APPENDIX 9-3

WATER FRAMEWORK DIRECTIVE COMPLIANCE ASSESSMENT

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WATER FRAMEWORK DIRECTIVE COMPLIANCE ASSESSMENT
CRUMHACH WIND FARM, CO. SLIGO

FINAL REPORT

Prepared for:

MKO

Prepared by:

HYDRO-ENVIRONMENTAL SERVICES

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1. INTRODUCTION

1.1 BACKGROUND

Hydro-Environmental Services (HES) were requested by MKO to complete a Water Framework Directive (WFD) Compliance Assessment for the proposed Crumhach Wind Farm, Co. Sligo.

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

Where the 'Proposed Wind Farm' is referred to, this refers to proposed 17 no. turbines and associated foundations and hard-standing areas, access tracks, temporary construction compounds, onsite 110kV substation, internal underground cabling, onsite LiDAR compounds, peat and spoil management areas, site drainage, biodiversity enhancement, borrow pits, turbine delivery route (TDR) accommodation works and all ancillary works and apparatus.

Where the 'Proposed Grid Connection Route' is referred to this encompasses the 41km 110kV underground cabling connecting the Proposed Wind Farm on-site 110kV substation to the existing Srananagh 220kV substation, and all ancillary works and apparatus.

Where the 'Existing Wind Farm' is referred to, this relates to all components of the existing Dunneill Wind Farm and Kingsmountain Wind Farm developments.

In addition, where the construction phase is detailed and assessed within the EIAR, this includes the removal of the existing 23 no. turbines at the Existing Wind Farm and the construction of the 17 no. Proposed Turbines and associated infrastructure at 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 David Broderick, Michael Gill and Nitesh Dalal.

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 worked on the EIS/EIARs for Lyre Wind Farm, Glenard Wind Farm, Ballyouskill Wind Farm, and over 60 other wind farm related

projects across the country. David worked on his first wind energy project in 2010, and he has continued to work on similar projects since then.

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 Lemanaghan Wind Farm, Seven Hills Wind Farm, Carrownagowan Wind Farm, and over 100 other wind farm related projects across the country. Michael worked on his first wind energy project in 2003, and he has continued to work on similar projects since then.

Nitesh Dalal (B.Tech, PG Dip., MSc) is an Environmental Scientist with over 8 years' experience in environmental consultancy. 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).

1.3 WATER FRAMEWORK DIRECTIVE

The EU Water Framework Directive (2000/60/EC), as amended by Directives 2008/105/EC, 2013/39/EU and 2014/101/EU ("**WFD**"), was established to ensure the protection of the water environment. The Directive was transposed in Ireland by the European Communities (Water Policy) Regulations 2003 (S.I. No. 722 of 2003).

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

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

[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.

- 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.

2. WATERBODY IDENTIFICATION CLASSIFICATION

2.1 INTRODUCTION

This section identifies those Surface Waterbodies (SWBs) and Groundwater Bodies (GWBs) 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 is located in Sligo Bay Surface water catchment within Hydrometric Area No. 35 of the Western River Basin District. The western part of the Proposed Wind Farm is mapped within the Easky_SC_010 river sub-catchment and the eastern part of the Proposed Wind Farm is mapped within the Dunmoran_SC_010 river sub-catchment.

The Existing Wind Farm (23 no. turbines) and the proposed Biodiversity Management and Enhancement Plan (BMEP) lands are situated within the Proposed Wind Farm and are dealt with herein.

Within the Easky_SC_010 river sub-catchment, the northern area of the Proposed Wind Farm is mapped within Buncrowey_010 river sub-basin while the southern area is mapped within the Easky_030 and Easky_020 river sub-basins. Within the Dunmoran_SC_010 river sub-catchment, the majority of the Proposed Wind Farm is mapped within the Dunneill_010 river sub-basin with some areas mapped within the Doonbeakin_010 and Lugdoon Stream_010 river sub-basins.

Within the Buncrowey_010 sub-basin, the Buncrowey_010 river waterbody and its tributaries flow through the Proposed Wind Farm. The Buncrowey_010 flows in northwestern direction and drains into the Easky_030 river waterbody. Within the Easky_030 sub-basin, the tributary of the Easky_030 originates from the Proposed Wind Farm and flows in northwest and drains into the Easky_040 river waterbody. Within the Easky_020 river sub-basin, the Easky_020 flows ~50m south of the Proposed Wind Farm and drains into the Easky_030 river waterbody.

Within the Dunneill_010 sub-basin, the Dunneill_010 river waterbody flows along the southern boundary of the Proposed Wind Farm and then flows to the north passing through the Proposed Wind Farm to drain into the Dunneill_020 river waterbody. Within the Doonbeakin_010 river sub-basin, the Doonbeakin_010 river waterbody flows through the northern part of the Proposed Wind Farm and flows in a northerly direction to drain into the Dunneill_020 river waterbody. Within the Lugdoon Stream_010 river sub-basin, the Lugdoon Stream_010 flows in a northerly direction though the northeastern section of the Proposed Wind Farm and drains into the Donegal Bay Southern coastal waterbody.

The existing 23 no. turbines from the Existing Wind Farm are located in the Dunmoran_SC_010 and drain to the Dunneill River (Dunneill_010 and Doonbeakin_010 sub-basins).

Table A below presents the catchment area of each waterbody downstream of the Proposed Wind as far as Donegal Bay Southern to which the Proposed Wind Farm ultimately drains into. The catchment area for the waterbodies increases progressively downstream as more tributaries discharge into SWBs. Therefore, those waterbodies which are located in close proximity to the Proposed Wind Farm are more susceptible to water quality impacts as a result of activities associated with the Proposed Wind Farm. The potential for the Proposed Wind Farm to impact a waterbody decreases further downstream due to the increasing catchment area to the surface waterbody and resulting increase in flow volumes.

Table A: Catchment Area Downstream of Proposed Wind Farm

WFD River Sub-Basin	Total downstream Catchment Area (km²)
Easky_SC_010 sub-catchment	
Buncrowey_010	~19
Easky_020	~34
Easky_030	~90
Easky_040	~100
Dunmoran_SC_010 sub-catchment	
Doonbeakin_010	~9
Dunneill_010	~12
Dunneill_020	~29
Lugdoon Stream_010	~11

Proposed Grid Connection Route

Regionally, the Proposed Grid Connection Route is located in Sligo Bay Surface water catchment within Hydrometric Area No. 35 of the Western River Basin District. The majority of the Proposed Grid Connection Route (26.1km) is mapped within the Dunmoran_SC_010 river sub-catchment with a short section (1.6km) in the west mapped within the Easky_SC_010 river sub-catchment and the eastern part is mapped within the Owenmore[Sligo]_SC_040 (5.5km) and Owenmore[Sligo]_SC_030 (7.8km) river sub-catchments.

Within the Easky_SC_010 river sub-catchment, the Proposed Grid Connection Route is mapped within the Buncrowey_010 river sub-basin. Within the Dunmoran_SC_010 river sub-catchment, the Proposed Grid Connection Route is mapped within the Dunneill_010, Doonbeakin_010, Dunneill_020, Lugdoon Stream_010, Kilrusheighter_010, Doonflin_010, Dunmoran_020 and Barnabrack_010 river sub-basins. Within the Owenmore[Sligo]_SC_040 river sub-catchment, the Proposed Grid Connection Route is mapped within the Ballysodare_010 and Owenmore (Sligo)_080 river sub-basins. Within the Owenmore[Sligo]_SC_030 river sub-catchments, the Proposed Grid Connection Route is mapped within the Owenmore (Sligo)_080, Unshin_050 and Unshin_040 river sub-basins.

