a projected future scenario for the end of the century (c. 2100). Given the relatively short timeframe between this assessment and proposed commencement of construction works (c. 5 years) and designed operating life of the Proposed Development (35 years), the MRFS is appropriate for assessing likely evolution of baseline hydrological conditions.

The effects of other proposed and / or consented developments are considered in section 11.8 – Cumulative Effects.

Water Quality

This assessment has considered the existing baseline with regard to surface water quality and the future status / objectives for future years, as defined by the EPA for the relevant river catchments. Consideration has also been given to the effects of reduced future river summer flows, increased storminess, and higher intensity rainfall (refer to Technical Appendix 11-2 Water Quality Assessment for details).

Changes to baseline conditions in relation to water quality may also occur as a result of on-going commercial forestry operations at the Site with the River Clydagh catchment. As noted in the Do-Nothing section (11.4.1), on-going felling operations are managed as per the felling licence(s) granted by the Minister for Agriculture, Food & the Marine under the Forestry Act 2014. No changes to baseline conditions are, therefore, expected from on-going felling operations.

However, commercial forestry operations at the Site are to cease for the duration of the construction phase of the Proposed Development. As outlined in section 11.6.3 (Adaptive Response – Work Stoppages), water quality monitoring will be implemented and will gather further baseline data (for 12 months prior to the commencement of pre-construction felling) and will provide an up-to-date dataset capturing any changes in baseline conditions that may occur due to natural processes or anthropogenic sources (i.e., changes in land use, other nearby developments) prior to commencement of the Proposed Development.

The effects of other proposed and / or consented developments are considered in section 11.8 – Cumulative Effects.

11.4.3 Activities Associated with Construction, Operation and Decommissioning

This section outlines and describes the potential likely effects of the Proposed Development on hydrological patterns and water quality within the Site, and in the downstream environment, that have the potential to arise in the absence of mitigation. Keyhole felling is part of the construction-phase; however, due to its potential effect on the water environment, it is assessed in its own right as a distinct activity during the construction phase of the development within this chapter. The following phases are, therefore, considered;

- Construction of the Proposed Development (including keyhole felling);
- Operation and maintenance of the Proposed Development; and
- Decommissioning of the Proposed Development.

During each phase some of the activities undertaken have the potential to modify hydrological regimes and affect water quality on the site and the downstream environment. Due to the nature of the Proposed Development site and work undertaken, the hazards and associated effects will be similar for each phase, with an increased likelihood during the construction phase.

Components Contributing to Predicted Environmental Effects

During the enabling works phase, keyhole tree felling is required to create access track corridors and space for turbines and other infrastructure. The total area needed to accommodate the 17 turbines and associated infrastructure is c. 152 ha.

Pre-construction felling shall be facilitated by existing forestry tracks, where all affected forest compartments are accessible by existing tracks and existing watercourse crossings. Off-track plant movements will be by low-bearing forestry equipment. Details in relation to forestry and felling work are included in Appendix 4-2.

Felling of trees may result in increased mobilisation and transportation via surface water runoff of dissolved and / or sediment-bound nutrients / phosphate fertilisers from the disturbed soils and breakdown of organic matter (brash etc) into the wider water environment.

The tree felling activities required as part of the Proposed Development will be the subject of a Limited Felling Licence (LFL) application to the Forest Service in accordance with the Forestry Act 2014 and the Forestry Regulations 2017 (S.I. 191/2017).

During construction, the Proposed Development comprises construction of infrastructure which have the potential to cause change to local hydrology and water quality in the absence of mitigation. The works comprise:

- earthworks (excavations to form infrastructure foundations, excavations at borrow pits to win aggregate);
- handling, placement, and storage of peat / spoil;
- plant movements with associated use of lubricants and fuel oils;
- placement of aggregates and cementitious materials;
- dewatering associated with development of borrow pits;
- construction of temporary compounds, turbine foundations, building foundations, access tracks, and cable trenches.

The operational phase of the Proposed Development (the designed operating life of 35 years) will cause runoff from access tracks, turbine bases and hard standings via drainage features. It will require onsite welfare facilities with associated waste at the sub-station, and potentially necessitate storage and use of oils, fuels and lubricants on-site, each with the potential to cause adverse effects on the environment without adequate avoidance, design, or mitigation measures.

Activities associated with the decommissioning phase at the end of the operating design life are generally as per those for the construction phase albeit to a lesser extent; i.e., plant movements with associated use of lubricants and fuel oils, spoil handling, and reinstatement and restoration of ground cover.

Further details of all construction, operation and decommissioning phase activities are provided in Chapter 4: Description of the Development of this EIAR.

11.4.4 Likely Significant Effects

The likely effects of the Proposed Development on the surface water environment prior to any avoidance, careful design, or additional mitigation are summarised in the following sections.

Changes in Runoff and Flow Patterns

Pre-construction felling by low-bearing forestry plant may cause localised compaction of soils. Vegetation removal may also increase surface water runoff rates. No other substantial earthworks are anticipated during felling that would affect runoff and hydrological patterns, where the felling plan uses pre-existing forestry tracks.

New temporary and permanent impermeable surfaces, as well as temporary compaction of soils due to plant and site traffic movements during the wind farm construction-phase, may cause increased rate and volume of surface water runoff due to the reduced permeable area on the Site through which rainfall can infiltrate. Impermeable surfaces will cause an increased "flashy" response to rainfall events, with increased water velocities in new and existing drainage features. As a consequence, the effect would be likely to cause temporary or permanent increases in surface water runoff rates and volumes, leading to increased flood risk and increased effects of erosion and scour in downstream watercourses.

Significant excavations, including borrow pits and linear works such as access tracks, drainage ditches and cable trenches, have the potential to act as barriers to runoff resulting in ponding, or development of preferential flow routes, diverting surface water away from its existing route. Spoil storage and peat repositories may also cause barriers and affect preferential surface water flow routes. Consequently, temporarily or permanently redirected surface water flows may starve areas where water currently flows, or cause flooding of areas where water currently does not flow.

Works to existing surface watercourses (such as installation of culverts or bridges) have the potential to cause an obstruction to flow and may alter conveyance capacities, potentially causing temporary or permanent restrictions in watercourse channels, affecting upstream water levels, and increasing flood risk.

Changes to Water Quality (Sediment / Suspended Pollution)

Temporary activities required to construct windfarm infrastructure would require pre-construction felling, ground disturbance (due to excavations and plant and vehicle movements), stripping and excavation of peat and soils, and temporary and permanent spoil storage. Exposed soils have potential to release fine sediments in surface water runoff or where excavations come in contact with surface watercourses.

Construction of hardstanding areas and access tracks require importing, handling and placement of aggregate, which would have the potential to release fine sediments into surface water runoff. The proximity of such works to surface watercourse could increase the risk of pollution to the wider water environment.

Temporary surface water gathering in significant excavations has the potential to be significantly polluted due to contact with excavated surfaces and aggregates.

Silt and suspended sediments and debris entering watercourses would have the potential to adversely modify stream morphologies, smother habitats and harm aquatic flora and fauna.

Changes to Water Quality (Nutrient loss)

Felling of trees has the potential to result in increased mobilisation and transportation via surface water runoff of dissolved and / or sediment-bound nutrients / phosphate fertilisers from the disturbed soils into the wider water environment, as well as loss of nutrients to the water environment from decomposed vegetative matter. Such a potential effect is likely to be realised during and after felling, and during disturbance of soils during earthworks.

Nutrient enrichment entering waterbodies (i.e., Lough Leane) has the potential to adversely affect water quality, with associated effects to fish and aquatic ecology.

Changes to Water Quality (Chemical Pollution)

Temporary storage and onsite use of chemicals, fuels and oils associated with construction activities, and use of wet concrete and other cementitious material, may result in potentially harmful substances entering the water environment. Possible pathways to hydrological receptors include:

- accidental spillages;
- improper transport and refuelling;
- inappropriate storage and disposal procedures; and
- gradual leakage or single failure of storage tanks or refuelling mechanisms.

During the operational phase of the Proposed Development, the permanent presence of oils and lubricants associated with turbine operations and maintenance has a similar potential to enter and pollution the water environment.

Wastewater effluent from temporary construction phase welfare facilities and permanent substation building welfare facilities has the potential to enter surface waters.

As a consequence, chemical pollutants from construction activities, storage of materials, or from coliforms from wastewater entering watercourses have the potential to adversely affect water quality, with associated effects to potable supplies, fish and aquatic ecology.

11.5 Mitigation Measures (Embedded & Design Measures)

11.5.1 Embedded Mitigation

The magnitude and significance of those effects determined as being likely to be a consequence of the Proposed Development can be substantially reduced or eliminated through a proactive design approach. The approach aims to avoid identified baseline receptors with a particular emphasis in relation to fishery / aquatic species and habitats (i.e., the qualifying interests of the designated site hydrologically connected to the Proposed Development).

This section identifies the embedded mitigation measures which have been committed to by the Applicant and will be implemented in full. Additional mitigation is then specified to further reduce and / or eliminate remaining residual effects.

Detail of the design evolution highlighting considerations made with regards to hydrology and water quality management is presented in Chapter 3: Design Evolution and Consideration of Alternatives.

The Proposed Development layout has evolved so that the design avoids environmental constraints pertinent to the water environment, per the following sections.

Water Features

As a precautionary measure, and in accordance with the guidance previously adhered to for wind farm projects, buffer / exclusion zones to 'major' and 'minor' watercourses were adopted as constraints in the design layout, and for incorporation as a construction buffer in relation to construction activities in proximity to watercourses. Major watercourses are those where catchment within Site is >0.25 km^2. Minor watercourses represent tributary channels within the Site where the catchment area was less than 0.25 km^2.

Avoidance measures have been developed in accordance with legislation and best practice guidance outlined in Table 11-1 and the 'The Proposed Development has been reviewed in relation to planning policy specific to the water environment.

Statutory national, regional and local planning policy frameworks and associated supplementary guidelines pertinent to this chapter and the proposed development include:

- Relevant National Plans and Programmes:
  - Project Ireland 2024 – National Planning Framework (NPF) (Department of Housing, Planning and Local Government, 2018);
  - National Development Plan (NDP) (Department of Public Expenditure and Reform, 2021);
  - Our Sustainable Future – A Framework for Sustainable Development for Ireland (Department of the Environment, Community and Local Government, 2012);
  - Ireland's Environment – An Assessment (Environmental Protection Agency, 2016);
  - Department of Environment, Heritage and Local Government (2006) Wind Energy Development Guidelines for Planning Authorities;

    Department of Housing, Planning and Local Government (2019) Draft Revised Wind Energy Development Guidelines;

  - Flood mapping and management information developed and published through the National CFRAMS Programme (Office of Public Works, 2009 to present (January 2024));
  - River Basin Management Plan for Ireland (Department of Housing, Local Government and Heritage, 2018);
  - The Planning System and Flood Risk Management: Guidelines for Planning Authorities (Department of Environment, Heritage and Local Government/Office of Public Works, 2009);
  - Construction, Replacement or Alteration of Bridges and Culverts: A Guide to Applying for Consent under Section 50 of the Arterial Drainage Act, 1945 (OPW 2022); and
  - The Greater Dublin Strategic Drainage Study (GDSDS) (Dublin City Council, 2005.

- Relevant Regional Plans and Programmes:
  - Strategic Environmental Assessment (SEA) Regional Spatial and Economic Strategy for the Southern Region (Southern Regional Assembly, 2020)
- Relevant Local Plans and Programmes:
  - Kerry County Development Plan 2022-2028; and
  - Cork County Development Plan 2022-2028.

Industry Guidelines' within section 11.2.1, respectively. Mitigation for all water features aims to preserve existing water quality ratings as a minimum.

Establishment of intact vegetated buffer zones between infrastructure and water features allows:

- Protection of water quality by filtering runoff within riparian vegetation before it enters the watercourse;
- Space for natural fluvial processes such as channel shape and planform adjustment, which help restore and maintain the natural dynamic balance of river systems and associated habitats;
- Establishment of vegetation to stabilise banks and reduce soil erosion;
- Access for the maintenance and inspection of watercourses and for dealing with any residual risk of pollution incidents; and
- Habitat for plants and animals to form part of a habitat network.

The sensitivity of the water feature and the associated degree of protection it is therefore afforded, is primarily dependent on:

- Environmental designations on the water feature or downstream environment;
- Fisheries or ecological potential in the water feature or in the downstream environment;
- Water feature morphology (natural substrate or artificial channel, soil / ground type);
- Water feature size, capacity to convey water and hydrological potential (flows) – proportionate to the size of the catchment drained by the water feature;
- Nature and topography of the surrounding land, i.e. wet, poorly drained soils and steep slopes (>10°) would require greater protection; and

- Sensitivity of the water feature to particular types of pollution, i.e. silts / nutrient enrichment / chemical pollution.

The following industry guidance relevant and similar in nature to the construction and operational activities for the Proposed Development has been reviewed and adhered to:

- Inland Fisheries Ireland (2016): Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters
- SEPA / NIEA (2018) Guidance for Pollution Prevention (GPP): GGP5-Works and Maintenance in or Near Water;
- SEPA / NIEA (2000-2023) Guidance for Pollution Prevention (GPP) Pollution Prevention Guidance (PPG) series;
- Best practice in relation to forestry works (in particular on upland and peat sites) recommends riparian buffer reflecting stream size, with buffers from 10 –25 m (DAFM, 2023); and
- Best practice in management of sediments and runoff from exposed ground in relation to agriculture recommends buffers of up to 10 m in order to protect surface waters from pollution by suspended solids, and nutrient enrichment by organic / inorganic fertilisers (GAEC, 2018).

The classification of major and minor watercourses has been determined via a combination of desktop assessments and site surveys (surveys undertaken between January 2021 and July 2022, refer to section 11.2.3), with all channels subject to catchment and flow analysis by geographic information system (GIS) flow-raster accumulation analysis.

The rationale adopted in relation to water feature buffers is informed by knowledge, understanding and experience of similar developments whereby infill, disturbance, construction activity or storage of materials within 50 m of natural (major) watercourses should be avoided. A conservative approach has been adopted for the Proposed Development and a 60 m buffer has been applied to major watercourses within the Site.

Major and minor water features considered for the purposes of the Proposed Development are shown on Figure 11-5 and drawings 'SWMP_01 to 30' in Appendix 11-4: Surface Water Management Plan.

