APPENDIX 9-5

WATER FRAMEWORK DIRECTIVE ASSESSMENT

HYDRO ENVIRONMENTAL SERVICES

22 Lower Main St
Dungarvan
Co.Waterford
Ireland

tel: +353 (0)58 44122
fax: +353 (0)58 44244
email: info@hydroenvironmental.ie
web: www.hydroenvironmental.ie

WATER FRAMEWORK DIRECTIVE COMPLIANCE ASSESSMENT
CLONBERNE WIND FARM, CO. GALWAY

FINAL REPORT

Prepared for:

MKO

Prepared by:

HYDRO-ENVIRONMENTAL SERVICES

DOCUMENT INFORMATION

Document Title:	**WATER FRAMEWORK DIRECTIVE COMPLIANCE ASSESSMENT CLONBERNE WIND FARM, CO. GALWAY**
Issue Date:	**12th June 2024**
Project Number:	**P1508-0**
Project Reporting History:	**P1508-0**
current revision no:	**FINAL_REV F0**
Author:	**MICHAEL GILL** **DAVID BRODERICK**
Signed:	 _____ **Michael Gill B.A., B.A.I., M.Sc., MIEI** **Managing Director – Hydro-Environmental Services**

Disclaimer:
This report has been prepared by HES with all reasonable skill, care and diligence within the terms of the contract with the client, incorporating our terms and conditions and taking account of the resources devoted to it by agreement with the client. We disclaim any responsibility to the client and others in respect of any matters outside the scope of the above. This report is confidential to the client and we accept no responsibility of whatsoever nature to third parties to whom this report, or any part thereof, is made known. Any such party relies upon the report at their own risk.

TABLE OF CONTENTS

1. INTRODUCTION 4
1.1 BACKGROUND 4
1.2 STATEMENT OF AUTHORITY 4
1.3 WATER FRAMEWORK DIRECTIVE 5
2. WATERBODY IDENTIFICATION CLASSIFICATION 6
2.1 INTRODUCTION 6
2.2 SURFACE WATERBODY IDENTIFICATION 6
2.3 SURFACE WATER BODY CLASSIFICATION 9
2.4 GROUNDWATER BODY IDENTIFICATION 13
2.5 GROUNDWATER BODY CLASSIFICATION 13
2.6 PROTECTED AREA IDENTIFICATION 13
2.6.1 Nature Conservation Designations 13
2.6.2 Bathing Waters 14
2.6.3 Nutrient Sensitive Areas 14
2.6.4 Shellfish Waters 14
2.6.5 Drinking Water 15
3. WFD SCREENING 16
3.1 SURFACE WATER BODIES 16
3.2 GROUNDWATER BODIES 16
3.3 PROTECTED AREAS 17
3.4 WFD SCREENING SUMMARY 17
4. WFD COMPLIANCE ASSESSMENT 22
4.1 PROPOSALS 22
4.2 POTENTIAL EFFECTS 22
4.2.1 Construction Phase (Unmitigated) 22
4.2.2 Operational Phase (Unmitigated) 26
4.3 MITIGATION MEASURES 28
4.3.1 Construction Phase 28
4.3.2 Operational Phase 34
4.3.1 Decommissioning Phase 35
4.3.2 Potential Effects with the Implementation of Mitigation 35
5. WFD ASSESSMENT CONCLUSION 37

FIGURES (IN TEXT)

Figure A: Local Hydrology Map 8
Figure B: WFD Surface Waterbody and Groundwater Body Status (2016-2021) 10

TABLES IN TEXT

Table A: Upstream Catchment Size for River Waterbodies 7
Table B: Summary WFD Information for Surface Water Bodies 11
Table C: Summary WFD Information for Groundwater Bodies 13
Table D: Screening of WFD water bodies located within the study area 18
Table E: Surface Water Quality Impacts during Construction Phase (Unmitigated) 23
Table F: Potential Surface Water Quality Effects along the Proposed Grid Connection Route During Construction Phase (Unmitigated) 24
Table G: Potential Surface Water Quality Effects Associated with TDR Works during Construction Phase (Unmitigated) 24
Table H: Groundwater Quality Impacts during Construction Phase (Unmitigated) 25
Table I: Potential Impact on Surface Water Flows during Operational Phase (Unmitigated) 27
Table J: Surface Water Quality Impacts during Operational Phase (Unmitigated) 27
Table K: Summary of Drainage Mitigation & their Application 28
Table L: Summary of WFD Status for Unmitigated and Mitigated Scenarios 36

1. INTRODUCTION

1.1 BACKGROUND

Hydro-Environmental Services (HES) were requested by MKO to complete a Water Framework Directive (WFD) Compliance Assessment for the proposed Clonberne Wind Farm and Grid Connection (Proposed Project), Co. Galway.

Where 'the Site' is referred to, this relates to the primary study area for the Proposed Project EIAR, as delineated by the EIAR Site Boundary and includes both the Wind Farm site and Grid Connection.

Where the 'Wind Farm site' is referred to, this refers to the 11 no. turbines and associated foundations and hard-standing areas, turbine delivery route (TDR) accommodation works, access roads, 2 no. temporary construction compounds, met mast, underground cabling, peat, spoil and overburden repositories, wind farm drainage, tree felling, 1 no. borrow pit, peatland enhancement area and all ancillary works.

The "Grid Connection" relates to the ~2.8km underground 220kV Cabling Route, on-site 220kV substation, proposed access road, 2 no. new interface/end mast towers and all associated infrastructure.

This WFD Assessment is intended to supplement the EIAR submitted as part of the Proposed Project planning application.

1.2 STATEMENT OF AUTHORITY

Hydro-Environmental Services (HES) are a specialist hydrological, hydrogeological and environmental practice that delivers a range of water and environmental management consultancy services to the private and public sectors across Ireland and Northern Ireland. HES was established in 2005, and our office is located in Dungarvan, County Waterford. We routinely complete impact assessments for hydrology and hydrogeology for a large variety of project types including wind farms.

This WFD assessment was prepared by Michael Gill and David Broderick.

Michael Gill (P. Geo., B.A.I., MSc, Dip. Geol., MIEI) is an Environmental Engineer with over 18 years' environmental consultancy experience in Ireland. Michael has completed numerous hydrological and hydrogeological impact assessments of wind farms in Ireland. He has also managed EIAR assessments for infrastructure projects and private residential and commercial developments. In addition, he has substantial experience in wastewater engineering and site suitability assessments, contaminated land investigation and assessment, wetland hydrology/hydrogeology, water resource assessments, surface water drainage design and SUDs design, and surface water/groundwater interactions. For example, Michael has worked on the EIS/EIARs for Slievecallan WF, Cahermurphy (Phase I & II) WF, Carrownagowan WF, and Croagh WF and over 100 other wind farm related projects across the country.

David Broderick (P. Geo., BSc, H. Dip Env Eng, MSc) is a Hydrogeologist with over 17 years' experience in both the public and private sectors. Having spent two years working in the Geological Survey of Ireland working mainly on groundwater and source protection studies David moved into the private sector. David has a strong background in groundwater resource assessment, karst hydrology and hydrogeological/hydrological investigations in relation to developments such as quarries and wind farms. David has completed numerous geology and water sections for input into EIARs for a range of commercial developments. David has worked on the EIS/EIARs for Ardderroo Wind Farm, Knockalough Wind Farm, and Oweninny Wind Farm, and over 60 other wind farm related projects across the country.

1.3 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 ("**WFD**"), was established to ensure the protection of the water environment. The Directive was transposed in Ireland by the European Communities (Water Policy) Regulations 2003 (S.I. No. 722 of 2003).

The WFD requires that all member states protect and improve water quality in all waters, with the aim of achieving good status by 2027 at the latest. Any new development must ensure that this fundamental requirement of the WFD is not compromised.

The WFD is implemented through the River Basin Management Plans (RBMP) which comprises a six-yearly cycle of planning, action and review. RBMPs include identifying river basin districts, water bodies, protected areas and any pressures or risks, monitoring and setting environmental objectives. In Ireland the first RBMP covered the period from 2010 to 2015 with the second cycle plan covering the period from 2018 to 2021.

The River Basin Management Plan (2018 - 2021) objectives, which have been integrated into the design of the proposed wind farm development, include:

- Ensure full compliance with relevant EU legislation;
- Prevent deterioration and maintain a 'high' status where it already exists;
- Protect, enhance and restore all waters with aim to achieve at least good status by 2027;
- Ensure waters in protected areas meet requirements; and,
- Implement targeted actions and pilot schemes in focused sub-catchments aimed at (1) targeting water bodies close to meeting their objectives and (2) addressing more complex issues that will build knowledge for the third cycle.

Furthermore, the Department of Housing, Local Government and Heritage are currently reviewing the submissions made on the Draft 3rd Cycle River Basin Management Plan (2022 - 2027) which was out for public consultation in Q4 of 2021 and Q1 of 2022. As of June 2024, the plan has not been published while the draft plan is available to view at https://www.gov.ie/en/consultation/2bda0-public-consultation-on-the-draft-river-basin-management-plan-for-ireland-2022-2027/.

Our understanding of these objectives is that water bodies, regardless of whether they have 'Poor' or 'High' status, should be treated the same in terms of the level of protection and mitigation measures employed.

2. WATERBODY IDENTIFICATION CLASSIFICATION

2.1 INTRODUCTION

This section identifies those surface water, groundwater bodies and protected areas with potential to be affected by the Proposed Project and reviews any available WFD information.

2.2 SURFACE WATERBODY IDENTIFICATION

The Site is located in the regional Lough Corrib (Corrib_030) surface water catchment within Hydrometric Area 30 of the Western River Basin District (WRBD).

