APPENDIX 9-4

WFD Report

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WATER FRAMEWORK DIRECTIVE COMPLIANCE ASSESSMENT
KILLOSHULAN WIND FARM
CO. KILKENNY

FINAL REPORT

Prepared for:

KILLOSHULAN RENEWABLE ENERGY LIMITED

Prepared by:

HYDRO-ENVIRONMENTAL SERVICES

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1. INTRODUCTION

1.1 BACKGROUND

Hydro-Environmental Services (HES) were engaged by MKO Ireland, on behalf of Killoshulan Renewable Energy Limited to complete a Water Framework Directive (WFD) Compliance Assessment for the Proposed Wind Farm and Proposed Grid Connection (Proposed Project) at Killoshulan and adjacent townlands near Freshford, Co. Kilkenny.

This WFD Compliance Assessment is written to accompany Chapter 9 of the Environmental Impact Assessment Report (EIAR) for the Proposed Project. The Proposed Project (Proposed Wind Farm and Proposed Grid Connection) is described in full in Chapter 4 of the EIAR. For the purposes of this WFD Compliance Assessment, and consistent with the EIAR, the various components are described and assessed using the following references: 'Proposed Project', 'Proposed Wind Farm site', Proposed Grid Connection' and the 'Site'.

The purpose of this WFD assessment is to determine if any specific components or activities associated with the Proposed Project will compromise WFD objectives or cause a deterioration in the status of any surface water or groundwater body and/or jeopardise the attainment of good surface water or groundwater status. This assessment will determine the water bodies with the potential to be impacted, describe the proposed mitigation measures and determine if the project is in compliance with the objectives of the WFD.

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 geological, 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 Nitesh Dalal, David Broderick and Michael Gill.

Nitesh Dalal (B.Tech, PG Dip., MSc) is an Environmental Scientist with over 7 years' experience in environmental consultancy and environmental management in India and over 2 years environmental consultancy experience in Ireland. Nitesh holds a M.Sc. in Environmental Science from University College Dublin (2024), a PG Diploma in Health, Safety and Environment from Annamalai University, India (2021) and B.Tech. in Environmental Engineering (2016) from Guru Gobind Singh Indraprastha University, India (2016).

David Broderick (P. Geo., BSc, H. Dip Env Eng, MSc) is a Hydrogeologist with over 19 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 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 Clonberne Wind Farm, Cooloo Wind Farm, and Ballyouskill Wind Farm, and over 60 other wind farm related projects across the country.

Michael Gill (P. Geo., B.A.I., MSc, Dip. Geol., MIEI) is an Environmental Engineer/Hydrologist with over 24 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 Sheskin Wind Farm, Seven Hills Wind Farm, and Ballydermot Wind Farm, and over 100 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, 2014/101/EU and 2026/805 ("**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, and the third cycle covers the period from 2022 to 2027[1]. The RBMPs are forward looking.

The Water Action Plan 2024 is Ireland's 3rd River Basin Management Plan (2022 - 2027). The objectives of the Water Action Plan 2024 have been integrated into the design of the Proposed Project and include:

- Ensure full compliance with relevant EU legislation;
- Prevent deterioration;
- Meet the water standards and objectives for designated protected areas;
- Protect high-status waters; and,
- Implement targeted action and pilot schemes in focus sub-catchments aimed at (i) targeting water bodies close to meeting their objective and (ii) addressing more complex issues that will build knowledge for future cycles.

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.

[1] *The WFD RBMP cycles are forward looking plans, so 2009-2015 (1st Cycle), 2016-2021 (2nd Cycle), and 2022-2027 (3rd Cycle) are the plans and they use status from the previous 6 years.*
The EPA updates status every three years, but they also complete an additional assessment mid-RBMP cycle. The mid-cycle status does not get reported to the Commission.
The linkage between the two is that the 2nd Cycle plan uses the 2009-2015 status, the 3rd Cycle plan uses the 2016-2021 status. The 2013-2018 status was not used in the RBMP and the 2019-2024 status will not be used in the next RBMP.

2. WATERBODY IDENTIFICATION CLASSIFICATION

2.1 INTRODUCTION

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

2.2 SURFACE WATERBODY IDENTIFICATION

Proposed Wind Farm:

Regionally, the Proposed Wind Farm located within the Nore WFD Catchment within Hydrometric Area No. 15 of the South-Eastern River Basin District.

On a more local scale, the majority of the Proposed Wind Farm site (including all Proposed Wind Farm infrastructure) is mapped within the Nore_SC_070 river sub-catchment with a very small area on northwest mapped within the Goul_SC_010 river sub-catchment where there is no Proposed Wind Farm infrastructure.

Within the Goul_SC_010 river sub-catchment, the Proposed Wind Farm site is mapped within the Goul_040 and Goul_050 river sub-basin and within the Nore_SC_070 river sub-catchment, the majority of the Proposed Wind Farm site is mapped within the Gorteenahilla_010 river sub-basin with the southeastern part mapped within the Nuenna_010 river sub-basin and eastern part mapped within the Nuenna_020 river sub-basin.

Within the Goul_040 river sub-basin, the Goul_040 river is mapped ~4.4km east of the Proposed Wind Farm site and flows north to drain out into the Goul_050 river. Within the Goul_050 river sub-basin, the Goul_050 river is mapped ~1.4km north of the Proposed Wind Farm site and flows in a north-westerly direction into the Goul_060 river waterbody which flows into the Nore river via Erkina_050 river. Within the Nuenna_010 river sub-basin, the tributary of the Nuenna_010 river originates adjacent to the Proposed Wind Farm site boundary and flows south and then east to drain into the Nuenna_020 river waterbody. Within the Nuenna_020 river sub-basin, the Nuenna_020 river is ~450m south of the Proposed Wind Farm site and flows east towards the River Nore. Within the Gorteenahilla_010 river sub-basin, the Gorteenahilla_010 river waterbody passes through the Proposed Wind Farm site and flows in towards east towards the Nuenna_020 river waterbody.

Table A presents the catchment area of each waterbody downstream of the Proposed Wind Farm site. The catchment area for the waterbodies increases progressively downstream as more tributaries discharge into the Goul and Nore Rivers. Therefore, those waterbodies which are in close proximity to the Site are more susceptible to water quality impacts as a result of activities associated with the Proposed Wind Farm. The potential for the Proposed Project to impact a waterbody decreases further downstream due to the increasing catchment area to the surface waterbody and resulting increase in flow volumes. This is especially the case for the River Nore waterbody itself.

Table A: Catchment Area Downstream of Proposed Wind Farm

WFD River Sub-Basin	Total Upstream Catchment Area (km²)
Nore WFD Catchment	
Gorteenahilla_010	~22
Nuenna_010	~23
Nuenna_020	~92
Goul_040	~118
Goul_050	~136
Goul_060	~159
Ekrina_050	~380
Nore_110	~947
Nore_120	~1059
Nore_130	~1067
Nore_140	~1105
Nore_150	~1235
Nore_160	~1516
Nore_170	~1647
Nore_180	~1705
Nore_190	~1746
Nore_200	~1769
Nore_210	~2222
Nore_220	~2305
Nore_230	~2358
Nore_240	~2418
Nore_250	~2446

Proposed Grid Connection:

Regionally, the Proposed Grid Connection is located within the Nore WFD Catchment within Hydrometric Area No. 15 of the South-Eastern River Basin District.

On a more local scale, the majority of the Proposed Grid Connection is mapped within the Nore_SC_070 river sub-catchment with a short section in east mapped within the Nore_SC_060 river sub-catchment.

Within the Nore_SC_060 river sub-catchment, the Proposed Grid Connection is mapped within the Nore_120 river sub-basin and within the Nore_SC_070 river sub-catchment, the Proposed 110kV Underground Cabling from west to east is mapped within the Gorteenahilla_010, Nore_150, Lisdowney_010, Nore_140 and Nore_120 river sub-basins.

Within the Gorteenahilla_010 river sub-basin, the Proposed 110kV Underground Cabling crosses the Gorteenahilla_010 river twice which flows in southeast and drains into the Nuenna_020 which further flows down into the Nore_150 river. Within the Nore_150 river sub-basin, the Nore_150 river is mapped ~350m south of the Proposed 110kV Underground Cabling which flows in southwest direction and drains into the Nore_160 river. Within the Lisdowney_010 river sub-basin, the Proposed 110kV Underground Cabling crosses the Lisdowney_010 river which flows in southeast and drains into the Nore_140 river. Within the Nore_140 river sub-basin, the Proposed 110kV Underground Cabling crosses the Nore_140 river which flows in southwest and then in south to drain into the Nore_150 river. Within the Nore_120 river sub-basin, the Proposed 110kV Underground Cabling crosses the Nore_120 river which flows in south to drain out into the Nore_130 river.

Table B presents the catchment area of each waterbody downstream of the Proposed Grid Connection. The catchment area for the waterbodies increases progressively downstream as more tributaries discharge into the River Nore. Therefore, those waterbodies which are in close proximity to the Proposed Grid Connection are more susceptible to water quality impacts

because of activities associated with the Proposed Grid Connection. The potential for the Proposed Project to impact a waterbody decreases further downstream due to the increasing catchment area to the surface waterbody and resulting increase in flow volumes.

Table B: Catchment Area Downstream of Proposed Grid Connection

WFD River Sub-Basin	Total Upstream Catchment Area (km²)
Nore WFD Catchment	
Gorteenahilla_010	~22
Nuenna_020	~92
Lisdowney_010	~13
Nore_120	~1059
Nore_130	~1067
Nore_140	~1105
Nore_150	~1235
Nore_160	~1516
Nore_170	~1647
Nore_180	~1705
Nore_190	~1746
Nore_200	~1769
Nore_210	~2222
Nore_220	~2305
Nore_230	~2358
Nore_240	~2418
Nore_250	~2446

Turbine Delivery Route (TDR) Accommodation Works:

Regionally, the Turbine Delivery Route (TDR) Accommodation works are located within the Nore WFD Catchment within Hydrometric Area No. 15 of the South-Eastern River Basin District.

On a more local scale, the TDR Accommodation works are mapped within the Nore_SC_070 and Goul_SC_010 river sub-catchments. Within the Nore_SC_070 river sub-catchment, the TDR Accommodation works are mapped within the Nuenna_010 river sub-basin and within the Goul_SC_010 river sub-catchment, the TDR Accommodation works are mapped within the Goul_030 river sub-basin.

Within the Nuenna_010 river sub-basin, the tributary Nuenna_010 river is mapped ~300m west of the TDR Accommodation works and flows south into the Nuenna_010 river which then flows to the east and drains into the Nuenna_020 river. Within the Goul_030 river sub-basin, the closest TDR Accommodation works to the Goul_030 river is ~80m west. The Goul_030 river flows northwest and drains out into the Goul_040 river.

Table C presents the catchment area of each waterbody downstream of the TDR Accommodation works. The catchment area for the waterbodies increases progressively downstream as more tributaries discharge into the Nuenna, Goul and Nore Rivers. Therefore, those waterbodies which are in close proximity to the TDR Accommodation works are potentially more susceptible to water quality impacts as a result of these activities. The potential for the Proposed Project to impact a waterbody decreases further downstream due to the increasing catchment area to the surface waterbody and resulting increase in flow volumes.