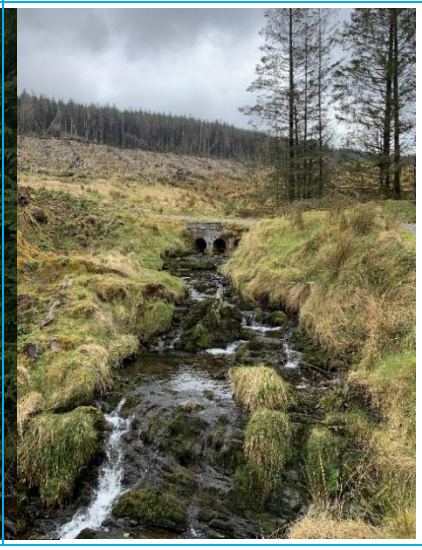
Major Watercourses

Major watercourses identified and requiring application of a buffer to the proposed turbines and infrastructure are largely as per OSI close scale vector mapping and were subject to ground truthing within the Proposed Development site.

A conservative 60 m buffer has been applied to the major watercourses identified in the baseline assessment, i.e., where catchment within Site is >0.25 km^2.

Examples of major watercourses are shown on the following Plate 11-1 and their locations within the Site are shown on Figure 11-5.

Plate 11- 1: Major Watercourse Examples

Location	Lower reach of River Clydagh Tributary -4 draining the western section of the Site	Upper reach of Mullaghanish Stream Tributary draining the eastern section of the Site
Grid Ref.	517801, 583255	521766, 582881
Photo Ref.	IMG_8149	IMG_9856
Figure 11-5 Ref.	Photograph #1	Photograph #2
		

Minor Watercourses

Minor watercourses were given buffers of 10 m based on SEPA guidance (Guidance for Pollution Prevention GPP5: Works and Maintenance in or Near Water, 2018) in the absence of equivalent guidance in Ireland, and represent tributary channels within the Site where the catchment area was less than 0.25 km^2.

Many are the sources / upper reaches of the more identifiable downstream channels and appear as grass / heather-covered depressions in the land. They are distinct and easily identifiable on aerial imagery but often harder to differentiate from the surrounding land at ground level during dry conditions. Others are more defined channels cut into peat.

Examples of minor watercourses are shown on the following Plate 12-2 and their locations within the Site are shown on Figure 11-5.

Plate 12- 2: Minor Watercourse Examples

Location	Minor watercourse channel through forested area discharging into the Mullaghanish Stream within the eastern section of the Site	Minor watercourse draining towards the River Clydagh from the north-eastern section of the Site
Grid Ref.	520850, 583584	521561, 584263
Photo Ref.	IMG_8202	IMG_8229
Figure 11-5 Ref.	Photograph #3	Photograph #4
		

Other Drainage Features

All other minor drainage features (mapped or otherwise) comprising; dry or partially dry forestry ditches, ephemeral drains, dry track drainage, grips, peat cuttings or other drainage features, are not significant in the context of Proposed Development hydrology and habitat potential.

Such features will be managed during and following construction by means of diversion and / or temporary blocking (with prior settlement features upstream of, and outside, the drainage channel), using filtration check dams or similar, in order to prevent residual indirect potential pollution downstream caused by connectivity to downstream waterways.

Adopted Watercourse Buffers

Conservative minimum hydrological buffer zones are adopted and implemented as shown in Table 11-19. The buffer widths adopted exceed those recommended in industry guidance. The allowance provided gives due consideration to the nature of peat soil conditions at the Proposed Development site, antecedent weather, moisture and base flow, and a significantly increased factor of safety in all instances given the significance of fishery interests within downstream catchments, including aquatic qualifying interest species of the Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC.

Table 11-19: Minimum Adopted Hydrological Buffer Zones

Water Features	Minimum Recommended Width of Buffer Strip	Width of Adopted Buffer Strip
Major Watercourses (catchment >0.25 km²)	50 m	60 m
Minor Watercourses (catchment <0.25 km²)	10 m	10 m
Other Drainage Features	Managed on-site by diversion / temporary blocking in accordance with Guidance for Pollution Prevention (GPP) and Pollution Prevention Guidance (PPG) series. (In lieu of specific pollution prevention guidance for RoI, it is recommended that the Guidance on Pollution Prevention (GPP) series (SEPA / NIEA, 2023) relevant in similar adjacent jurisdictions be consulted as examples of best practice)	

Discretion has been adopted where applying buffers to 'other drainage features' based on observed site conditions and using professional judgement. Given the number of ephemeral features, peat drains, and artificial drainage features (in the context of site hydrology and habitat potential), it is not practical or necessary to apply buffers to all 'surface water drains' (as per GPP5).

Protection of other drainage features will be implemented via observational design at the time of implementing the development to suit site conditions and will include appropriate buffer strips or other appropriate temporary measures. Such an approach is routine and well understood and managed by the onshore wind development sector.

Such features will be managed during and following construction by means of diversion and / or temporary blocking (with prior settlement features upstream of, and outside, the drainage channel), using filtration check dams or similar, in order to prevent residual indirect potential pollution downstream caused by connectivity to downstream waterways.

Buffers are indicated on Surface Water Management drawings included at Appendix 11-4.

New infrastructure is designed to lie outside hydrological buffer zones for major and minor watercourses. This includes those elements of the works associated with earthworks and greatest potential for spillage or leakage of chemical pollutants, i.e.:

- All turbine bases, crane pads and associated working areas;
- All borrow pits;
- Temporary and permanent spoil and peat repositories; and
- Enabling works compound, substation and construction compound, fuel and chemical storage areas and any other platforms.

New permanent access tracks are to lie outside of buffer zones; with the exception of unavoidable crossings of water features and a section (approximately 60 m) of new track at the westernmost section of the Site which marginally encroaches on a 60 m buffer to facilitate access. At that location, additional mitigation (silt fencing) to manage potential increased risk due to encroachment on the buffer is proposed; refer to drainage plans in the site SWMP (Appendix 11-4).

Careful consideration has been given to the routing of access tracks in order to avoid / limit crossing of watercourses. Where crossings are proposed, appropriate design measures shall be incorporated to control or reduce the potential effect of the Proposed Development on the receiving environment (refer to 'Watercourse Crossings' within section 11.5.2 of this chapter).

The route of the 110kV grid connection is designed to lie outside of buffer zones; with the exception of an unavoidable crossing of a water course where the route is co-located with an existing track. At that location, additional mitigation in response to weather and measures stated in relation to working in proximity to water to manage potential increased risk due to encroachment on the buffer is proposed; refer also to the SWMP (Appendix 11-4).

Any other development in buffers (including felling) will adopt additional mitigation to control surface water as set out in the site SWMP (Appendix 11-4).

Abstractions

The proposed infrastructure layout within the Site is such that no development (tracks, turbines or other significant infrastructure) is sited within 250 m of any known or potential potable water abstraction identified in the previous screening assessment (refer to section 11.3.18). No further constraint is required.

Floodplains

All development is sited within Flood Zone C, as defined in the OPW Guidelines (OPW, 2009), with the exception of where access tracks are required to cross watercourses within the site.

OPW PFRA flood mapping indicates that the site is not in an area at risk of pluvial flooding.

Infrastructure is designed to ensure that conveyance of watercourse and surface water is not impeded by providing drainage culverts / under track crossings where necessary.

Drainage infrastructure to be installed (refer to Section 11.5.2 and Appendix 11-4 Surface Water Management Plan) ensures a standard of flood protection from surface water for the 1% AEP / 1 in 100-year rainfall event, including allowance for Climate Change.

Site drainage and watercourse crossings shall allow passage of watercourse flows as considered within Appendix 11-1 Flood Risk Assessment and accompanying drainage management drawings and 'Watercourse Crossing Schedule' in Appendix 11-4 Surface Water Management Plan.

11.5.2 Designed Measures

Normal design measures associated with development of the type proposed are not considered "mitigation" in EIA terms but are important in their effect of controlling or reducing the potential effect of the Proposed Development on the receiving environment. Such measures are outlined in the following sections.

Site Drainage Management and SuDS Design

The Proposed Development adopts a surface water management plan / site drainage design using the principles of Sustainable Drainage, promoting the principles of onsite retention of flows and use of buffers and silt removal techniques. All drainage related mitigation measures will be encompassed by a robust and proven Sustainable Drainage System (SuDS) design proposed as part of the Proposed Development which will be used to control drainage and silt management on the site.

The proposed on-site drainage is set out in detail at Appendix 11-4: Surface Water Management Plan and the accompanying set of drainage drawings. The drainage manages flood risk to the Proposed Development, provides environmental protection and manages water quality and silt / suspended sediment, and avoids unnecessary disruption to existing hydrological patterns by adhering to the following principles:

- Track and hardstanding drainage adopts SuDS principles and ensures that runoff from new track and hardstanding shall be reduced to the pre-development greenfield rate. The drainage system caters for protection for up to a 1 in 100-year / 1% AEP rainfall event including allowance for climate change;
- The drainage plan adopts sub-catchments to manage runoff from the Proposed Development where sub-catchments mimic natural topography to avoid "crossing catchments" which could locally affect flood risk;
- Drainage maintains existing overland flow routes and channels. Existing natural flow paths are maintained through the use of piped crossings under road alignments at natural depressions and at regular intermediate intervals;
- Drainage minimises transporting rainfall runoff in long linear drainage swales by providing regular channel "breakouts", whereby water is encouraged to flow overland, thus maintaining existing natural hydrological patterns;
- Drainage reducing surface water flow rates and volumes by attenuating runoff from tracks and hardstands "at source" by providing check-dams in swales, whereby the flow velocity and rate of discharge is artificially reduced to mimic natural properties. This provides an additional layer of protection rather than relying solely on "end of line" attenuation basins;
- Drainage provides attenuation and settlement ponds at main surface water discharge locations at end of drainage "runs", where runoff from significant new impermeable areas is treated and attenuated before being discharged, either by dispersal overland, or over a riparian zone adjacent to a watercourse; and
- Proposals include temporary drainage and settlement features at borrow pits, which are a potential source of sediments and reduced quality runoff due to dust and sludge caused by rock breaking, crushing and heavy plant movements.

Drainage design will reduce chemical, silt and other suspended pollutant transport by providing a "treatment train" of two to three stages of pollutant removal to all surface water runoff, nominally by:

- Ensuring that drainage swales are designed to convey flows at a low velocity by using a wide, flat-bottomed drain;
- Providing settlement and filtration features in all linear drainage swales (check dams, filtration dams) to reduce flow velocity and encourage settlement;
- Encouraging appropriate vegetation growth in the base of all linear drainage to provide additional filtration of water;

- Providing settlement ponds at discharge locations in order to provide treatment to contaminated runoff prior to discharge;
- Discharging surface water runoff over undisturbed vegetated ground, hence allowing any remaining silts and other pollutants to drop out of flows before entering the watercourse (having the effect of polishing the runoff); and
- Preventing the discharge of surface water runoff flows directly to existing watercourses or drainage. Discharges will be via SuDS and buffer zones which will act as a filter strip, allowing deposition of suspended solids and other pollutants.

Consideration specific to the proposed infrastructure elements are documented in the detailed site-specific drainage management / SuDS design – refer to Appendix 11-4: Surface Water Management Plan and accompanying drainage drawings.

Drainage at Upgraded Tracks

The Proposed Development design includes the upgrading of sections of existing access track associated with the existing commercial forestry workings. As such, the proposed upgrade works (maintenance of existing running surface and associated drainage) will encounter the current track drainage which is locally significant in terms of drainage function.

In these instances, additional mitigation measures will be deployed where necessary, including placement of temporary silt barriers (e.g., check dams) within retained and replacement drains. Additional mitigation is discussed further in in section 11.6.3 - Temporary SuDS.

Watercourse Crossings

As described in section 11.5.1, the number of watercourse and drainage crossings has been minimised through the principle of avoidance at the layout design stage. The Proposed Development will result in the following crossings of major and minor watercourses:

- 7 no. crossing of major watercourses; and
- 1 no. crossings of a minor watercourse.

Crossings are designed to accommodate the track width and minimise length of affected channel.

Hydraulic design of crossings has been undertaken as per the guidance and requirements provided in CIRIA C786 "Culverts, Screen and Outfall Manual", with primary parameters as follows:

- Width of the culvert will be greater than the width of the active drainage channel;
- Alignment of the culvert will suit the alignment of the drainage channel, i.e. preserve the existing direction of flow;
- The slope of the culvert will not exceed the slope of the bed of the existing drainage channel;
- Detailed design of crossings will comply with OPW Section 50 guidelines, which will include providing freeboard to design flood levels and ensuring no increase in flood risk elsewhere as a result of the bridge / culvert. Detailed hydraulic design of culverts and similar structures post permission is normal and accepted practice for wind farms in Ireland; and

- Fisheries shall be protected by adopting the guidance stated in 'Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters' as published by Inland Fisheries Ireland (2016).

Hydraulic design of crossings has been undertaken as part of this assessment and details are provided in a 'Watercourse Crossing Schedule' included as part of Appendix 11-4: Surface Water Management Plan.

Culvert form (type) detailed in the Watercourse Crossing Schedule is informed by site-specific assessments (i.e., Chapter 8: Biodiversity and Appendix 8-3 Aquatic Ecology). Clear-span / bottomless crossings are required at the proposed 8 no. crossings to:

- Ensure preservation of the stream habitats (substrate for spawning etc.); and
- To avoid instream works during the construction of the crossings that could adversely affect water quality (i.e., bed disturbance causing release of sediment etc).

Design drawings for bottomless / clear-span crossings have been provided as part of the planning application and are included as part of the Drainage Management Drawings within Appendix 11-4: Surface Water Management Plan.

Consultation and approval will be sought from all relevant stakeholders and regulators in accordance with OPW Section 50 guidelines (OPW, 2022), at the pre-construction detailed design stage for all works in and affecting watercourses and drains.

Any temporary bridging structure shall be of a temporary bridging platform / baily bridge that themselves that can be erected without in-channel works. Temporary culverts or any other proposal causing disturbance of the stream bed or bank to allow far-bank access will not be permitted.

Peat Repositories & Borrow Pits

Peat repositories and borrow pits which are to be backfilled with spoil are sited outside buffer zones; however, they have the potential to be a source of sediment that would cause reduced quality runoff requiring treatment. All repositories are sited outside hydrological pollution prevention buffers. Measures that will be implemented in full to control reduced quality runoff from spoil comprise filtration of runoff through boundary aggregate bunds and across intact vegetated buffers.