Table B presents the catchment area of each waterbody downstream of the Proposed Grid Connection Route as far as Donegal Bay Southern, Sligo Bay and Ballysadare Estuary into which the Proposed Grid Connection Route ultimately drains towards. The catchment area for the waterbodies increases progressively downstream as more tributaries discharge into SWBs. Therefore, those waterbodies which are located in close proximity to the Proposed Grid Connection Route are more susceptible to water quality effects as a result of activities associated with the Proposed Grid Connection Route. The potential for the Proposed Grid Connection Route to affect 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 Route

WFD River Sub-Basin	Total downstream Catchment Area (km²)
Easky_SC_010 river sub-catchment	
Buncrowey_010	~19
Easky_030	~90
Easky_040	~100
Dunmoran_SC_010 river sub-catchment	
Doonbeakin_010	~9
Dunneill_010	~12
Dunneill_020	~29
Lugdoon Stream_010	~11
Kilrusheighter_010	~12
Doonflin_010	~20

Dunmoran_020	~34
Barnabrack_010	~44
Owenmore[Sligo]_SC_040 river sub-catchment	
Owenmore(Sligo)_080	~411
Ballysodare_010	~640
Owenmore[Sligo]_SC_030 river sub-catchment	
Owenmore(Sligo)_080	~411
Unshin_040	~201
Unshin_050	~221

Turbine Delivery Route (TDR) Works

Regionally, the TDR works are located in Sligo Bay Surface water catchment within Hydrometric Area No. 35 of the Western River Basin District.

More locally, the TDR works are mapped within the Easky_SC_010 river sub-catchment and Owenmore(Sligo)_SC_040. The respective sub-basins in which the works are proposed include the Carrownrush_010 river sub-basin and Ballysodare_010.

Table C presents the catchment area of each waterbody downstream of the Proposed TDR Works.

Table C: Catchment Area Downstream of Proposed Turbine Delivery Route Works

WFD River Sub-Basin	Total downstream Catchment Area (km²)
Easky_SC_010 river sub-catchment	
Carrownrush_010	~17
Owenmore(Sligo)_SC_040	
Ballysodare_010	~640

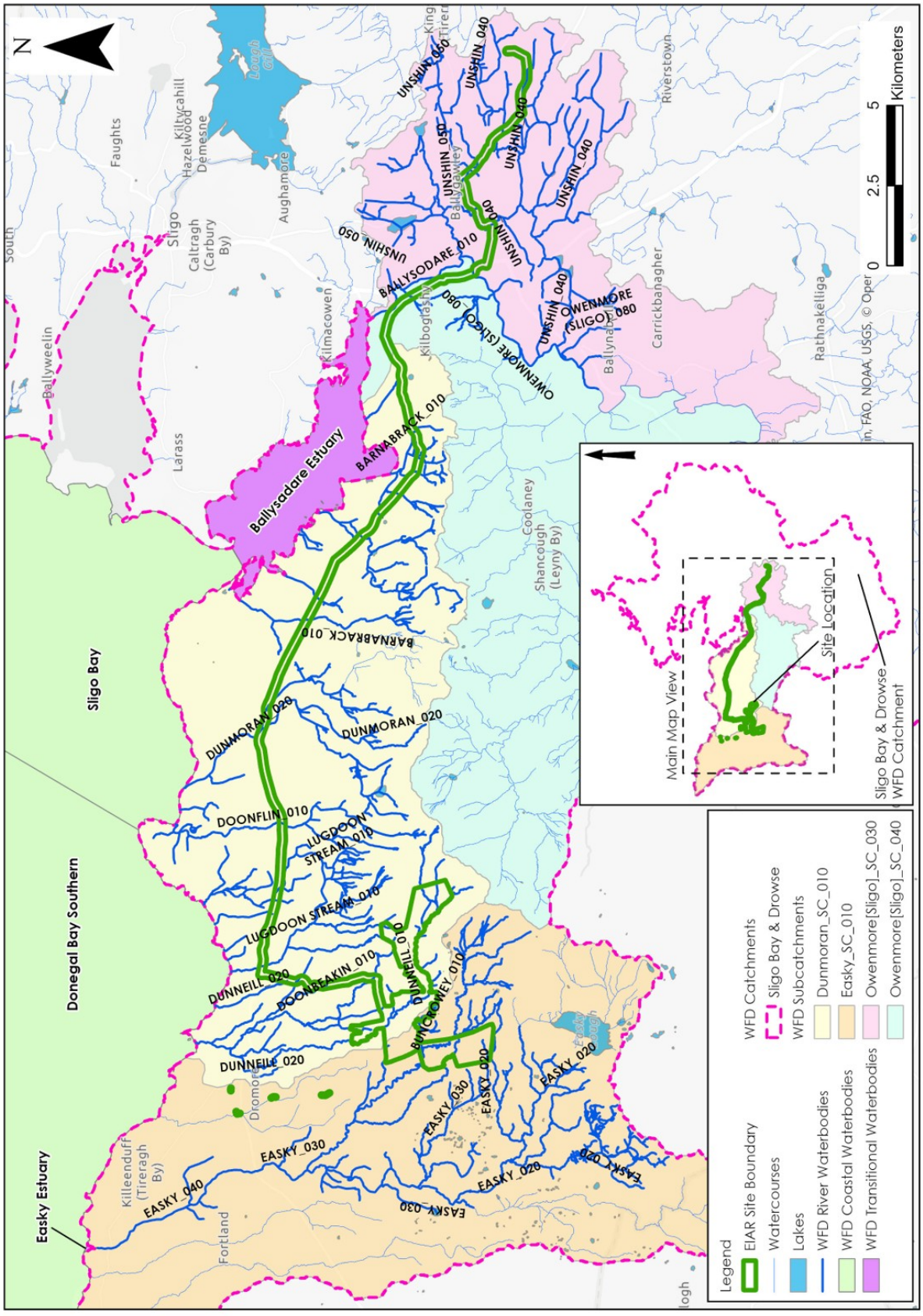

Figure A: Local Hydrology Map

2.3 SURFACE WATER BODY CLASSIFICATION

A summary of the WFD status and risk result for 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 Project is situated within 4 no. Sub-catchments; the Easky_SC_010 and the Dunmoran_SC_010, Owenmore[Sligo]_SC_040 and Owenmore[Sligo]_SC_030 sub-catchments.

Within the Easky_SC_010 river sub-catchment, the Easky_020, Easky_030 and Easky_040 have achieved "High" status in the latest WFD cycle (2019-2024). The Buncrowey_010 has achieved "Moderate" status and Carrownrush_010 "Good" status. The Easky_020 and Easky_030 are 'not at risk' of failing to achieve its WFD objectives, the Easky_040 and Carrownrush_010 are under review while the Bunrcrowey_010 is 'at risk' of failing to achieve its WFD objectives. Forestry is the identified significant pressure on the Buncrowey_010 SWB.

Within the Dunmoran_SC_010 river sub-catchment, the Doonbeakin_010, Dunneill_010, Lugdoon Stream_010, Kilrusheighter_010, Dunmoran_020 and Barnabrack_010 have achieved "Good" status in the latest WFD cycle while the Dunneill_020 and Doonflin_010 have achieved "Moderate" status in the latest WFD cycle. The Doonbeakin_010 and the Dunmoran_020 are 'not at risk' of failing to achieve its WFD objectives, the Kilrusheighter_010 and Barnabrack_010 are under review while the Dunneill_010, Dunneill_020, Lugdoon Stream_010 and Doonflin_010 are 'at risk' of failing to achieve its WFD objectives. Agriculture is the identified significant pressure on the Lugdoon Stream_010 and Doonflin_010. Hydromorphology is the identified significant pressure on the Dunneill_010, while Anthropogenic is the identified significant pressure on the Dunneill_020 SWB.

Within the Owenmore[Sligo]_SC_040 river sub-catchment, the Owenmore(Sligo)_080 have achieved "Moderate" status in the latest WFD cycle while the Ballysodare_010 has achieved "Poor" status in the latest WFD cycle. Both SWBs are 'at risk' of failing to achieve its WFD objectives. Urban Wastewater is the identified significant pressure on the Owenmore(Sligo)_080 and Anthropogenic is the identified significant pressure on the Ballysodare_010 SWB.

Within the Owenmore[Sligo]_SC_030 river sub-catchment, the Unshin_040 and the Unshin_050 have achieved "High" status in the latest WFD cycle and are 'not at risk' of failing to achieve its WFD objectives.

In terms of transitional water body, the Easky Estuary has achieved "High" status in the latest WFD cycle and is 'not at risk' of failing to achieve its WFD objectives while the Ballysadare Estuary achieved "Moderate" status in the latest WFD cycle and is 'at risk' of failing to achieve its WFD objectives. Agriculture and Urban Wastewater is the identified significant pressure on the Ballysadare Estuary transitional waterbody.