On a more local scale the Site is located in the River Clare catchment wherein it exists within two surface water sub-catchments. The majority (80%) of the Wind Farm site which includes all 11 no. turbine locations, 1 no. temporary construction compound, borrow pit, peat repositories (4 no.) and spoil storage area (1 no.) are located in the Clare[Galway]_SC_040. The Wind Farm site drains to the River Clare, which is located approximately 23km downstream (southwest) of the Site, via the Grange River.

The northern portion of the Wind Farm site (20%) is located in the Sinking River sub-catchment (Sinking_SC_010). The Sinking River is located to the northwest and approximately 5.5km downstream of the Wind Farm site. Proposed infrastructure within the Sinking River sub-catchment is limited to the Wind Farm site entrance, ~1.6km of access road and 1 no. construction compound. The Sinking River drains into the River Clare approximately 22km downstream of the Site.

The downstream distance to Lough Corrib in the Clare[Galway]_SC_040 is approximately 50km while in the Sinking_SC_010 sub-catchment it is approximately 67km.

The portion of the Wind Farm site within the Clare[Galway]_SC_040 sub-catchment drains locally to the Levally Stream (Levally Stream_010 sub-basin) which has several tributaries that drain the Site. The portion of the Wind Farm site within the Sinking River sub-catchment drains locally to a headwater stream of the Sinking River (Sinking_020).

The proposed Grid Connection (including substation and 2 no. end masts) is located in the Clare[Galway]_SC_040 sub-catchment and is also drained locally by the Levally Stream.

With regard the TDR accommodation works areas, 2 no. of these areas are located in the Clare[Galway]_SC_030 and 1 no. accommodation area located in the Sinking_SC_010 sub-catchment.

Error! Reference source not found. Presents the total upstream sub catchment area that drains the Site, and the total subcatchment area of the rivers downstream from the site as far as the Corrib Lower lake body. The total upstream sub catchment area is 1,137.9km^2. Therefore, the river waterbodies which are located in close proximity to the Site that have relatively smaller catchment areas (Levally Stream_010) will be more susceptible to water quality impacts as a result of the Proposed Development in comparison to the downstream river and lake bodies, located downstream of the Site.

A local hydrology map of the area is shown below in **Figure** A.

Table A: Upstream Catchment Size for River Waterbodies

WFD River Sub-Basin	Total Upstream Catchment Area (km²)
Levally Stream_010	39.9
Grange (Galway)_020	93.2
Grange (Galway)_030	104.5
Grange (Galway)_040	125.6
Sinking_020	156.6
Sinking_030	173.5
Clare (Galway)_010	354.2
Clare (Galway)_020	447.5
Clare (Galway)_030	476.4
Clare (Galway)_040	520.5
Clare (Galway)_050	671.3
Clare (Galway)_060	705.2
Clare (Galway)_070	942.9
Clare (Galway)_080	987.8
Clare (Galway)_090	1041.9
Clare (Galway)_100	1137.9

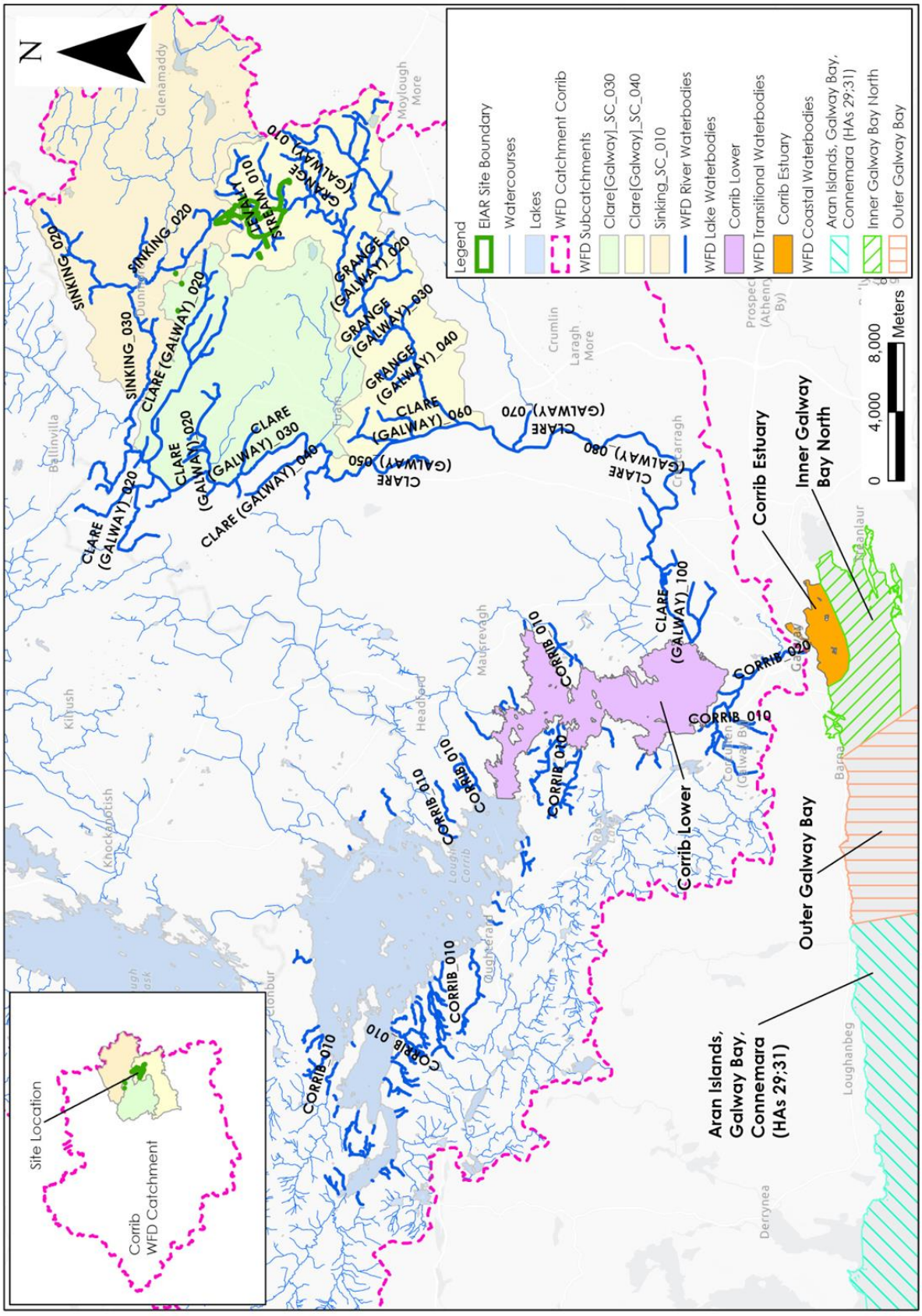

Figure A: Local Hydrology Map

2.3 SURFACE WATER BODY CLASSIFICATION

A summary of the WFD status and risk result for Surface Water Bodies (SWBs) downstream of the Proposed Project site are shown in **Table B**. The overall status of SWBs is based on the ecological, chemical and quantitative status of each SWB.

Local Groundwater Body (GWB) and Surface water Body (SWB) status information is available from (www.catchments.ie).

The Site is primarily drained by the Levally Stream_010 river waterbody which is assigned a 2016-2021 Status of "Good" and is deemed to be "Not at risk" of missing out on the WFDs 2027 objectives. The Levally Stream_010 river waterbody feeds into the Grange River (Grange (Galway)_020).

The Grange (Galway)_020 to Grange (Galway)_040 river waterbodies downstream of the Site have achieved "Good" Status and are all deemed to be "Not at risk" of missing out on their WFDs 2027 objectives.

The very northern portion of the Site is drained by the Sinking River. Both the Sinking_020 and the Sinking_030 river waterbodies downstream of the Site achieved "Good" Status and are deemed to be "Not at risk" of failing to achieve their WFDs 2027 objectives.

Both the Grange and Sinking Rivers drain into the Clare (Galway) River downstream from the Site. The status of the Clare (Galway) River ranges from "Poor" (Clare (Galway)_060) to "Moderate" (Clare (Galway)_050, Clare (Galway)_080, Clare (Galway)_090 and Clare (Galway)_100) to "Good" (Clare (Galway)_010, Clare (Galway)_020, Clare (Galway)_030, Clare (Galway)_040 and Clare (Galway)_070). The risk status of the Clare (Galway)_050 and the Clare (Galway)_100 river waterbodies are currently under review. The Clare (Galway)_060, Clare (Galway)_080 and Clare (Galway)_090 SWB's are all deemed to be "at risk" with hydromorphology listed as the significant pressure acting negatively on the river waterbodies. All other river segments of the Clare (Galway) river are classified as being "not at risk".

The Clare (Galway) River eventually drains into the Corrib Lower lake waterbody which has been assigned "Good" status and is deemed to be "Not at risk".

Outflowing from the Corrib Lower lake is the Corrib River. Both the Corrib_010 and Corrib_020 SWB's, achieved a WFD 2016-2021 Status of "Good" and are "Not at risk".

The Corrib River discharges into the Corrib Estuary transitional waterbody which has a Status of "Moderate" and is currently "Under Review" for the Risk 3rd Cycle.

In terms of coastal waterbodies, the Inner Galway Bay North coastal waterbody has a current WFD 2016-2021 Status of "Good" and is deemed by the Risk 3rd Cycle to be "Not at risk". Further out to sea, the Outer Galway Bay coastal waterbody has a current WFD 2016-2021 Status of "High" and is deemed to be "Not at risk" of missing out on the WFDs objectives. The Aran Islands, Galway Bay and Connemara (HAs 29;31) coastal waterbody has a current WFD 2016-2021 Status of "High" and is deemed to be "Under Review".

The SWB status for the 2016-2021 WFD cycle are shown on Error! Reference source not found..