Table C: Catchment Area Downstream of TDR Accommodation Works

WFD River Sub-Basin	Total Upstream Catchment Area (km²)
Nore WFD Catchment	
Nuenna_010	~23
Nuenna_020	~92
Goul_030	~87
Goul_040	~118
Goul_050	~136
Goul_060	~159
Ekrina_050	~380
Nore_110	~947
Nore_120	~1059
Nore_130	~1067
Nore_140	~1105
Nore_150	~1235
Nore_160	~1516
Nore_170	~1647
Nore_180	~1705
Nore_190	~1746
Nore_200	~1769
Nore_210	~2222
Nore_220	~2305
Nore_230	~2358
Nore_240	~2418
Nore_250	~2446

The river waterbodies in the immediate vicinity and downstream of the Proposed Project are shown in **Figure A.**

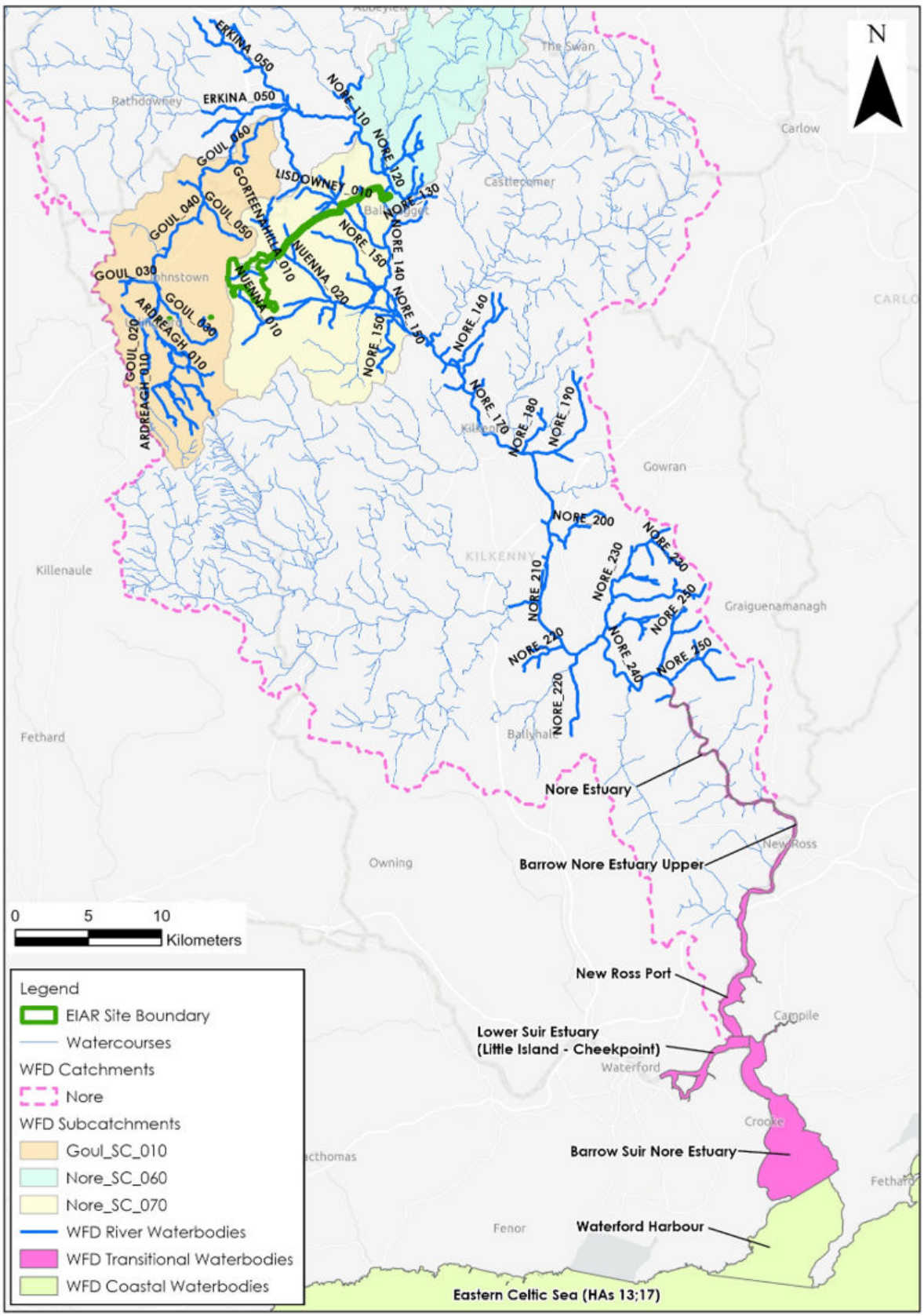


Figure A: Regional Hydrology Map

2.3 SURFACE WATER BODY CLASSIFICATION

A summary of the WFD status and risk result for Water Bodies (SWBs) downstream of the Proposed Project are shown in **Table D**. The overall status 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).

As described in **Section 2.2** above, the Proposed Wind Farm and the Proposed Grid Connection are drained by the Gorteenahilla_010 which have achieved "Moderate" status in the latest WFD cycle (2019-2024) and is 'at risk' of failing to achieve its WFD objectives with Forestry and Agriculture as identified significant pressure on this SWB. The southern side of the Proposed Wind Farm is drained by Nuenna_010 and Nuenna_020 river sub-basin. The Nuenna_010 have achieved "Moderate" status in the latest WFD cycle and is 'at risk' with agriculture as identified significant pressure on this SWB which the Nuenna_020 have achieved "Poor" status in the latest WFD cycle and is 'at risk' of failing to achieve its WFD objectives with Agriculture and Urban wastewater as identified significant pressure on this SWB.

The TDR accommodation works are mapped within the Goul_030 river sub-basin and the northwestern part of the Proposed Wind Farm is mapped within the Goul_040 and Goul_050 river sub-basin. The Goul_030 and Goul_050 have achieved "Moderate" status in the latest WFD cycle and is 'at risk' of failing to achieve its WFD objectives with agriculture as identified significant pressure on these SWBs while the Goul_040 have achieved "Poor" status in the latest WFD cycle and is 'at risk' of failing to achieve its WFD objectives with Forestry and agriculture as identified significant pressure on this SWB. Downstream of the Goul_050, the Goul_060 have achieved "Poor" status in the latest WFD cycle and is 'at risk' with Agriculture and Hydromorphology as identified significant pressure, the Ekrina_050 have achieved "Moderate" status and is 'at risk' with Agriculture as identified significant pressure and the Nore_110 have achieved "Good" status and is 'not at risk' of failing to achieve its WFD objectives.

The Proposed Grid Connection is drained by the Lisdowney_010, Nore_120, Nore_140 and Nore_150 river sub-basins. The Lisdowney_120 achieved "Moderate" status in the latest WFD cycle and is 'at risk' of failing to achieve its WFD objectives with agriculture as identified significant pressure in this SWB. The Nore_120, 150, 170 to 190 and 210 to 240 achieved "Moderate" status while the Nore_130, 140, 160, 200 and 250 have achieved "Good" status in the latest WFD cycle. In terms of risk status, the Nore_120 and 230 are 'at risk', the Nore_190 to 220 and 240 are under review and the Nore_130 to 180 and 250 is 'not at risk' of failing to achieve its WFD objectives. Agriculture is identified significant pressure on Nore_120 and Urban run-off is the identified significant pressure on the Nore_230 SWB.

In terms of transitional waterbodies, the Nore Estuary, Barrow Nore Estuary Upper, New Ross Port, Lower Suir Estuary (Little Island - Cheekpoint) and Barrow Suir Nore Estuary transitional water bodies have achieved "Moderate" status in the latest WFD cycle and are 'at risk' of failing to achieve its WFD objectives with Agriculture as identified significant pressure on these SWBs. Urban run-off is additional significant pressure on the Barrow Nore Estuary Upper transitional waterbody.

In terms of coastal waterbodies, the Waterford Harbour have achieved "Good" status in the latest WFD cycle and is 'at risk' of failing to achieve its WFD objectives with Agriculture and Urban run-off as identified significant pressure on this SWB while the Eastern Celtic Sea (HAs 13;17) have achieved "High" status in the latest WFD cycle and is 'not at risk' of failing to achieve its WFD objectives. The SWB status for the 2019-2024 WFD cycle is shown on **Figure B.**

Table D: Summary WFD Information for Water Bodies

SWB	Overall Status 2013-2018	Overall Status 2016-2021	Overall Status 2019-2024	Risk Status 3rd Cycle	Pressures
Gorteenahilla_010	Poor	Moderate	Moderate	At risk	Forestry and Agriculture
Lisdowney_010	Good	Moderate	Moderate	At risk	Agriculture
Nuenna_010	Moderate	Moderate	Moderate	At risk	Agriculture
Nuenna_020	Moderate	Poor	Poor	At risk	Agriculture and Urban wastewater
Goul_030	Moderate	Moderate	Moderate	At risk	Agriculture
Goul_040	Moderate	Poor	Poor	At risk	Forestry and Agriculture
Goul_050	Moderate	Moderate	Moderate	At risk	Agriculture
Goul_060	Poor	Poor	Poor	At risk	Agriculture and Hydromorphology
Ekrina_050	Moderate	Moderate	Moderate	At risk	Agriculture
Nore_110	Good	Good	Good	Not at risk	None
Nore_120	Good	Moderate	Moderate	At risk	Agriculture
Nore_130	Good	Good	Good	Not at risk	None
Nore_140	Good	Good	Good	Not at risk	None
Nore_150	Good	Good	Moderate	Not at risk	None
Nore_160	Good	Good	Good	Not at risk	None
Nore_170	Good	Good	Moderate	Not at risk	None
Nore_180	Good	Good	Moderate	Not at risk	None
Nore_190	Moderate	Moderate	Moderate	Under review	-
Nore_200	Moderate	Good	Good	Under review	-

Nore_210	Good	Good	Moderate	Under review	-
Nore_220	Moderate	Good	Moderate	Under review	-
Nore_230	Moderate	Moderate	Moderate	At risk	Urban run-off
Nore_240	Moderate	Good	Moderate	Under review	-
Nore_250	Good	Good	Good	Not at risk	None
Nore Estuary	Good	Moderate	Moderate	At risk	Agriculture
Barrow Nore Estuary Upper	Moderate	Moderate	Moderate	At risk	Agriculture and Urban run-off
New Ross Port	Moderate	Moderate	Moderate	At risk	Agriculture
Lower Suir Estuary (Little Island - Cheekpoint)	Good	Moderate	Moderate	At risk	Agriculture
Barrow Suir Nore Estuary	Moderate	Moderate	Moderate	At risk	Agriculture
Waterford Harbour	Moderate	Moderate	Good	At risk	Agriculture and Urban run-off
Eastern Celtic Sea (HAs 13;17)	Moderate	Good	High	Not at risk	None

2.4 GROUNDWATER BODY IDENTIFICATION

According to the GSI bedrock geological map of Ireland at 1:100,000 scale, the northern part of the Proposed Wind Farm site is underlain by the Killeshin Siltstone Formation described as Muddy siltstone & silty mudstone with the southern part underlain by the Clogrenan Formation described as Cherty, muddy, calcarenitic limestone and Ballyadams Formation described as Crinoidal wackestone/packstone limestone.

The majority of the Proposed Grid Connection is underlain by Killeshin Siltstone Formation with central part underlain by Bregaun Flagstone Formation described as Thick flaggy sandstone and siltstone and eastern part underlain by Ballyadams Formation and Durrow Formation described as Shaly fossiliferous & oolitic limestone. The TDR accommodation works are mapped on the Ballyadams Formation and Aghmacart Formation described as Dark shaly micrite, peloidal limestone.