Peat slide risk and associated potential effects to downstream water quality from peat repositories and borrow pits, and associated mitigation, is considered in Chapter 10: Soils, Geology and Hydrogeology.

11.6 Effect of the Proposed Development

11.6.1 Project Specific Water Quality Assessment

Due to the hydrological connection between the Proposed Development site and sensitive downstream receptors i.e., Lough Leane (a nutrient sensitive area that has been subject to algal blooms) and the Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC (including the River Clydagh with aquatic qualifying interests), a project-specific quantitative water quality modelling assessment has been undertaken (as detailed in Appendix 11-2: Water Quality Assessment), which assesses

the potential effect of the Proposed Development taking into account embedded and designed mitigation.

The purpose of the assessment was specifically to assess the surface water discharge from the Site and the potential for effects to downstream environmental receptors caused by:

- potential for reduced quality construction phase runoff discharged in site drainage containing elevated levels of suspended solids that would affect SAC qualifying interests in the Clydagh River and downstream, and
- potential nutrient release associated with felling operations affecting Lough Leane.

The assessment determined compliance of surface water discharges from the Site with established Environmental Quality Standards (EQS) for existing / baseline conditions and during the proposed pre-construction felling and construction phase.

Further information on the assessment process and detailed results is provided in Appendix 11-2: Water Quality Assessment and summarised in the following sections.

Nutrient Assessment / Lough Leane Assessment

As noted in section 11.3.11, Lough Leane has previously been subject to historic eutrophication and excessive nutrient-loading. The potential release associated with felling operations affecting Lough Leane has been included for quantitative assessment because of historic algae bloom events in the Lough and the feedback during stakeholder consultation that there were assertions in the past that these were related to forestry in the catchment.

As stated above (section 11.3.17), water quality data was obtained during baseline sampling while pre-existing commercial forestry operations were ongoing on the site of the Proposed Development and on adjacent land. This is relevant because the effect of felling, which is proposed as part of the Proposed Development, was captured within the existing baseline.

No exceedances of established water quality thresholds were identified within the baseline dataset that suggested deterioration attributable to on-going commercial forestry operations. The maximum TSS and turbidity values recorded were reflective of natural seasonal wet conditions, coinciding with the winter sampling immediately after a period of heavy rainfall. In short, sufficient evidence was available to determine that nutrient release from felling to date is not causing water quality issues in the Site or surrounds.

To ensure a precautionary analysis that reflects the planning history and stakeholder concerns, assessment of the effects of nutrient release associated with felling operations, a quantitative assessment of the water quality parameters primarily responsible for eutrophication (i.e., phosphorous and nitrogen) have been assessed at Lough Leane by 'far field dispersion modelling'.

A detailed 1D ICM water quality model of the River Clydagh / River Flesk has been developed to model the watercourse from immediately downstream of the Site Boundary to its confluence with Lough Leane (refer to Appendix 11-2: Water Quality Assessment for further details on the modelling approach).

For each of the nutrients modelled, downstream dispersion through the River Clydagh / River Flesk catchment is such that concentrations drop below the legislative limits and levels do not exceed the relevant EQS threshold levels at the point of discharge to Lough Leane.

The assessment outcome demonstrates that the predicted effect of felling as a result of the Proposed Development would cause no measurable effect to concentrations of nutrients entering Lough Leane from the River Clydagh / River Flesk catchment. The outcome is consistent with previous studies (e.g., EPA, 2003) which indicate that existing pressures in Lough Leane are as a result of agriculture and urban wastewater discharges in the wider lough catchment.

Suspended Solids / River Clydagh & SAC Assessment

To assess potential effects to the River Clydagh (including the SAC) and its primary tributaries on the Site as a result of release of suspended sediment in runoff from proposed site drainage, hydraulic modelling has been carried out to simulate the transport and dispersal of the relevant water quality parameters presented in section 11.3.17 of this report. The aim of the 2D 'far field study' is to assess compliance of total suspended solids (TSS) within the Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC with EQS threshold levels and adherence with the relevant EU Water Quality Directives.

A detailed Infoworks ICM 2D hydrodynamic river model of the River Clydagh has been developed, allowing accurate determination of TSS pollutant concentrations in the SAC in the vicinity, and immediately downstream of the Proposed Development (refer to Appendix 11-2: Water Quality Assessment for further details on the modelling approach).

Model simulations reflect the embedded design which ensures that settlement is provided to manage all runoff up to clay range particles which are in suspension, and which are unlikely to settle without use of flocculent or similar. Measures such as settlement ponds and swales are common industry practice and considered as primary mitigation in EIA terms.

The results of the model show that TSS concentrations do not exceed EQS threshold levels along the River Clydagh or its tributaries, except along a short stretch of watercourse 'River Clydagh Tributary -1', downstream of a proposed outfall. However, downstream of this reach, TSS concentrations fall below threshold levels and reduce further still when the watercourse discharges into the River Clydagh. Recommended limits are not exceeded at any point within the SAC. Maps showing distribution of concentrations are included at Appendix 11-2: Water Quality Assessment.

The assessment outcome demonstrates that the predicted effect of discharges from the Site as a result of the Proposed Development would cause no significant adverse effect to concentrations of total suspended solids in the SAC, and no significant effect to qualifying interests.

Summary

Results from the detailed quantitative water quality assessment reach the following conclusion:

- Surface water discharged from the Proposed Development site during pre-construction felling will not lead to significant adverse effects on water (nutrient) quality in Lough Leane; and
- Surface water discharged from the proposed drainage system to be installed at the Proposed Development site during the construction phase will not lead to significant

adverse effects on water quality (suspended solids) in the River Clydagh and the SAC or further downstream.

Full details of the quantitative assessment are included at Appendix 11-2: Water Quality Assessment. Measures to mitigate residual risks are described in subsequent sections of this chapter, and outlined in Appendix 11-3: Water Quality Monitoring and Response Plan.

11.6.2 Effect of the Proposed Development

Potential environmental effects have been determined based on criteria outlined within Section 11.2.4 taking into account the effect of avoidance by design measures (embedded mitigation) and normal prescribed measures proposed (designed mitigation) and described in preceding sections.

The key conclusions of the assessment are summarised below with the complete assessment schedules and rationale informing the potential effects provided in Section 11.10. The assessment determined that:

- Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC – including River Clydagh and River Flesk:
  - Embedded mitigation and design measures do not fully remove potential risk to the receptor with regards to changes to water quality (chemical pollution) resulting in potential **Major Adverse** effects during construction, operational, and decommissioning phases;
- Lough Leane:
  - Embedded mitigation and design measures do not fully remove potential risk to the receptor with regards to changes to water quality (chemical pollution) resulting in potential **Minor Adverse** effects during construction, operational, and decommissioning phases;
- Major watercourses draining the Proposed Development:
  - Embedded mitigation and design measures do not fully remove potential risk to the receptors with regards to changes to water quality resulting in potential **Major Adverse** effects during construction / decommissioning phases and **Minor Adverse** effects during operational phase;
- Minor watercourses draining the Proposed Development:
  - Embedded mitigation and design measures do not fully remove potential risk to the receptors with regards to changes to water quality resulting in potential **Minor Adverse** effects during construction, operational, and decommissioning phases;
- Watercourses draining the section of the Proposed Development where site access is proposed:
  - Embedded mitigation and design measures do not fully remove potential risk to the receptors with regards to changes to water quality resulting in potential **Major Adverse** effects during construction / decommissioning phases and **Minor Adverse** effects during operational phase;
- Watercourses draining the section of the Proposed Development where the 110kV grid connection is proposed:
  - Embedded mitigation and design measures do not fully remove potential risk to the receptor with regards to changes to water quality resulting in potential

effects ranging from **Minor** to **Moderate Adverse** during construction / decommissioning phases and **Minor Adverse** effects during operational phase;

- Off-site major watercourses (downstream Clydagh / Flesk catchment including reach designated for drinking water)
  - Embedded mitigation and design measures do not fully remove potential risk to the receptor with regards to changes to water quality resulting in potential **Moderate Adverse** effects during construction / decommissioning phases and **Minor Adverse** effects during operational phase.

11.6.3 Additional Mitigation Measures – Construction Phase

Additional mitigation measures, over and above the avoidance by design and buffer zones previously detailed, are proposed to reduce and / or prevent the residual significant effects where the residual risk cannot be removed with complete certainty by the designed / embedded measures.

Adaptive Response – Work Stoppages

Risks to water quality during the construction phase, including pre-construction felling, are to be mitigated by the embedded mitigation (avoidance, buffer zones), designed measures, and additional mitigations set out in this and subsequent report sections. Following mitigation, the construction phase is not predicted to give rise to any significant residual effect to water quality. Monitoring will be carried out as follows to confirm the efficacy and implementation of all relevant mitigation measures and commitments identified in section 11.5.

The overarching principle of operation is to undertake comprehensive water quality monitoring. In the unlikely event that there is a deterioration in water quality as a result of the works, the contractor will respond to changes in water quality before that change is of a magnitude that would cause a significant environmental effect, primarily by ceasing work either site-wide, or stopping work in a local catchment where the pressure affecting water quality can be identified on a sub-catchment by sub-catchment basis. Work will be allowed to recommence after water quality has returned to below the specified threshold (refer to Appendix 11-3).

The approach is precautious and addresses submissions made during consultation (as set out in section 11.2.2) in relation to the potential effect of the Proposed Development on the water environment, which have previously centred on the contention that historic algae bloom events in Lough Leane were related to forestry in the catchment. Specifically in relation to the potential effect of forestry clearance; as described in the Water Quality Assessment (Appendix 11-2), approximately 57 ha of the proposed felling area (equivalent to approximately 38% of the total proposed based on Coillte data) was felled as part of ongoing commercial operations during the period of design evolution and environmental assessments (i.e., 2 years). This included the period when water quality data was being gathered (refer to section 11.3.17), without any notable exceedance of EQS standards observed. Nonetheless, a precautionary approach has been adopted for the purposes of the assessment.

Details in relation to how the adaptive response is to be managed is set out in a Water Quality Monitoring and Response Plan (Appendix 11-3). Water quality monitoring will be implemented and will gather further baseline data (for 12 months prior to the commencement of pre-construction felling) and will monitor effects on the surface

water quality during construction (including felling), operational (12 months post-construction) and decommissioning phases of the Proposed Development.

The Plan will ensure that Environmental Quality Standards and established thresholds are not exceeded during the project construction phase (including felling), with high frequency snapshot monitoring of ambient physical chemical water quality indicators, and continuous monitoring of key parameters (including Turbidity, Ammonium Nitrogen and Molybdate Reactive Phosphorous) relevant to a response from felling or release of nutrients. Exceedances shall initiate a response plan which will require work (felling / earthworks / civil works) to cease on the site, or within the sub-catchment (as set out above). Works shall only recommence when monitoring has determined that specific water quality parameters have returned to acceptable levels.

Monitoring and analysis shall be undertaken by a suitably qualified Environmental Consultant / Environmental Clerk of Works (ECoW) who has specific hydrology (and water quality) experience. Monitoring results shall be compared against the legislative limits / water quality target levels outlined in section 11.3.17 and detailed in Appendix 11-2 and Appendix 11-3 as well as future pre-commencement baseline water quality data that is planned to be gathered as part of the Plan. Proposed maximum threshold limits are defined in Appendix 11-3 that are below quality standard levels. If limits are exceeded or are expected to be exceeded at any time during these phases, works on site or within the sub-catchment (as set out above) shall cease. Works shall only recommence when monitoring has determined that specific water quality parameters have returned to acceptable levels determined by the Environmental Consultant / ECoW.

The procedure for determining water quality standards, exceedance thresholds, minimum monitoring locations and monitoring frequencies, and protocol for implementing adaptive response (review of existing mitigation effectiveness, work stoppage) and restarting work is as set out in Appendix 11-3: Water Quality Monitoring & Response Plan.

Responding to Weather

The works programme for the construction phase will take account of weather forecasts and predicted rainfall in the region. Monitoring of weather forecasts and initiating the Response Plan shall be the responsibility of a suitably qualified Environmental Consultant / Environmental Clerk of Works (ECoW).

Work will be suspended or scaled back if heavy rain is forecast. The extent to which works will be scaled back or suspended will relate directly to scale and nature of the work proposed, the proximity to a receiving watercourse, and the amount of rainfall forecast.

The following forecasting systems are available and will be used on a daily basis at the site to direct proposed construction activities:

- General Forecasts: Available on a national, regional, and county level from the Met Eireann website (www.met.ie/forecasts). These provide general information on weather patterns including rainfall, wind speed and direction but do not provide any quantitative rainfall estimates;
- MeteoAlarm: Alerts to the possible occurrence of severe weather for the next 2 days. Less useful than general forecasts as only available on a provincial scale;

- 3-hour Rainfall Maps: Forecast quantitative rainfall amounts for the next 3 hours but does not account for possible heavy localised events;
- Rainfall Radar Images: Images covering the entire country are freely available from the Met Eireann website (www.met.ie/latest/rainfall_radar.asp). The images are a composite of radar data from Shannon and Dublin airports and give a picture of current rainfall extent and intensity. Images show a quantitative measure of recent rainfall. A 3-hour record is given and is updated every 15 minutes. Radar images are not predictive; and,
- Consultancy Service: Met Eireann provide a 24-hour telephone consultancy service. The forecaster will provide interpretation of weather data and give the best available forecast for the area of interest.

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

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

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

Prior to works being suspended the following control measures shall be completed:

- Secure all open excavations; and
- Provide temporary or emergency drainage to prevent back-up of surface runoff.

Contractor will avoid working during heavy rainfall and for up to 24 hours after heavy events to ensure drainage systems are not overloaded. ECoW shall check drainage after rainfall event and prior to recommencement of works.

Pollution Prevention Measures

During all phases of the Proposed Development, the site manager will ensure that mitigation measures as identified within this assessment are fully implemented and that activities are carried out in such a manner as to prevent or reduce effects. The following construction and decommissioning phase-specific measures will be implemented. The following sections should be read in conjunction with the construction management information provided within Chapter 4: Description of Development, which includes the Construction Environmental Management Plan (CEMP) and Appendix 11-4: Surface Water Management Plan.

To ensure best practice on site and to help avoid pollution release to watercourses, IFI 'Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters' (2016) will be adhered to. The Guidance on Pollution Prevention (GPP) series (SEPA / NIEA, 2022), relevant in similar adjacent jurisdictions, will be consulted (as additional examples of best practice) and complied with to help avoid pollution release to watercourses.