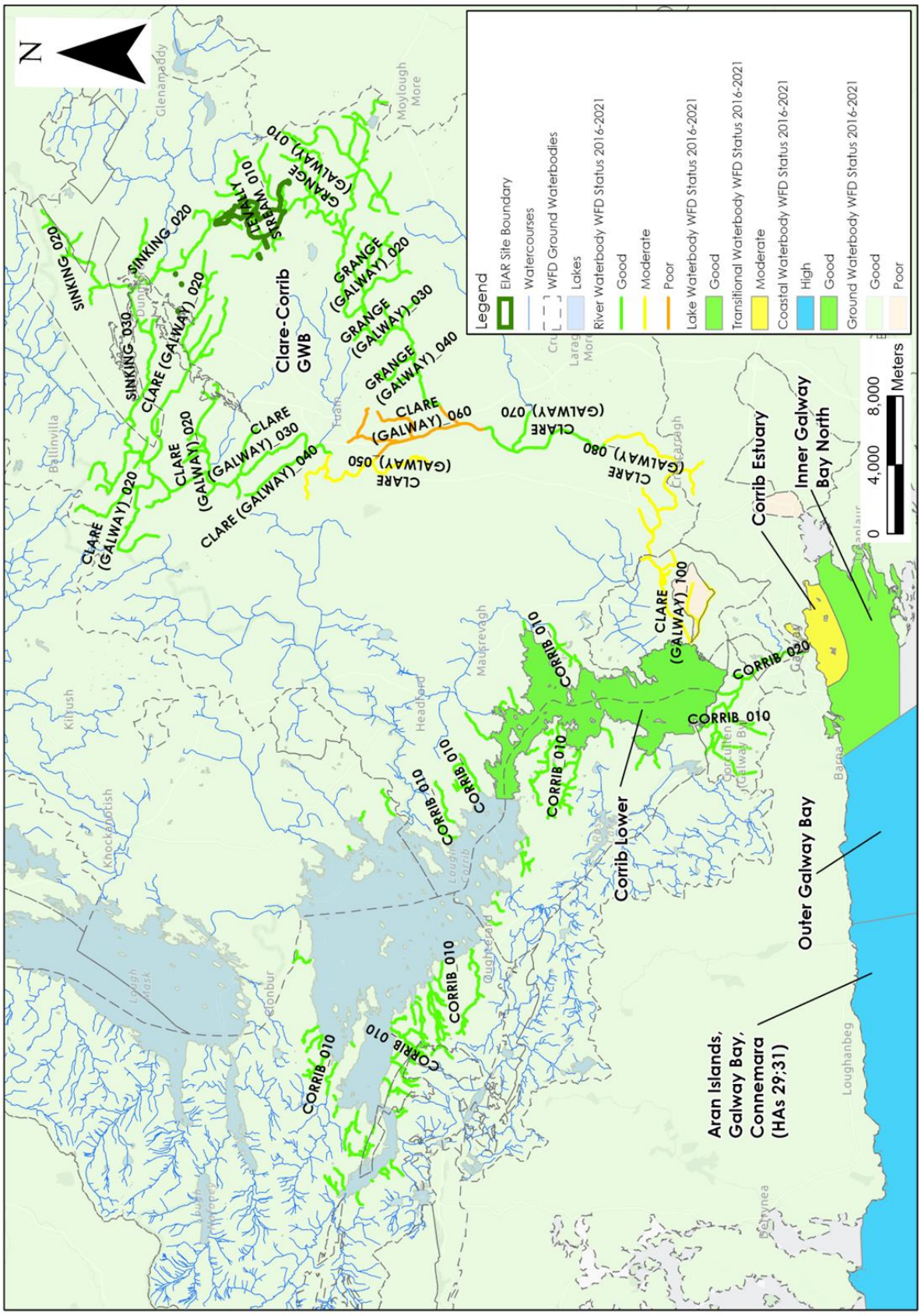

Figure B: WFD Surface Waterbody and Groundwater Body Status (2016-2021)

Table B: Summary WFD Information for Surface Water Bodies

SWB	Overall Status (2010-2015)	Overall Status (2013-2018)	Overall Status (2016-2021)	Risk 3rd Cycle	Pressures
Levally Stream_010	Moderate	Good	Good	Not at risk	-
Grange (Galway)_020	Good	Moderate	Good	Not at risk	-
Grange (Galway)_030	Good	Good	Good	Not at risk	-
Grange (Galway)_040	Good	Good	Good	Not at risk	-
Sinking_020	Moderate	Good	Good	Not at risk	-
Sinking_030	Good	Moderate	Good	Not at risk	-
Clare (Galway)_010	Moderate	Moderate	Good	Not at risk	-
Clare (Galway)_020	Unassigned	Good	Good	Not at risk	-
Clare (Galway)_030	Good	Good	Good	Not at risk	-
Clare (Galway)_040	Good	Good	Good	Not at risk	-
Clare (Galway)_050	Good	Good	Moderate	Review	-
Clare (Galway)_060	Moderate	Moderate	Poor	At risk	Hydro
Clare (Galway)_070	Good	Good	Good	Not at risk	-
Clare (Galway)_080	Moderate	Moderate	Moderate	At risk	Hydro
Clare (Galway)_090	Moderate	Moderate	Moderate	At risk	Hydro
Clare (Galway)_100	Unassigned	Moderate	Moderate	Under review	-
Corrib Lower	Moderate	Good	Good	Not at risk	-
Corrib_010	Unassigned	Unassigned	Good	Not at risk	-
Corrib_020	Good	Good	Good	Not at risk	-
Corrib Estuary	Good	Good	Moderate	Review	-
Inner Galway Bay North	Good	Good	Good	Not at risk	-
Outer Galway Bay	High	High	High	Not at risk	-

Aran Islands, Galway Bay, Connemara (HAs 29;31)	Unassigned	High	High	Review	-

2.4 GROUNDWATER BODY IDENTIFICATION

The Proposed Project site is located in the Clare-Corrib Groundwater Body (IE_WE_G_0020) which has a mapped surface area of 1,344km^2.

The bedrock type of the Clare-Corrib GWB is predominantly Dinantian Pure Bedded Limestone (Burren Formation) which also underlies the Proposed Project site. The Burren Formation is classified by the GSI as a Regionally Important Karstified Aquifer which is dominated by conduit flow (Rkc).

2.5 GROUNDWATER BODY CLASSIFICATION

The Clare-Corrib (IE_WE_G_0020) Groundwater Body (GWB) underlies the entire Site. The GWB is currently assigned 'Good Status', which is defined based on the quantitative status and chemical status of the GWB. The Clare-Corrib GWB is "Not at risk" of failing to meet its WFD objectives.

The GWB status for the 2016-2021 WFD cycles are shown on **Figure** B.

Table C: Summary WFD Information for Groundwater Bodies

GWB	Overall Status (2010-2015)	Overall Status (2013-2018)	Overall Status (2016-2021)	Risk 3rd Cycle	Pressures
Clare-Corrib	Good	Good	Good	Not at risk	-

2.6 PROTECTED AREA IDENTIFICATION

The WFD requires that activities are also in compliance with other relevant legislation, as considered below. Nature conservation designations, bathing waters, Nutrient Sensitive Areas (NSA's), shellfish protected areas and Drinking Water Protected Area's (DWPA) within the vicinity of the Site are considered at as part of the assessment.

2.6.1 Nature Conservation Designations

Within the Republic of Ireland designated sites include Natural Heritage Areas (NHAs), Proposed Natural Heritage Areas (pNHAs), Special Areas of Conservation (SACs), candidate Special Areas of Conservation (cSAC) and Special Protection Areas (SPAs).

Ramsar sites are wetlands of international importance designated under the Ramsar Convention (adopted in 1971 and came into force in 1975), providing a framework for the conservation and wise use of wetlands and their resources.

The closest designated site to the Site is Lough Corrib SAC (Site Code: 000297) which includes sections of the Levally Stream and Sinking River immediately downstream of the Site. The proposed Grid Connection briefly intercepts Lough Corrib SAC where it follows a public road after leaving the Wind Farm site on the southeast. The Grid Connection cable route intercepts the SAC for about 160m as the route goes over an existing bridge crossing on the Levally Stream. The closest turbine to the SAC (T10) is 0.6km away.

The Lough Corrib SPA (Site Code: 004042) and pNHA (Site Code: 000297) is located ~34km southwest of the Proposed Development (as the crow flies). Rivers that drain the Proposed Project site ultimately drain towards the Lough Corrib SPA. The site is a Special Protection Area (SPA) under the E.U. Birds Directive.

Levally Lough SAC/pNHA (Site Code: 000295) is located ~2km southwest of the Proposed Project site. The Site Synopsis (NPWS, 2013) description of Levalley Lough is as follows:

> *"Levally Lough is a fluctuating lake, or turlough, situated 9 km east of Tuam and to the north of the Grange River in Co. Galway. It is overlooked by a low rise on the north side, with some esker or drift mound to the south. The land is flat at the eastern and western ends. A stream enters the turlough from the north-east corner".*

There is no surface water connection between the Site and Levally Lough. However, given that the general groundwater flow direction in the area of the Site is to the south/southwest, it has to be assumed that Levally Lough is potentially down-gradient of the Site with respect to groundwater flow.

Drumbulcaun Lough pNHA is located 1km to the west of the site, where it exists in a separate surface water and groundwater catchment to that of the Site.

Downstream of the Proposed Project site, within Galway Bay, there are 2 no. Designated Sites, these include:

- Galway Bay Complex SAC (Site Code: 000268)
- Inner Galway Bay SPA (Site Code: 004031)

2.6.2 Bathing Waters

Bathing waters are those designated under the Bathing Water Directive (76/160/EEC) or the later revised Bathing Water Directive (2006/7/EC).