In terms of Coastal water body, Donegal Bay Southern have achieved "High" status in the latest WFD cycle and is 'not at risk' of failing to achieve its WFD objectives while Sligo Bay has achieved "Good" status in the latest WFD cycle and is 'at risk' of failing to achieve its WFD objectives. Anthropogenic is the identified significant pressure on the Sligo Bay coastal water body.

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

Table D: Summary WFD Information for River Water Bodies

SWB	Overall Status 2013-2018	Overall Status 2016-2021	Overall Status 2019-2024	Risk Status 3rd Cycle	Pressures
Easky_SC_010 river sub-catchment					
Buncrowey_010	Moderate	Moderate	Moderate	At Risk	Forestry
Easky_020	Good	Good	High	Not at Risk	None
Easky_030	High	High	High	Not at Risk	None
Easky_040	Good	High	High	Under review	-
Carrownrush_010	Good	Good	Good	Under review	-
Easky Estuary	High	Good	High	Not at Risk	None
Donegal Bay Southern	High	High	High	Not at Risk	None
Dunmoran_SC_010 river sub-catchment					
Doonbeakin_010	Good	Good	Good	Not at Risk	None
Dunneill_010	Good	Good	Good	At Risk	Hydromorphology
Dunneill_020	Good	Moderate	Moderate	At Risk	Anthropogenic
Lugdoon Stream_010	Moderate	Moderate	Good	At Risk	Agriculture
Kilrusheighter_010	Good	Good	Good	Under review	-
Doonflin_010	Moderate	Moderate	Moderate	At Risk	Agriculture
Dunmoran_020	Good	Good	Good	Not at Risk	None
Barnabrack_010	Good	Good	Good	Under review	-
Owenmore[Sligo]_SC_040 river sub-catchment					
Owenmore(Sligo)_080	Moderate	Poor	Moderate	At Risk	Urban Wastewater
Ballysodare_010	Good	Moderate	Poor	At Risk	Anthropogenic
Ballysadare Estuary	Moderate	Moderate	Moderate	At Risk	Agriculture and Urban Wastewater
Sligo Bay	Good	Moderate	Good	At Risk	Anthropogenic
Owenmore[Sligo]_SC_030 river sub-catchment					
Unshin_040	High	High	High	Not at Risk	None
Unshin_050	High	High	High	Not at Risk	None

2.4 GROUNDWATER BODY IDENTIFICATION

Proposed Wind Farm

The Proposed Wind Farm is largely located within the Collooney Groundwater Body (GWB) (IE_WE_G_0048) which has a mapped surface area of 231.8km^2.

A small portion on the far west of the Proposed Wind Farm extends into the Easky East Groundwater Body (IE_WE_G_0050), which has a mapped surface area of 94.3km^2.

The Collooney GWB is classified as 'poorly productive bedrock' while the Easky East GWB is classified as 'karstic' according to WFD mapping.

Proposed Grid Connection Route

The Proposed Grid Connection Route is located within the Collooney GWB (described above) along with the Beltra-Sligo GWS (IE_WE_G_0043), Carrowmore West (IE_WE_G_0040) and Ballygawley GWB (IE_WE_G_0039) which are all classified as karstic according to WFD mapping.

The eastern end of the Proposed Grid Connection Route is located in the Lavagh-Ballintougher GWB (IE_WE_G_0038) which is classified as 'poorly productive bedrock'.

Turbine Deliver Route Works

The TDR works are mapped within the Collooney GWB and Carrowmore West GWB as described above.

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. Summary WFD information for GWBs underlying the Proposed Development is presented in **Table E**.

The Easky East, Collooney, Beltra-Sligo, Carrowmore West, Ballygawley and Lavagh-Ballintougher GWBs underlying the Site have achieved "Good" status in the latest WFD cycle and are 'Not at Risk' of failing to achieve its WFD objectives.

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

Table E: Summary WFD Information for Groundwater Bodies

GWB	Overall Status 2013-2018	Overall Status 2016-2021	Overall Status 2019-2024	Risk Status 3rd Cycle	Pressures
Easky East	Good	Good	Good	Not at risk	None
Collooney	Good	Good	Good	Not at risk	None
Beltra-Sligo	Good	Good	Good	Not at risk	None
Carrowmore West	Good	Good	Good	Not at risk	None
Ballygawley	Good	Good	Good	Not at risk	None
Lavagh-	Good	Good	Good	Not at risk	None

Ballintougher					

2.6 ZONE OF INFLUENCE

The Zone of Influence (ZoI) to the Site extends to the following SWBs and GWBS:

- River Waterbodies – Buncrowey_010, Easky_010 to Easky_030, Carrownrush_010, Doonbeakin_010, Dunneill_010 and 020, Lugdoon Stream_010, Kilrusheighter_010, Doonflin_010, Dunmoran_020, Barnabrack_010, Owenmore(Sligo)_080, Ballysodare_010, Unshin_040 and Unshin_050 rivers;
- GWBs – Easky East, Collooney, Beltra-Sligo, Carrowmore West, Ballygawley and Lavagh-Ballintougher GWBs; and,
- Transitional and Coastal Waterbodies – Easky Estuary, Ballysadare Estuary, Sligo Bay and Donegal Bay Southern.

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 areas (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 Site is located adjacent to the Ox Mountain Bogs SAC and pNHA (Site Code: 002006) with a small area of the Ox Mountain Bogs SAC mapped within the northern area of the Proposed Wind Farm (where no development is proposed).

Other designated sites in the close vicinity of the Site are:

- Easky River pNHA (Site Code: 001665) is mapped ~6.5km northwest of the Site and is hydrologically connected via Easky River;
- Dunneill River pNHA (Site Code: 001664) is mapped ~3.5km north of the Site and is hydrologically connected via Dunneill River;
- Knockalongy and Knockachree Cliffs SAC and pNHA (Site Code: 001669) are mapped ~2.5 east of the Proposed Wind Farm and ~2.8km south of the Proposed Grid Connection Route;
- Aughris Head pNHA (Site Code: 000620) is mapped ~2.7km north of the Proposed Grid Connection Route;
- Aughris Head SPA (Site Code: 004133) is mapped ~3.9km north of the Proposed Grid Connection Route;
- Ballysadare Bay SAC and pNHA (Site Code: 000622) and Ballysadare Bay SPA (Site Code: 004129) is mapped adjacent to the Proposed Grid Connection Route and located directly downstream;
- Slieveward Bog NHA (Site Code: 001902) is mapped ~250 west of the Proposed Grid Connection Route. This NHA is located upstream of the Proposed Grid Connection Route;

- Unshin River SAC/pNHA (Site Code: 001898) is mapped adjacent to the Proposed Grid Connection Route and is located directly downstream;
- Union Wood SAC and pNHA (Site Code: 000638) is mapped adjacent to the Proposed Grid Connection Route;
- Ballygawley Lough pNHA (Site Code: 001909) is mapped ~1.5km north of the Proposed Grid Connection Route which is an up-stream location relative to the Site; and,
- Lough Dargan pNHA (Site Code: 0019096) is mapped ~1.5km northwest of the Proposed Grid Connection Route which is an upstream location relative to the Site.

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 is no designated bathing waters located in the close vicinity of the Site. The nearest designated bathing area is Dunmoran Beach, which is located ~7.5km northeast and downstream of the Proposed Wind Farm and ~1.9km north of the Proposed Grid Connection Route. The Dunmoran Beach bathing waters (Identification code: IEWEBWC450_0000_0200) lies within Sligo Bay.

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.

Within the Sligo Bay WFD catchment, no SWB is mapped as Nutrient Sensitive Areas (NSA).

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.

There are no Shellfish protected area sites within the vicinity of the Site. The closest Shellfish protected area is the Sligo Bay (IE_WE_470_0000) shellfish area mapped ~8km north and downstream of the Proposed Grid Connection Route.

2.7.5 Salmonid Waters

There is no Salmonid Waters mapped in the vicinity or downstream of the Site according to WFD mapping.

2.7.6 Drinking Water Protected Areas (DWPAs)

There are no surface water DWPAs located downstream of the Site. The closest DWPA is Easky Lough, located ~ 1.8km south of the Proposed Wind Farm.

The Proposed Wind Farm is not located in the Easky Lough surface water catchment. Easky Lough is located 5km further up-stream in the Easky River catchment relative to the Proposed Wind Farm.

There are no public water supply or group water scheme groundwater source protection areas encroached by the Site. Meanwhile all GWB's in Ireland are considered as Drinking water protected areas.