The Killeshin Siltstone Formation and the Bregaun Flagstone Formation are classified as Poor Aquifer - Bedrock which is Generally Unproductive except for Local Zones (Pl). The Clogrenan Formation and the Ballyadams Formation are classified as Regionally Important Aquifer - Karstified (diffuse) (Rkd). The Durrow Formation and Aghmacart Formation are classified as Locally Important Aquifer - Bedrock which is Moderately Productive only in Local Zones (Ll). The eastern part of the Proposed Grid Connection is underlain by Regionally important gravel aquifer (Rg).

In terms of Groundwater Bodies (GWBs), the northern half of the Proposed Wind Farm is underlain by Lisdowney GWB (IE_SC_G_088) with southern part underlain by Durrow GWB (IE_SE_G_156). The majority of the Proposed Grid Connection is underlain by Lisdowney GWB (IE_SC_G_088) with eastern part underlain by Durrow GWB (IE_SE_G_156) and Kilkenny-Ballynakill Gravels GWB (IE_SE_G_163). The TDR Accommodation works are underlain by Durrow GWB (IE_SE_G_156), GWDTE- The Loughans Turlough Groundwater Body (IE_SE_G_134) and Rathdowney GWB (IE_SE_G_114).

The GWB status for the 2019-2024 WFD cycle are shown on **Figure B.**

2.5 GROUNDWATER BODY CLASSIFICATION

The GWBs are assigned a status based on the assessment of groundwater chemical and quantitative figures.

The Lisdowney, Durrow, Kilkenny-Ballynakill Gravels, The Loughans Turlough (Groundwater Dependent Terrestrial Ecosystem GWDTE) and Rathdowney GWBs underlying the Proposed Project have achieved "Good" status in the latest WFD cycle (2019-2024) and are 'not at risk' of failing to achieve their WFD objectives except for the Durrow GWB is 'at risk' of failing to achieve its WFD objectives with agriculture as identified significant pressure on this GWB.

Table A: Summary WFD Information for Groundwater Bodies

GWB	Overall Status 2013-2018	Overall Status 2016-2021	Overall Status 2019-2024	Risk Status 3rd Cycle	Pressures
Lisdowney	Good	Good	Good	Not at risk	None
Durrow	Poor	Poor	Good	At risk	Agriculture
Kilkenny-Ballynakill Gravels	Good	Good	Good	Not at risk	None
The Loughans Turlough (GWDTE)	Good	Good	Good	Not at risk	None
Rathdowney	Good	Good	Good	Not at risk	None

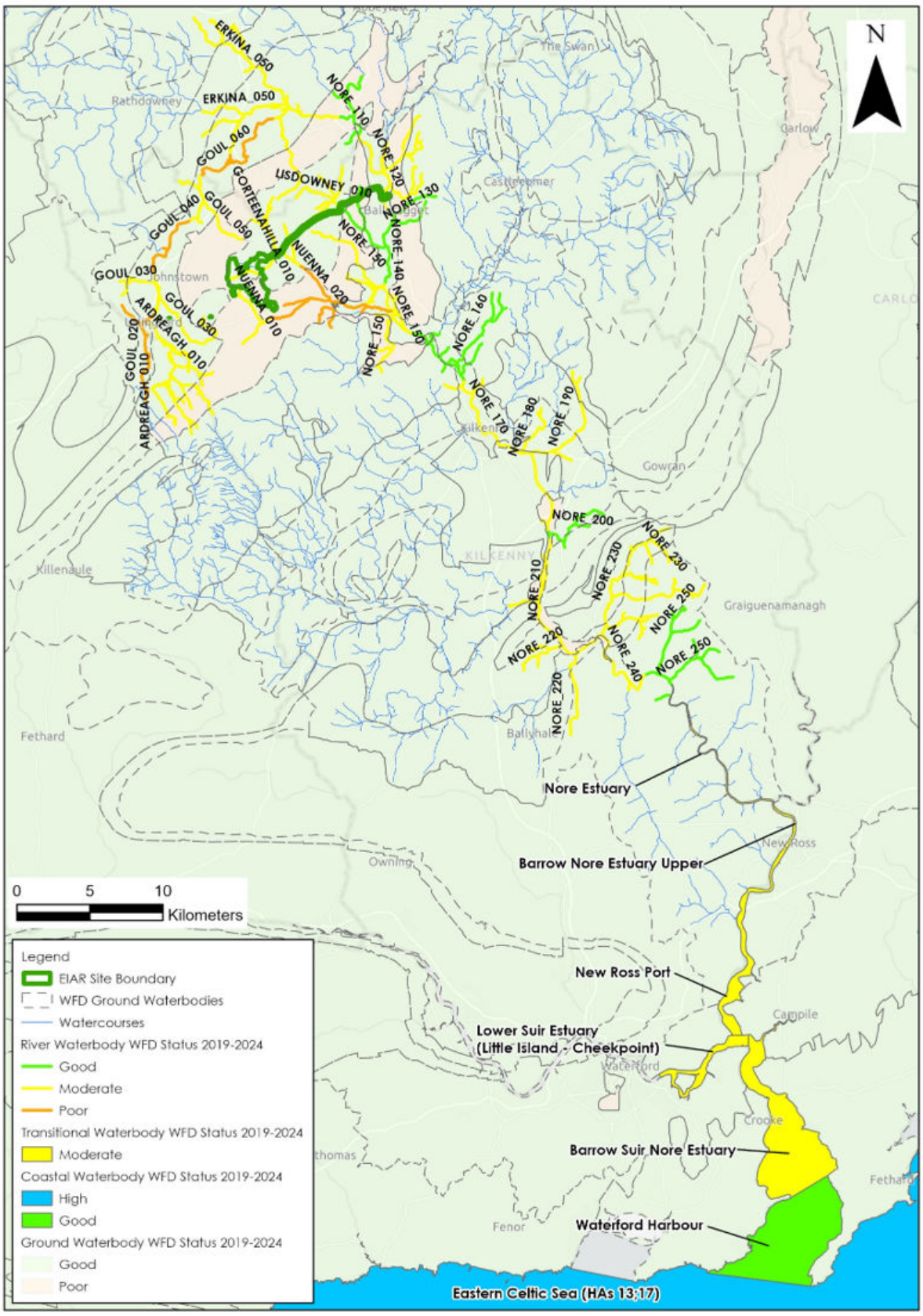


Figure A: WFD Groundwater and Surface Waterbody Status (2019-2024)

2.6 ZONE OF INFLUENCE

The potential Zone of Influence (ZoI) of the Proposed Project extends to the following SWBs and GWBS:

- River SWBs – Gorteenahilla_010, Lisdowney_010, Nuenna_010 and 020, Goul_030 to 060, Ekrina_050 and Nore_110 to 250;
- GWBs – Lisdowney, Durrow, Kilkenny-Ballynakill Gravels, Loughans Turlough (GWDTE) and Rathdowney GWBs; and,
- Transitional and Coastal Waterbodies – Nore Estuary, Barrow Nore Estuary Upper, New Ross Port, Lower Suir Estuary (Little Island - Cheekpoint), Barrow Suir Nore Estuary, Waterford Harbour and Eastern Celtic Sea (HAs 13;17).

2.7 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), shellfish areas and drinking water protected area's (DWPA) are looked at as part of the assessment.

2.7.1 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 Proposed Wind Farm and the TDR accommodation works are not mapped within any designated conservation site. The far eastern end of the Proposed Grid Connection is mapped within the River Barrow and River Nore SAC (Site Code: 002162), River Nore SPA (Site Code: 004233) and the River Nore/Abbeyleix Woods Complex pNHA (Site Code: 002076).

The Spahill and Clomantagh Hill SAC and pNHA (Site Code: 000849) is mapped adjacent to the southwestern and northwestern boundary of the Proposed Wind Farm.

The potentially hydrologically connected designated sites located downstream of the Proposed Project are:

- The Inchbeg pNHA (Site Code: 000836) is located ~7.3km east of the Proposed Wind Farm. Incgbeg pNHA is potentially hydrologically connected to the Proposed Project via the Nuenna River and River Nore;
- The Ardaloo Fen pNHA (Site Code: 000821) is located ~9.5km southeast of the Proposed Wind Farm. The Ardaloo Feb pNHA is potentially hydrologically connected to the Proposed Project via the Nuenna River and River Nore;
- The Curragh and Goul River Marsh pNHA (Site Code: 000420) is located ~9km north of the Proposed Wind Farm. The Curragh and Goul River Marsh pNHA is potentially hydrologically connected to Proposed Wind Farm and the TDR accommodation works via the Goul River; and,
- The Loughans SAC and pNHA (Site Code: 000407) is located downstream of the TDR accommodation works only, ~2.7km southwest of the Proposed Wind Farm. The Proposed Wind Farm site is not hydrologically or hydrogeological connected to The Loughans SAC and pNHA (refer to Section 9.3.14 of EIAR Chapter 9 which exams this in detail).

Designated sites located within 10km of the Proposed Project but not hydrologically or hydrogeologically connected include:

- The Cullahill Mountain SAC and pNHA (Site Code: 000831) is located ~2.7km north of the Proposed Wind Farm site;
- The Galmoy Fen SAC and pNHA (Site Code: 001858) is located ~6.7km northwest of the Proposed Wind Farm site;
- The Kilcooly Abbey Lake pNHA (Site Code: 000958) is located ~8.4km southwest of the Proposed Wind Farm site; and,
- The Spahill and Clomantagh Hill SAC and pNHA (Site Code: 000849) is mapped adjacent to the southwestern and northwestern boundary of the Proposed Wind Farm. The Spahill and Clomantagh Hill SAC and pNHA is not a water dependant habitat.

2.7.2 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 no designated bathing waters located in the vicinity of the Proposed Project.

2.7.3 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.

The Nore_190 to 220, 240 and 250, the Nore Estuary, Barrow Nore Estuary Upper, New Ross Port, Lower Suir Estuary (Little Island - Cheekpoint) and Barrow Suir Nore Estuary transitional waterbodies and the Eastern Celtic Sea (HAs 13;17) coastal waterbody are mapped as NSA downstream of the Proposed Project.

2.7.4 Shellfish Areas

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

The New Ross Port transitional waterbody and the Waterford Harbour coastal waterbody are mapped as Shellfish Area downstream of the Proposed Project.

2.7.5 Salmonid Waters

The Nore_110 to Nore_250 SWB is mapped as Salmonid Waters downstream of the Proposed Project.

2.7.6 Drinking Water Protected Areas

The 3rd Cycle Nore Catchment Report (EPA, 2024) states that there are 6 no. SWBs in the catchment which have been identified as Drinking Water Protected Areas (DWPAs). The Nore_120, 160 and 220 river waterbodies are mapped as DWPA downstream of the Proposed Project.

The Nore_160 DWPA relates to the Kilkenny City (Troyswood) Water Supply, with the abstraction point located approximately 17.7 km downstream on the River Nore (Nore_160).

Meanwhile all GWB's in Ireland are considered as Drinking water protected areas.

Also, the Clomantagh Killoshulan (Balief) Group Water Scheme (GWS) groundwater source protection area (SPA) includes lands on the southern portion of the Proposed Wind Farm (including Proposed Turbine locations T1 to T4).

Balief/Clomantagh GWS and Urlingford/Johnstown Public Water Supply (PWS) SPAs are located 1.3km and 3.2km respectively to the southwest of the Proposed Wind Farm site. There is no Proposed Wind Farm or Proposed Grid Connection infrastructure within either of these source protection areas. However, the TDR (R693) briefly passes through both SPAs where some minor road alterations are required.