There are two bathing waters in or directly adjacent to the catchment identified under the Bathing Water Regulations 2008. These bathing waters are:

- Grattan Road Beach ~40km southwest of the Wind Farm site
- Ballyloughane Beach ~38km southwest of the Wind Farm site

Both bathing waters had a Sufficient Classification for 2020.

2.6.3 Nutrient Sensitive Areas

Nutrient Sensitive Areas (NSA) comprise Nitrate Vulnerable Zones and polluted waters designated under the Nitrates Directive (91/676/EEC) and areas designated as sensitive areas under the Urban Wastewater Treatment Directive (UWWTD)(91/271/EEC). Sensitive areas under the UWWTD are water bodies affected by eutrophication associated with elevated nitrate concentrations and act as an indication that action is required to prevent further pollution caused by nutrients.

There are no NSAs within the vicinity of the Site or downstream of the Site.

2.6.4 Shellfish Waters

The Shellfish Waters Directive (2006/113/EC) aims to protect or improve shellfish waters in order to support shellfish life and growth.

There are no shellfish protected areas that lie downstream of the Site.

2.6.5 Drinking Water

Downstream of the Site there are 3 no. surface water Drinking Water Protected Areas (DWPA's). These DWPA's include:

- The Clare (Galway)_020 DWPA
- The Lower Corrib DWPA
- The Corrib_020 DWPA

All waterbodies in the catchment met the DWPA objective in 2019.

The Proposed Project site is also partially located in the groundwater Zone of Contribution (ZoC) to the Gurteen/Cloonmore Group Water Scheme (spring source).

Turbines potentially located inside the ZoC include T1, T2, T3 & T4. The ZoC with the Site was investigated as part of the EIAR (refer to Water Chapter 9 of the EIAR).

3. WFD SCREENING

As discussed in **Section 2**, there are a total of 18 no. river water bodies that are located in the vicinity or downstream of the Site. In addition, there is 1 no. lake waterbody, 1 no. transitional waterbody and 3 no. coastal waterbodies downstream. Furthermore, the Proposed Project site is underlain by 1 no. groundwater body.

3.1 SURFACE WATER BODIES

As shown in **Figure** A above, there are 23 no. SWBs located in the vicinity or downstream of the Site.

With consideration for the construction, operational and decommissioning phases of the Proposed Project site, it is considered that the Levally Stream_010 and the Sinking_020 river sub basins will be brought through to the WFD Impact Assessment as elements of the Wind Farm site, Grid Connection and TDR works are located within these river sub basins.

Additionally, with regard the TDR accommodation works areas, 2 no. of these areas are located in the Clare[Galway]_020 river sub basin. The Clare[Galway]_020 SWB will be screened into the assessment due to the proposed upgrades within the sub basin.

The Sinking_030 river sub basin will be brought into the WFD Impact Assessment as it lies directly downstream of the Site.

The Grange (Galway) River (Grange (Galway)_020, Grange (Galway)_030 and Grange (Galway)_040) will be brought into the WFD Impact Assessment as it lies directly downstream of the Levally Stream_010 which primarily drains the Site.

The Clare (Galway) River (Clare (Galway)_010, and Clare (Galway_030 to Clare (Galway)_100) will not be brought into the WFD Impact Assessment due to the large flow volumes within the river and its distal downstream location from the Site (>20km). The Clare (Galway)_020 river waterbody will however be included in the assessment, due to the presence of TDR works as explained above.

The Corrib Lower lake waterbody will be screened out of the WFD Impact Assessment due to its distal downstream distance from the Proposed Project and the large volume of water it holds, which has high diluting capabilities. The possibility for surface water quality deterioration from the Site is insignificant.

Downstream of the Corrib Lower Lake waterbody, the Corrib River (Corrib_010 and Corrib_020 SWB's) will not be brought through to the WFD Impact Assessment due to their distal location downstream of the Proposed Project. There will be no possibility for the deterioration in quality of these SWBs.

The Corrib Estuary transitional waterbody will not be brought through to the WFD Impact Assessment as there is a large volume of saline water and large tidal currents in this waterbody. Similarly, the coastal waterbodies downstream of the Proposed Development (Inner Galway Bay North, Outer Galway Bay and the Aran Islands, Galway Bay, Connemara (HAs 29;31)) will not be brought through to the WFD Impact Assessment.

3.2 GROUNDWATER BODIES

With respect to groundwater bodies, the Clare-Corrib GWB has been screened in due to its location directly underlying the Site. The site works must not in any way result in a deterioration in the status of this GWB and/or prevent it from meeting the biological and chemical characteristics for good status in the future.

3.3 PROTECTED AREAS

The Lough Corrib SAC (000297) has been screened into the assessment as it includes sections of the Levally Stream and Sinking River immediately downstream of the Site.

The Lough Corrib SPA (004042) and pNHA (000297) will not be brought through to the WFD Impact Assessment due to its distal location from the Site and the fact that there will be no possibility for the deterioration of surface water quality due to the large volumes of water and the upstream catchment area of the Lake.

Although, there is no surface water connection between the Site and Levally Lough SAC/pNHA, the SAC has been screened in as groundwater flow direction in the area of the Site is to the south/southwest, therefore, it has to be assumed that Levally Lough is potentially down-gradient of the Site with respect to groundwater flow.

Drumbulcaun Lough pNHA has been screened out as there are no hydrological or hydrogeological connections between the Proposed Project and the pNHA.

Both the Galway Bay Complex SAC/pNHA and the Inner Galway Bay SPA have been screened out as they are located distally from the Site within transitional and coastal waters.

The bathing waters at Grattan Road Beach and Ballyloughane Beach have been screened out due to its distant location from the Proposed Project site. Additionally, these bathing waters are located within the Corrib Estuary transitional waterbody and due to the large volumes of water within this waterbody and the saline nature of these waters, the Proposed Project has no potential to cause a deterioration to this bathing area.

The Clare (Galway)_020 DWPA (IEPA1_WE_30C010300) will be brought into the WFD Impact Assessment due to the presence of proposed TDR works within the Clare (Galway)_)20 river sub basin.

The Corrib Lower (IE_WE_30_666a) DWPA will not be brought through to the WFD Impact Assessment due to its distal downstream location and due to the large volumes of water within the lake waterbody.

The Corrib_020 (IE_WE_30C020600) DWPA lies downstream of the Lower Corrib lake body and the Site. This DWPA will not be brought through to the WFD Impact Assessment due to it being situated downstream of the Lower Corrib lake body. The Corrib_020 WFD Status will not deteriorate due to the proposed works at the Site.

3.4 WFD SCREENING SUMMARY

A summary of WFD Screening discussed above is shown in **Table D**.

Table D: Screening of WFD water bodies located within the study area

Type	WFD Classification	Waterbody Name/ID	Inclusion in Assessment	Justification
Surface Water Body	River	Levally Stream_010	**Yes**	The Wind Farm site and Grid Connection is mapped within the Levally Stream_010 river sub-basin. An assessment is required to consider the potential impacts of the Proposed Project on this SWB.
	River	Grange (Galway)_020	**Yes**	The Grange (Galway)_020 is located downstream of the Levally Stream_010 and hydrologically connected to the Site. Due to its proximal location to the Site, it will be brought through to the WFD Impact Assessment.
	River	Grange (Galway)_030	**Yes**	The Grange (Galway)_030 is located downstream of the Grange (Galway)_020 and hydrologically connected to the Site. Due to its proximal location to the Site, it will be brought through to the WFD Impact Assessment.
	River	Grange (Galway)_040	**Yes**	The Grange (Galway)_030 is located downstream of the Grange (Galway)_020 and hydrologically connected to the Site. Due to these factors, it will be brought through to the WFD Impact Assessment.
	River	Sinking_020	**Yes**	The very northern section of the Site is located within the Sinking_020 WFD river sub basin and as so, the Sinking_020 SWB will be included into the WFD Impact Assessment.
	River	Sinking_030	**Yes**	The Sinking_030 is located downstream of the Sinking_020 and proximally to the Site. Therefore, it will be brought through to the WFD Impact Assessment.
	River	Clare (Galway)_010	No	The Clare (Galway)_010 is located distally from the Site and has a large volume of water with high flow rates. As such there will be no deterioration in this SWB caused by the works at the Site. Therefore, it will not be brought through to the WFD Impact Assessment.
	River	Clare (Galway)_020	**Yes**	Proposed upgrade TDR works are within the Clare (Galway)_020 river sub basin. An assessment is required to consider the potential impacts of the Proposed Project on this SWB.
	River	Clare (Galway)_030	No	The Clare (Galway)_030 is located distally from the Site and has a large volume of water with high flow rates. As such there will be no deterioration in this SWB caused by the works at the Site. Therefore, it will not be brought through to the WFD Impact Assessment.
	River	Clare (Galway)_040	No	The Clare (Galway)_040 is located distally from the Site and has a large volume of water with high flow rates. As such there will be no deterioration in this SWB caused by the works at the Site. Therefore, it will not be brought through to the WFD Impact Assessment.
	River	Clare (Galway)_050	No	The Clare (Galway)_050 is located distally from the Site and has a large volume of water with high flow rates. As such there will be no deterioration in this SWB caused by the works at the Site. Therefore, it will not be brought through to the WFD Impact Assessment.