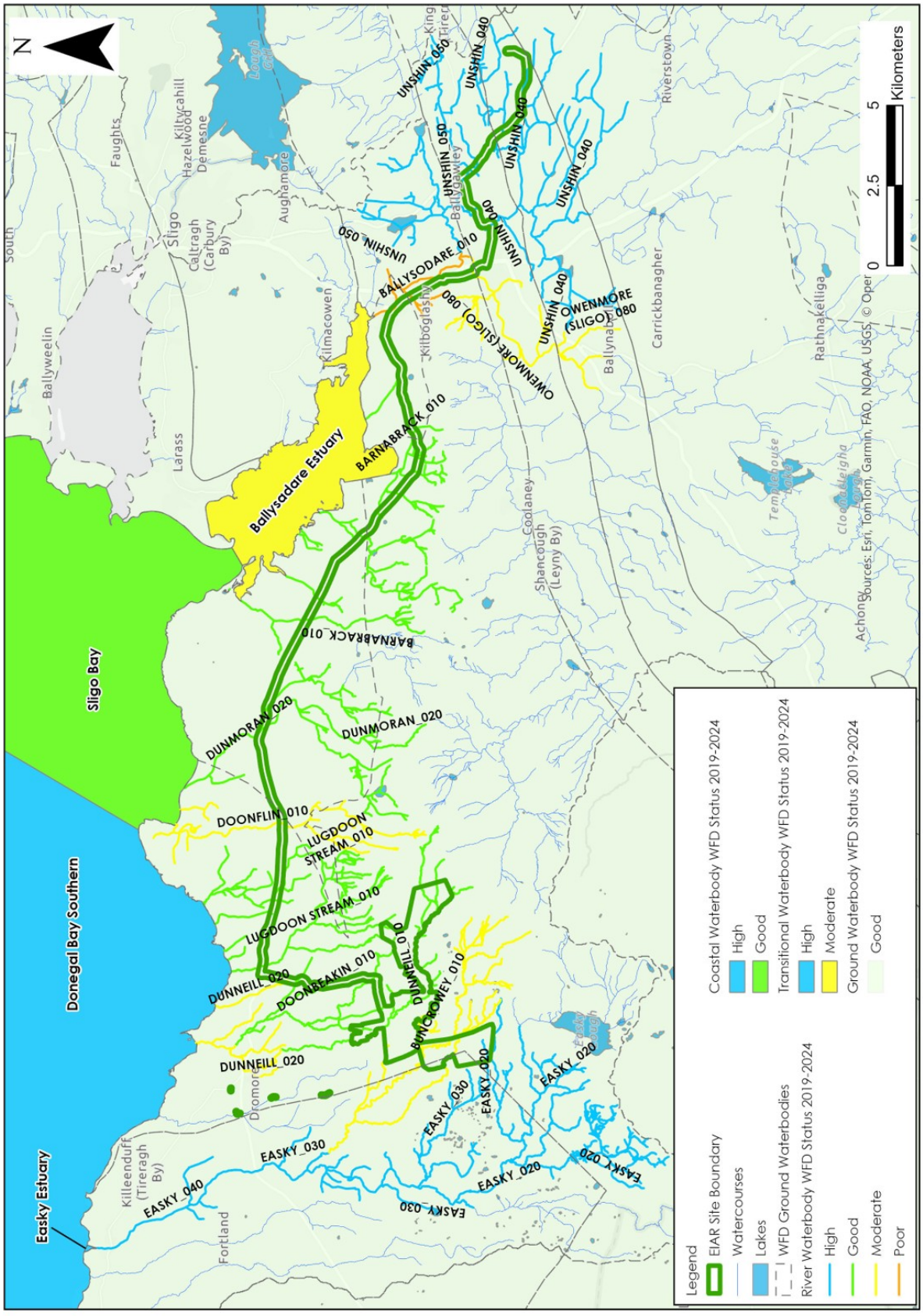

Figure B: WFD Groundwater and Surface Waterbody Status (2019-2024)

3. WFD SCREENING

As discussed in **Section 2,** there are a total of 21 no. SWBs which includes 17 no. river water bodies, 2 no. transitional water bodies and 2 no. coastal water bodies that are located downstream of the Site. Furthermore, the Site is underlain by 6 no. separate groundwater bodies.

3.1 SURFACE WATER BODIES

The river waterbodies in the immediate vicinity and downstream of the Site are described in **Section 2.2** above.

With consideration for the construction, operational and decommissioning phases of the Proposed Project, it is considered that the Buncrowey_010, Easky_020, Easky_030, Carrownrush_010, Doonbeakin_010, Dunneill_010, Dunneill_020, Lugdoon Stream_010, Kilrusheighter_010, Doonflin_010, Dunmoran_020, Barnabrack_010, Owenmore(Sligo)_080, Ballysodare_010, Unshin_040 and Unshin_050 and their associated small unnamed tributaries within the vicinity and downstream of the Proposed Project site are carried through into the WFD Impact assessment. These SWBs have been screened in due to their proximity to the Site and the proposed Works within these river river sub-basins. The proposed 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.

The Easky_040 has been screened in due to its location directly downstream of the Easky_030 river and carried through into the WFD Impact Assessment. The Proposed Project works must not in any way result in a deterioration in the status of these river waterbodies and/or prevent them from meeting the biological and chemical characteristics for good status in the future.

The Carrownrush_010 is scoped out for further assessment due to proposed development within this sub-basin being limited to the TDR works which have no potential to affect the WFD status of the river waterbody.

The Easky Estuary and the Ballysadare Estuary transitional SWBs has been screened out due to the large volumes of water within these SWBs as a result of tidal influence and their distal locations downstream of the Site. The Proposed Project has no potential to cause a deterioration in status of these SWBs and/or jeopardise the attainment of good surface water status in the future.

Sligo Bay and Donegal Bay Southern coastal SWBs are also screened out due to the large volumes of water within these coastal waterbodies and their distal location downstream of the Site. The Proposed Project has no potential to cause a deterioration in status of these SWBs and/or jeopardise the attainment of good surface water status in the future.

3.2 GROUNDWATER BODIES

With respect to GWBs, the Easky East, Collooney, Beltra-Sligo, Carrowmore West, Ballygawley and Lavagh-Ballintougher GWBs have all been screened in due to their location directly underling the Site. The Proposed Project works must not in any way result in a deterioration in the status of these GWB and/or prevent them from meeting the biological and chemical characteristics for good status in the future.

3.3 PROTECTED AREAS

Ox Mountain Bogs SAC/pNHA: The Ox Mountain Bogs SAC/pNHA is mapped adjacent to the Proposed Wind Farm, with a section of the Ox Mountain Bogs SAC/pNHA mapped within the northern area of the Proposed Wind Farm (where no development is proposed).

An assessment is required to consider the potential impacts of the Proposed Project on this protected area. This site comprises several upland blanket bogs situated in the Slieve Gamph, or Ox Mountain range, on the border between counties Sligo and Mayo. The Ox Mountains Bogs SAC is of considerable conservation significance, due primarily to the extensive, largely intact areas of blanket bog it contains. This habitat is listed, and given priority status, on Annex I of the E.U. Habitats Directive. The value of the site is increased by the presence of good examples of several other annex-listed habitats, i.e. wet heath, dry heath, oligotrophic lakes, transition mires, Rhynchosporion vegetation and dystrophic lakes. Also of note is the presence of Marsh Saxifrage and Vertigo geyeri, both nationally rare species, and the populations of two rare and threatened bird species. Part of the site has been designated as a Statutory Nature Reserve. The Ox Mountain Bogs SAC/pNHA is screened in due to its close proximity to the Site.

Easky River pNHA: The Easky River pNHA consists of a steeply sloping woodland along the Riverbank of the Easky River. Several species of flora not native to the area are found in the calcareous flushed areas, while the woodland has a rich ground flora, some of which is locally important for bird and mammal species. The Easky River pNHA has been screened in due to its location downstream of the Site.

Dunneill River pNHA: The Dunneill River pNHA consists of a section of the Dunneill River which runs through a Limestone gorge which is generally wooded along the riverbanks. The narrow woodland fringe is comprised of ash, sessile oak, hawthorn, and blackthorn.