Key requirements for control of chemical pollution risk that will be implemented include those outlined in the following sections.

Storage

All equipment, materials and chemicals required for the Proposed Development will be stored away from any watercourse (i.e. outside previously stated buffer zones). Chemical, fuel and oil stores will be sited on impervious bases in accordance with GPP2: Above Ground Oil Storage Tanks and within a secured bund of 110% of the storage capacity. Storage space shall be located within the three temporary construction compounds (as described in Chapter 4: Description of Development); the same conditions shall apply where materials are stored at main working areas (e.g. turbine cranepads).

Vehicles and Refuelling

Standing machinery will have drip trays placed underneath to prevent oil and fuel leaks causing pollution. Spill kits will also be available in designated areas throughout the Proposed Development. Refuelling of vehicles and machinery will be carried out on an impermeable surface in designated areas, away from any watercourse or drainage ditches (i.e., outside previously stated buffer zones, refer to section 11.5.1).

Maintenance

On-site maintenance (outside of construction compounds) to construction plant will be avoided in all practicable instances, unless vehicles have broken down necessitating maintenance at the point of breakdown. Suitable measures in accordance with a Pollution Prevention Plan (PPP) will be put in place prior to commencement of maintenance in this instance comprising spill kit, drip trays, absorbent booms.

Cement and Concrete Batching

Measures to prevent discharge of alkaline wastewaters or contaminated storm water to watercourses will be determined before commencement of works. Concrete contaminated water will be discharged to a lined basin in order that it be contained for authorised disposal off site. Wastewater spillage will be minimised by using settling tanks and recycling water. Spill kits will also be available in designated areas throughout the Proposed Development.

Mess and Welfare Facilities

Mess and welfare facilities will be required during the construction phase and will be located at the construction compounds. Foul effluent disposal shall be via chemical facilities with periodic tankered removal by a licensed waste haulier for licensed offsite disposal (i.e., there shall be no emission of treated or untreated foul effluent on the site).

Construction in the Vicinity of Watercourses

Work in or near water is expected to be limited to construction of drainage outfalls and pre-construction felling.

Within watercourse buffer zones (refer to 'Adopted Watercourse Buffers' in section 11.5.1), works will be managed and limited in accordance with the previous section "Responding to Weather" so that execution of the works are undertaken during periods of low flow and low rainfall, in order to minimise contact with water.

Construction of Watercourse Crossings

Construction of watercourse crossings will be managed and limited in accordance with the previous section "Responding to Weather" so that execution of the works are undertaken during periods with low rainfall and low river water levels. Work will adhere to any working period restrictions imposed by Inland Fisheries Ireland.

Construction will be strictly as per the design for each identified watercourse crossing and will fully implement all SuDS and additional mitigating measures indicated within this proposal and further detailed at the design stage. For purposes of developing design, the proposed mitigation will include:

- Prior planning of access to both banks to allow installation of abutments / foundations for clear-span / bottomless structures, which may include erecting temporary bridging structures;
- Installation of silt fences parallel to the watercourse channel in the vicinity of the proposed crossing, between culvert / bridge footings and the river bank;
- Installation of small cut-off drains to prevent natural surface runoff entering area of construction activity;
- Installation of filtration or other silt entraining features within the watercourse channel immediately downstream of the works location.

Temporary SuDS

SuDS, comprising temporary drainage and silt management features will be constructed prior to earthworks (including preliminary or enabling works including pre-construction felling) proceeding to construct any linear works (tracks / hardstanding areas / cable routes), turbine bases, and other infrastructure.

Drainage will be provided to temporary earthworks. Permanent drainage will be installed in advance of or in parallel with completion of tracks and hardstanding areas; a planning design for permanent drainage is shown at Appendix 11-4: Surface Water Management Plan.

Temporary measures will include:

- Temporary silt fences erected in areas where risk of pollution to watercourses has been identified e.g. watercourse crossing locations and areas where felling lie within watercourse buffer zones;
- Placing temporary filtration silt fences within drainage channels where required;
- Installing temporary constructed settlement features such as sumps or settlement ponds / lagoons in areas where water is to be discharged. Principles and design standards for sizing of treatment are stated in Appendix 11-4;
- Upslope cut-off drainage channels approximately parallel to the proposed track alignment installed in advance of any excavated cuttings for the track or turbine hardstanding areas;
- Drains, natural flow paths and cut-off drain outlet locations will be identified and charted, in order to ensure that piped crossings can be installed in advance of or adjacent to the track construction;
- Settlement ponds will be constructed in advance of commencing excavations for foundations and at any other locations where dewatering of reduced quality runoff is expected; and

- Trackside drainage swales will be installed in parallel with track construction. Note that this may require that drainage swales are reformed on an ongoing basis as temporary track alignments are modified to their eventual finished design level.

The prevention measures described above will be in place at all times during the construction phase to prevent the conveyance of silts to receiving watercourses. Further detail on the measures above is elaborated on in Appendix 11-4: Surface Water Management Plan.

Electrical Cable Laying

Cable laying works associated with the 110kV grid connection route will be managed and limited in accordance with the previous section "Responding to Weather" so that execution of the works is undertaken during periods with low rainfall likely to coincide with low superficial groundwater levels in order to reduce the likelihood of runoff entering the excavations.

Excavation of cable trenches will be carried out over short distances, with frequent backfilling of trenches to minimise opportunity for the ingress of water into open trenches. Temporary silt traps will be provided in longer trench runs and on steeper slopes and spoil will be stored in line with a spoil management plan, which will be produced as part of the CEMP / CMS at the pre-construction stage. Cable laying is further addressed in Appendix 4-1 CEMP and Appendix 10-3 PMP, bearing in mind that these are live documents to be updated in line with the conditions of the planning permission if granted.

Further details on electrical cable laying are provided Appendix 4-3 Underground Cable Construction Methodology.

Excavations and Spoil Management

Soil and subsoil excavation, movement and placement will be undertaken in accordance with best practice guidelines and measures outlined in Appendix 10-3 PMP, including:

- Material stockpiles shall be located at least 60 m away from watercourses, including site ditches, to reduce the potential for sediment to be transferred into the wider hydrological system. Excavated material other than peat will be used as engineering fill for the Proposed Development, where drainage will be captured in the proposed temporary and permanent drainage plan described previously; and excess excavated material will be used to backfill borrow pits where runoff will be managed by borrow pit drainage described separately.
- Areas of stockpiled storage will not be permitted to obstruct the flow of overland surface water with specific drainage to spoil mounds to be provided (refer to Appendix 4-3 Underground Cable Construction Methodology and Appendix 10-3 PMP);
- Inspection of any stockpile areas will be carried out, particularly following periods of dry or wet weather. If turfs are identified as drying, they shall be moved to a permanent reinstatement area or temporary irrigation shall be carried out until such a time as permanent reinstatement is possibe. All temporary storage of peat material shall be carried out in accordance with the rules outlined in Technical Appendix 10-3: Peat Management Plan. Inspection of temporary stockpiles is the responsibility of the ECoW;

- Irrigation of peat turves will be agreed in advance with the Ecological Clerk of Works (ECoW) and Geotechnical Engineer. Should wetting of turves be required in order to prevent desiccation, mitigation will be adopted to prevent run-off or discharge to any adjacent watercourses;
- Care shall be taken during peat excavation to ensure it is segregated from other soil types ,as material reinstatements/ and reuse requirements are different for varying material as outlined in Technical Appendix 10-3: Peat Management Plan. Particular care will be taken to review recorded peat depths and excavation volumes throughout the construction phase and will be reviewed within the construction phase Peat Management Plan and CEMP;
- Peat shall be separated and stored by type, namely the acrotelmic and catotelmic layers;
- Catotelmic peat will only be reinstated within the peat repository areas and the borrow pit areas. Peat excavated will only be used for reinstatement where such reuse poses no risk of polluting watercourses and evidence can be provided (i.e., from confirmatory GI, groundwater and surface water monitoring) that the required water table at the chosen location can be maintained;
- Construction sequencing shall minimise the temporary stockpiling of peat, ensuring reinstatement accommodation space for generated peat materials. Were necessary, peat shall be stockpiled for a minimal amount of time prior to placement/reuse. Stockpile will be subject to the inspection by the ECoW and geometry restrictions as outlined in Technical Appendix 10-3. Inspection will be the responsibility of the ECoW and will be carried out at regular intervals not exceeding three days, particularly after heavy rainfall or prolonged periods of dry weather;
- Temporary stockpiling will be carried out outside of the watercourse and environmental buffers, and the buffer areas outline in Technical Appendix 10-3 Peat Management Plan. An observational approach will be used to monitor the acrotelmic and catotelmic peat materials. Placement may be as landscaping, side casting for suitable acrotelmic peat, and catatelmic peat with a high decomposition will be placed within the peat repositories, or within the excavated borrow pit cells;
- Temporary storage will be safe in so far as it protects the structure and integrity of the excavated peat. Excessive disturbance to the peat material can cause loss of fabric and compressive strength, and such disturbed peat will not be suitable for reinstatement and will need to be placed within the peat repository areas or excavated borrow pit cells. Reinstatement of peat and peat turves will be completed during the construction phase at the earliest practicable opportunity to avoid prolonged storage. Visual inspection of all temporary stockpiled and reinstated peat material will be carried out by the project Geotechnical Engineer;
- Peat stockpile locations will be selected to limit re-handling as far as reasonably possible; and
- Excavated peat shall be stored and reused as close as possible to the immediate area.

As part of the detailed CEMP, a spoil management strategy (informed by confirmatory construction-stage ground investigations and construction-stage peat stability assessment) will be developed by the appointed competent contractor for the development, which will include management of surface water.

Refer to Chapter 10: Soils, Geology and Hydrogeology and Appendix 10-3 Peat Management Plan for further details.

Dewatering of Excavations & Borrow Pits

Turbine base foundations will be on bedrock or other hard strata above bedrock and, therefore, deep excavations into bedrock and the associated bedrock aquifer are not proposed. Dewatering below the bedrock aquifer groundwater table is, therefore, not anticipated.

Dewatering of excavations may be required, depending on groundwater levels and flow, although based on the existing site investigation information, significant shallow groundwater is considered to be unlikely. Confirmatory ground investigations will include rotary boreholes for bedrock core collection and assessment of bedrock quality. Borehole will be installed with standpipe installation and seasonal groundwater monitoring will be carried out to identify any variations in the groundwater levels.

Four borrow pits are planned which shall be 5 m deep in bedrock, subject to the results of the confirmatory ground investigations and the encountered bedrock quality. Bedrock groundwater from fracture flow and shallow groundwater encountered at these locations will require dewatering.

All contaminated groundwater or rainfall runoff collected in excavations will be discharged via settlement ponds or filter strips prior to entry to the receiving water environment. Temporary pumping of groundwater will be carried out as required to facilitate excavation and remove wastewater with high concentrations of suspended soils into settlement features.

The earthworks will not take place during severe weather conditions if they present a risk to materials management or stability.

Any settlement lagoons or filter strips associated with dewatering will be regularly inspected, particularly after periods of heavy rainfall and prior to periods of forecast heavy rainfall. Maintenance (to clear blockages or remove silt) will be carried out in periods of dry weather where practicable.

Settlement features at borrow pits and wider maintenance requirements are further considered in Appendix 11-4: Surface Water Management Plan.

Dust Management

Loose track material generated during the use of access tracks and the construction compound will be prevented from reaching watercourses by maintenance of surface water drainage systems installed at aggregate based hard standing areas. In dry weather dust suppression methods such as by dust suppression bowser will be employed.

Maintenance of Pollution Prevention Measures

All SuDS and additional pollution prevention measures installed will be subject to a regular maintenance regime for the life of the construction phase in order to maintain functionality of all features. This will comprise:

- Unblocking of drains;
- Maintenance of access road and other hard standing surfaces;

- Replacement of filtration features; and
- Removal of silt build-up from settlement and filtration features.

11.6.4 Mitigating Measures - Operational Phase

Mitigation of the effects of the Proposed Development will comprise the following:

- Ensure best practice is adhered to at the Proposed Development and avoid pollution release to watercourses by incorporating Pollution Prevention Guidance notes into management policy (refer to section 11.2.1 – Industry Guidelines);
- Permanent welfare facilities will be installed as part of control building / substation facilities. Foul effluent will be disposed of through the use of sealed cesspools or chemical facilities with periodic tankered removal by a licensed waste haulier for licensed offsite disposal (i.e., there shall be no emission on the site);
- Continuation of monitoring for the specified phase (12 months) of the operational life of the development (after commissioning) for validatory purposes Monitoring results shall be retained and reported on monthly for inspection by the local authority or EPA if required; and
- Cyclical maintenance of permanent SuDS drainage features installed during the construction phase, including unblocking of drains, maintenance of access road and other hard standing surfaces, and removal of silt build-up from settlement features. A maintenance programme is included in Appendix 11-4: Surface Water Management Plan.

11.6.5 Mitigating Measures – Decommissioning Phase

As noted in section 11.4.3, activities associated with the decommissioning phase at the end of the operating design life are generally as per those for the construction phase, and as such, mitigation measures outlined in the construction phase will be followed as appropriate during the decommissioning phase of the Proposed Development.

The Irish Wind Energy Association (IWEA) states that when decommissioning a wind farm "the concrete bases could be removed, but it may be better to leave them under the ground, as this causes less disturbance". As a result, the turbine foundations, hardstanding, cable ducting, access tracks and associated infrastructure will be left in-situ, as it is considered that it will cause less environmental damage than removal.

With regards to water quality, it is recommended that a similar approach to the construction and operational phase procedures be employed during decommissioning phase, i.e., a review of measured chemical parameters in relation to relevant EQS at the time of decommissioning, pre-decommissioning baseline chemical data and expected natural chemical ranges is to be undertaken by a suitably qualified professional Environmental Consultant / ECoW.

Notwithstanding changes in requirements by the planning authority, environmental regulators or stakeholders, decommissioning phase monitoring would comprise 6 months pre-decommissioning baseline monitoring, continuous and grab sample monitoring for the duration of decommissioning, and in-situ / grab sample monitoring for a 6-month period on completion of decommissioning.

11.7 Residual Effects

Potential environmental effects have been determined based on criteria outlined within section 11.2.4 (taking into account the effect of additional mitigation measures proposed and described in preceding sections) of all receptors identified as previously having an unmitigated effect significance greater than 'not significant'.

The key conclusions of the assessment are summarised here with the complete assessment schedules and rationale informing the potential effects, evaluated per the criteria stated in Section 11.2.4 provided in Section 11.10.