In addition, the Proposed Grid Connection underground cable passes through the Ballyconra Public Water Supply (PWS) SPA for approximately 1.8km. The underground cable will be contained within the carriageway of the public road when inside the mapped SPA.

3. WFD SCREENING

As discussed in **Section 2**, there are a total of 31 no. waterbodies (24 no. river waterbodies, 5 no. transitional waterbodies and 2 no. coastal waterbodies) which are located in the vicinity and downstream of the Site. In addition, 5 no. groundwater bodies underlie the Site.

3.1 SURFACE WATER BODIES

The waterbodies in the immediate vicinity and downstream of the Proposed Project are shown in **Figure** A and described in **Section 2.2** above.

With consideration for the construction, operational and decommissioning phases of the Proposed Project, it is considered that the Gorteenahilla_010, Lisdowney_010, Nuenna_010, Nuenna_020, Goul_030, Goul_040, Goul_050, Nore_120, Nore_140 and Nore_150 rivers within the vicinity and downstream of the Site are carried through into the WFD Impact Assessment.

These SWBs have been included for further assessment due to their proximal location to the Proposed Project works. The Proposed Project works must not in any way result in a deterioration in the status of these SWBS and/or prevent them from meeting the biological and chemical characteristics for good status in the future.

Downstream of these SWBs, as outlined in **Section 2.2,** the catchment area of the River Nore river waterbodies increase significantly therefore the potential for the Proposed Project to impact a waterbody decreases further downstream due to the increasing catchment area to the surface waterbody and resulting increase in flow volumes. The proposed works have no potential to cause a deterioration in the status of this screened out SWBs and/or jeopardise its attainment of good surface water status.

3.2 GROUNDWATER BODIES

With respect to groundwater bodies, the Lisdowney, Durrow, Kilkenny-Ballynakill Gravels, Loughlans Turlough GWDTE and Rathdowney GWB's are carried through to the WFD Assessment due to their location directly underlying the Proposed Project.

3.3 PROTECTED AREAS

River Barrow and River Nore SAC and SPA: The Site is located upstream of the River Barrow and River Nore SAC and SPA. With consideration for the construction and operation activities associated with the Proposed Project, it is considered that the River Barrow and River Nore SAC and SPA is carried through into the WFD Impact Assessment.

River Nore/Abbeyleix Woods Complex pNHA: The Site is located upstream of the River Nore/Abbeyleix Woods Complex pNHA. With consideration for the construction and operation activities associated with the Proposed Project, it is considered that the River Nore/Abbeyleix Woods Complex pNHA is carried through into the WFD Impact Assessment.

Nore 120, 140 and Nore 150 Salmonid Waters: The Proposed Grid Connection is mapped within the Nore_120, 140 and 150 river sub basins. With consideration for the construction and operation activities associated with the Proposed Project, it is considered that the Nore_120, 140 and Nore_150 Salmonid Waters is carried through into the WFD Impact Assessment.

Nore 120 DWPA: The Proposed Grid Connection is mapped within the Nore_120 river sub basin. With consideration for the construction and operation activities associated with the Proposed Project, it is considered that the Nore_120 DWPA is carried through into the WFD Impact Assessment. DWPA's downstream of the Nore_120 are screen out due to downstream distance, increasing surface water catchment and large flows in the River Nore.

Clomantagh Killoshulan (Balief) GWS groundwater source protection area (SPA) includes lands on the southern portion of the Proposed Wind Farm (including Proposed Turbine locations T1 to T4). The GWS is carried through into the WFD Impact Assessment.

Balief/Clomantagh GWS and Urlingford/Johnstown Public Water Supply (PWS) are not hydrogeological connected to either the Proposed Wind Farm or Proposed Grid Connection and are therefore scoped out for further assessment. The proposed TDR works have no potential to significantly affect these sources. This GWS and PWS are not carried through into the WFD Impact Assessment.

Ballyconra Public Water Supply (PWS) source protection area is intercepted by the Proposed Grid Connection. However, due to the underground cable being within the carriageway of a public road within the source protection area, the shallow nature of the trench works (1.2m) and the setback distance from the PWS supply boreholes (0.8km), the Ballyconra PWS is screened out the WFD Impact Assessment.

All other designated sites have been screened out due to distant location, increased volume of water within associated SWB or lack of hydrological connection between the designated site and the Proposed Project.

3.4 WFD SCREENING SUMMARY

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

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

Type	WFD Classification	Waterbody Name/ID	Inclusion in Assessment	Justification
Surface Water Body	Nore WFD Catchment			
	River	Gorteenahilla_010	**Yes**	The Proposed Wind Farm and the Proposed Grid Connection is mapped within the Gorteenahilla_010 river sub-basin. An assessment is required to consider the potential impacts on this SWB.
	River	Lisdowney_010	**Yes**	The Proposed Grid Connection is mapped within the Lisdowney_010 river sub-basin. An assessment is required to consider the potential impacts on this SWB
	River	Nuenna_010	**Yes**	The Proposed Wind Farm and the TDR Accommodation works are mapped within the Nuenna_010 river sub-basin. An assessment is required to consider the potential impacts on this SWB
	River	Nuenna_020	**Yes**	The Proposed Wind Farm is mapped within the Nuenna_020 river sub-basin. An assessment is required to consider the potential impacts on this SWB
	River	Goul_030	**Yes**	The TDR Accommodation works are mapped within the Goul_030 river sub-basin. An assessment is required to consider the potential impacts on this SWB
	River	Goul_040	No	The Proposed Wind Farm is mapped within the Goul_040 river sub-basin but there is no proposed infrastructure within the SWB.
	River	Goul_050	No	The Proposed Wind Farm is mapped within the Goul_050 river sub-basin but here is no proposed infrastructure within the SWB.
	River	Goul_060	No	The Goul_060 is mapped directly downstream of Goul_050 and no works are proposed within the Goul_050 river sub-basin. Therefore, the Goul_060 has been screened out.
	River	Ekrina_050	No	The Ekrina_050 SWB has been screened out due to its distal location from the site and the increasing volumes of water within the surface water body.
	River	Nore_110	No	The Nore_110 SWB has been screened out due to its distal location from the site and the increasing volumes of water within the surface water body.
	River	Nore_120	**Yes**	The Proposed Grid connection is mapped within the Nore_120 river sub basin. An assessment is required to consider the potential impacts on this SWB
	River	Nore_130	No	The Nore_130 SWB has been screened out due to increasing volumes of water within the surface water body.
	River	Nore_140	**yes**	The Proposed Grid connection is mapped within the Nore_140 river sub basin. An assessment is required to consider the potential impacts of the Proposed Project on this SWB
	River	Nore_150	**yes**	The Proposed Grid connection is mapped within the Nore_150 river sub basin. An assessment is required to consider the potential impacts on this SWB
	River	Nore_160	No	The Nore_160 SWB has been screened out due to its distal location from the site and the increasing volumes of water within the Nore River.
	River	Nore_170	No	The Nore_170 SWB has been screened out due to its distal location from the site and the increasing volumes of water within the Nore River.
	River	Nore_180	No	The Nore_180 SWB has been screened out due to its distal location from the site and the

				increasing volumes of water within the Nore River.
	River	Nore_190	No	The Nore_190 SWB has been screened out due to its distal location from the site and the increasing volumes of water within the Nore River.
	River	Nore_200	No	The Nore_200 SWB has been screened out due to its distal location from the site and the increasing volumes of water within the Nore River.
	River	Nore_210	No	The Nore_210 SWB has been screened out due to its distal location from the site and the increasing volumes of water within the Nore River.
	River	Nore_220	No	The Nore_220 SWB has been screened out due to its distal location from the site and the increasing volumes of water within the Nore River.
	River	Nore_230	No	The Nore_230 SWB has been screened out due to its distal location from the site and the increasing volumes of water within the Nore River.
	River	Nore_240	No	The Nore_240 SWB has been screened out due to its distal location from the site and the increasing volumes of water within the Nore River.
	River	Nore_250	No	The Nore_240 SWB has been screened out due to its distal location from the site and the increasing volumes of water within the Nore River.
	Transitional	Nore Estuary	No	The Nore Estuary SWB has been screened out due to the saline nature of its waters and the large volumes of water within the Bay. The Proposed Project has no potential to impact the status of this SWB.
	Transitional	Upper Barrow Estuary	No	The Upper Barrow Estuary SWB has been screened out due to the saline nature of its waters and the large volumes of water within the Bay. The Proposed Project has no potential to impact the status of this SWB.
	Transitional	Barrow Nore Estuary Upper	No	The Barrow Nore Estuary SWB has been screened out due to the saline nature of its waters and the large volumes of water within the Bay. The Proposed Project has no potential to impact the status of this SWB.
	Transitional	New Ross Port	No	The New Ross Port SWB has been screened out due to the saline nature of its waters and the large volumes of water within the Bay. The Proposed Project has no potential to impact the status of this SWB.
	Transitional	Lower Suir Estuary (Little Island - Cheekpoint)	No	The Lower Suir Estuary (Little Island - Cheekpoint) SWB has been screened out due to the saline nature of its waters and the large volumes of water within the Bay. The Proposed Project has no potential to impact the status of this SWB.
	Transitional	Barrow Suir Nore Estuary	No	The Barrow Suir Nore Estuary SWB has been screened out due to the saline nature of its waters and the large volumes of water within the Bay. The Proposed Project has no potential to impact the status of this SWB.
	Coastal	Waterford Harbour	No	The Waterford Harbour SWB has been screened out due to the saline nature of its waters and the large volumes of water within the Bay. The Proposed Project has no potential to impact the status of this SWB.
	Coastal	Eastern Celtic Sea (HAs 13;17)	No	The Eastern Celtic Sea (HAs 13;17) SWB has been screened out due to the saline nature of its waters and the large volumes of water within the Bay. The Proposed Project has no potential to impact the status of this SWB.
Groundwater	Groundwater Bodies			