A previous study by An Foras Forbartha recorded the presence of maidenhair fern (Adiantum capillusveneris), which is mainly restricted to the Burren and Aran Islands. However, its presence has not been recorded in more recent studies. The Dunneill River pNHA has been screened in due to its location downstream of the Site.

Ballysadare Bay SAC and pNHA: Ballysadare Bay extends for about 10 km westwards from the town of Ballysadare, Co. Sligo, and is the most southerly of three inlets of the larger Sligo Bay. The estuarine channel of the Ballysadare River winds its way through the bay, finally reaching the open sea near the spit at Strandhill dunes. Ballysadare Bay is of high ecological value for its range of good quality coastal habitats. Actively developing dune systems are rare on the west coast and the sand dune system at Strandhill is of particular interest as a large and intact example of a habitat type which is under general threat from development. The rarity of intact dune systems is recognised in the listing of fixed dunes as a priority habitat on Annex I of the E.U. Habitats Directive. The salt marshes at Ballysadare Bay are relatively good examples for the west coast, and that at Abbeytown is unusual as it is forming on quarry waste. The presence of two Annex II species within the site adds further importance. Furthermore, the bay supports nationally important numbers of waterfowl. The Ballysadare Bay SAC and pNHA is screened in due to its location downstream of the Proposed Grid Connection Route.

Unshin River SAC and pNHA: The Unshin River runs from Lough Arrow north to Ballysadare Bay, Co. Sligo. The river is largely undrained and unaltered along much of its course. The marginal vegetation associated with the river is also included in the site, along with other semi-natural habitats adjacent to the river. Many of these habitat types are interesting and of conservation value in their own right. Other watercourses included within the site are the Owenboy/ Owenbeg and a number of smaller tributaries. The Unshin River flows across a number of geological boundaries between sandstone, shales and limestone. This results in unusual physico-chemical qualities which in turn are reflected in the rich and varied plant and animal populations. The Unshin River SAC and pNHA has been screened in due to its location downstream of the Proposed Grid Connection Route.

Union Wood SAC and pNHA: Union Wood is located on the eastern bank of the Ballysadare River between Ballysadare and Collooney in Co. Sligo. The site contains old oak woodland which is typical of western Oak wood (Blechno-Quercetum) and one of the best remaining in the region. The Union Wood SAC and pNHA has been screened out due to Proposed Grid Connection Route underground cable being located within the carriageway of a public road at this location.

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

3.4 WFD SCREENING SUMMARY

A summary of WFD Screening for SWBs and GWBs discussed above is shown in **Table F** below.

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	**Easky_SC_010 river sub-catchment**			
	River	Buncrowey_010	**Yes**	The Proposed Wind Farm, Proposed Grid Connection Route, BMEP lands and TDR works are mapped within the Buncrowey_010. An assessment is required to consider the potential impacts of the Proposed Project on this SWB.
	River	Easky_020	**Yes**	The Proposed Wind Farm and TDR work area are mapped within the Easky_020. An assessment is required to consider the potential impacts of the Proposed Project on this SWB.
	River	Easky_030	**Yes**	The Proposed Wind Farm, Proposed Grid Connection Route, BMEP lands and TDR works are located upstream of the Easky_030. An assessment is required to consider the potential impacts of the Proposed Project on this SWB.
	River	Easky_040	**Yes**	The Proposed Wind Farm, Proposed Grid Connection Route, BMEP lands and TDR works are located upstream of the Easky_040. An assessment is required to consider the potential impacts of the Proposed Project on this SWB.
	River	Carrownrush_010	No	Development within the Carrownrush_010 is limited to the TDR. Therefore, the Proposed Project is not likely to affect the status of this SWB.
	Transitional	Easky Estuary	No	Easky Estuary transitional SWB has been screened out due to its distal location from the Proposed Project and the large volumes of water within the estuary due to tidal flux. Therefore, the Proposed Project has no potential to affect the status of this Transitional SWB.
	Coastal	Donegal Bay Southern	No	The Donegal Bay Southern coastal SWB has been screened out due the large volumes of water within this coastal waterbody. Therefore, the Proposed Project has no potential to affect the status of this coastal waterbody.
	Dunmoran_SC_010 river sub-catchment			
	River	Doonbeakin_010	**Yes**	The Proposed Wind Farm, Proposed Grid Connection Route and Existing Wind Farm are mapped within the Doonbeakin_010. An assessment is required to consider the potential impacts of the Proposed Project on this SWB.
	River	Dunneill_010	**Yes**	The Proposed Wind Farm, Proposed Grid Connection Route, BMEP lands and Existing Wind Farm are located in the Dunneill_010. An assessment is required to consider the potential impacts of the Proposed Project on this SWB.
	River	Dunneill_020	**Yes**	The Proposed Grid Connection Route is mapped within the Dunneill_020 river sub-basin and is also located directly downstream of the Dunneill_010. An assessment is required to consider the potential impacts of the Proposed Project on this SWB.
	River	Lugdoon Stream_010	**Yes**	The Proposed Wind Farm and Proposed Grid Connection Route are mapped within the Lugdoon Stream_010. An assessment is required to consider the potential impacts of the Proposed Project on this SWB.
	River	Kilrusheighter_010	**Yes**	The Proposed Grid Connection Route is mapped within the Kilrusheighter_010 river sub-basin. An assessment is required to consider the potential impacts of the Proposed Project on this SWB.
	River	Doonflin_010	**Yes**	The Proposed Grid Connection Route is mapped within the Doonflin_010 river. An assessment is required to consider the potential impacts of the Proposed Project on this SWB.
	River	Dunmoran_020	**Yes**	The Proposed Grid Connection Route is mapped within the Dunmoran_020 river sub-basin. An assessment is required to consider the potential impacts of the Proposed Project on this SWB.

	River	Barnabrack_010	**Yes**	The Proposed Grid Connection Route is mapped within the Barnabrack_010 river sub-basin. An assessment is required to consider the potential impacts of the Proposed Project on this SWB.
	Owenmore[Sligo]_SC_040 river sub-catchment			
	River	Owenmore (Sligo)_080	**Yes**	The Proposed Grid Connection Route is mapped within the Owenmore(Sligo)_080 river sub-basin. An assessment is required to consider the potential impacts of the Proposed Project on this SWB.
	River	Ballysodare_010	**Yes**	The Proposed Grid Connection Route and TDR works area are mapped within the Ballysodare_010 river sub-basin. An assessment is required to consider the potential impacts of the Proposed Project on this SWB.
	Transitional	Ballysadare Estuary	No	Ballysadare Estuary transitional SWB has been screened out due to its distal location from the Proposed Project and the large volumes of saline water within the Ballysadare Estuary due to tidal flux. Therefore, the Proposed Project has no potential to affect the status of this Transitional SWB.
	Coastal	Sligo Bay	No	The Sligo Bay coastal SWB has been screened out due to its distal location from the Proposed Project, intervening lands, and the large volumes of saline water within this coastal waterbody. Therefore, the Proposed Project has no potential to affect the status of this coastal SWB.
	Owenmore[Sligo]_SC_030 river sub-catchment			
	River	Unshin_040	**Yes**	The Proposed Grid Connection Route is mapped within the Unshin_040 river sub-basin. An assessment is required to consider the potential impacts of the Proposed Project on this SWB.
	River	Unshin_050	**Yes**	The Proposed Grid Connection Route is mapped within the Unshin_050 river sub-basin. An assessment is required to consider the potential impacts of the Proposed Project on this SWB.
Groundwater Bodies				
Groundwater Body	Groundwater	Easky East	**Yes**	The far western portion of the Proposed Wind Farm is mapped to overlie the Easky East GWB. An assessment is required to consider the potential impacts of the Proposed Project on this GWB.
	Groundwater	Collooney	**Yes**	The Proposed Wind Farm, Proposed Grid Connection Route, TDR works and BMEP lands are mapped to overlie the Collooney GWB. An assessment is required to consider the potential impacts of the Proposed Project on this GWB.
	Groundwater	Beltra-Sligo	**Yes**	The Proposed Grid Connection Route is mapped to overlie the Beltra-Sligo GWB. An assessment is required to consider the potential impacts of the Proposed Project on this GWB.
	Groundwater	Carrowmore West	**Yes**	The Proposed Grid Connection Route and TDR works are mapped to overlie the Carrowmore West GWB. An assessment is required to consider the potential impacts of the Proposed Project on this GWB.
	Groundwater	Ballygawley	**Yes**	The Proposed Grid Connection Route is mapped to overlie the Ballygawley GWB. An assessment is required to consider the potential impacts of the Proposed Project on this GWB.
	Groundwater	Lavagh-Ballintougher	**Yes**	The Proposed Grid Connection Route is mapped to overlie the Lavagh-Ballintougher GWB. An assessment is required to consider the potential impacts of the Proposed Project on this GWB.
Protected Areas				
Protected Areas	Nature Conservation Designations	Ox Mountain Bogs SAC/pNHA	**Yes**	The Ox Mountain Bogs SAC/pNHA is mapped adjacent to the Proposed Wind Farm. The western portion of the Proposed Wind Farm is upgradient of the SAC with regard surface water and groundwater flow. An assessment is required to consider the potential impacts of the Proposed Development on this protected area.
		Easky River pNHA	**Yes**	Easky River pNHA is mapped along the lower reaches of the Easky River and is located downstream of the Proposed Wind Farm, Proposed Grid Connection Route, BMEP lands and TDR works. An assessment is required to consider the potential impacts of the Proposed Project on this protected area.
		Dunneill River pNHA	**Yes**	Dunneill River pNHA is located downstream of the Proposed Wind Farm, Proposed Grid Connection Route, Existing Wind Farm, BMEP lands and TDR works. An assessment is required to consider the potential impacts of