The assessment concludes for construction and decommissioning phases that the significance of residual effects, after implementation of additional mitigation, would be **Not Significant** at all receptors.

The assessment concludes that for the operational phase, the significance of residual effects, after implementation of additional mitigation, would be **Not Significant** at all receptors including the adjacent SAC.

11.8 Cumulative Effects

An assessment has been undertaken of the cumulative effect on the water environment of the Proposed Development in conjunction with other known wind farms and other developments that could give rise to significant cumulative effects that are in planning, construction, or operation at the time of the application (refer to Appendix 2-3: Cumulative Sites).

The assessment aims to determine potential for cumulative effect within the hydrological setting of the Proposed Development caused by an accumulation of other developments. The hydrological setting for the purposes of the assessment is the downstream catchments hydrologically connected to the Proposed Development as identified on EPA mapping as described in section 11.3.5 and shown on Figure 11-1.

Existing operational wind farms around the site are captured within the baseline conditions assessed in this EIAR and as such the residual effects determined for the Proposed Development are effectively cumulative with those pre-existing developments.

Consent at Knocknamork Wind Farm for a sub-station and an increase in tip height of the seven turbines that are already present at that site, which borders the south of the Proposed Development (refer to Appendix 2-3: Cumulative Sites) would cause construction works to amend ground level infrastructure foundations. The EIAR for the Knocknamork development notes that with mitigation, there are no significant residual effects on hydrology / water quality associated with that development.

Grid routes from Gortyrahilly Wind Farm and Inchamore Wind Farm are both proposed to be routed through the Proposed Development site, largely along existing forestry tracks which is expected to cause minimal ground disturbance (refer to Appendix 2-3: Cumulative Sites). The respective environmental assessments submitted in support of those respective proposed developments conclude that any negative impacts arising from the development will be "not significant".

All or parts of the developments (Knocknamork, Gortrahilly Grid Route and Inchamore Grid Route) are within the Clydagh River catchment. The predicted environmental effect caused by the Proposed Development is Not Significant during the construction

phase. The likelihood of a cumulative effect would be greatest where construction phases coincided.

Mitigation proposed for the Proposed Development, and in particular the extensive programme of water quality monitoring and associated response plans to cease work in the event of exceedance of established water quality threshold requiring adaptive mitigation (as described in Appendix 11-3 WQMRP) would measure any effect within the Clydagh irrespective of what it is attributable, and the response plan would be implemented accordingly. As such there is no potential significant cumulative effect to the water environment in conjunction with Gortyrahilly Wind Farm and Inchamore Wind Farm grid routes, and Knocknamork Extension.

In relation to potential cumulative effects of the Proposed Development with ongoing commercial forestry operations elsewhere in the Clydagh River catchment, the findings of the Water Quality Assessment (Appendix 11-2) indicate that pre-existing pressures at Lough Leane are unlikely to be attributable to forestry operations. The detailed baseline assessment of water quality concludes there is no evidence of elevated parameters that would lead to nutrient enrichment in Lough Leane in the Clydagh and Flesk rivers, which would include for the effect of ongoing felling. The effect of ongoing commercial felling is captured in the baseline assessment. The detailed quantitative assessment concludes that there will be no measurable change to water quality parameters causing nutrient enrichment in the river reaches draining into Lough Leane as a result of the Proposed Development. There potential for cumulative effects of the Proposed Development in conjunction with pre-existing felling operations has therefore been assessed and found to be not significant.

11.9 Summary and Conclusion (and Statement of Significance)

This assessment identifies the potential hydrological effects, including surface water quality, of the Proposed Development. It summarises the relevant legislation and guidance and provides appropriate baseline information, enabling the potential effects to be identified.

Aspects of the design, construction, operation, and decommissioning of the Proposed Development that may potentially affect the receiving water environment have been identified and the pathways for effects assessed. It has been determined that without mitigation, the Proposed Development has the potential to cause adverse effects of major significance primarily driven by the sensitivity of receiving watercourses (WFD status) and qualifying interests of the adjacent designated Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC. As such, informed by the baseline assessment and pathways identified, mitigation integrated as part of design and proposed during construction phase includes:

- Avoidance of water features based on baseline constraints mapping;
- Design of site elements to minimise effects on the water environment;
- Implementation of a comprehensive surface water management plan comprising the use of SuDS (drainage) and silt management in order to prevent pathways for pollution;
- Implementation of adaptive response planning informed by a comprehensive Water Quality Monitoring and Response Plan adjacent to the Site; and

- Construction phase pollution prevention procedures in accordance with best practice guidance.

Monitoring of the effect of the Proposed Development on the water environment and fisheries habitat will be provided by the Applicant through physicochemical water quality monitoring. Implementation of the mitigation proposed eliminates or reduces the potential significance of effect to all receptors to "not significant".

As outlined in section 11.2.4, effects graded below major or moderate significance are not considered to be 'significant' in accordance with the EPA Guidance 2022.

The assessment of the magnitude of the predicted effect has taken into account the full range of infrastructure proposed by the application. The range of turbines proposed causes no change to work at ground level that would affect the magnitude of any effect to hydrology. The foundation footprint will remain the same for all turbines within the range and, therefore, there will be no change to the significance of any of the predicted effects on hydrology for all turbines within the proposed range.

As noted in section 11.1.4, a fundamental requirement of the WFD is to attain good ecological water status of water bodies and that deterioration in the status of water bodies is prevented. Any effect that would compromise the achievement of a WFD objective, or result in the deterioration in the status of a water body, is considered as a significant effect. This assessment outlines mitigation measures specifically in relation to management of surface water (detailed further in Technical Appendix 11-4 Surface Water Management Plan) to prevent deterioration of water quality and quantity. As this assessment concludes that overall residual effects of the Proposed Development on the water environment are "not significant", WFD objectives are deemed to have been satisfied.

There is no likelihood of significant cumulative effects over and above any pre-existing effect caused by existing, proposed or consented projects.

11.10 Assessment Schedules

Effect of Embedded Mitigation & Design Measures

Table 11-20: Potential Magnitude and Significance of Effects to Receptors – Including Effect of Embedded Mitigation & Design Measures

Receptor / Sensitivity	Potential Effect	Phase of Proposed Development	Embedded Mitigation & Design Measures	Magnitude	Potential Effect Significance	Likelihood	Overall Effect Significance and Rationale
Designated Site (Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC – including River Clydagh and River Flesk) (Extremely High)	Changes in runoff and flow patterns	Construction, Operational & Decommissioning	- Buffer / exclusion zones in relation to construction activities in proximity to watercourses. - Construction / decommissioning phase surface water management plan / and permanent site drainage design using the principles of Sustainable Drainage. - Temporary watercourse crossings within the Proposed Development site will be bridging platforms / Bailey Bridges that themselves require no in-channel work. - Permanent watercourse crossings within the Proposed Development will be bottomless / clear-span crossings. - Design evolution has resulted in avoidance of watercourses with the exception of unavoidable watercourse crossings to facilitate access.	Negligible	Imperceptible	Unlikely	**Not Significant** The mitigation measures will minimise potential changes in runoff and flow patterns at the Proposed Development which is adjacent and hydrologically connected to the SAC. The drainage strategy adopted ensures that natural catchments are mirrored and ensures that water is not lost from the catchments that would result in a loss of available water draining into the designated site. SuDS features also ensure response to rainfall is not exacerbated. No temporary or permanent watercourse crossings are proposed within the Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC. Those proposed as part of the Proposed Development, that are outside the SAC, will be bridging platforms / Bailey Bridges (construction-phase) that themselves require no in-channel work, and bottomless / clear-span crossings (permanent). These do not require in-stream works, allow free flow of water within channels, and maintain unobstructed passage for fish and / or macroinvertebrates including qualifying interest species of the SAC.

Receptor / Sensitivity	Potential Effect	Phase of Proposed Development	Embedded Mitigation & Design Measures	Magnitude	Potential Effect Significance	Likelihood	Overall Effect Significance and Rationale
	Changes to water quality (sediment / suspended pollution)	Construction & Decommissioning	- Buffer / exclusion zones in relation to construction activities in proximity to watercourses. - Construction / decommissioning phase surface water management plan / site drainage design using the principles of Sustainable Drainage, promoting the principles of onsite retention of flows and use of vegetated buffers and other silt removal techniques.	Negligible	Imperceptible	Unlikely	**Not Significant** The detailed assessment outcome (**Appendix 11-2**) demonstrates that embedded mitigation and design measures reduce the potential risk to the receptor with regards to changes to water quality (sediment / suspended pollution) such that established EQS thresholds are not exceeded in the SAC.
		Operational	- Permanent site drainage design using the principles of Sustainable Drainage. Design evolution has resulted in avoidance of watercourses with the exception of unavoidable watercourse crossings to facilitate access.	Negligible	Imperceptible	Unlikely	**Not Significant** The detailed assessment outcome (based on a conservative construction phase scenario) (Appendix 11-2) demonstrates that the predicted effect of the Proposed Development would cause no measurable effect to concentrations of sediment / suspended pollution in the downstream catchment. These findings are applicable also to the operational phase of the Proposed Development.
	Changes to water quality (chemical pollution of surface water)	Construction & Decommissioning	- Buffer / exclusion zones in relation to construction activities in proximity to watercourses. - Construction / decommissioning phase surface water management plan / site drainage design using the principles of Sustainable Drainage, promoting the principles of onsite retention of flows and use of vegetated buffers.	Large Adverse	Profound	Likely	**Major Adverse** Embedded mitigation and design measures do not fully remove potential risk to the receptor with regards to potential changes to water quality (chemical pollution of surface water). In the absence of additional mitigation measures, spillage of oils, chemicals, or cementitious material associated with temporary construction, and / or arising due to improper site management, would be likely to cause a temporary fundamental change in water quality in watercourses within the Proposed

Receptor / Sensitivity	Potential Effect	Phase of Proposed Development	Embedded Mitigation & Design Measures	Magnitude	Potential Effect Significance	Likelihood	Overall Effect Significance and Rationale
							Development Site which are hydrologically connected to the SAC site, with potential loss / extensive change to water dependent habitat / species.
		Operational	- Permanent site drainage design using the principles of Sustainable Drainage. - Design evolution has resulted in avoidance of watercourses with the exception of unavoidable watercourse crossings to facilitate access.	Large Adverse	Profound	Likely	**Major Adverse** In the absence of additional mitigation measures, accidental spillage / leaks of oils, chemicals, or other materials stored on site arising due to improper site management, would be likely to cause a temporary fundamental change in water quality in watercourses within the Proposed Development site which are hydrologically connected to the designated SAC, with potential loss / extensive change to water dependent habitat / species.
Off-site lake waterbody (Lough Leane) (High)	Changes in runoff and flow patterns	Construction, Operational & Decommissioning	- Construction / decommissioning phase surface water management plan / and permanent site drainage design using the principles of Sustainable Drainage. - Temporary watercourse crossings within the Proposed Development site will be bridging platforms / Bailey Bridges that themselves require no in-channel work. - Permanent watercourse crossings within the Proposed Development will be bottomless / clear-span crossings.	Negligible	Imperceptible	Unlikely	**Not Significant** The construction phase mitigation measures will minimise potential changes in runoff and flow patterns at the Proposed Development site. The drainage strategy adopted ensures that natural catchments are mirrored and ensures that water is not lost from the catchments that would result in a loss of available water draining into the Lough Leane catchment. The Site as a proportion of the waterbody catchment hydrologically shared with the lough is not significant (i.e., c. 1.8%). Given this, and the distance between the Site and the lough (c. 30 km downstream), and the embedded mitigation / design proposed, runoff and flow patterns to the lough will be unaffected by the Proposed Development.

Receptor / Sensitivity	Potential Effect	Phase of Proposed Development	Embedded Mitigation & Design Measures	Magnitude	Potential Effect Significance	Likelihood	Overall Effect Significance and Rationale
	Changes to water quality (sediment / suspended pollution)	Construction & Decommissioning	- Buffer / exclusion zones in relation to construction activities in proximity to watercourses. - Construction / decommissioning phase surface water management plan / site drainage design using the principles of Sustainable Drainage, promoting the principles of onsite retention of flows and use of vegetated buffers and other silt removal techniques.	Negligible	Imperceptible	Unlikely	**Not Significant** The Site as a proportion of the waterbody catchment hydrologically shared with the lough is not significant (i.e., c. 1.8%). Given this, and the distance between the Site and the lough (c. 30 km downstream), the lough will be unaffected by any potential changes in water quality (sediment / suspended pollution) relating to the Proposed Development. The detailed assessment outcome (**Appendix 11-2**) demonstrates that the predicted effects of the Proposed Development would cause no measurable effect to concentrations of sediment / suspended pollution entering Lough Leane from the River Flesk catchment.
		Operational	- Permanent site drainage design using the principles of Sustainable Drainage. - Design evolution has resulted in avoidance of watercourses with the exception of unavoidable watercourse crossings to facilitate access.	Negligible	Imperceptible	Unlikely	**Not Significant** The Site as a proportion of the waterbody catchment hydrologically shared with the lough is not significant (i.e., c. 1.8%). Given this, and the distance between the Site and the lough (c. 30 km downstream), the lough will be unaffected by any potential changes in water quality (sediment / suspended pollution) relating to the Proposed Development. The detailed assessment outcome (based on a conservative construction phase scenario) (**Appendix 11-2**) demonstrates that the predicted effect of the Proposed Development would cause no measurable effect to concentrations of sediment / suspended pollution in the downstream catchment. These findings are applicable also to the operational phase of the Proposed

Receptor / Sensitivity	Potential Effect	Phase of Proposed Development	Embedded Mitigation & Design Measures	Magnitude	Potential Effect Significance	Likelihood	Overall Effect Significance and Rationale
							Development.
	Changes to water quality (nutrient loss)	Construction & Decommissioning	- Buffer / exclusion zones in relation to construction activities in proximity to watercourses. - Construction / decommissioning phase surface water management plan / site drainage design using the principles of Sustainable Drainage, promoting the principles of onsite retention of flows and use of vegetated buffers.	Negligible	Imperceptible	Unlikely	**Not Significant** The detailed assessment outcome (**Appendix 11-2**) demonstrates that the predicted effect of felling as a result of the Proposed Development would cause no measurable effect to concentrations of nutrients entering Lough Leane from the River Flesk catchment.
		Operational	- N/A	Negligible	Imperceptible	Unlikely	**Not Significant** No activities during the operational phase of the Proposed Development would cause changes to water quality with regards to nutrient loss (e.g., no earthworks / felling that can cause increased sediment release via surface water runoff or increased mobilisation and transportation via surface water runoff of dissolved and / or sediment-bound nutrients / phosphate fertilisers).