Body	Groundwater	Lisdowney	**Yes**	The Proposed Wind Farm and the Proposed Grid Connection are mapped to overlie the Lisdowney GWB. An assessment is required to consider the potential impacts on this GWB
	Groundwater	Durrow	**Yes**	The Proposed Wind Farm, Proposed Grid Connection and the TDR Accommodation works are mapped to overlie the Durrow GWB. An assessment is required to consider the potential impacts on this GWB.
	Groundwater	Kilkenny-Ballynakill Gravels	**Yes**	The Proposed Grid Connection is mapped to overlie the Kilkenny-Ballynakill Gravels GWB. An assessment is required to consider the potential impacts on this GWB.
	Groundwater	Loughans Turlough (GWDTE)	**Yes**	The TDR Accommodation works are mapped within The Loughans Turlough (GWDTE) GWB. An assessment is required to consider the potential impacts on this GWB.
	Groundwater	Rathdowney GWB	**Yes**	The TDR Accommodation works are mapped within the Rathdowney GWB. An assessment is required to consider the potential impacts on this GWB.
Protected Areas	Protected Areas			
	Nature Conservation Areas	River Barrow and River Nore SAC and SPA	**Yes**	The Site is located upstream of the River Barrow and River Nore SAC and SPA. Therefore, an assessment is required to consider the potential impacts on this SAC and SPA.
		River Nore/Abbeyleix Woods Complex pNHA	**Yes**	The Site is located upstream of the River Nore/Abbeyleix Woods Complex pNHA. Therefore, an assessment is required to consider the potential impacts on this SAC and SPA.
		Inchbeg pNHA	No	The Inchbeg pNHA has been screened out due to distant location and increase volume of water within the associated SWB. The Proposed Project has no potential to impact the status this pNHA.
		Ardaloo Fen pNHA	No	The Ardaloo Fen pNHA has been screened out due to distant location and increase volume of water within the associated SWB. The Proposed Project has no potential to impact the status this pNHA.
		Curragh And Goul River Marsh pNHA	No	The Curragh And Goul River Marsh pNHA has been screened out due to distant location and increase volume of water within the associated SWB. The Proposed Project has no potential to impact the status this pNHA.
		Loughans SAC and pNHA	**Yes**	The Loughans SAC and pNHA is screened in for assessment due proposed TDR works within the turloughs surface water catchment.
		Cullahill Mountain SAC and pNHA	No	The Cullahill Mountain SAC and pNHA has been screened out due to lack of hydrological connection. The Proposed Project has no potential to impact the status this SAC and pNHA.
		Galmoy Fen SAC and pNHA	No	The Galmoy Fen SAC and pNHA has been screened out due to lack of hydrological connection. The Proposed Project has no potential to impact the status this SAC and pNHA.
		Kilcooly Abbey Lake pNHA	No	The Kilcooly Abbey Lake pNHA has been screened out due to lack of hydrological connection. The Proposed Project has no potential to impact the status this pNHA.
	NSA	Nore_190 to 220, 240 and 250	No	The Nore_190 to 220, 240 and 250 NSA has been screened out due to its distal location from the site and the increasing volumes of water within the Nore River. The Proposed Project has no potential to impact the status of these NSAs.
		Nore Estuary, Barrow Nore	No	The Nore Estuary, Barrow Nore Estuary Upper, New Ross Port, Lower Suir Estuary (Little Island - Cheekpoint) and Barrow Suir Nore Estuary has been screened out due to the saline nature of

		Estuary Upper, New Ross Port, Lower Suir Estuary (Little Island - Cheekpoint) and Barrow Suir Nore Estuary		its waters and the large volumes of water within the Bay. The Proposed Project has no potential to impact the status of these NSAs.
		Eastern Celtic Sea (HAs 13;17)	No	The Eastern Celtic Sea (HAs 13;17) NSA has been screened out due to the saline nature of its waters and the large volumes of water within the Bay. The Proposed Project has no potential to impact the status of this NSA.
	Shellfish Areas	New Ross Port	No	The New Ross Port Shellfish Areas has been screened out due to the saline nature of its waters and the large volumes of water within the Bay. The Proposed Project has no potential to impact the status of this Shellfish Areas.
		Waterford Harbour	No	The Waterford Harbour Shellfish Areas has been screened out due to the saline nature of its waters and the large volumes of water within the Bay. The Proposed Project has no potential to impact the status of this Shellfish Areas.
	Salmonid Waters	Nore_120, 140 and Nore_150	**Yes**	The Proposed Grid connection route is mapped within the Nore_120, 140 and 150 river sub basin. An assessment is required to consider the potential impacts of the Proposed Project on these Salmonid Waters
		Nore_110, 130 and 160 to 250	No	The Nore_110, 130 and 160 to 250 Salmonid Waters has been screened out due to its distal location from the site and the increasing volumes of water within the Nore River.
	Drinking Water Protected Areas	Nore_120	**Yes**	The Proposed Grid Connection is mapped within the Nore_120 river sub basin. An assessment is required to consider the potential impacts of the Proposed Project on this DWPA.
		Nore_160 and 220	No	The Nore_160 and 220 DWPAs has been screened out due to its distal location from the Site and the increasing volumes of water within the Nore River.
		Clomantagh Killoshulan (Balief) GWS	**Yes**	The Proposed Wind Farm is mapped within the GWS SPA. An assessment is required to consider the potential impacts of the Proposed Project on this GWS.
		Ballyconra PWS	No	The Proposed Grid Connection is mapped within the Ballyconra PWS SPA but due to the underground cable being along a public road with a 0.8km setback distance from the source boreholes, no effects are likely.
		Balief/Clomantagh GWS	No	GWS not hydrogeological connected to either the Proposed Wind Farm or Proposed Grid Connection and are therefore scoped out for further assessment. The proposed TDR works have no potential to significantly affect this source.
		Urlingford/Johnstown PWS	No	PWS not hydrogeological connected to either the Proposed Wind Farm or Proposed Grid Connection and are therefore scoped out for further assessment. The proposed TDR works have no potential to significantly affect this source.

4. SCOPING OF WATERBODY ELEMENTS

4.1 SWB SCOPING

The Proposed Project has the potential to interact with downstream water bodies through:

- Earthworks and the entrainment of suspended solids in surface water runoff;
- Potential contamination from hydrocarbons and cement-based products during refuelling and minor maintenance works;
- Potential contamination from wastewater; and,
- Changes in downstream surface water flow volumes due to the Proposed Project footprint.

Accordingly, the WFD quality elements scoped into the assessment are summarised in **Table B**.

Table B: SWB Quality Element Scoping

WFD Quality Element	Scoped In / Out	Justification
Hydromorphology	**Scoped In**	Works at watercourse crossings have the potential to alter local flow conditions in receiving surface waters.
Physico-Chemical Quality	**Scoped In**	Construction and operational activities have the potential to affect suspended solids, nutrients and hydrocarbons.
Biological Quality Elements	**Scoped In**	Biological receptors are dependent upon maintenance of hydromorphological and physico-chemical conditions.
Priority Substances / Specific Pollutants	**Scoped In**	Potential accidental release of hydrocarbons during extended operational phase.
Protected Areas	**Scoped In**	Hydrologically connected downstream designated sites require consideration.
Fish Migration / Fish Passage	**Scoped In**	Watercourse crossings and culverts are proposed.
Estuarine Processes	Scoped Out	The Project Site is inland and a significant distance from any estuarine waterbody.
Coastal Waterbody Processes	Scoped Out	The Project Site is inland and a significant distance from any coastal waterbody.

4.2 GWB SCOPING

Those water body quality elements taken forward into the WFD Compliance assessment for the Proposed Project are included in **Table C**. These have been identified using professional expertise as those WFD quality elements with the potential to be affected by the Proposed Project (including the abstraction and discharge of water from the proposed borrow pit).

Table C: Scoping of Groundwater Element Scoping

WFD Quality Element	Scoped in/Out	Justification
Saline (or Other) Intrusions Test Quantitative Test	Scoped out	The Proposed Project Site is inland and a significant distance from any coastal waterbody and does not include any permanent or significant dewatering.
Impact of Groundwater on Surface Water Ecological/Quantitative Status Test	Scoped out	There will be no alteration of surface water or groundwater flows, volumes or levels.
Groundwater Dependent Ecosystems Quantitative Test	**Scoped In**	There is Groundwater Dependent Ecosystems located near the Proposed Project (TDR Works only).
Water Balance Test	Scoped out	The Proposed Project does not include any abstraction or significant long-term dewatering.
Saline (or Other) Intrusions Test Chemical Test	Scoped out	The Site is inland and a significant distance from any coastal waterbody and does not include any dewatering.
Impact of Groundwater on Surface Water Ecological/Chemical Status Test	**Scoped in**	As outlined in the SWB scoping above
Groundwater Dependent Ecosystems Ecological/Chemical Status test	**Scoped In**	There is Groundwater Dependent Ecosystems located near the Proposed Project.
Drinking Water Protected Area Test	**Scoped In**	There is GWS SPAs in the vicinity of the Proposed Project.
General Chemical Assessment Test	**Scoped In**	Potential for affects in the Regionally Important Karstified Aquifers (Extreme groundwater vulnerability)

5. WFD COMPLIANCE ASSESSMENT

5.1 PROPOSALS

Please refer to Chapter 4 of the EIAR for a full description of the Proposed Project.

The Proposed Project consists of 10 no. wind turbines and associated infrastructure including hardstands, 2 no. temporary construction compound, new site access tracks, an on-site Proposed 110kV Substation and BESS compound, 1 no. spoil management area, cabling between the turbines and the on-site Proposed 110kV Substation, 12.6km of underground cabling between the Proposed 110kV Substation and the existing Ballyraggett 110kV Substation and works along the turbine delivery route.

5.2 POTENTIAL EFFECTS

5.2.1 Construction Phase (Unmitigated)

5.2.1.1 Potential Surface Water Quality Effects from the Proposed Wind Farm

Construction phase activities including tree felling, site levelling/construction and building turbine foundation excavation will require earthworks resulting in removal of vegetation cover and excavation of soil, subsoils and bedrock. The main risk will be from surface water runoff from bare soil, spoil management areas and borrow pit drainage/dewatering during construction works.

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.

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 (cement) and contamination which in turn could affect the water quality and fish stocks of downstream water bodies such as the nearby Gorteenahilla and Nuenna rivers.

A summary of potential status change to SWBs arising from surface water quality impacts from earthworks during the construction phase of the Proposed Wind Farm in the unmitigated scenario are outlined in **Table D**.

Table D: Potential Surface Water Quality Effects (Proposed Wind Farm) during Construction Phase (Unmitigated)

SWB	WFD Code	Current Status	Assessed Potential Status Change
Gorteenahilla_010	IE_SE_15G080300	Moderate	Poor
Nuenna_010	IE_SE_15N020100	Moderate	Poor
Nuenna_020	IE_SE_15N020400	Poor	Bad

Nore_150	IE_SE_15N011700	Moderate	Moderate

5.2.1.2 Potential Surface Water Quality Effects (Proposed Grid Connection)

Based on the EPA mapping, and site surveys, there will be a requirement for 6 no. watercourse crossings along the Proposed Grid Connection cable route.

No in-stream works are required at any of these watercourse crossings, however due to the close proximity of local waterbodies to the works 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. However, due to short works duration and transient nature of the works across several separate sub-basins, mainly within the carriageway of public road, no significant water quality effects are expected.

Table E: Potential Surface Water Quality Effects (Proposed Grid Connection) during Construction Phase (Unmitigated)

SWB	WFD Code	Current Status	Assessed Potential Status Change
Gorteenahilla_010	IE_SE_15G080300	Moderate	Moderate
Nuenna_020	IE_SE_15N020400	Poor	Poor
Lisdowney_010	IE_SE_15L020100	Moderate	Moderate
Nore_120	IE_SE_15N011400	Moderate	Moderate
Nore_130	IE_SE_15N011500	Good	Good
Nore_140	IE_SE_15N011600	Good	Good
Nore_150	IE_SE_15N011700	Moderate	Moderate

5.2.1.3 Potential Surface Water Quality Effects (TDR Accommodation Works)

No in-stream or near stream works are required at the TDR accommodation works areas. Also, all earthworks are minor.

The works will be of a short-duration, minor and transient in nature which limits the potential for significant effects.

Table F: Potential Surface Water Quality Effects (TDR Accommodation works) during Construction Phase (Unmitigated)

SWB	WFD Code	Current Status	Assessed Potential Status Change
Nuenna_010	IE_SE_15N020100	Moderate	Moderate
Nuenna_020	IE_SE_15N020400	Poor	Poor
Goul_030	IE_SE_15G020200	Moderate	Moderate

Goul_040	IE_SE_15G020300	Poor	Poor
Goul_050	IE_SE_15G020360	Moderate	Moderate

5.2.1.4 Potential Groundwater Quality Effects (Proposed Project)

Accidental spillage during refuelling of construction plant with petroleum hydrocarbons is a major pollution risk to groundwater. The accumulation of small spills of fuels and lubricants during routine plant use can also be a pollution risk. Chemicals such as cement-based compounds also pose a threat to the groundwater environment. Runoff from concrete works can impact on groundwater quality.