				the Proposed Project on this protected area.
		Knockalongy and Knockachree Cliffs SAC and pNHA	No	The Knockalongy and Knockachree Cliffs SAC and pNHA has been screened out due to its distance from the Site and also because it's not a water dependant habitat. Therefore, the Proposed Project has no potential to impact the status of this designated site.
		Aughris Head pNHA	No	The Aughris Head pNHA has been screened out due to its distance from the Site and also because it's not a water dependant habitat. Therefore, the Proposed Project has no potential to impact the status of this designated site.
		Aughris Head SPA	No	The Aughris Head SPA has been screened out due to its distance from the Site and also because it's not a water dependant habitat. Therefore, the Proposed Project has no potential to impact the status of this designated site.
		Ballysadare Bay SAC and pNHA	**Yes**	The Ballysadare Bay SAC and pNHA is mapped adjacent to the Proposed Grid Connection Route. An assessment is required to consider the potential impacts of the Proposed Project on this protected area.
		Slieveward Bog NHA	No	The Slieveward Bog NHA has been screened out due to lack of hydrological and hydrogeological connectivity. Therefore, the Proposed Project have no potential to impact the status of this designated site.
		Unshin River SAC and pNHA	**Yes**	The Unshin River SAC and pNHA is mapped downstream of the Proposed Grid Connection Route. An assessment is required to consider the potential impacts of the Proposed Project on this protected area.
		Union Wood SAC and pNHA	**Yes**	The Union Wood SAC and pNHA is mapped has been screened out due to its distance from the Site and also because it's not a water dependant habitat. Therefore, the Proposed Project has no potential to impact the status of this designated site.
		Ballygawley Lough pNHA	No	The Ballygawley Lough pNHA has been screened out due to lack of hydrological and hydrogeological connectivity. Therefore, the Proposed Project have no potential to impact the status of this designated site.
		Lough Dargan pNHA	No	The Lough Dargan pNHA has been screened out due to lack of hydrological and hydrogeological connectivity. Therefore, the Proposed Project has no potential to impact the status of this designated site.
	Shellfish Area	Sligo Bay	No	The Sligo Bay shellfish waters have been screened out due to its distal location from the Proposed Project and large volume of water within the associated SWB. The Proposed Project has no potential to impact these Shellfish Waters.
	Bathing Waters	Dunmoran Beach	No	The Dunmoran Beach bathing waters have been screened out due to its distal location downstream from the Site and the large volume of water within Sligo Bay. The Proposed Project has no potential to impact these bathing Waters.
	Drinking Water Protected Areas	Easky Lough	No	The Easky Lake DWPA has been screened out due to lack of hydrological and hydrogeological connectivity with the Site. The Proposed Project has no potential to impact the status of this DWPA.

4. WFD COMPLIANCE ASSESSMENT

4.1 PROPOSALS

Please refer to Section 4.1 of the EIAR for a description of the Proposed Project (i.e. Proposed Wind Farm and Proposed Grid Connection Route).

The main characteristics of the Proposed Wind Farm that could impact on hydrology and hydrogeology are:

- Removal of the existing 23 no. turbines at the Existing Wind Farm developments;
- Establishment of 4 no. temporary construction compounds, which will involve minor regrading of soil/subsoil and the emplacement of hardstands. Welfare facilities will be provided at the primary temporary construction compound. Wastewater effluent will be collected in a wastewater holding tank and periodically emptied by a licenced contractor;
- Construction of new site access tracks will predominantly use the excavate and replace technique. This will involve the use of aggregate from 3 no. proposed on-site borrow pits;
- Construction of 14 no. Proposed Turbine new crane hardstand areas and upgrade of 3 no. Existing Wind Farm hardstand areas along with turbine assemblage areas will utilise ground bearing foundations;
- Settlement ponds where constructed will be volume neutral, i.e. all material excavated will be used to form side bunds and landscaping around the ponds. There will be no excess material from settlement pond construction. The proposed settlement pond locations (refer to Appendix 4-3 drainage plan drawings) have been assessed for peat instability risks;
- Grey water will be supplied by rainwater harvesting at the substation and water tankered to site where required. Bottled water will be used for potable supply;
- Construction of 17 no. Proposed Turbine foundations, which are expected to be a combination of gravity base and piled foundation design;
- Cabling between Proposed Turbine locations and the on-site 110kV substation will involve the excavation of a shallow trench (approximately 1.2m deep), placement of ducting and backfilling;
- Replacement of 1 no. existing watercourse crossing culvert along the existing access track between Proposed Turbines T3 and T5. The other 8 no. existing watercourse crossing structures will not require replacement but may require minor upgrade works such as widening;
- Tree felling (total 29.3ha) for the purposes of Proposed Wind Farm construction;
- Establishment of 5 no. dedicated peat and spoil management areas as well as utilising the 3 no. exhausted borrow pits for permanent peat placement;
- Upgrade of 8.2km of existing access tracks and construction of 5.1km of new access tracks using both excavate/replace and floating road methods;
- Construction of the on-site 110kV substation and control building with a subsoil bearing foundation. Welfare facilities will be provided at the substation along with a temporary construction compound;
- Turbine delivery route accommodation works along the L63071, L2702, L6309 and N59; and
- Enhancement of 36ha of peatland habitats.

The main characteristics of the Proposed Grid Connection Route that could impact on hydrology and hydrogeology are:

- Approximately 41km of an underground cabling route between the proposed 110kV substation at the Proposed Wind Farm and the existing Srananagh 220kV substation involving the excavation of a double shallow trench (approximately 1.2m deep), placement of ducting and backfilling with aggregate, lean-mix concrete, and excavated material, as appropriate (depending on the location of the cable trench);
- 34 no. existing watercourse culvert/bridge crossings along the public road section of the cable route (33 no. of these are EPA mapped watercourses);
- At 19 no. of these crossing locations the cable will be placed either underneath or above the culvert by open trench method;
- At 15 no. of these crossing locations (i.e. mainly bridges) the cable will be placed by means of Horizontal Directional Drilling (HDD); and,
- No in-stream are proposed at any existing crossing location.

4.2 POTENTIAL EFFECTS

4.2.1 Construction Phase (Unmitigated)

4.2.1.1 Potential Surface Water Quality Effects from Proposed Wind Farm Works

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

The existing 23 no. turbines and meteorological mast onsite will be removed from the Site. On the dismantling of existing turbines and meteorological mast, it is not intended to remove the concrete foundation from the ground and therefore no significant earthworks will be required.

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

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

Clear felling of coniferous forestry plantations is also proposed over 29.3ha. Potential surface water quality effects from felling include the release of elevated concentrations of suspended solids and nutrient release which has the potential to effect downstream surface water quality.

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

The proposed BMEP works have no potential to affect WFD status.