Type	WFD Classification	Waterbody Name/ID	Inclusion in Assessment	Justification
	River	Clare (Galway)_060	No	The Clare (Galway)_060 is located distally from the Site and has a large volume of water with high flow rates. As such there will be no deterioration in this SWB caused by the works at the Site. Therefore, it will not be brought through to the WFD Impact Assessment.
	River	Clare (Galway)_070	No	The Clare (Galway)_070 is located distally from the Site and has a large volume of water with high flow rates. As such there will be no deterioration in this SWB caused by the works at the Site. Therefore, it will not be brought through to the WFD Impact Assessment.
	River	Clare (Galway)_080	No	The Clare (Galway)_080 is located distally from the Site and has a large volume of water with high flow rates. As such there will be no deterioration in this SWB caused by the works at the Site. Therefore, it will not be brought through to the WFD Impact Assessment.
	River	Clare (Galway)_090	No	The Clare (Galway)_090 is located distally from the Site and has a large volume of water with high flow rates. As such there will be no deterioration in this SWB caused by the works at the Site. Therefore, it will not be brought through to the WFD Impact Assessment.
	River	Clare (Galway)_100	No	The Clare (Galway)_100 is located distally from the Site and has a large volume of water with high flow rates. As such there will be no deterioration in this SWB caused by the works at the Site. Therefore, it will not be brought through to the WFD Impact Assessment.
	Lake	Lower Corrib	No	The Lower Corrib lake body (Lough Corrib) will not be included into the WFD Impact Assessment due to the large amount of water it holds and distal downstream location from the Site. Therefore, there will be no deterioration of status for the SWB.
	River	Corrib_010	No	The Corrib_010 is located downstream of Lough Corrib. Due to the large amount of water in the lake there will not be the possibility of the Site causing a deterioration in this SWB WFD Status. Therefore, it will not be brought through to the WFD Impact Assessment.
	River	Corrib_020	No	The Corrib_020 is located downstream of Lough Corrib and due to the large amount of water in the lake there will not be the possibility of the Site causing a deterioration in this SWBs WFD Status. Therefore, it will not be brought through to the WFD Impact Assessment.
	Transitional	Corrib Estuary	No	The Corrib Estuary has a large amount of saline water and strong tidal currents. There is no possibility of this SWBs WFD Status deteriorating as a result of the Site and as such it will not be brought through to the WFD Impact Assessment.
	Coastal	Inner Galway Bay North	No	The Inner Galway Bay North has a large amount of saline water and strong tidal currents. There is no possibility of this SWBs WFD Status deteriorating as a result of the Site and as such it will not be brought through to the WFD Impact Assessment.
	Coastal	Outer Galway Bay	No	The Outer Galway Bay has a large amount of saline water and strong tidal currents.

Type	WFD Classification	Waterbody Name/ID	Inclusion in Assessment	Justification
				There is no possibility of this SWBs WFD Status deteriorating as a result of the Site and as such it will not be brought through to the WFD Impact Assessment.
	Coastal	Aran Islands, Galway Bay, Connemara (HAs 29;31)	No	The Inner Galway Bay North has a large amount of saline water and strong tidal currents. There is no possibility of this SWBs WFD Status deteriorating as a result of the Proposed Development Site and as such it will not be brought through to the WFD Impact Assessment.
Groundwater Body	Groundwater	Clare-Corrib	**Yes**	The Clare Corrib GWB underlies the Site. An assessment is required to consider potential impacts of the Site on this GWB.
Protected Areas	Designated Sites	Lough Corrib SAC	**Yes**	The Lough Corrib SAC has been screened into the assessment as it includes sections of the Levally Stream and Sinking River immediately downstream of the Site.
		Lough Corrib SPA/pNHA	No	Lough Corrib SPA/pNHA is located within the Lower Corrib lake body. Due to its distal location from the Site and the large amount of water that the lake holds, there will be no deterioration in the status of the lake and therefore it will not be brought through to the WFD Impact Assessment.
		Levally Lough SAC/pNHA	**Yes**	Groundwater flow direction in the area of the Site is to the south/southwest, therefore, Levally Lough is potentially down-gradient of the Site with respect to groundwater flow, and thus will be screened into the assessment.
		Drumbulcaun Lough pNHA	No	Drumbulcaun Lough pNHA has been screened out as there are no hydrological or hydrogeological connections between the Proposed Project and the pNHA.
		Galway Bay Complex SAC/pNHA	No	The Galway Bay Complex SAC/ pNHA has been screened out as its located distally from the Site within transitional and coastal waters.
		Inner Galway Bay SPA	No	The Inner Galway Bay SPA has been screened out as it is located distally from the Site within transitional and coastal waters.
	Bathing Waters	Ballyloughane Beach	No	The Ballyloughane Beach bathing waters have been screened out due to its distal location from the Proposed Development and the large volumes of water associated with the transitional waterbody. The Proposed Development has no potential to impact these Bathing Waters
		Grattan Road Beach	No	The Grattan Road Beach bathing waters have been screened out due to its distal location from the Proposed Development and the large volumes of water associated with the transitional waterbody. The Proposed Development has no potential to impact these Bathing Waters

Type	WFD Classification	Waterbody Name/ID	Inclusion in Assessment	Justification
	Drinking Water Protected Areas	Clare (Galway)_020	**Yes**	Proposed upgrade TDR works are within the Clare (Galway)_020 river sub basin. An assessment is required to consider the potential impacts of the Proposed Project on this DWPA.
		Lower Corrib	No	The Lower Corrib (Lough Corrib) DWPA will not be brought into the WFD Impact Assessment due to large amount of water that has the capability of diluting any possible contaminants that come downstream of the Site. Therefore, there will be no deterioration in the SWBs status.
		Corrib_020	No	The Corrib_020 DWPA will not be brought into the WFD Impact Assessment due to the fact that it lies downstream of Lough Corrib and it also has a large amount of water and high velocity flow, that has the capability of diluting any possible contaminants that come downstream of the Site. Therefore, there will be no deterioration in the SWBs status.
		Gurteen/Cloonmore Group Water Scheme SPA	**Yes**	Turbines potentially located inside the ZoC include T1, T2, T3 & T4.

4. WFD COMPLIANCE ASSESSMENT

4.1 PROPOSALS

The Proposed Project is described in full in Chapter 4 of the EIAR.

Due to the nature of wind energy developments (and associated grid connections and TDR works), being near surface construction activities, impacts on groundwater are generally negligible and surface water is generally the main sensitive receptor assessed during impact assessments. The primary risks to groundwater will be chemical pollution of groundwater from cementitious materials, hydrocarbon spillage and leakages.

The primary risk to surface waters will be entrained suspended sediments (peat and soil particles) in site runoff during earthworks and tree felling along with release cement-based compounds and/or hydrocarbons. The Proposed Project may also result in changes to surface water runoff volumes and flow patterns.

There are a number of potential adverse effects to both surface and groundwater.

4.2 POTENTIAL EFFECTS

4.2.1 Construction Phase (Unmitigated)

4.2.1.1 Potential Surface Water Quality Effects from Works within the Wind Farm Site

Construction phase activities including tree felling, site levelling, roadway construction and turbine/substation foundation excavation will require earthworks resulting in removal of vegetation cover and excavation of peat, soil and subsoils. The main risk will be from surface water runoff from bare soil/peat and spoil/peat storage areas during construction works.

Due to deep peat at turbine T7, piling is likely to be required as an alternative option to gravity base. At turbine locations T1, T2, T3 & T4, which are located inside the refined ZoC to the Gurteen/Cloonmore GWS spring, only a gravity base foundation or precast piling is being considered.

Hydrocarbons and cement-based compounds will be used during the construction phase. Accidental spillage during refuelling of construction plant with petroleum hydrocarbons is a significant pollution risk to surface waters at all construction sites. The accumulation of small spills of fuels and lubricants during routine plant use can also be a pollution risk. Hydrocarbon has a high toxicity to humans, and all flora and fauna, including fish, and is persistent in the environment. It is also a nutrient supply for adapted micro-organisms, which can rapidly deplete dissolved oxygen in waters, resulting in the death of aquatic organisms.

Release of effluent from wastewater treatment systems also has the potential to impact on surface waters if site conditions are not suitable for an on-site percolation unit.

Clear felling of coniferous forestry plantations is also proposed over ~10.3ha. Potential surface water quality effects from felling include the release of elevated concentrations of suspended solids and nutrient release which has the potential to effect downstream surface water quality.

The construction of 5 no. new watercourse crossing (clearspan bridge design) and upgrade of 1 no. bridge crossing on Stream A (tributary of the Levally Stream) will be required to facilitate the Wind Farm Site development infrastructure.

New watercourse crossings (i.e. bridges/culverts) or upgrade of existing crossings will only be required at the Wind Farm site and not the Grid Connection.

Establishment of 4 no. peat repositories and 1 no. spoil repository area and the peatland enhancement of 11.6ha of cutover bog for biodiversity enhancement are also proposed.

Construction phase activities can result in the release of suspended solids and pollutants in runoff water and could result in an increase in the suspended sediment load, resulting in increased turbidity, increased pH and contamination which in turn could affect the water quality and fish stocks in the downstream SWBs.

The SWB likely to be most impacted by these activities is the Levally Stream_010 SWB. Further downstream, the potential for water quality effects will decrease downstream due to the increasing volumes of water within the respective SWBs.

A summary of potential status change to SWBs arising from surface water quality impacts from earthworks during the construction phase of the Proposed Development in the unmitigated scenario are outlined in

Table E.

Table E: Surface Water Quality Impacts during Construction Phase (Unmitigated)

SWB	WFD Code	Current Status	Assessed Potential Status Change
Levally Stream_010	IE_WE_30L070100	Good	Moderate
Grange (Galway)_020	IE_WE_30G020400	Good	Moderate
Grange (Galway)_030	IE_WE_30G020500	Good	Good
Grange (Galway)_040	IE_WE_30G020700	Good	Good
Sinking_020	IE_WE_30S010300	Good	Good
Sinking_030	IE_WE_30S010400	Good	Good

4.2.1.2 Potential Surface Water Quality Effects Along the Proposed Grid Connection Route

The Proposed Grid Connection comprises a proposed 220kV on-site substation, approximately ~2.8km of underground cabling route, ~1.2km of new access track and 2 no. end masts, 1 no. watercourse crossings on tributary of the Levally Stream (1 no. existing bridge on public road). Directional drilling will be used to cross the existing bridge on the public road.