These sources of contamination have the potential to impact on groundwater quality in the underlying groundwater body.

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 L**.

Table G: Potential Groundwater Quality Effects (Proposed Project) during Construction Phase (Unmitigated)

SWB	WFD Code	Current Status	Assessed Potential Status Change
Lisdowney	IE_SE_G_088	Good	Moderate
Durrow	IE_SE_G_156	Good	Moderate
Kilkenny-Ballynakill Gravels	IE_SE_G_163	Good	Moderate
Loughlans Turlough (GWDTE)	IE_SE_G_134	Good	Moderate
Rathdowney	IE_SE_G_114	Good	Moderate

5.2.1.5 Potential Effects on Protected Areas

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

River Barrow and River Nore SAC and SPA: Surface water connections from the Proposed Project to the SAC and pNHA could transfer poor quality surface water that may affect the conservation objectives of the River Barrow and River Nore SAC and SPA.

River Nore/Abbeyleix Woods Complex pNHA: Surface water connections from Site to the pNHA could transfer poor quality surface water that may affect the conservation objectives of the River Nore/Abbeyleix Woods Complex pNHA.

Nore_120, 140 and Nore_150 Salmonid Waters: Surface water connections from Site to the Salmonid Waters could transfer poor quality surface water that may affect the conservation objectives of the Nore_120, 140 and 150 Salmonid Waters.

Nore_120 DWPA: Surface water connections from the Proposed Grid Connection to the DWPA could transfer poor quality surface water that may affect the conservation objectives of the Nore_120 DWPA.

Clomantagh Killoshulan (Balief) GWS Groundwater connections from the Proposed Wind Farm site to the GWS spring could transfer poor quality groundwater that may affect the water quality of the source.

All other designated sites have been screened out due to distant location, increased volume of water within associated SWB or lack of hydrological connection between the designated site and the Proposed Project.

5.2.2 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 wind farm site and will be associated with minor maintenance works.

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

5.2.2.1 Potential Hydromorphological Effects Downstream of Proposed Wind Farm due to Increased Runoff

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 Proposed Project and increase flood risk downstream of the development.

Progressive replacement of the vegetated surface with impermeable surfaces will decrease the permeability of the ground within the Site footprint (i.e., turbine bases, hardstandings, and to a lesser extent the new access roads) and 110kV substation/BESS.

The emplacement of the Proposed Wind Farm footprint, as described in Chapter 4 of the EIAR, (assuming emplacement of impermeable materials as a worst-case scenario) could result in an average total site increase in surface water runoff of approximately 8,161m^3/month. This represents a potential increase of approximately 3.4% in the average daily/monthly volume of runoff from the Proposed Wind Farm 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 Wind Farm site being developed. Specifically, the permanent Proposed Wind Farm footprint is approximately 16.6ha, representing 2.9% of the Proposed Wind Farm site of 573ha.

Also, this calculation assumes that all hardstanding areas will be impermeable, which is considered to be a conservative assumption. 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 M**.

Table H: Potential Hydromorphological Effects Downstream of Proposed Wind Farm during Operational Phase (Unmitigated)

SWB	WFD Code	Current Status	Assessed Potential Status Change
Gorteenahilla_010	IE_SE_15G080300	Moderate	Moderate
Nuenna_010	IE_SE_15N020100	Moderate	Moderate
Nuenna_020	IE_SE_15N020400	Poor	Poor
Goul_040	IE_SE_15G020300	Poor	Poor
Goul_050	IE_SE_15G020360	Moderate	Moderate
Goul_060	IE_SE_15G020500	Poor	Poor
Ekrina_050	IE_SE_15E010550	Moderate	Moderate

5.2.2.2 Potential Surface Water Quality Effects from Operational Proposed Wind Farm 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 Project in the unmitigated scenario are outlined in **Table N**.

Table N: Potential Surface Water Quality Effects Downstream of Proposed Wind Farm Site during Operational Phase (Unmitigated)

SWB	WFD Code	Current Status	Assessed Potential Status Change
Gorteenahilla_010	IE_SE_15G080300	Moderate	Moderate
Nuenna_010	IE_SE_15N020100	Moderate	Moderate
Nuenna_020	IE_SE_15N020400	Poor	Poor
Goul_040	IE_SE_15G020300	Poor	Poor
Goul_050	IE_SE_15G020360	Moderate	Moderate
Goul_060	IE_SE_15G020500	Poor	Poor
Ekrina_050	IE_SE_15E010550	Moderate	Moderate

5.2.2.3 Groundwater Quality Impacts at the Proposed Wind Farm

The risks to groundwater quality are the same as those described in **Section 5.2.1.4** but of a much lesser extent than during the construction phase due to the limited activity at the Proposed Wind Farm site with only minor maintenance required during the operational phase.

A summary of potential status change to GWBs arising from groundwater quality impacts during the operation stage of the Proposed Project in the unmitigated scenario are outlined in **Table O**.

Table O: Groundwater Quality Impacts (Proposed Wind Farm) During Operational Phase (Unmitigated)

SWB	WFD Code	Current Status	Assessed Potential Status Change
Lisdowney	IE_SE_G_088	Good	Moderate
Durrow	IE_SE_G_156	Good	Moderate

5.2.2.4 Potential Effects on Protect Areas

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.

5.3 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.

5.3.1 Construction Phase

5.3.1.1 Mitigation Measures for Earthworks (Removal of Vegetation Cover, Tree Felling, Excavations and Stock Piling)

Mitigation by Avoidance

The key mitigation measure during the construction phase of the Proposed Wind Farm is the avoidance of sensitive aquatic areas where possible from Figure 9-16 of the EIAR it can be seen that all of the key areas of the Proposed Wind Farm infrastructure are actually significantly away from the 50m delineated buffer zones with the exception of proposed new roads, 3 no. proposed crossings on the Foyle South Stream (Gorteenahilla_010).

As described below, specific mitigation measures, incorporated into the design of the project and through implementation of best practice methodologies (discussed below) will be employed where work inside buffer zones is proposed.

The generally large setback distance from sensitive hydrological features at the Site ensures that sufficient space is provided for the installation of drainage mitigation measures (discussed below) and to ensure their effective operation. The proposed buffer zone will ensure:

- Avoidance of physical damage to watercourses, and associated release of sediment;
- Avoidance of excavations within close proximity to surface water courses;

- Avoidance of the entry of suspended sediment from earthworks into watercourses; and,
- Avoidance of the entry of suspended sediment from the construction phase drainage system into watercourses, achieved in part by ending drain discharge outside the buffer zone and allowing percolation across the vegetation of the buffer zone.

Mitigation by Prevention

The following section details the measures which will be put in place during the construction phase to ensure that surface water features are protected from the release of silt or sediment and to ensure that all surface water runoff is fully treated and attenuated to avoid the discharge of dirty water.

- Source controls to limit the likelihood for 'dirty water' to occur:
    - Interceptor drains, vee-drains, diversion drains, flume pipes, erosion and velocity control measures such as use of sand bags, oyster bags filled with clean washed gravel, filter fabrics, and other similar/equivalent or appropriate systems;
    - Small working areas, covering stockpiles, weathering off stockpiles, cessation of works in certain areas or other similar/equivalent or appropriate measures.
- In-Line controls to ensure appropriate management of silt laden water:
    - Interceptor drains, vee-drains, oversized swales, erosion and velocity control measures such as check dams, sand bags, oyster bags, straw bales, flow limiters, weirs, baffles, silt bags, silt fences, sedimats, filter fabrics, and collection sumps, temporary sumps/attenuation lagoons, sediment traps, pumping systems, settlement ponds, temporary pumping chambers, or other similar/equivalent or appropriate systems.
- Treatment systems to fully attenuate silt laden waters prior to discharge:
    - Temporary sumps and attenuation ponds, temporary storage lagoons, sediment traps, and settlement ponds, and proprietary settlement systems such as Siltbuster, and/or other similar/equivalent or appropriate systems; and

It should be noted for this site that an extensive network of forestry and agricultural drains already exists, and these will be integrated and enhanced as required and used within the wind farm drainage system. The integration of the existing land drainage network and the proposed wind farm network is common practice in wind energy developments and will also result in benefits to surrounding lands.

The main elements of interaction with existing drains will be as follows:

- Apart from interceptor drains, which will convey clean runoff water to the downstream drainage system, there will be no direct discharge (without treatment for sediment reduction and attenuation for flow management) of runoff from the wind farm drainage into the existing site drainage network. This will reduce the likelihood of any increased risk of downstream flooding or sediment transport/erosion;
- Silt traps will be placed in the existing drains upstream of any streams where construction works is taking place, and these will be diverted into proposed interceptor drains, or culverted under/across the works area; and
- Buffered outfalls, which will be numerous over the site, will promote percolation of drainage waters across vegetation and close to the point at which the additional runoff is generated, rather than direct discharge to the existing drains of the site.

Water Treatment Train

While the silt/sediment ponds and lagoons are assessed as providing a sufficient level of protection to avoid any deterioration in downstream water quality; a final line of defence can be provided by a water treatment train such as a 'Siltbuster', if required. If the discharge water from construction areas fails to be of a high quality, then a filtration treatment system (such as a 'Siltbuster' or similar equivalent treatment train [sequence of water treatment processes]) will be used to filter and treat all surface discharge water collected in the dirty water drainage system. This water treatment train will apply for the entirety of the construction phase.

Silt Fences
Silt fences will be emplaced within drains down-gradient of all construction areas. Silt fences are effective at removing heavy settleable solids. This will act to prevent entry to watercourses of sand and gravel sized sediment, released from excavation of mineral sub-soils of glacial and glacio-fluvial origin, and entrained in surface water runoff. Inspection and maintenance of these of these structures during construction phase is critical to their functioning to stated purpose. They will remain in place throughout the entire construction phase. Double silt fences will be emplaced within drains down-gradient of all construction areas inside the hydrological buffer zones to provide an additional layer of protection in these areas.

Silt Bags
Silt bags will be used where small to medium volumes of water need to be pumped from excavations. As water is pumped through the bag, most of the sediment is retained by the geotextile fabric allowing filtered water to pass through. Silt bags will be used with natural vegetation filters or sedimats (sediment entrapment mats, consisting of coir or jute matting) placed at the silt bag location to provide further treatment of the water outfall from the silt bag. Sedimats will be secured to the ground surface using stakes/pegs. The sedimat will extend to the full width of the outfall to ensure all water passes through this additional treatment measure.

Management of Runoff from Spoil Management Area
It is proposed that excavated spoil will be used for landscaping where required. The excess material will then be placed in 1 no. Spoil Management Area. The Spoil Management Area is located outside of 50m watercourse buffers and also outside of 30m karst feature buffers (enclosed depression or sink holes). During the initial construction of deposition area, silt fences, straw bales and biodegradable geogrids will be used to control surface water runoff from works areas.

Where applicable, the vegetative top-soil layer of the soil and spoil management areas will be rolled back to facilitate placement of excavated spoil, following which the vegetative-top soils layer will be reinstated. Where reinstatement is not possible, spoil management areas will be sealed with a digger bucket and seeded as soon possible to reduce sediment entrainment in runoff.

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

Subsoil reinstatement areas will be sealed with a digger bucket and vegetated as soon possible to reduce sediment entrainment in runoff. Once re-vegetated and stabilised spoil management area will no longer be a potential source of silt laden runoff.