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

Table G: Potential Surface Water Quality Effects of the Proposed Wind Farm Works during Construction Phase (Unmitigated)

SWB	WFD Code	Current Status	Assessed Potential Status Change
Easky_SC_010 river sub-catchment			
Buncrowey_010	IE_WE_35B090500	Moderate	Poor
Easky_020	IE_WE_35E010020	High	Good
Easky_030	IE_WE_35E010100	High	Good
Easky_040	IE_WE_35E010200	High	Good
Dunmoran_SC_010 river sub-catchment			
Doonbeakin_010	IE_WE_35D090400	Good	Moderate
Dunneill_010	IE_WE_35D060100	Good	Moderate
Dunneill_020	IE_WE_35D060200	Moderate	Poor
Lugdoon Stream_010	IE_WE_35L010400	Good	Moderate

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

Along the Proposed Grid Connection Route there are 34 no. existing watercourse culvert/bridge crossings along the public road section of the cable route (31 no. of these are EPA mapped watercourses). No in-stream are proposed at any existing crossing location.

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

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

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

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

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

SWB	WFD Code	Current Status	Assessed Potential Status Change
Easky_SC_010 river sub-catchment			
Buncrowey_010	IE_WE_35B090500	Moderate	Moderate
Easky_030	IE_WE_35E010100	High	High
Easky_040	IE_WE_35E010200	High	High
Dunmoran_SC_010 river sub-catchment			
Doonbeakin_010	IE_WE_35D090400	Good	Good
Dunneill_010	IE_WE_35D060100	Good	Good
Dunneill_020	IE_WE_35D060200	Moderate	Moderate
Lugdoon Stream_010	IE_WE_35L010400	Good	Good
Kilrusheighter_010	IE_WE_35K350910	Good	Good
Doonflin_010	IE_WE_35D100600	Moderate	Moderate
Dunmoran_020	IE_WE_35D161400	Good	Good
Barnabrack_010	IE_WE_35B300790	Good	Good
Owenmore(Sligo)_080	IE_WE_35O060900	Moderate	Moderate
Ballysodare_010	IE_WE_35B050100	Poor	Poor
Unshin_040	IE_WE_35U010500	High	High
Unshin_050	IE_WE_35U010600	High	High

4.2.1.3 Potential Groundwater Quality/Quantity Effects at the Proposed Wind Farm

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

In addition, groundwater seepages may occur in Proposed Turbine base excavations, particularly those on lower elevations and this will create additional volumes of water to be treated by the drainage management system.

Furthermore, temporary dewatering of excavations (borrow pit, turbine base etc) may drawdown the local groundwater table.

However, due to the low permeability of the bedrock aquifer and the shallow nature of the proposed works, there is limited potential for the Proposed Project to change the overall status of the underlying GWBs.

A summary of potential status change to GWBs arising from works at the Proposed Wind Farm during the construction phase in the unmitigated scenario are outlined in **Table I**.

Table I: Potential Groundwater Effects at Proposed Wind Farm during Construction Phase (Unmitigated)

GWB	WFD Code	Current Status	Assessed Potential Status Change
Easky East	IE_WE_G_0050	Good	Good
Collooney	IE_WE_G_0048	Good	Good

4.2.1.4 Potential Groundwater Quality/Quantity Effects along the Proposed Grid Connection Route

The Proposed Grid Connection Route is located in the Easky East, Collooney, Beltra-Sligo, Carrowmore West, Ballygawley and Lavagh-Ballintougher GWBs.

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. Release of effluent from site welfare wastewater treatment systems has the potential to impact on groundwater and surface waters.

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

However, Due to the shallow, short-term and transient nature of the Proposed Grid Connection Route works within the carriageway of public roads, there is very low potential for any effects during earthworks and excavation works on the GWBs.

A summary of potential status change to GWBs arising from potential groundwater quality impacts along the Grid Connection Route during the construction phase of the Proposed Project in the unmitigated scenario are outlined in **Table J**.

Table J: Potential Groundwater Effects Along Proposed Grid Connection Route during Construction Phase (Unmitigated)

GWB	WFD Code	Current Status	Assessed Potential Status Change
Easky East	IE_WE_G_0050	Good	Good
Collooney	IE_WE_G_0048	Good	Good
Beltra-Sligo	IE_WE_G_0043	Good	Good
Carrowmore West	IE_WE_G_0040	Good	Good
Ballygawley	IE_WE_G_0039	Good	Good
Lavagh-Ballintougher	IE_WE_G_0038	Good	Good

4.2.1.5 Potential Effects on Protected Areas

The surface water connections from the Site 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:

Ox Mountain Bogs SAC/pNHA: The Proposed Wind Farm is located adjacent to the Ox Mountain Bogs SAC pNHA. An area of the Ox Mountain Bog SAC is also located within the Site, adjacent to the Existing Wind Farm, however, no new infrastructure is proposed in this area.

On the eastern portion of the Proposed Wind Farm the upper reaches of the Dunneill River (Owenduff River) form a hydrological boundary between the Proposed Wind Farm and the Ox Mountain Bog SAC to the south. Even though the Proposed Wind Farm infrastructure is located upslope of the Ox Mountain Bog SAC, there is no potential for surface water or groundwater flows towards the Ox Mountain Bog SAC due to the presence of the Owenduff River.

Only the western portion of the Proposed Wind Farm (i.e. Proposed Turbines T1 to T6) is potentially located up-gradient of the SAC with regard surface water flows and groundwater flowpaths. Therefore, only works on the western portion of the Site have the potential to affect the conservation objectives of the SAC/pNHA.

The ground elevations at Proposed Turbines T1 to T6 are >175m OD while the elevation of Ox Mountain Bogs SAC bog is typically <160m OD where it is located downslope of the Proposed Wind Farm infrastructure. Therefore, as the base of any Proposed Turbine excavations will be at a higher elevation than the SAC (>15m elevation difference), there will be no potential to affect groundwater levels or groundwater flow paths at the location of the SAC.

Easky River pNHA: The Esker River pNHA is mapped downstream of the Site. Any works within the Site have the potential to affect the conservation objectives of the pNHA.

Dunneill River pNHA: The Dunneill River pNHA is mapped downstream of the Site. Any works within the Site have the potential to affect the conservation objectives of the pNHA.

Ballysadare Bay SAC and pNHA: The Ballysadare Bay SAC and pNHA is mapped adjacent to the Proposed Grid Connection Route. Any works within the Site have the potential to affect the conservation objectives of the SAC and pNHA.

Unshin River SAC and pNHA: The Unshin River SAC and pNHA is mapped adjacent to the Proposed Grid Connection Route. Any works within the Site have the potential to affect the conservation objectives of the SAC and pNHA.

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

4.2.2 Operational Phase (Unmitigated)

Potential effects associated with the operational phase of the Proposed Project will be significantly reduced in comparison to the construction phase. Any effects will occur at the Proposed Wind Farm and will be associated with minor maintenance works and therefore no negative WFD affects are expected.

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

4.2.2.1 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.

Hardstand emplacement will only be required at the Proposed Wind Farm and not the Proposed Grid Connection Route. The water balance assessment does not include the Proposed Grid Connection Route as it follows public roads and therefore the underground cabling cannot alter the hydrological regime along the route which is already a hardstand surface.

The emplacement of the Proposed Project 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 2,998m^3/month or 97m^3/day.

This represents a potential increase of approximately 0.2% in the average daily/monthly volume of runoff from the Proposed Wind Farm 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 being developed. Specifically, the Proposed Wind Farm permanent footprint is approximately 21ha, representing 2.8% of the total Proposed Wind Farm area of 743ha.

The additional volume is low due to the fact that the runoff potential from the Site is naturally high (93%). Also, this calculation assumes that all hardstanding areas will be impermeable which considered to be a worst-case scenario. The increase in runoff from most of the development catchment will therefore be imperceptible and this is before mitigation measures will be put in place

A summary of potential status change to SWBs arising from increased runoff during the operation phase in the unmitigated scenario are outlined in **Table K**.

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

SWB	WFD Code	Current Status	Assessed Potential Status Change
Easky_SC_010 river sub-catchment			
Buncrowey_010	IE_WE_35B090500	Moderate	Moderate
Easky_020	IE_WE_35E010020	High	High
Easky_030	IE_WE_35E010100	High	High
Easky_040	IE_WE_35E010200	High	High
Dunmoran_SC_010 river sub-catchment			
Doonbeakin_010	IE_WE_35D090400	Good	Good
Dunneill_010	IE_WE_35D060100	Good	Good
Dunneill_020	IE_WE_35D060200	Moderate	Moderate
Lugdoon Stream_010	IE_WE_35L010400	Good	Good

4.2.2.2 Potential Surface Water Quality Effects from Proposed Wind Farm Operational Phase 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 phase in the unmitigated scenario are outlined in **Table L**.