Receptor / Sensitivity	Potential Effect	Phase of Proposed Development	Embedded Mitigation & Design Measures	Magnitude	Potential Effect Significance	Likelihood	Overall Effect Significance and Rationale
	Changes to water quality (chemical pollution of surface water)	Construction & Decommissioning	- Buffer / exclusion zones in relation to construction activities in proximity to watercourses. - Construction / decommissioning phase surface water management plan / site drainage design using the principles of Sustainable Drainage, promoting the principles of onsite retention of flows and use of vegetated buffers.	Small Adverse	Moderate Adverse	Unlikely	**Minor Adverse** Embedded mitigation measures do not fully remove potential risk to the receptor with regards to potential changes to water quality (chemical pollution of surface water). In the absence of additional mitigation measures, spillage of oils, chemicals, or cementitious material associated with temporary construction, and / or arising due to improper site management, could cause a temporary fundamental change in water quality in watercourses hydrologically connecting the Proposed Development site and the lough. However, the Site as a proportion of the waterbody catchment hydrologically shared with the lough is not significant (i.e., c. 1.8%). Given this, and the distance between the Site and the lough (c. 30 km downstream), any potential effects in the absence of additional mitigation would result in a minor deterioration in water quality.
		Operational	- Permanent site drainage design using the principles of Sustainable Drainage. - Design evolution has resulted in avoidance of watercourses with the exception of unavoidable watercourse crossings to facilitate access.	Small Adverse	Moderate Adverse	Unlikely	**Minor Adverse** In the absence of additional mitigation measures, accidental spillage / leaks of oils, chemicals, or other materials stored on site arising due to improper site management, could cause a temporary fundamental change in water quality in watercourses within the Proposed Development site which are hydrologically connected to the lough. However, the Site as a proportion of the waterbody catchment hydrologically shared with the lough is not significant (i.e., c. 1.8%). Given this, and the distance between the Site and the lough (c. 30 km downstream), any potential

Receptor / Sensitivity	Potential Effect	Phase of Proposed Development	Embedded Mitigation & Design Measures	Magnitude	Potential Effect Significance	Likelihood	Overall Effect Significance and Rationale
							effects in the absence of additional mitigation would result in a minor deterioration in water quality.
Major watercourses draining the Proposed Development (High)	Changes in runoff and flow patterns	Construction, Operational & Decommissioning	- Buffer / exclusion zones in relation to construction activities in proximity to watercourses and / or floodplains. - Construction / decommissioning phase surface water management plan / and permanent site drainage design using the principles of Sustainable Drainage. - Temporary watercourse crossings within the Proposed Development site will be bridging platforms / Bailey Bridges that themselves require no in-channel work. - Permanent watercourse crossings within the Proposed Development will be bottomless / clear-span crossings. - Design evolution has resulted in avoidance of watercourses with the exception of unavoidable watercourse crossings to facilitate access.	Negligible	Imperceptible	Unlikely	**Not Significant** The mitigation measures will minimise potential changes in runoff and flow patterns at the Proposed Development site. The drainage strategy adopted ensures that natural catchments are mirrored and ensures that water is not lost from them. SuDS features also ensure response to rainfall is not exacerbated. Design of watercourse crossings of major watercourses on-site when adopting best practice design standards as stated result in no significant localised effect in terms of restricted capacity that would cause any change to runoff and flow patterns or increase flood risk. Temporary crossings will be bridging platforms / Bailey Bridges (that themselves require no in-channel work), permanent crossings will be bottomless / clear-span crossings. These crossings do not require in-stream works, allow free flow of water within channels, and maintain unobstructed passage for fish and / or macroinvertebrates.
	Changes to water quality (sediment / suspended pollution)	Construction & Decommissioning	- Buffer / exclusion zones in relation to construction activities in proximity to watercourses. - Construction / decommissioning phase surface water management plan / site drainage design	Large Adverse	Significant Adverse	Likely	**Major Adverse** Embedded mitigation measures do not fully remove potential risk to the receptor with regards to changes to water quality (sediment / suspended pollution). In the absence of additional mitigation measures, temporary short-term construction activities adjacent to

Receptor / Sensitivity	Potential Effect	Phase of Proposed Development	Embedded Mitigation & Design Measures	Magnitude	Potential Effect Significance	Likelihood	Overall Effect Significance and Rationale
			using the principles of Sustainable Drainage, promoting the principles of onsite retention of flows and use of vegetated buffers and other silt removal techniques.				watercourses would be likely to cause a temporary fundamental change in water quality in watercourses within the Proposed Development site, with potential loss / extensive change to water dependent habitat / species.
		Operational	- Permanent site drainage design using the principles of Sustainable Drainage. - Design evolution has resulted in avoidance of watercourses with the exception of unavoidable watercourse crossings to facilitate access.	Small Adverse	Slight Adverse	Likely	**Minor Adverse** In the absence of additional mitigation measures e.g., improper maintenance of permanent SuDS drainage features / improper site management, the operation of the Proposed Development would be likely to cause a temporary, small adverse (minor deterioration in water quality change with regards to sediment / suspended pollution in watercourses within the Proposed Development site.
	Changes to water quality (chemical pollution of surface water)	Construction & Decommissioning	- Buffer / exclusion zones in relation to construction activities in proximity to watercourses. - Construction / decommissioning phase surface water management plan / site drainage design using the principles of Sustainable Drainage, promoting the principles of onsite retention of flows and use of vegetated buffers.	Large Adverse	Significant Adverse	Likely	**Major Adverse** Embedded mitigation and design measures do not fully remove potential risk to the receptor with regards to potential changes to water quality (chemical pollution of surface water) In the absence of additional mitigation measures, spillage of oils, chemicals, or cementitious material associated with temporary construction, and / or arising due to improper site management, would be likely to cause a temporary fundamental change in water quality in watercourses within the Proposed Development site, with potential loss / extensive change to water dependent habitat / species.
		Operational	- Permanent site drainage design using the principles of Sustainable Drainage. - Design evolution has resulted in avoidance of watercourses	Small Adverse	Slight Adverse	Likely	**Minor Adverse** In the absence of additional mitigation measures, accidental spillage / leaks of oils, chemicals, or other materials stored on site arising due to improper site

Receptor / Sensitivity	Potential Effect	Phase of Proposed Development	Embedded Mitigation & Design Measures	Magnitude	Potential Effect Significance	Likelihood	Overall Effect Significance and Rationale
			with the exception of unavoidable watercourse crossings to facilitate access.				management, would be likely to cause a temporary, small adverse (minor deterioration in water quality) change in watercourses within the Proposed Development site.
Minor watercourses draining the Proposed Development (Low)	Changes in runoff and flow patterns	Construction, Operational & Decommissioning	- Buffer / exclusion zones in relation to construction activities in proximity to watercourses and / or floodplains. - Construction / decommissioning phase surface water management plan / and permanent site drainage design using the principles of Sustainable Drainage. - Temporary watercourse crossings within the Proposed Development site will be bridging platforms / Bailey Bridges that themselves require no in-channel work. - Permanent watercourse crossings within the Proposed Development will be bottomless / clear-span crossings. - Design evolution has resulted in avoidance of watercourses with the exception of unavoidable watercourse crossings to facilitate access.	Negligible	Imperceptible	Unlikely	**Not Significant** The mitigation measures will minimise potential changes in runoff and flow patterns at the Proposed Development site. The drainage strategy adopted ensures that natural catchments are mirrored and ensures that water is not lost from them. SuDS features also ensure response to rainfall is not exacerbated. Design of watercourse crossings of minor watercourses on-site when adopting best practice design standards as stated result in no significant localised effect in terms of restricted capacity that would cause any change to runoff and flow patterns or increase flood risk. Temporary crossings will be bridging platforms / Bailey Bridges (that themselves require no in-channel work), permanent crossings will be bottomless / clear-span crossings. These crossings do not require in-stream works, allow free flow of water within channels, and maintain unobstructed passage for fish and / or macroinvertebrates.
	Changes to water quality (sediment / suspended pollution)	Construction & Decommissioning	- Buffer / exclusion zones in relation to construction activities in proximity to watercourses. - Construction / decommissioning phase surface water management plan / site drainage design	Small Adverse	Slight Adverse	Likely	**Minor Adverse** Embedded mitigation measures do not fully remove potential risk to the receptor with regards to changes to water quality (sediment / suspended pollution). In the absence of additional mitigation measures, temporary short-term construction activities adjacent to

Receptor / Sensitivity	Potential Effect	Phase of Proposed Development	Embedded Mitigation & Design Measures	Magnitude	Potential Effect Significance	Likelihood	Overall Effect Significance and Rationale
			using the principles of Sustainable Drainage, promoting the principles of onsite retention of flows and use of vegetated buffers and other silt removal techniques.				watercourses would be likely to cause a temporary, small adverse (minor deterioration in water quality) change in watercourses within the Proposed Development site.
		Operational	- Permanent site drainage design using the principles of Sustainable Drainage. - Design evolution has resulted in avoidance of watercourses with the exception of unavoidable watercourse crossings to facilitate access.	Small Adverse	Slight Adverse	Likely	**Minor Adverse** In the absence of additional mitigation measures e.g., improper maintenance of permanent SuDS drainage features / improper site management, the operation of the Proposed Development would be likely to cause a temporary, small adverse (minor deterioration in water quality) change regards to sediment / suspended pollution in watercourses within the Proposed Development site.
	Changes to water quality (chemical pollution of surface water)	Construction & Decommissioning	- Buffer / exclusion zones in relation to construction activities in proximity to watercourses. - Construction phase surface water management plan / site drainage design using the principles of Sustainable Drainage, promoting the principles of onsite retention of flows and use of vegetated buffers.	Small Adverse	Slight Adverse	Likely	**Minor Adverse** Embedded mitigation and design measures do not fully remove potential risk to the receptor with regards to potential changes to water quality (chemical pollution of surface water) In the absence of additional mitigation measures, spillage of oils, chemicals, or cementitious material associated with temporary construction, and / or arising due to improper site management, would be likely to cause a temporary, small adverse (minor deterioration in water quality) change in watercourses within the Proposed Development site.
		Operational	- Permanent site drainage design using the principles of Sustainable Drainage. - Design evolution has resulted in avoidance of watercourses with the exception of unavoidable watercourse	Small Adverse	Slight Adverse	Likely	**Minor Adverse** In the absence of additional mitigation measures, accidental spillage / leaks of oils, chemicals, or other materials stored on site arising due to improper site management, would be likely to cause a temporary, small adverse (minor

Receptor / Sensitivity	Potential Effect	Phase of Proposed Development	Embedded Mitigation & Design Measures	Magnitude	Potential Effect Significance	Likelihood	Overall Effect Significance and Rationale
			crossings to facilitate access.				deterioration in water quality) change in watercourses within the Proposed Development site.
Watercourses draining the section of the Proposed Development where site access is proposed. (Very High)	Changes in runoff and flow patterns	Construction, Operational & Decommissioning	- Buffer / exclusion zones in relation to construction activities in proximity to watercourses and / or floodplains. - Construction / decommissioning phase surface water management plan / and permanent site drainage design using the principles of Sustainable Drainage. - Temporary watercourse crossings within the Proposed Development site will be bridging platforms / Bailey Bridges that themselves require no in-channel work. - Permanent watercourse crossings within the Proposed Development will be bottomless / clear-span crossings. - Design evolution has resulted in avoidance of watercourses with the exception of unavoidable watercourse crossings to facilitate access.	Negligible	Imperceptible	Unlikely	**Not Significant** The mitigation measures will minimise potential changes in runoff and flow patterns at the Proposed Development site. The drainage strategy adopted ensures that natural catchments are mirrored and ensures that water is not lost from them. SuDS features also ensure response to rainfall is not exacerbated. Design of watercourse crossings of major watercourses on-site when adopting best practice design standards as stated result in no significant localised effect in terms of restricted capacity that would cause any change to runoff and flow patterns or increase flood risk. Temporary crossings will be bridging platforms / Bailey Bridges (that themselves require no in-channel work), permanent crossings will be bottomless / clear-span crossings. These crossings do not require in-stream works, allow free flow of water within channels, and maintain unobstructed passage for fish and / or macroinvertebrates.
	Changes to water quality (sediment / suspended pollution)	Construction & Decommissioning	- Buffer / exclusion zones in relation to construction activities in proximity to watercourses. - Construction phase surface water management plan / site drainage design using the principles of Sustainable Drainage, promoting the principles of onsite retention of	Moderate Adverse	Significant Adverse	Likely	**Major Adverse** Embedded mitigation measures do not fully remove potential risk to the receptor with regards to changes to water quality (sediment / suspended pollution). In the absence of additional mitigation measures, a moderate adverse (medium risk) of pollution to surface water) remains, and temporary short-term construction activities adjacent to

Receptor / Sensitivity	Potential Effect	Phase of Proposed Development	Embedded Mitigation & Design Measures	Magnitude	Potential Effect Significance	Likelihood	Overall Effect Significance and Rationale
			flows and use of vegetated buffers and other silt removal techniques.				watercourses would be likely to cause a temporary fundamental change in water quality in watercourses within the Proposed Development site.
		Operational	- Permanent site drainage design using the principles of Sustainable Drainage. - Design evolution has resulted in avoidance of watercourses with the exception of unavoidable watercourse crossings to facilitate access.	Small Adverse	Significant Adverse	Rare	**Minor Adverse** In the absence of additional mitigation measures e.g., improper maintenance of permanent SuDS drainage features / improper site management, the operation of the Proposed Development could cause a temporary, small adverse (minor deterioration in water quality) change with regards to sediment / suspended pollution in watercourses within the Proposed Development site.
	Changes to water quality (chemical pollution of surface water)	Construction & Decommissioning	- Buffer / exclusion zones in relation to construction activities in proximity to watercourses. - Construction phase surface water management plan / site drainage design using the principles of Sustainable Drainage, promoting the principles of onsite retention of flows and use of vegetated buffers.	Moderate Adverse	Significant Adverse	Likely	**Major Adverse** Embedded mitigation and design measures do not fully remove potential risk to the receptor with regards to potential changes to water quality (chemical pollution of surface water) In the absence of additional mitigation measures, a moderate adverse (medium risk) of pollution to surface water remains, and spillage of oils, chemicals, or cementitious material associated with temporary construction, and / or arising due to improper site management, would be likely to cause a temporary fundamental change in water quality in watercourses within the Proposed Development site.
		Operational	- Permanent site drainage design using the principles of Sustainable Drainage. - Design evolution has resulted in avoidance of watercourses with the exception of unavoidable watercourse crossings to facilitate access.	Small Adverse	Significant Adverse	Rare	**Minor Adverse** In the absence of additional mitigation measures, accidental spillage / leaks of oils, chemicals, or other materials stored on site arising due to improper site management, could cause a temporary, small adverse (minor deterioration in water quality) change in

Receptor / Sensitivity	Potential Effect	Phase of Proposed Development	Embedded Mitigation & Design Measures	Magnitude	Potential Effect Significance	Likelihood	Overall Effect Significance and Rationale
							watercourses within the Proposed Development site.
Watercourses draining the section of the Proposed Development where the 110kV grid connection route is proposed. (High)	Changes in runoff and flow patterns	Construction, Operational & Decommissioning	- The grid connection cable shall be buried within existing tracks and will not require any in-channel works.	Negligible	Imperceptible	Unlikely	**Not Significant** The nature and scale of the works within this section of the Site as a proportion of the waterbody catchments is not significant. The cable route would by its nature (buried) be unlikely to affect runoff and flow patterns. Appropriate techniques to manage surface water around working areas would be implemented.
	Changes to water quality (sediment / suspended pollution)	Construction & Decommissioning	- Construction phase surface water management plan / site drainage design using the principles of Sustainable Drainage, promoting the principles of onsite retention of flows and use of vegetated buffers and other silt removal techniques.	Small Adverse	Slight Adverse	Likely	**Minor Adverse** Embedded mitigation measures do not fully remove potential risk to the receptor with regards to changes to water quality (sediment / suspended pollution). In the absence of additional mitigation measures, temporary short-term construction activities adjacent to watercourses would be likely to cause a temporary, small adverse (minor deterioration in water quality) change in watercourses within the Proposed Development site.