Due to the close proximity of local waterbodies to the at the crossing locations, there is a potential for surface water quality impacts during trench excavation work due to runoff from the road surface. This runoff may contain elevated concentrations of suspended sediment, cementitious runoff and/or hydrocarbons.

Some minor groundwater/surface water seepages will likely occur in trench excavations and substation foundation excavations and this will create additional volumes of water to be treated by the runoff management system. Inflows will likely require management and treatment to reduce suspended sediments.

Construction activities along the Proposed Grid Connection Route only have the potential for short term effects due to the minor and transient nature of the works. The limits the potential for the Proposed Project to alter the overall status of a SWB.

A summary of potential status change to SWBs arising from works along the Proposed Grid Connection Route during the construction phase of the Proposed Project in the unmitigated scenario are outlined in **Table F.**

Table F: Potential Surface Water Quality Effects along the Proposed Grid Connection Route During Construction Phase (Unmitigated)

SWB	WFD Code	Current Status	Assessed Potential Status Change
Levally Stream_010	IE_WE_30L070100	Good	Good

4.2.1.3 Potential Surface Water Quality Effects Associated with TDR Works

Minor earthworks are required for turbine delivery. These include for temporary widening of existing road junctions at 3 no. locations along the proposed route. Junction works are required on the N83, the L6466 local road junction within Clare (Galway)_020 river sub basin, and the R328 within the Sinking_020 river sub basin.

Within the Clare (Galway)_020 river sub basin, the nearest mapped EPA watercourse to the proposed TDR works are ~1km to the south. Whilst the nearest watercourse to TDR works within the Sinking_020 river sub basin is ~260m east of the works area.

Due to the fact that there are no direct drainage pathways between the works and any mapped surface watercourses within these river sub-basins, the proposed works have very limited potential to cause a deterioration in the status of these screened out SWBs and/or jeopardise their attainment of good surface water status.

Due to the minor and short-term nature of the proposed works along the TDR, there is limited potential for the Proposed Project to alter the overall status of the receiving SWBs.

A summary of potential status change to SWBs arising from works along the TDR during the construction phase of the Proposed Project in the unmitigated scenario are outlined in **Table G.**

Table G: Potential Surface Water Quality Effects Associated with TDR Works during Construction Phase (Unmitigated)

SWB	WFD Code	Current Status	Assessed Potential Status Change
Sinking_020	IE_WE_30S010300	Good	Good
Clare (Galway)_020	IE_WE_30C010300	Good	Good

4.2.1.4 Potential Groundwater Quality/Quantity Effects

The accidental spillage of hydrocarbons, the release of effluent from wastewater treatment systems and the release of cement-based products have the potential to negatively impact on groundwater water quality at the Proposed Project site.

It is acknowledged that the Site is underlain by a Regionally Important Aquifer, however due to the basin peat geological setting, the groundwater vulnerability rating of the Site is mainly

Low to Moderate. This is because the majority of the Site is covered by low permeability peat as well as deep glacial deposits, which acts as a protective cover to the underlying aquifer. The low vulnerability rating means groundwater is much less sensitive to effects.

Any contaminants which may be accidently released on-site are more likely to travel to nearby streams within surface runoff. The deep and relatively low permeability of the glacial deposits means contaminants are unlikely to reach the bedrock and will instead disperse with the glacial deposits and would remain localised to the source or would be removed as runoff during wet periods.

In addition, groundwater seepages may occur in turbine base excavations, particularly those on lower elevations and this will create additional volumes of water to be treated by the drainage management system. Furthermore, temporary dewatering of excavations (turbine bases etc) may drawdown the local groundwater table.

Piling, which will likely be undertaken at some turbine locations, does not require active dewatering (albeit some temporary displacement of local groundwater may occur) and therefore has no potential to significantly affect groundwater levels during construction.

Groundwater flows in the bedrock of the borrow pit will be limited to localised flows in the upper weathered bedrock layers or localised weaknesses. No regional groundwater flows will be intercepted during the operation of the borrow pit.

Nevertheless, groundwater level impacts due to the Proposed Project are not anticipated to be significant due to the local hydrogeological regime. No groundwater level impacts are predicted from the construction of the collector cabling trench, access roads, substation, compound or met mast due to the relatively shallow nature of the excavation (i.e. 0 -~3m).

The Proposed Grid Connection Route and TDR works are also located in the Clare-Corrib GWB. However, due to the shallow, short-term and transient nature of the proposed works, there is no potential for any effects during earthworks and excavation works on the GWBs.

A summary of potential status change to GWBs arising from potential groundwater quality impacts during the construction phase of the Proposed Project in the unmitigated scenario are outlined in

Table H.

Table H: Groundwater Quality Impacts during Construction Phase (Unmitigated)

GWB	WFD Code	Current Status	Assessed Potential Status Change
Clare-Corrib	IE_WE_G_0020	Good	Good

4.2.1.5 Potential Protected Area Impacts

The hydrological and hydrogeological water connections from the Proposed Project could transfer poor quality surface water that may affect the conservation objectives of these designated sites. The designated sites included in this assessment and deemed to be hydrologically or hydrogeologically connected to the Proposed Project include:

Lough Corrib SAC: This SAC is located immediately downstream of the Proposed Wind Farm site, the Proposed Grid Connection. Any potential deterioration in surface water quality has the potential to affect this SAC.

Levally Lough SAC: There is no surface water connection between the Site and Levally Lough. However, given that the general groundwater flow direction in the area of the Site is to the south/southwest, it has to be assumed that Levally Lough is potentially down-gradient of the Site with respect to groundwater flow.

The groundwater level monitoring carried at the Site suggests that the Levally Stream is a local discharge zone for groundwater in the area of the Site. The fact that the Levally Stream separates the Site and Levally Lough, groundwater flows arising from the Site (especially shallow groundwater flows in the glacial deposits) are more likely to discharge into the Levally Stream rather than travel further south towards Levally Lough.

Also, due to the large coverage of peat, presence of deep glacial tills deposits and poorly draining soils across the Site, the risk to groundwater quality in the deeper karst limestone is low.

4.2.2 Operational Phase (Unmitigated)

Potential effects associated with the operational phase of the Proposed Project will be much reduced in comparison to the construction phase. Any effects will occur at the Site and will be associated with minor maintenance works or changes in runoff volumes associated with the footprint of the Proposed Project.

No maintenance works will be required along the Proposed Grid Connection Route or along the TDR and therefore there is no potential to impact on the status of downstream SWBs or underlying GWBs.

4.2.2.1 Increased Site Runoff and Hydromorphology Effects on River Water Bodies

Progressive replacement of the soil or vegetated surfaces with impermeable surfaces could potentially result in an increase in the proportion of surface water runoff reaching the surface water drainage network. This could potentially increase runoff from the Site and increase flood risk downstream of the Site.

As stated in the EIAR the emplacement of the Proposed Project infrastructure could result in an average total increase in surface water runoff of ~ 1,261m^3/month. During storm rainfall events, additional runoff coupled with increased velocity of flow could increase hydraulic loading, resulting in erosion of watercourses and causing hydromorphological effects. This represents a potential increase of approximately 0.3% in the average daily/monthly volume of runoff from the Site area in comparison to the baseline pre-development site runoff conditions.

This is a very small increase in average runoff and results from a relatively small area of the overall Proposed Project site being developed. Specifically, the Proposed Project footprint is approximately 17.5ha, representing 5% of the total EIAR Study Area of 353ha.

The additional volume is low due to the fact that the runoff potential from the Site is naturally high (94%). Also, this calculation assumes that all hardstanding areas will be impermeable which considered to be a worst-case scenario. The increase in runoff from most of the development catchment will therefore be imperceptible and this is before mitigation measures will be put in place. This water balance assessment demonstrates that even in the absence of mitigation, the potential to alter the water balance of the Site or downstream hydrology/morphology is imperceptible.

A summary of potential status change to SWBs arising from increased runoff during the operation stage of the Proposed Project in the unmitigated scenario are outlined in **Table I**.

Table I: Potential Impact on Surface Water Flows during Operational Phase (Unmitigated)

SWB	WFD Code	Current Status	Assessed Potential Status Change
Levally Stream_010	IE_WE_30L070100	Good	Good
Grange (Galway)_020	IE_WE_30G020400	Good	Good
Grange (Galway)_030	IE_WE_30G020500	Good	Good
Grange (Galway)_040	IE_WE_30G020700	Good	Good
Sinking_020	IE_WE_30S010300	Good	Good
Sinking_030	IE_WE_30S010400	Good	Good

4.2.2.2 Surface Water Quality Impacts from Operational Site Drainage

During the operational phase, the potential for silt-laden runoff is much reduced compared to the construction phase. In addition, all permanent drainage controls will be in place and the disturbance of ground and excavation works will be complete. Some minor maintenance works may be completed, such as maintenance of site entrances, internal roads and hardstand areas. These works would be of a very minor scale and would be very infrequent. Potential sources of sediment laden water would only arise from surface water runoff from small areas where new material is added during maintenance works.

A summary of potential status change to SWBs arising from surface water quality impacts during the operation stage of the proposed development in the unmitigated scenario are outlined in

Table J.