Proposed Grid Connection 110kV Underground Cabling
Mitigation measures which are outlined below will be implemented to ensure that silt laden or contaminated surface water runoff from the trenching work does not discharge directly to the SWB:

- All existing dry drains that intercept the works area will be temporarily blocked down-gradient of the works using temporary check dams/silt traps (e.g. straw bales);
- Clean water diversion drains will be installed upgradient of the works areas, as required;
- Check dams/silt fence arrangements (silt traps or straw bales) will be placed in all existing drains that have surface water flows and also along existing roadside drains;
- A double silt fence perimeter will be placed down-slope of works areas that are located inside the watercourse 50m buffer zones;
- At drain crossing locations, where open trenching is required, damming and over pumping method will be used to manage flows in the drain.

Specific mitigation measures relating to the directional drilling at the crossing location are detailed below.

Directional Drilling

The following mitigation will be carried out during directional drilling works:

- Firstly, the crossing works area will be clearly marked out with fencing or flagging tape to avoid unnecessary disturbance of vegetation;
- A minimum 10 metre vegetative buffer zone will be maintained (if present) between disturbed areas and the watercourse bank. There will be no storage of material / equipment, excavated material (see below) or overnight parking of machinery inside the 10m buffer zone;
- Double silt fencing will be placed upslope of the buffer zone on each side of the watercourse.
- Mats will be used underneath the excavator, inside the 10 metre vegetative buffer zone, to prevent soil erosion/rutting and potential surface water quality impacts from localised surface water runoff;
- Temporary storage of excavated material will be undertaken outside of the 10m buffer on flat ground or within a local hollow area. A containment berm will be placed downslope of the excavated material which in turn will be surrounded by secondary silt fence protection to prevent saturated soil from flowing back into the watercourse;
- Operation of machinery and use of equipment within the 10m buffer will be kept to a minimum to avoid any unnecessary disturbance;
- There will be no refuelling allowed within 100m of the watercourse crossing;
- All plant will be checked for purpose of use prior to mobilisation at the watercourse crossing; and,
- Works shall not take place during periods of heavy rainfall and will be scaled back or suspended if heavy rain is forecasted.

Mitigation Measures relating to the use of a mixture of a natural, inert and fully biodegradable drilling fluid such as Clear Bore™ and water for directional drilling include:

- The area around the Clear Bore™ 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.

A Fracture Blow-out (Frac-out) Prevention and Contingency Plan will be prepared by the drilling contractor prior to construction and will include the following measures:

- The drilling fluid/bentonite will be non-toxic and naturally biodegradable (i.e., Clear Bore Drilling Fluid or similar will be used);
- The area around the drilling fluid batching, pumping and recycling plants will be bunded using terram and/or sandbags to contain any potential spillage;
- A double row of silt fencing will be placed between the works area and the adjacent river;
- Spills of drilling fluid will be cleaned up immediately and transported off-site for disposal at a licensed facility;
- Adequately sized skips will be used where temporary storage of arisings are required;
- The drilling process/pressure will be constantly monitored to detect any possible leaks or breakouts into the surrounding geology or local watercourse;
- This will be gauged by observation and by monitoring the pumping rates and pressures. If any signs of breakout occur then drilling will be immediately stopped;
- Any frac-out material will be contained and removed off-site;
- The drilling location will be reviewed, before re-commencing with a higher viscosity drilling fluid mix; and,

- If the risk of further frac-out is high, a new drilling alignment will be sought at the crossing location

Pre-emptive Site Drainage Management

The works programme for the initial construction stage of the development will also take account of weather forecasts, and predicted rainfall in particular. Large excavations and movements of soil/subsoil or vegetation stripping will be suspended or scaled back if prolonged or intense rain is forecast. The extent to which works will be scaled back or suspended will relate directly to the amount of rainfall forecast.

The following forecasting systems are available and will be used on a daily 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;
- Meteo Alarm: 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 will allow work to be safely controlled (from a water quality perspective) in the event of an impending high rainfall intensity event.

Works will be suspended if forecasting suggests either 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 will be completed:

- Secure all open excavations;
- Provide temporary or emergency drainage to prevent back-up of surface runoff; and,
- Avoid working during heavy rainfall and for up to 24-hours after heavy events to ensure drainage systems are not overloaded.

Timing of Construction Works

The construction of the site drainage system will be carried out, at the respective locations, prior to other activities being commenced. The construction of the drainage system will only be carried out during periods of, where possible, no rainfall, therefore avoiding runoff. This will avoid the risk of entrainment of suspended sediment in surface water runoff, and transport via this pathway to surface watercourses. Construction of the drainage system during this period will also ensure that attenuation features associated with the drainage system will be in place and functional for all subsequent construction works.

Monitoring

Prior to the commencement of development, a detailed Site Drainage Plan and SWMP will be prepared to detail the siting and composition of the surface water management measures. The respective plans, which will form part of a detailed Construction Environmental Management Plan (CEMP), will be prepared prior to the commencement of development.

The CEMP will also include a detailed Water Quality Monitoring Plan for the monitoring of surface waters in the vicinity of the construction site by a designated Environmental Manager. The monitoring programme will comprise field testing and laboratory analysis of a range of agreed parameters. The civil works contractor, who will be responsible for the construction of the site drainage system, and Environmental Manager will undertake regular inspections of the drainage system to ensure that all measures are functioning effectively. The surface water sampling locations used in this EIAR (i.e. SW1 – SW3) will be used during construction activities. Regular inspections of all installed drainage systems will be undertaken, especially after heavy rainfall, to check for blockages, and ensure there is no build-up of standing water in parts of the systems where it is not intended.

Any excess build-up of silt levels that may decrease the effectiveness of the drainage feature, will be removed and disposed of in an appropriate manner.

5.3.1.2 Mitigation Measures for Excavation dewatering and effects on Surface Water Quality

The management of excavation dewatering (pumping), particularly in relation to any accumulation of water in foundations or electricity line trenches, 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;
- The interceptor drainage will be discharged to the site constructed drainage system or onto natural vegetated surfaces and not directly to surface waters to ensure that Greenfield runoff rates are mimicked;
- If required, pumping of excavation inflows will prevent build-up of water in the excavation;
- The pumped water volumes will be discharged via volume and silt/sediment ponds and settlement lagoons 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 wind farm excavations by the Environmental Manager will occur during the construction phase. If high levels of seepage inflow occur, excavation work at this location will cease immediately and a geotechnical assessment undertaken; and,
- A mobile 'Siltbuster' or similar equivalent specialist treatment system will be available on-site for emergencies. Siltbusters are mobile silt traps that can remove fine particles from water using a proven technology and hydraulic design in a rugged unit. The mobile units are specifically designed for use on construction-sites. They will be used as final line of defence if needed.

5.3.1.3 Mitigation measures for Release of Hydrocarbons during construction and storage

Mitigation measures proposed to avoid release of hydrocarbons at the site are as follows:

- The volume of fuels or oils stored on site will be minimised. All fuel and oil will be stored in an appropriately bunded area within the temporary construction compound. Only an appropriate volume of fuel will be stored at any given time. The bunded area will be roofed to avoid the ingress of rainfall and will be fitted with a storm drainage system and an appropriate oil interceptor;
- All bunded areas will have 110% capacity of the volume to be stored;
- On site refuelling 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 at the temporary compound and will be towed around the site by a 4x4 jeep to where

plant and machinery is located. No refuelling will be permitted at works locations within the 50m hydrological buffer. The 4x4 jeep will also be fully stocked with 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 to avoid any accidental leakages;

- All plant and machinery used during construction will be regularly inspected for leaks and fitness for purpose;
- Spill kits will be readily available to deal with and accidental spillages;
- All waste tar material arising from road cuttings (from trenching or other works in public roads) will be removed off-site and taken to a licensed waste facility. Due to the potential for contamination of soils and subsoils, it is not proposed to utilise this material for any reinstatement works; and
- An outline emergency plan for the construction phase to deal with accidental spillages is contained within the Planning-Stage CEMP (Annex 3.4). This emergency plan will be further developed prior to the commencement of development, and will be agreed with the Planning Authority as part of the detailed CEMP.

5.3.1.4 Mitigation Measures for Release of Cement-Based Products

The following mitigation measures are proposed to ensure that the release of cement-based products is avoided:

- No batching of wet-cement products will occur on site. Ready-mixed concrete will be brought to site as required and, where possible, emplacement of pre-cast products, will take utilised;
- All drain crossings will utilise pre-cast products and the use of wet-cement products within the hydrological buffer will be avoided;
- Where concrete is delivered on site, only the chute will be cleaned, using the smallest volume of water practicable. Chute cleaning will be undertaken at lined cement washout ponds with waters being stored in the temporary construction compound, removed off site and disposed of at an approved licensed facility. No discharge of cement contaminated waters to the construction phase drainage system or directly to any artificial drain or watercourse will be allowed;
- Weather forecasting will be used to ensure that prolonged or intense rainfall is not predicted during concrete pouring activities; and,
- The concrete pour site will be kept free of standing water and plastic covers will be ready in case of sudden rainfall event.

5.3.1.5 Mitigation for Morphological and Hydrological Effects due to New Watercourse Crossing Works (Proposed Wind Farm)

- All proposed 3 no. new stream crossings will be bottomless or clear span structures 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 Ireland2 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

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

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.

5.3.1.6 Mitigations Measures for Hydrological Impacts on the Designated Sites

The proposed mitigation measures for protection of surface water quality, which will include buffer zones and robust drainage control measures (i.e. interceptor drains, swales, silt/settlement ponds, settlement lagoons), will ensure that the quality of runoff from development areas will be very high. Accordingly, no further mitigation measures are assessed as being required.

5.3.1.7 Mitigation Measures for Effects on the WFD status

No additional targeted measures are required or proposed in respect of the WFD assessment. The strict implementation of the measures set out in the preceding sections will ensure that the status of both surface water and groundwater bodies in the vicinity of the site will be maintained.

With regard to treatment standards, the drainage system has been designed to achieve compliance with surface water Environmental Quality Standards (EQS) in the downstream receiving waters.

The application of the drainage management as outlined will ensure compliance with EU Surface Water Regulations and WFD requirements while also maintaining the baseline hydrology of the site.

As such, the project is compliant with the requirements of the Water Framework Directive (2000/60/EC) and the Groundwater Directive (2006/118/EC).

5.3.1.8 Mitigation Measures for Effects on Clomantagh/Killoshulan (Balief) GWS

Mitigation By Design:

<u>Avoidance of Ground Surface Karst features:</u>

All mapped enclosed depressions and swallow holes at the Proposed Wind Farm site have been avoided by the Proposed Wind Farm infrastructure.

All Proposed Wind Farm infrastructure surface water drainage outfalls at level spreaders will be located outside the 30m karst feature buffer zones.

During the construction phase all runoff from works areas (i.e. dirty water) will be attenuated and treated to a high quality prior to being released outside of 30m karst feature buffer zones. Refer to Section 9.5.2.3 of the EIAR for drainage mitigation details.

<u>Avoidance of Subsurface Karst features:</u>

Detailed drilling and geophysical surveys have been carried out to investigate the potential presence of sub surface karst features at proposed turbines T1 to T4.

Investigations carried out at the proposed turbines T1 to T2 identified potential subsurface karst features (clay infills) near both turbines (refer to in Section 9.3.9.3 of the EIAR for commentary on the investigations. No evidence of karst was found at turbine location T3.