Receptor / Sensitivity	Potential Effect	Phase of Proposed Development	Embedded Mitigation & Design Measures	Magnitude	Potential Effect Significance	Likelihood	Overall Effect Significance and Rationale
		Operational	- Design evolution in relation to the grid connection cable being buried in tracks and not requiring any in-stream works.	Small Adverse	Slight Adverse	Unlikely	**Minor Adverse** The occurrence of activities during the operational phase of the Proposed Development that would cause changes to water quality with regards to sediment / suspended pollution will be unlikely. However, in the absence of additional mitigation measures, temporary short-term activities (e.g., cable maintenance) adjacent to watercourses could cause a temporary, small adverse (minor deterioration in water quality) change in watercourses within the Proposed Development site.
	Changes to water quality (chemical pollution of surface water)	Construction & Decommissioning	- Construction phase surface water management plan / site drainage design using the principles of Sustainable Drainage, promoting the principles of onsite retention of flows and use of vegetated buffers.	Moderate Adverse	Moderate Adverse	Likely	**Moderate Adverse** Embedded mitigation and design measures do not fully remove potential risk to the receptor with regards to potential changes to water quality (chemical pollution of surface water). In the absence of additional mitigation measures, a moderate adverse (medium risk) of pollution to surface water remains, and spillage of oils, chemicals, or cementitious material associated with temporary construction, and / or arising due to improper site management, would be likely to cause a temporary fundamental change in water quality in watercourses within the Proposed Development site.
		Operational	- Design evolution in relation to grid connection cable being buried in tracks and not requiring any in-stream works.	Small Adverse	Slight Adverse	Unlikely	**Minor Adverse** The occurrence of activities during the operational phase of the Proposed Development that would cause changes to water quality with regards to chemical pollution will be unlikely. However, in the absence of additional mitigation measures, temporary short-

Receptor / Sensitivity	Potential Effect	Phase of Proposed Development	Embedded Mitigation & Design Measures	Magnitude	Potential Effect Significance	Likelihood	Overall Effect Significance and Rationale
							term activities (e.g., cable maintenance) adjacent to watercourses could cause a temporary, small adverse (minor deterioration in water quality) change in watercourses within the Proposed Development site.
Off-site major watercourses (Downstream Clydagh / Flesk catchment including reach designated for drinking water) (Very High)	Changes in runoff and flow patterns	Construction Operational & Decommissioning	- Construction / decommissioning phase surface water management plan / site drainage design using the principles of Sustainable Drainage. - Temporary watercourse crossings within the Proposed Development site will be bridging platforms / Bailey Bridges that themselves require no in-channel work. - Permanent watercourse crossings within the Proposed Development will be bottomless / clear-span crossings.	Negligible	Imperceptible	Unlikely	**Not Significant** The mitigation measures will minimise potential changes in runoff and flow patterns at the Proposed Development site. The drainage strategy adopted ensures that natural catchments are mirrored and ensures that water is not lost from the catchments that would result in a loss of available water draining into the downstream Clydagh / Flesk catchment. In implementing the embedded mitigation / design proposed, runoff and flow patterns to downstream Clydagh / Flesk catchment will be unaffected by the Proposed Development.
	Changes to water quality (sediment / suspended pollution)	Construction & Decommissioning	- Buffer / exclusion zones in relation to construction activities in proximity to watercourses. - Construction phase surface water management plan / site drainage design using the principles of Sustainable Drainage, promoting the principles of onsite retention of flows and use of vegetated buffers and other silt removal techniques.	Negligible	Imperceptible	Unlikely	**Not Significant** The detailed assessment outcome (**Appendix 11-2**) demonstrates that the predicted effect of the Proposed Development would cause no measurable effect to concentrations of sediment / suspended pollution in the downstream Clydagh / Flesk catchment.
		Operational	- Permanent site drainage design using the principles of Sustainable Drainage. - Design evolution has resulted in avoidance of watercourses	Negligible	Imperceptible	Unlikely	**Not Significant** The detailed assessment outcome (based on a conservative construction phase scenario) (**Appendix 11-2**) demonstrates that the predicted effect

Receptor / Sensitivity	Potential Effect	Phase of Proposed Development	Embedded Mitigation & Design Measures	Magnitude	Potential Effect Significance	Likelihood	Overall Effect Significance and Rationale
			with the exception of unavoidable watercourse crossings to facilitate access.				of the Proposed Development would cause no measurable effect to concentrations of sediment / suspended pollution in the downstream Clydagh / Flesk catchment. These findings are applicable also to the operational phase of the Proposed Development.
	Changes to water quality (chemical pollution of surface water)	Construction & Decommissioning	- Buffer / exclusion zones in relation to construction activities in proximity to watercourses. - Construction / decommissioning phase surface water management plan / site drainage design using the principles of Sustainable Drainage, promoting the principles of onsite retention of flows and use of vegetated buffers.	Small Adverse	Moderate Adverse	Likely	**Moderate Adverse** Embedded mitigation measures do not fully remove potential risk to the receptor with regards to potential changes to water quality (chemical pollution of surface water). In the absence of additional mitigation measures, spillage of oils, chemicals, or cementitious material associated with temporary construction, and / or arising due to improper site management, would be likely to cause a temporary, small adverse (minor deterioration in water quality) change in watercourses hydrologically connecting the Proposed Development.
		Operational	- Permanent site drainage design using the principles of Sustainable Drainage. - Design evolution has resulted in avoidance of watercourses with the exception of unavoidable watercourse crossings to facilitate access.	Negligible	Imperceptible	Likely	**Minor Adverse** In the absence of additional mitigation measures, accidental spillage / leaks of oils, chemicals, or other materials stored on site arising due to improper site management, would be likely to cause a temporary detrimental change in water quality in watercourses within the Proposed Development site which are hydrologically connected to the downstream Clydagh / Flesk catchment.
Tracks, turbines, and associated buildings (Low)	Risk to occupants and infrastructure due to identified	Construction, Operational & Decommissioning	- Buffer / exclusion zones in relation to construction activities in proximity to watercourses and / or floodplains. - Construction phase surface	Negligible	Imperceptible	Unlikely	**Not Significant** The Proposed Development has been designed to avoid areas potentially susceptible to fluvial flooding and pluvial ponding.

Receptor / Sensitivity	Potential Effect	Phase of Proposed Development	Embedded Mitigation & Design Measures	Magnitude	Potential Effect Significance	Likelihood	Overall Effect Significance and Rationale
	potential risk of flooding.		water management plan / site drainage design using the principles of Sustainable Drainage. - Temporary watercourse crossings within the Proposed Development site will be bridging platforms / Bailey Bridges that themselves require no in-channel work. - Design evolution has resulted in avoidance of watercourses with the exception of unavoidable watercourse crossings to facilitate access.				

Mitigated Effects

Table 11-21: Mitigated Effects

Receptor / Sensitivity	Potential Effect	Phase of Proposed Development	Additional Mitigation	Magnitude	Potential Effect Significance	Likelihood	Residual Effect Significance and Rationale
Designated Site (Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC – including River Clydagh and River Flesk) (Extremely High)	Changes to water quality (chemical pollution of surface water)	Construction & Decommissioning	The measures to further reduce the potential effects of changes to water quality (chemical pollution of surface water) include those outlined in section 11.6.3 of this assessment under the following sections and related sub-sections: - Adaptive Response – Work Stoppages - Pollution Prevention Measures - Construction Best Practice And measures outlined in the appendices noted below: - Appendix 4-1: Construction Environmental Management Plan - Appendix 11-3: Water Quality Monitoring and Response Plan - Appendix 11-4: Surface Water Management Plan	Negligible	Imperceptible	Rare	**Not Significant** Potential adverse effects to the SAC as a result of the construction and decommissioning of the Proposed Development that cannot be fully mitigated by embedded mitigation and / or design measures will be managed via the additional mitigation measures noted to further reduce the overall significance of residual effect to Not Significant.
		Operational	The measures to further reduce the potential effects of changes to water quality (chemical pollution of surface water) include those outlined in section 11.6.4 of this assessment relating to: - Ensuring best practice is adhered to avoid pollution release to watercourses. - Management of foul effluent associated with permanent welfare facilities. - Cyclical maintenance of permanent SuDS drainage. And operational phase measures	Negligible	Imperceptible	Rare	**Not Significant** Potential adverse effects to the SAC during the operational phase of the Proposed Development that cannot be fully mitigated by embedded mitigation and / or design measures will be managed via the addition measures noted to further reduce the overall significance of residual effect to Not Significant.

Receptor / Sensitivity	Potential Effect	Phase of Proposed Development	Additional Mitigation	Magnitude	Potential Effect Significance	Likelihood	Residual Effect Significance and Rationale
			outlined in the appendices noted below: - Appendix 11-3: Water Quality Monitoring and Response Plan - Appendix 11-4: Surface Water Management Plan				
Off-site lake waterbody (Lough Leane) (High)	Changes to water quality (chemical pollution of surface water)	Construction & Decommissioning	The measures to further reduce the potential effects of changes to water quality (chemical pollution of surface water) include those outlined in section 11.6.3 of this assessment under the following sections and related sub-sections: - Adaptive Response – Work Stoppages - Pollution Prevention Measures - Construction Best Practice And measures outlined in the appendices noted below: - Appendix 4-1: Construction Environmental Management Plan - Appendix 11-3: Water Quality Monitoring and Response Plan - Appendix 11-4: Surface Water Management Plan	Negligible	Imperceptible	Rare	**Not Significant** Potential adverse effects to the lough as a result of the construction and decommissioning of the Proposed Development that cannot be fully mitigated by embedded mitigation and / or design measures will be managed via the additional mitigation measures noted to further reduce the overall significance of residual effect to Not Significant.
		Operational	The measures to further reduce the potential effects of changes to water quality (chemical pollution of surface water) include those outlined in section 11.6.4 of this assessment relating to: - Ensuring best practice is adhered to avoid pollution release to watercourses - Management of foul effluent associated with permanent welfare facilities - Cyclical maintenance of	Negligible	Imperceptible	Rare	**Not Significant** Potential adverse effects to the lough during the operational phase of the Proposed Development that cannot be fully mitigated by embedded mitigation and / or design measures will be managed via the addition measures noted to further reduce the overall significance of residual effect to Not Significant.

Receptor / Sensitivity	Potential Effect	Phase of Proposed Development	Additional Mitigation	Magnitude	Potential Effect Significance	Likelihood	Residual Effect Significance and Rationale
			permanent SuDS drainage. And operational phase measures outlined in the appendices noted below: - Appendix 11-3: Water Quality Monitoring and Response Plan - Appendix 11-4: Surface Water Management Plan				
Major watercourses draining the Proposed Development (High)	Changes to water quality (sediment / suspended pollution)	Construction & Decommissioning	The measures to further reduce the potential effects of changes to water quality (sediment / suspended pollution) include those outlined in section 11.6.3 of this assessment under the following sections and related sub-sections: - Adaptive Response – Work Stoppages - Pollution Prevention Measures - Construction Best Practice And measures outlined in the appendices noted below: - Appendix 4-1: Construction Environmental Management Plan - Appendix 11-3: Water Quality Monitoring and Response Plan - Appendix 11-4: Surface Water Management Plan	Negligible	Imperceptible	Unlikely	**Not Significant** Potential adverse effects to the watercourses at the Proposed Development site as a result of the construction and decommissioning of the Proposed Development that cannot be fully mitigated by embedded mitigation and / or design measures will be managed via the additional mitigation measures noted to further reduce the overall significance of residual effect to Not Significant.
		Operational	The measures to further reduce the potential effects of changes to water quality (sediment / suspended pollution) include those outlined in section 11.6.4 of this assessment relating to: - Ensuring best practice is adhered to avoid pollution release to watercourses. - Management of foul effluent associated with permanent	Negligible	Imperceptible	Unlikely	**Not Significant** Potential adverse effects to the watercourses at the Proposed Development site during the operational phase of the Proposed Development that cannot be fully mitigated by embedded mitigation and / or design measures will be managed via the addition measures noted to further reduce the overall significance of residual effect to Not Significant.