Table J: Surface Water Quality Impacts during Operational Phase (Unmitigated)

SWB	WFD Code	Current Status	Assessed Potential Status Change
Levally Stream_010	IE_WE_30L070100	Good	Good
Grange (Galway)_020	IE_WE_30G020400	Good	Good
Grange (Galway)_030	IE_WE_30G020500	Good	Good
Grange (Galway)_040	IE_WE_30G020700	Good	Good
Sinking_020	IE_WE_30S010300	Good	Good
Sinking_030	IE_WE_30S010400	Good	Good

4.2.2.3 Potential Protected Area Impacts

During the operational phase, the potential for silt-laden runoff is much reduced compared to the construction phase. In addition, all permanent drainage controls will be in place and the disturbance of ground and excavation works will be complete.

Therefore, the risk of any operational phase activities that may affect the conservation objectives of the protected areas is greatly reduced.

4.3 MITIGATION MEASURES

In order to mitigate against the potential negative effects on surface and groundwater quality, quantity and flow patterns, mitigation measures will be implemented during the construction and operational phases of the Proposed Project. These are outlined below.

4.3.1 Construction Phase

4.3.1.1 Mitigation Measures to Protect Surface Water Quality during Earthworks

A suite of general SuDs drainage controls available for surface water management are summarised (along with their application) in **Table** K below. These include avoidance controls, source controls, in-line controls, water treatment controls, and outfall controls.

Table K: Summary of Drainage Mitigation & their Application

Management Type	Description of SuDs drainage control method	Applicable Works Area
Avoidance Controls:	• Application of buffer zones to natural watercourses where possible to avoid excavations in close proximity to watercourses and avoid the release of suspended sediment into watercourses; • Using small working areas; and, • Working in appropriate weather and suspending certain work activities in advance of forecasted wet weather.	Construction work areas where sediment is being generated.
Source Controls:	• Use of upstream interceptor drains and downstream collector drains, vee-drains, diversion drains, flumes and culvert pipes.	Construction work areas where sediment is being generated.
	• Using small working areas; • Covering stockpiles; • Weathering off / sealing stockpiles and promoting vegetation growth.	Stockpiles areas
In-Line Controls:	• Interceptor drains, vee-drains, oversized swales/collector drains; • Erosion and velocity control measures such as: o sand bags; o oyster bags filled with gravel; o filter fabrics; o straw bales; o flow limiters; o weirs or baffles; o and/or other similar/equivalent or appropriate systems. • Silt fences, filter fabrics; • Collection sumps, temporary sumps, pumping systems; • Attenuation lagoons; • Sediment traps, stilling / settlement ponds.	Interceptor and collection drainage systems
Water Treatment Controls:	• Temporary sumps; • Attenuation ponds; • Temporary storage lagoons; • Sediment traps, Stilling / Settlement ponds, silt bags;	Surface water treatment locations

Management Type	Description of SuDs drainage control method	Applicable Works Area
	• Proprietary settlement systems such as Siltbuster, and/or other similar/equivalent or appropriate systems.	
Outfall Controls:	• Levelspreaders; • Buffered outfalls; • Vegetation filters; • Silt bags; • Flow limiters and weirs.	Drainage run outfalls and overland discharge points

Each element of the Proposed Project will have an array of drainage control measures to ensure protection of downstream watercourses. Each drainage control element is not stand alone but occurs as part of a treatment train of control systems (i.e., check dams, silt traps, settlement ponds etc).

4.3.1.2 Mitigation Measures to Water Quality during Excavation Dewatering

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

- Appropriate interceptor drainage, to prevent upslope surface runoff from entering excavations will be put in place;
- If required, pumping of excavation inflows will prevent build-up of water in the excavation;
- The interceptor drainage will be discharged to the site constructed drainage system or onto natural vegetated surfaces and not directly to surface waters;
- The pumped water volumes will be discharged via volume and sediment attenuation ponds adjacent to excavation areas, or via specialist treatment systems such as a Siltbuster unit;
- There will be no direct discharge to surface watercourses, and therefore no risk of hydraulic loading or contamination will occur;
- Daily monitoring of excavations by a suitably qualified person will occur during the construction phase. If high levels of seepage inflow occur, excavation work should immediately be stopped and a geotechnical assessment undertaken; and,
- A mobile 'Siltbuster' or similar equivalent specialist treatment system will be available on-site for emergencies in order to treat sediment polluted waters from settlement ponds or excavations should they occur. Siltbusters are mobile silt traps that can remove fine particles from water using a proven technology and hydraulic design in a rugged unit. The mobile units are specifically designed for use on construction-sites. They will be used as a final line of defence if needed.

4.3.1.3 Mitigation Measures to Protect Against the Release of Hydrocarbons

Mitigation measures proposed to avoid the release of hydrocarbons at the Wind Farm site and along the Grid Connection route include:

- Minimal refuelling or maintenance of vehicles or plant will take place on-site. Off-site refuelling will occur where possible;
- On site re-fuelling of machinery will be carried out using a mobile double skinned fuel bowser;
- The fuel bowser, a double-axel custom-built refuelling trailer will be re-filled off site, and will be towed around the site by a 4x4 jeep to where machinery is located;
- The 4x4 jeep will also carry fuel absorbent material and pads in the event of any accidental spillages;
- The fuel bowser will be parked on a level area in the construction compound when not in use and only designated trained and competent operatives will be authorised to refuel plant on site;

- Mobile measures such as drip trays and fuel absorbent mats will be used during all refuelling operations;
- Onsite refuelling will be carried out by trained personnel only;
- Fuels stored on site will be minimized and will be appropriately bunded;
- Surface water runoff from temporary construction compounds will be collected and drained via silt traps and hydrocarbons interceptors prior to recharge to ground;
- A permit to fuel will be put in place;
- The plant used during construction will be regularly inspected for leaks and fitness for purpose;
- An emergency plan for the construction phase to deal with accidental spillages is included within the Construction and Environmental Management Plan; and,
- Spill kits will be available to deal with any accidental spillage in and outside the re-fuelling area.

4.3.1.4 Mitigation Measures to Prevent Groundwater and Surface Water Contamination from Wastewater Disposal

Mitigation measures proposed to avoid the release of wastewater at the Wind Farm site include:

- It is proposed to manage wastewater from the staff welfare facilities in the control buildings/substation by means of a sealed storage tank, with all wastewater being tankered off site by permitted waste collector to wastewater treatment plants. It is not proposed to treat wastewater on-site.

4.3.1.5 Mitigation Measures to Prevent the Release of Cement-Based Products

Best practice methods for cement-based compounds:

- No batching of wet-concrete products will occur on site. Ready-mixed supply of wet concrete products and where possible, emplacement of pre-cast elements, will take place;
- Where possible pre-cast elements for culverts and concrete works will be used;
- Where concrete is delivered on site, only the chute will be cleaned, using the smallest volume of water practicable. No discharge of concrete contaminated waters to the construction phase drainage system or directly to any artificial drain or watercourse will be allowed. Chute cleaning water will be undertaken at lined concrete washout ponds;
- Weather forecasting will be used to plan dry days for pouring concrete; and,
- The pour site will be kept free of standing water and plastic covers will be ready in case of sudden rainfall event.

4.3.1.6 Mitigation Measures to Prevent Morphological Changes to Surface Water Crossing and Drainage Patterns

The proposed mitigation measures include:

- All proposed new stream crossings will be bottomless or clear span culverts and the existing banks will remain undisturbed. No in-stream excavation works are proposed and therefore there will be no direct impact on the stream at the proposed crossing location;
- Where the proposed cable route follows an existing road or road proposed for upgrade, the cable will pass over or below the culvert within the access road;

- All guidance / mitigation measures proposed by the OPW or the Inland Fisheries Ireland1 is incorporated into the design of the proposed crossings;
- As a further precaution, near stream construction work, will only be carried out during the period permitted by Inland Fisheries Ireland for in-stream works according to the Eastern Regional Fisheries Board (2004) guidance document "Requirements for the Protection of Fisheries Habitat during Construction and Development Works at River Sites", i.e., May to September inclusive. This time period coincides with the period of lowest expected rainfall, and therefore minimum runoff rates. This will minimise the risk of entrainment of suspended sediment in surface water runoff, and transport via this pathway to surface watercourses (any deviation from this will be done in discussion with the IFI);
- During the near stream construction work double row silt fences will be emplaced immediately down-gradient of the construction area for the duration of the construction phase. There will be no batching or storage of cement allowed in the vicinity of the crossing construction areas; and,
- All new river/stream crossings will require a Section 50 application (Arterial Drainage Act, 1945). The river/stream crossings will be designed in accordance with OPW guidelines/requirements on applying for a Section 50 consent.

4.3.1.7 Mitigation Measures to Prevent Water Quality Effect to surface Watercourses along the Proposed Grid Connection Route

Prior to the commencement of substation, cable trenching, access road or end mast works the following key temporary drainage measures will be installed:

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

The following mitigation measures are proposed for the underground cabling watercourse crossing works:

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

[1] Inland Fisheries Ireland (2016): Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters

- The area around the Clear Bore™ (or similar alternative) batching, pumping and recycling plants will be bunded using terram and sandbags in order to contain any spillages;
- One or more lines of silt fences will be placed between the works area and adjacent rivers and streams on both banks;
- Accidental spillage of fluids will be cleaned up immediately and transported off site for disposal at a licensed facility; and,
- Adequately sized skips will be used for temporary storage of drilling arisings during directional drilling works. This will ensure containment of drilling arisings and drilling flush.

4.3.1.8 Mitigation Measures for Clear-Felling

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

There is a requirement in the Forest Service Code of Practice and in the FSC Certification Standard for the installation of buffer zones adjacent to aquatic zones at planting stage. Minimum buffer zone widths recommended in the Forest Service (2000) guidance document "Forestry and Water Quality Guidelines" will be adhered to during felling operations. The setback distance from sensitive hydrological features means that adequate room is maintained for the proposed mitigation measures (discussed below) to be properly installed and operate effectively.