However, as illustrated on the annotated ERT and Seismic Refraction profile (**Appendix 8-5 of the EIAR**), the T1 and T2 turbine foundations can be constructed on competent limestone and will have no interaction with any potential subsurface karst feature. The required cut and fill at each turbine location will also have no interaction with any potential subsurface karst feature (see following mitigation below). Turbine T3 will be constructed on competent limestone and turbine T4 on mudstone bedrock.

Cut and Fill Design Measures:
Due to the presence of shallow limestone bedrock in the areas around T01, T02, T03 and locally at T4, the proposed earthworks associated with the access roads and hardstands has been designed in such a way as to minimise the cutting (excavation) extents and depths. Where possible infilling is emphasised out over cut. Refer to Table 8-13 of Chapter 8 (Land, Soils and Geology) which show that infill volumes significantly exceed cut volumes and therefore this mitigation approach has been achieved.

This preserves the existing overburden cover present above the limestone bedrock, maintaining the current topographic regime, and as such does not increase the risk of karst reactivation or exposure.

This has included a bespoke hardstand layout for turbine T3 which omits the blade fingers, in order to avoid significant cutting at this location. The alignment of the access roads has also avoided the mapped karst features in this area which lowers the risk of drainage associated with the access roads leading to reactivation of karst.

Construction Phase Karst Protocol:

A karst protocol, provided in Appendix E [of the FT Karst Assessment Report shown in Appendix 8-3 of the EIAR], has been developed to translate the karst risk to the construction stage. In all cases the formation level is to be checked by the Resident Engineer (RE) for any local soft / weak or loose areas. The RE is to be notified if any soft / weak or loose areas are identified.

Due to potential karst risks around turbines T1 and T2 and extending along the access road towards turbine T4, the following investigations shall be carried out:

- Formations for embankments or cuttings to be proof rolled and observed for signs of weakness; and,
- Formations for structure (turbine) foundations to be proof rolled as above. The excavation shall be extended to rock head (where feasible) in areas where the karst risk is high or where evidence of karst features is encountered during overburden excavation.

Water Quality Protection/Pollution Prevention Measures:

The following mitigation is proposed at all construction works areas inside the Clomantagh/Killoshulan (Balief) GWS source protection area:

- No storage of fuels, oils, cements, or chemicals will be permitted within the SPA;
- Refuelling of mobile plant (i.e. diggers, dumpers etc) will only be permitted outside the SPA;
- Refuelling of large immobile plant (i.e. cranes) will only be carried out with a refuelling truck that will be removed from SPA immediately after use;

- Spill kit stations will be present at each turbine location (T1 to T4);
- A geotextile liner will be placed below the founding layer (lean mix concrete) where concrete is to be poured. These both prevent vertical loss of wet concrete at turbine bases;
- Use of perimeter shuttering at turbine bases to prevent lateral loss of wet concrete;
- All temporary cement washout lagoons will be located outside the SPA;
- No wind farm drainage will be released inside the 30m karst buffer;
- There will be clear signage in place inside the SPA to remind construction workers that the area is inside a drinking water protection area; and,
- A double silt fence perimeter will be placed around all nearby karst features.

5.3.2 Operational Phase

5.3.2.1 Mitigation Measures for Progressive Replacement of Natural Syrface with Lower Permeability Surfaces

The operational phase drainage system of the project is described below:

- Interceptor drains will be installed up-gradient of all 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 tracks, turbine hardstanding areas and substation compound areas which may contain entrained suspended sediment, and channel it to settlement ponds for sediment settling;
- Transverse drains ('grips') will be constructed, where appropriate, in the surface layer of access tracks to divert any runoff into swales/track side drains;
- Check dams will be used along sections of access tracks drains to intercept silts at source. Check dams will be constructed from a 40mm non-friable crushed rock or similar;
- Swales and check dams 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 will be designed in accordance the greenfield runoff rate requirements; and,
- Imported rock for construction purposes and road surfacing will be strong, well-graded limestone which will be resistant to erosion and have a low likelihood to generate fines in hardstand runoff.

The operation of the underground grid connection will not result in any likely hydrological or water quality effects and therefore do not require mitigation measures.

5.3.2.2 Mitigation Measures for Hydrocarbons Spillage/Leakages

Mitigation measures relating to oils and fuels are as follows:

- Fuels stored on site will be minimised. Any storage areas will be bunded appropriately for the fuel storage volume for the time period of the construction;
- Any oil storage tanks will be located in a concrete bund, impervious to rainwater ingress, capable of holding 110% of the stored oil volume;
- Turbine transformers will be located within the turbines, and any leaks will be fully contained within the turbine thus eliminating any pathway for leakages to affect land and soil;
- Maintenance vehicles will be regularly inspected for leaks and fitness for purpose; and
- An emergency plan for the operational phase to deal with accidental spillages will be contained within Environmental Management Plan. Spill kits will be available to deal with accidental spillages.

5.3.3 Decommissioning Phase

As in the construction phase, temporary surface runoff control measures will again be put in place during decommissioning works. The drainage system will remain operational during the decommissioning phase and will serve to treat any sediment laden surface water run-off due to a renewed disturbance of soils. Following decommissioning, re-vegetation will be implemented as soon as practicable and monitored to ensure vegetation is established.

Likely effects would be similar to the construction phase but to a lesser degree. There would be increased trafficking and an increased risk of disturbance to underlying soils at the project site. Any such effects would be less than during the construction phase as the drainage system would be fully mature and would provide additional filtration of runoff. Any diesel or fuel oils stored on site would be bunded.

Following decommissioning, turbine foundations, hardstanding areas and access tracks will be rehabilitated in accordance with the methods outlined at Chapter 3. The access tracks may be left in place, subject to agreement with the Planning Authority and the landowner. It is considered that this approach will result in lesser effects that would their removal.

5.4 POTENTIAL EFFECTS ON QUALITY ELEMENTS WITH THE IMPLEMENTATION OF MITIGATION

A summary of potential effects on SWB quality elements is provided in **Table P**, and a summary of potential status change to SWBs arising from potential surface water quality element impacts of the Proposed Project are presented in **Table R**.

Table P: Potential Effects on receiving SWB Quality Elements

SWB Quality Element	Post Mitigation Potential Risk To Downstream Receptors	Reasoning
Hydromorphology	No	Refer to Sections 5.3.1.5, 5.3.2.1
Physio-Chemical Quality	No	Refer to Sections 5.3.1.1, 5.3.1.2, 5.3.1.3, 5.3.1.4 and 5.3.2.2
Biological Quality Elements	No	Refer to Sections 5.3.1.1, 5.3.1.2, 5.3.1.3, 5.3.1.4 and 5.3.2.2
Priority Substances / Specific Pollutants	No	Refer to Sections 5.3.1.1, 5.3.1.2, 5.3.1.3, 5.3.1.4 and 5.3.2.2
Protected Areas	No	Refer to Sections 5.3.1.1, 5.3.1.2, 5.3.1.3, 5.3.1.4 and 5.3.2.2
Fish Migration Passage	No	Refer to Sections 5.3.1.5, 5.3.2.1

A summary of potential effects on GWB quality elements is provided in **Table Q**, and a summary of potential status change to GWB Status arising from potential groundwater quality element impacts of the Proposed Project is presented in **Table R**.

Table Q: Potential Effects on receiving GWB Quality Elements

GWB Quality Element	Post Mitigation Potential Risk To Downstream Receptors	Reasoning
GWDTE	No	Section 5.2.1.3
Impact of GW on SW Ecological/Chemical Status	No	Refer to Sections 5.3.1.1, 5.3.1.2, 5.3.1.3, 5.3.1.4 and 5.3.2.2
DWPAs	No	Section 5.3.1.8
General Chemical Assessment Tests	No	Refer to Sections 5.3.1.1, 5.3.1.2, 5.3.1.3, 5.3.1.4, 5.3.2.2 and 5.3.1.8

5.5 POTENTIAL EFFECTS WITH THE IMPLEMENTATION OF MITIGATION

In all instances, the mitigation measures described in **Section 5.3** are sufficient to meet the WFD Objectives. The assessment of WFD elements for the WFD waterbodies is summarised in **Table R** below.

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

SWB	WFD Code	Current Status	Assessed Status - Unmitigated	Assessed Status with Mitigation Measures
Proposed Wind Farm				
Gorteenahilla_010	IE_SE_15G080300	Moderate	Poor	Moderate
Nuenna_010	IE_SE_15N020100	Moderate	Poor	Moderate
Nuenna_020	IE_SE_15N020400	Poor	Bad	Poor
Nore_150	IE_SE_15N011700	Moderate	Moderate	Moderate
Proposed Grid Connection				
Gorteenahilla_010	IE_SE_15G080300	Moderate	Moderate	Moderate
Nuenna_020	IE_SE_15N020400	Poor	Poor	Poor
Lisdowney_010	IE_SE_15L020100	Moderate	Moderate	Moderate
Nore_120	IE_SE_15N011400	Moderate	Moderate	Moderate
Nore_130	IE_SE_15N011500	Good	Good	Good
Nore_140	IE_SE_15N011600	Good	Good	Good
Nore_150	IE_SE_15N011700	Moderate	Moderate	Moderate
Nore_160	IE_SE_15N011750	Good	Good	Good
Nore_170	IE_SE_15N011950	Moderate	Moderate	Moderate
TDR Accommodation Works				
Nuenna_010	IE_SE_15N020100	Moderate	Moderate	Moderate
Nuenna_020	IE_SE_15N020400	Poor	Poor	Poor
Goul_030	IE_SE_15G020200	Moderate	Moderate	Moderate
Goul_040	IE_SE_15G020300	Poor	Poor	Poor
Goul_050	IE_SE_15G020360	Moderate	Moderate	Moderate
GWB				
Lisdowney	IE_SE_G_088	Good	Good	Good

Durrow	IE_SE_G_156	Good	Good	Good
Kilkenny-Ballynakill Gravels	IE_SE_G_163	Good	Good	Good
Loughans Turlough (GWDTE)	IE_SE_G_134	Good	Good	Good
Rathdowney	IE_SE_G_114	Good	Good	Good

5.6 CUMULATIVE EFFECTS

In addition to the Proposed Project, 3 no. other wind farm projects have been identified within the Nore_SC_070 catchment/cumulative study area.

Within these existing (Lisdowney Wind Farm) and proposed wind farms (Gathabawn WF & Seskin Renewables WF) there are a total of 14 no. turbines potentially situated within the Nore_SC_070.

In terms of operational phase, the total number of wind turbines that could potentially be operating in the cumulative study area is 24 no. (10 no. from Proposed Project and 14 no. turbines from the other wind farms).

The total area of the Nore_SC_070 catchment is c. 155km^2 which equates to 1 no. turbine per approximately 6.4km^2 which is considered not significant in terms of likely cumulative hydrological effects on the Nore_SC_070.

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

6. SUMMARY AND CONCLUSION

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

The Proposed Project does not involve any abstraction of groundwater or significant 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 Project 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 at the Site during the construction, operational and decommissioning phases of the Proposed Project. These mitigation measures will ensure the qualitative status of the underlying GWBs will not be altered by the Proposed Project.

Furthermore, mitigation measures during the construction, operation and decommissioning phases of the Proposed Project will ensure that there will be no significant effects on any of the protected areas in the vicinity of the Proposed Project.

As such, the Proposed Project:

- Will not cause a deterioration in the status of any surface and groundwater bodies;
- Will not jeopardise the objectives to achieve 'Good' surface water/groundwater status;
- Will not jeopardised the attainment of 'Good' surface water/groundwater chemical status;
- Will not jeopardised the attainment of 'Good' surface water/groundwater quantity status;
- 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)

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