Receptor / Sensitivity	Potential Effect	Phase of Proposed Development	Additional Mitigation	Magnitude	Potential Effect Significance	Likelihood	Residual Effect Significance and Rationale
			welfare facilities. - Cyclical maintenance of permanent SuDS drainage. And operational phase measures outlined in the appendices noted below: - Appendix 11-3: Water Quality Monitoring and Response Plan - Appendix 11-4: Surface Water Management Plan				
	Changes to water quality (chemical pollution of surface water)	Construction & Decommissioning	The measures to further reduce the potential effects of changes to water quality (chemical pollution of surface water) include those outlined in section 11.6.3 of this assessment under the following sections and related sub-sections: - Adaptive Response – Work Stoppages - Pollution Prevention Measures - Construction Best Practice And measures outlined in the appendices noted below: - Appendix 4-1: Construction Environmental Management Plan - Appendix 11-3: Water Quality Monitoring and Response Plan - Appendix 11-4: Surface Water Management Plan	Negligible	Imperceptible	Unlikely	**Not Significant** Potential adverse effects to the watercourses at the Proposed Development as a result of the construction and decommissioning of the Proposed Development that cannot be fully mitigated by embedded mitigation and / or design measures will be managed via the additional mitigation measures noted to further reduce the overall significance of residual effect to Not Significant.
		Operational	The measures to further reduce the potential effects of changes to water quality (chemical pollution of surface water) include those outlined in section 11.6.4 of this assessment relating to: - Ensuring best practice is adhered to avoid pollution release to watercourses.	Negligible	Imperceptible	Unlikely	**Not Significant** Potential adverse effects to the watercourses at the Proposed Development during the operational phase of the Proposed Development that cannot be fully mitigated by embedded mitigation and / or design measures will be managed via the addition measures noted to further

Receptor / Sensitivity	Potential Effect	Phase of Proposed Development	Additional Mitigation	Magnitude	Potential Effect Significance	Likelihood	Residual Effect Significance and Rationale
			- Management of foul effluent associated with permanent welfare facilities. - Cyclical maintenance of permanent SuDS drainage. And operational phase measures outlined in the appendices noted below: - Appendix 11-3: Water Quality Monitoring and Response Plan - Appendix 11-4: Surface Water Management Plan				reduce the overall significance of residual effect to Not Significant.
Minor watercourses draining the Proposed Development (Low)	Changes to water quality (sediment / suspended pollution)	Construction & Decommissioning	The measures to further reduce the potential effects of changes to water quality (sediment / suspended pollution) include those outlined in section 11.6.3 of this assessment under the following sections and related sub-sections: - Adaptive Response – Work Stoppages - Pollution Prevention Measures - Construction Best Practice And measures outlined in the appendices noted below: - Appendix 4-1: Construction Environmental Management Plan - Appendix 11-3: Water Quality Monitoring and Response Plan - Appendix 11-4: Surface Water Management Plan	Negligible	Imperceptible	Unlikely	**Not Significant** Potential adverse effects to the watercourses at the Proposed Development site as a result of the construction of the Proposed Development that cannot be fully mitigated by embedded mitigation and / or design measures will be managed via the additional mitigation measures noted to further reduce the overall significance of residual effect to Not Significant.

Receptor / Sensitivity	Potential Effect	Phase of Proposed Development	Additional Mitigation	Magnitude	Potential Effect Significance	Likelihood	Residual Effect Significance and Rationale
		Operational	The measures to further reduce the potential effects of changes to water quality (sediment / suspended pollution) include those outlined in section 11.6.4 of this assessment relating to: - Ensuring best practice is adhered to avoid pollution release to watercourses. - Management of foul effluent associated with permanent welfare facilities. - Cyclical maintenance of permanent SuDS drainage. And operational phase measures outlined in the appendices noted below: - Appendix 11-3: Water Quality Monitoring and Response Plan - Appendix 11-4: Surface Water Management Plan	Negligible	Imperceptible	Unlikely	**Not Significant** Potential adverse effects to the watercourses at the Proposed Development site during the operational phase of the Proposed Development that cannot be fully mitigated by embedded mitigation and / or design measures will be managed via the addition measures noted to further reduce the overall significance of residual effect to Not Significant.
	Changes to water quality (chemical pollution of surface water)	Construction & Decommissioning	The measures to further reduce the potential effects of changes to water quality (chemical pollution of surface water) include those outlined in section 11.6.3 of this assessment under the following sections and related sub-sections: - Adaptive Response – Work Stoppages - Pollution Prevention Measures - Construction Best Practice And measures outlined in the appendices noted below: - Appendix 4-1: Construction Environmental Management Plan - Appendix 11-3: Water Quality Monitoring and Response Plan	Negligible	Imperceptible	Unlikely	**Not Significant** Potential adverse effects to the watercourses at the Proposed Development as a result of the construction of the Proposed Development that cannot be fully mitigated by embedded mitigation and / or design measures will be managed via the additional mitigation measures noted to further reduce the overall significance of residual effect to Not Significant.

Receptor / Sensitivity	Potential Effect	Phase of Proposed Development	Additional Mitigation	Magnitude	Potential Effect Significance	Likelihood	Residual Effect Significance and Rationale
			- Appendix 11-4: Surface Water Management Plan				
		Operational	The measures to further reduce the potential effects of changes to water quality (chemical pollution of surface water) include those outlined in section 11.6.4 of this assessment relating to: - Ensuring best practice is adhered to avoid pollution release to watercourses. - Management of foul effluent associated with permanent welfare facilities. - Cyclical maintenance of permanent SuDS drainage. And operational phase measures outlined in the appendices noted below: - Appendix 11-3: Water Quality Monitoring and Response Plan - Appendix 11-4: Surface Water Management Plan	Negligible	Imperceptible	Unlikely	**Not Significant** Potential adverse effects to the watercourses at the Proposed Development during the operational phase of the Proposed Development that cannot be fully mitigated by embedded mitigation and / or design measures will be managed via the addition measures noted to further reduce the overall significance of residual effect to Not Significant.
Watercourses draining the section of the Proposed Development where site access is proposed. (Very High)	Changes to water quality (sediment / suspended pollution)	Construction & Decommissioning	The measures to further reduce the potential effects of changes to water quality (sediment / suspended pollution) include those outlined in section 11.6.3 of this assessment under the following sections and related sub-sections: - Adaptive Response – Work Stoppages - Pollution Prevention Measures - Construction Best Practice And measures outlined in the appendices noted below: - Appendix 4-1: Construction Environmental Management	Negligible	Imperceptible	Unlikely	**Not Significant** Potential adverse effects to the watercourses at the Proposed Development site as a result of the construction of the Proposed Development that cannot be fully mitigated by embedded mitigation and / or design measures will be managed via the additional mitigation measures noted to further reduce the overall significance of residual effect to Not Significant.

Receptor / Sensitivity	Potential Effect	Phase of Proposed Development	Additional Mitigation	Magnitude	Potential Effect Significance	Likelihood	Residual Effect Significance and Rationale
			Plan - Appendix 11-3: Water Quality Monitoring and Response Plan - Appendix 11-4: Surface Water Management Plan				
		Operational	The measures to further reduce the potential effects of changes to water quality (sediment / suspended pollution) include those outlined in section 11.6.4 of this assessment relating to: - Ensuring best practice is adhered to avoid pollution release to watercourses - Management of foul effluent associated with permanent welfare facilities - Cyclical maintenance of permanent SuDS drainage And operational phase measures outlined in the appendices noted below: - Appendix 11-3: Water Quality Monitoring and Response Plan - Appendix 11-4: Surface Water Management Plan	Negligible	Imperceptible	Unlikely	**Not Significant** Potential adverse effects to the watercourses at the Proposed Development site during the operational phase of the Proposed Development that cannot be fully mitigated by embedded mitigation and / or design measures will be managed via the addition measures noted to further reduce the overall significance of residual effect to Not Significant.
	Changes to water quality (chemical pollution of surface water)	Construction & Decommissioning	The measures to further reduce the potential effects of changes to water quality (chemical pollution of surface water) include those outlined in section 11.6.3 of this assessment under the following sections and related sub-sections: - Adaptive Response – Work Stoppages - Pollution Prevention Measures - Construction Best Practice And measures outlined in the appendices noted below:	Negligible	Imperceptible	Unlikely	**Not Significant** Potential adverse effects to the watercourses at the Proposed Development as a result of the construction of the Proposed Development that cannot be fully mitigated by embedded mitigation and / or design measures will be managed via the additional mitigation measures noted to further reduce the overall significance of residual effect to Not Significant.

Receptor / Sensitivity	Potential Effect	Phase of Proposed Development	Additional Mitigation	Magnitude	Potential Effect Significance	Likelihood	Residual Effect Significance and Rationale
			- Appendix 4-1: Construction Environmental Management Plan - Appendix 11-3: Water Quality Monitoring and Response Plan - Appendix 11-4: Surface Water Management Plan				
		Operational	The measures to further reduce the potential effects of changes to water quality (chemical pollution of surface water) include those outlined in section 11.6.4 of this assessment relating to: - Ensuring best practice is adhered to avoid pollution release to watercourses - Management of foul effluent associated with permanent welfare facilities - Cyclical maintenance of permanent SuDS drainage And operational phase measures outlined in the appendices noted below: - Appendix 11-3: Water Quality Monitoring and Response Plan - Appendix 11-4: Surface Water Management Plan	Negligible	Imperceptible	Unlikely	**Not Significant** Potential adverse effects to the watercourses at the Proposed Development during the operational phase of the Proposed Development that cannot be fully mitigated by embedded mitigation and / or design measures will be managed via the addition measures noted to further reduce the overall significance of residual effect to Not Significant.
Watercourses draining the section of the Proposed Development where the 110kV grid connection route is proposed. (High)	Changes to water quality (sediment / suspended pollution)	Construction & Decommissioning	The measures to further reduce the potential effects of changes to water quality (sediment / suspended pollution) include those outlined in section 11.6.3 of this assessment under the following sections and related sub-sections: - Adaptive Response – Work Stoppages - Pollution Prevention Measures - Construction Best Practice	Negligible	Imperceptible	Unlikely	**Not Significant** Potential adverse effects to the watercourses at the Proposed Development site as a result of the construction of the Proposed Development that cannot be fully mitigated by embedded mitigation and / or design measures will be managed via the additional mitigation measures noted to further reduce the overall significance of residual effect to Not

Receptor / Sensitivity	Potential Effect	Phase of Proposed Development	Additional Mitigation	Magnitude	Potential Effect Significance	Likelihood	Residual Effect Significance and Rationale
			And measures outlined in the appendices noted below: - Appendix 4-1: Construction Environmental Management Plan - Appendix 11-3: Water Quality Monitoring and Response Plan - Appendix 11-4: Surface Water Management Plan				Significant.
		Operational	The measures to further reduce the potential effects of changes to water quality (sediment / suspended pollution) include those outlined in section 11.6.4 of this assessment relating to: - Ensuring best practice is adhered to avoid pollution release to watercourses And measures outlined in the appendices noted below: - Appendix 11-4: Surface Water Management Plan	Negligible	Imperceptible	Rare	**Not Significant** Potential adverse effects to the watercourses at the Proposed Development as a result of operational activities (e.g., cable maintenance) will be managed via the addition measures noted to further reduce the overall significance of residual effect to Not Significant.
	Changes to water quality (chemical pollution of surface water)	Construction & Decommissioning	The measures to further reduce the potential effects of changes to water quality (chemical pollution of surface water) include those outlined in section 11.6.3 of this assessment under the following sections and related sub-sections: - Adaptive Response – Work Stoppages - Pollution Prevention Measures - Construction Best Practice And measures outlined in the appendices noted below: - Appendix 4-1: Construction Environmental Management Plan - Appendix 11-3: Water Quality	Negligible	Imperceptible	Unlikely	**Not Significant** Potential adverse effects to the watercourses at the Proposed Development as a result of the construction of the Proposed Development that cannot be fully mitigated by embedded mitigation and / or design measures will be managed via the additional mitigation measures noted to further reduce the overall significance of residual effect to Not Significant.

Receptor / Sensitivity	Potential Effect	Phase of Proposed Development	Additional Mitigation	Magnitude	Potential Effect Significance	Likelihood	Residual Effect Significance and Rationale
			Monitoring and Response Plan - Appendix 11-4: Surface Water Management Plan				
		Operational	The measures to further reduce the potential effects of changes to water quality (chemical pollution) include those outlined in section 11.6.4 of this assessment relating to: - Ensuring best practice is adhered to avoid pollution release to watercourses And measures outlined in the appendices noted below: - Appendix 11-4: Surface Water Management Plan	Negligible	Imperceptible	Rare	**Not Significant** Potential adverse effects to the watercourses at the Proposed Development as a result of operational activities (e.g., cable maintenance) will be managed via the addition measures noted to further reduce the overall significance of residual effect to Not Significant.
Off-site major watercourses (Downstream Clydagh / Flesk catchment including reach designated for drinking water) (Very High)	Changes to water quality (chemical pollution of surface water)	Construction & Decommissioning	The measures to further reduce the potential effects of changes to water quality (chemical pollution of surface water) include those outlined in section 11.6.3 of this assessment under the following sections and related sub-sections: - Adaptive Response – Work Stoppages - Pollution Prevention Measures - Construction Best Practice And measures outlined in the appendices noted below: - Appendix 4-1: Construction Environmental Management Plan - Appendix 11-3: Water Quality Monitoring and Response Plan - Appendix 11-4: Surface Water Management Plan	Negligible	Imperceptible	Unlikely	**Not Significant** Potential adverse effects to the watercourses of the downstream Clydagh / Flesk catchment (hydrologically linked to the Proposed Development) as a result of the construction of the Proposed Development that cannot be fully mitigated by embedded mitigation and / or design measures will be managed via the additional mitigation measures noted to further reduce the overall significance of residual effect to Not Significant.

Receptor / Sensitivity	Potential Effect	Phase of Proposed Development	Additional Mitigation	Magnitude	Potential Effect Significance	Likelihood	Residual Effect Significance and Rationale
		Operational	The measures to further reduce the potential effects of changes to water quality (chemical pollution of surface water) include those outlined in section 11.6.4 of this assessment relating to: - Ensuring best practice is adhered to avoid pollution release to watercourses - Management of foul effluent associated with permanent welfare facilities - Cyclical maintenance of permanent SuDS drainage And operational phase measures outlined in the appendices noted below: - Appendix 11-3: Water Quality Monitoring and Response Plan - Appendix 11-4: Surface Water Management Plan	Negligible	Imperceptible	Unlikely	**Not Significant** Potential adverse effects to the of the downstream Clydagh / Flesk catchment (hydrologically linked to the Proposed Development) during the operational phase of the Proposed Development that cannot be fully mitigated by embedded mitigation and / or design measures will be managed via the addition measures noted to further reduce the overall significance of residual effect to Not Significant.

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