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

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

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

In addition felling works will only be completed during periods of low rainfall and all drains will be inspected and maintained before, during and after the proposed felling works.

4.3.1.9 Mitigation Measures to Protect Groundwater Quality

The potential pollution of groundwater during the construction phase will be mitigated by the provision of appropriate controls and working methods. These include best practice methods for storage and handling of fuels and chemicals and wastewater outlined in Sections 4.3.1.3, 4.3.1.4 and 4.3.1.5 above.

4.3.1.10 Mitigation Measures to Protect Water Quality along the Turbine Delivery Route

Proposed Mitigation Measures:

- All works are minor and localised and cover very small areas;
- These works are distributed over a wide area;
- All works are temporary in nature; and,
- Application of the Pre-Construction Drainage Measures for surface water quality protection.

4.3.1.11 Mitigation Measures to Protect Water Quality at the Gurteen/Cloonmore GWS Source

- No storage of fuels, oils, cements or chemicals will be permitted within the refined ZoC;
- Refuelling of mobile plant (i.e. diggers, dumpers etc) will only be permitted outside the refined ZoC;
- Refuelling of large immobile plant (i.e. cranes) will only be carried out with a double skinned fuel bowser that will be removed from ZoC immediately after use;
- Spill kit stations will be present at each turbine location (T1, T2, T3 and T4);
- There will be no long term storage of peat/spoil inside the ZoC;
- An impermeable liner will be placed below the founding layer where concrete is to be poured;
- All cement washout lagoons will be located outside the ZoC; and,
- A protective layer of in-situ overburden (2 -3m) will remain above the top of bedrock where gravity foundation excavations are required for groundwater quality protection.

4.3.1.12 Mitigation Measures for Protected Areas

The potential for material to enter the downstream protected areas is negligible as mitigation controls as described above will be implemented. These measures include the use of silt fences, silt traps and check dams. Emphasis will also be placed on prevention of hydrocarbon releases to local watercourses.

It can be concluded that with best practice methods adhered to during the construction of the Proposed Project, the potential to affect the qualifying interests of downstream designated sites is not significant.

4.3.2 Operational Phase

4.3.2.1 Increased Site Runoff and Hydromorphology Effects

The operational phase drainage system of the Proposed Development will be installed and constructed in conjunction with the road and hardstanding construction work as described below:

- Interceptor drains will be installed up-gradient of all proposed infrastructure to collect clean surface runoff, in order to minimise the amount of runoff reaching areas where suspended sediment could become entrained. It will then be directed to areas where it can be re-distributed over the ground by means of a level spreader;
- Swales/road-side drains will be used to collect runoff from access roads and turbine hardstanding areas of the site, likely to have entrained suspended sediment, and channel it to settlement ponds for sediment settling;
- On steep sections of access road transverse drains ('grips') will be constructed in the surface layer of the road to divert any runoff off the road into swales/road side drains;
- Check dams will be used along sections of access road drains to intercept silts at source. Check dams will be constructed from a 4/40mm non-friable crushed rock;
- Settlement ponds, emplaced downstream of road swale sections and at turbine locations, will buffer volumes of runoff discharging from the drainage system during periods of high rainfall, by retaining water until the storm hydrograph has receded, thus reducing the hydraulic loading to watercourses; and,
- Settlement ponds have been designed in consideration of the greenfield runoff rate.

4.3.2.2 Mitigation Measures to Protect Surface Water Quality

The mitigation measures to protect against poor quality runoff during the operational phase of the Proposed Project are the same as those outlined in **Section 4.3.1.1** above.

Mitigation measures for oils and fuels during the operational phase of the Proposed Project are the same as those outlined in **Section 4.3.1.3** above.

4.3.2.3 Mitigation Measures to Protect Groundwater Quality

It is proposed to manage wastewater from the staff welfare facilities in the control buildings by means of a sealed storage tank, with all wastewater being tankered off site by permitted waste collector to wastewater treatment plants.

4.3.2.4 Mitigation Measures for Protected Areas

The mitigation measures to protect against poor quality runoff during the operational phase of the proposed development are the same as those outlined in **Section 4.3.1.1** above.

Mitigation measures for oils and fuels during the operational phase of the proposed development are the same as those outlines in **Section 4.3.1.3** above.

It can be concluded that with best practice methods adhered to during the operation phase of the Proposed Project, the potential for the project to impact upon the qualifying interests of the local designated sites is not significant.

4.3.1 Decommissioning Phase

The potential impacts associated with decommissioning of the Proposed Project will be similar to those associated with construction but of a reduced magnitude, due to the reduced scale of the proposed decommissioning works in comparison to construction phase works.

During decommissioning, it will be possible to reverse or at least reduce some of the potential effects caused during construction, and to a lesser extent operation, by rehabilitating constructed areas such as turbine bases and hard standing areas. This will be done by covering with peatland vegetation/scraw or poorly humified peat to encourage vegetation growth and reduce run-off and sedimentation.

The Wind Farm Site roadways will be kept and maintained following decommissioning of the turbine infrastructure, as these will be utilised by ongoing forestry works and by local farmers. The electrical cabling connecting the site infrastructure to the on-site substation will be removed, while the ducting itself will remain in-situ rather than excavating and removing it, as this is considered to have less of a potential environmental impact, in terms of soil exposure, and thus on the possibility of the generation of suspended sediment which could enter nearby watercourses.

The turbines will be removed by disassembling them in a reverse order to their erection. This will be completed using the same model cranes as used in their construction. They will then be transported off-site along their original delivery route. The disassembly and removal of the turbines will not have an impact on the hydrological/hydrogeological environment at the Wind Farm Site.

Other impacts such as possible soil compaction and contamination by fuel leaks will remain but will be of reduced magnitude than the construction phase because of the smaller scale of the works and reduced volumes on-site.

As noted in the Scottish Natural Heritage report (SNH) Research and Guidance on Restoration and Decommissioning of Onshore Wind Farms (SNH, 2013) reinstatement proposals for a wind farm are made approximately 30 years in advance, so within the lifespan of the wind farm, technological advances and preferred approaches to reinstatement are likely to change. According to the SNH guidance, it is, therefore:

> *"best practice not to limit options too far in advance of actual decommissioning but to maintain informed flexibility until close to the end-of-life of the wind farm".*

Some of the impacts will be avoided by leaving elements of the Proposed Project in place where appropriate. The substation will be retained by EirGrid as a permanent part of the national grid. The turbine bases will be rehabilitated by covering with local topsoil/peat in order to regenerate vegetation which will reduce runoff and sedimentation effects. Mitigation measures to avoid contamination by accidental fuel leakage and compaction of soil by on-site plant will be implemented as per the construction phase mitigation measures.

No significant effects on the hydrological and hydrogeological environment are envisaged during the decommissioning stage of the Proposed Project.

4.3.2 Potential Effects with the Implementation of Mitigation

In all instances, the mitigation measures described in **Section 4.3** will allow all relevant waterbodies to maintain their existing status and meet future WFD Objectives. The assessment of WFD elements for the WFD waterbodies is summarised in **Table L** below.

Table L: Summary of WFD Status for Unmitigated and Mitigated Scenarios

SWB	WFD Code	Current Status	Assessed Potential Status Change – Unmitigated	Assessed Potential Status Change – Mitigated
Surface Water Bodies				
Levally Stream_010	IE_WE_30L070100	Good	Moderate	Good
Grange (Galway)_020	IE_WE_30G020400	Good	Moderate	Good
Grange (Galway)_030	IE_WE_30G020500	Good	Good	Good
Grange (Galway)_040	IE_WE_30G020700	Good	Good	Good
Sinking_020	IE_WE_30S010300	Good	Good	Good
Sinking_030	IE_WE_30S010400	Good	Good	Good
Clare (Galway)_020	IE_WE_30C010300	Good	Good	Good
Groundwater Body				
Clare-Corrib	IE_WE_G_0020	Good	Good	Good

5. WFD ASSESSMENT CONCLUSION

WFD status for SWBs (Surface Water Bodies) and GWBs (Groundwater Bodies) hydraulically linked to the Proposed Project are defined in **Section 2** above.

The Proposed Project does not involve any abstraction of groundwater or alteration of drainage patterns. Therefore, the quantitative status (i.e., the available quantity (volume) of groundwater and surface water locally) to the receiving waters will remain unaltered during the construction and operational phase of the Proposed Project.

There is no direct discharge from the Proposed Wind Farm site to downstream receiving waters. Mitigation for the protection of surface water during the construction, operation and decommissioning phases of the Proposed Project will ensure the qualitative status of the receiving waters will not be altered by the Proposed Project.

There is also mitigation proposed to protect groundwater quality within the Proposed Project site during the construction, operational and decommissioning phases of the Proposed Project. These mitigation measures will ensure the qualitative status of the underlying GWB will not be altered by the Proposed Project.

There will be no change in GWB or SWB status in the underlying GWB or downstream SWBs resulting from the Proposed Project. There will be no change in quantitative (volume) or qualitative (chemical) status, and the underlying GWB and downstream SWBs are protected from any potential deterioration.

As such, the Proposed Project:

- will not cause a deterioration in the status of all surface and groundwater bodies assessed;
- will not jeopardise the objectives to achieve 'Good' surface water/groundwater status;
- does not jeopardise the attainment of 'Good' surface water/groundwater chemical status;
- does not jeopardise the attainment of 'Good' surface water/groundwater quantity status;
- does not permanently exclude or compromise the achievement of the objectives of the WFD in other waterbodies within the same river basin district;
- is compliant with the requirements of the Water Framework Directive (2000/60/EC); and,
- is consistent with other Community Environmental Legislation including the EIA Directive (2014/52/EU), the Habitats Directive (92/43/EEC) and the Birds Directive (2009/147/EC).

* * * * * * * * * * * * * *