Table L: Potential Surface Water Quality Effects of the Proposed Wind Farm during Operational Phase (Unmitigated)

SWB	WFD Code	Current Status	Assessed Potential Status Change
Easky_SC_010 river sub-catchment			
Buncrowey_010	IE_WE_35B090500	Moderate	Moderate
Easky_020	IE_WE_35E010020	High	High
Easky_030	IE_WE_35E010100	High	High
Easky_040	IE_WE_35E010200	High	High
Dunmoran_SC_010 river sub-catchment			
Doonbeakin_010	IE_WE_35D090400	Good	Good
Dunneill_010	IE_WE_35D060100	Good	Good
Dunneill_020	IE_WE_35D060200	Moderate	Moderate
Lugdoon Stream_010	IE_WE_35L010400	Good	Good

4.2.2.3 Potential Effects on Protected 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.

4.3 MITIGATION MEASURES

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

4.3.1 Construction Phase

4.3.1.1 Mitigation Measures for Clear Felling

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

- Forestry Standards Manual (Forest Service, 2015);
- Forest Protection Guidelines (Forest Service, 2002);

- Forest Operations and Water Protection Guidelines (Coillte, 2013);
- Forestry and Water Quality Guidelines (Forest Service, 2000b);
- Forests and Water, Achieving Objectives under Ireland's River Basin Management Plan 2018-2021 (DAFM, 2018);
- Coillte Planting Guideline SOP;
- A Guide to Forest Tree Species Selection and Silviculture in Ireland (Horgan et al., 2003);
- Management Guidelines for Ireland's Native Woodlands. Jointly published by the National Parks & Wildlife Service (Cross and Collins, 2017);
- Native Woodland Scheme Framework (Forest Service, 2018); and,
- Code of Best Forest Practice (Forest Service, 2000)

Mitigation by Avoidance:

There is a requirement in the Forest Service Code of Practice and in the FSC Certification Standard for the installation of buffer zones adjacent to aquatic zones at planting stage. Minimum buffer zone widths recommended in the Forest Service (2000) guidance document "*Forestry and Water Quality Guidelines*" are shown in **Table M** below. These include avoidance controls, source controls, in-line controls, water treatment controls, and outfall controls.

Table M: Minimum Buffer Zone Width (Forest Service, 2000)

Average slope leading to the aquatic zone		Buffer zone width on either side of the aquatic zone	Buffer zone width for highly erodible soils
Moderate	(0 – 15%)	10 m	15 m
Steep	(15 – 30%)	15 m	20 m
Very Steep	(>30%)	20 m	25 m

A self-imposed 50m buffer from streams and lakes was applied during the constraints mapping and will be maintained during the construction phase. Apart from the total 9 no. existing water crossing locations (Existing Wind Farm access tracks, public roads (for upgrade) and existing bog tracks) and TDR overrun areas, the Proposed Wind Farm infrastructure is located outside the delineated buffer zones within the Proposed Wind Farm.

Due to downstream Freshwater Pearl Mussel populations in the Easky River, a 100m buffer will be maintained for a tributary stream of the Easky River which flows to the south of Proposed Turbine T5.

The large distance between most of the proposed felling areas (which are outside the 50m and 100m buffer zone) and sensitive aquatic zones means that potential poor-quality runoff from felling areas, will be adequately managed and attenuated prior to even reaching the aquatic buffer zone and primary drainage routes.

Mitigation by Design:

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

- Machine combinations (i.e., handheld or mechanical) will be chosen which are most suitable for ground conditions and which will minimise soils disturbance;
- All machinery will be operated by suitably qualified personnel;
- Checking and maintenance of roads and culverts will be on-going through any felling operation. No tracking of vehicle through watercourses will occur, as vehicles will use

road infrastructure and existing watercourse crossing points. Existing drains will not be disturbed during felling works;
- Machines will traverse the Site along specified off-road routes (referred to as racks);
- The location of racks will be chosen to avoid wet and potentially sensitive areas;
- Ditches which drain from the proposed area to be felled towards existing surface watercourses will be blocked, and temporary silt traps will be constructed. No direct discharge of such ditches to watercourses will occur. Drains and sediment traps will be installed during ground preparation. Collector drains will be excavated at an acute angle to the contour (approximately 0.3%-3% gradient), to minimise flow velocities. Main drains to take the discharge from collector drains will include water drops and rock armour, as required, where there are steep gradients, and will avoid being placed at right angles to the contour;
- Sediment traps will be sited in drains downstream of felling areas. Machine access will be maintained to enable the accumulated sediment to be excavated. Sediment will be carefully disposed of in the peat disposal areas. Where possible, all new silt traps will be constructed on even ground and not on sloping ground;
- All drainage channels will taper out before entering the 50m buffer zone. This ensures that discharged water gently fans out over the buffer zone before entering the aquatic zone, with sediment filtered out from the flow by ground vegetation within the zone. On erodible soils, silt traps will be installed at the end of the drainage channels, to the outside of the buffer zone;
- Drains and silt traps will be maintained throughout all felling works, ensuring that they are clear of sediment build-up and are not severely eroded. Correct drain alignment, spacing and depth will ensure that erosion and sediment build-up are minimized and controlled;
- Brash mats will be used to support vehicles on soft ground, reducing peat and mineral soils erosion and avoiding the formation of rutted areas, in which surface water ponding can occur. Brash mat renewal will take place when they become heavily used and worn. Provision will be made for brash mats along all off-road routes, to protect the soil from compaction and rutting. Where there is risk of severe erosion occurring, extraction will be suspended during periods of high rainfall;
- Timber will be stacked in dry areas, and outside a local 50 metre watercourse buffer. Straw bales and check dams to be emplaced on the down gradient side of timber storage/processing sites;
- Works will be carried out during periods of no, or low rainfall, in order to minimise entrainment of exposed sediment in surface water run-off;
- Refuelling or maintenance of machinery will not occur within 100m of a watercourse. Fuel truck, drip kits, qualified personnel will be used where refuelling is required;
- A permit to refuel system will be adopted;
- Branches, logs or debris will not be allowed to build up in aquatic zones. All such material will be removed when harvesting operations have been completed, but care will be taken to avoid removing natural debris deflectors;
- Crossing of streams will not be permitted;
- Trees will be cut manually from along streams and using machinery to extract whole tree; and,
- Travel only perpendicular to and away from stream.

Silt Traps:

Silt traps will be strategically placed down-gradient within forestry drains near streams. The main purpose of the silt traps and drain blocking is to slow water flow, increase residence time, and allow settling of silt in a controlled manner.

Drain Inspection and Maintenance:

The following items shall be carried out during pre-felling inspections and after:

- Communication with tree felling operatives in advance to determine whether any areas have been reported where there is unusual water logging or bogging of machines;
- Inspection of all areas reported as having unusual ground conditions;
- Inspection of main drainage ditches and outfalls. During pre-felling inspections, the main drainage ditches shall be identified. Ideally the pre-felling inspection shall be carried out during rainfall;
- Following tree felling all main drains shall be inspected to ensure that they are functioning;
- Extraction tracks near drains will be broken up and diversion channels created to ensure that water in the tracks spreads out over the adjoining ground;
- Culverts on drains exiting in the Site will be unblocked; and,
- All accumulated silt will be removed from drains and culverts, and silt traps, and this removed material will be deposited away from watercourses to ensure that it will not be carried back into the trap or stream during subsequent rainfall.

Surface Water Quality Monitoring:

Sampling will be completed before, during (if the operation is conducted over a protracted time) and after the felling activity. The 'before' sampling will be conducted within 4 weeks of the felling activity commencing, preferably in medium to high water flow conditions. The "during" sampling will be undertaken once a week or after rainfall events. The 'after' sampling will comprise as many samplings as necessary to demonstrate that water quality has returned to pre-activity status (i.e., where an impact has been shown).

Criteria for the selection of water sampling points include the following:

- Avoid man-made ditches and drains, or watercourses that do not have year-round flows, i.e. avoid ephemeral ditches, drains or watercourses;
- Select sampling points upstream and downstream of the forestry activities;
- It is advantageous if the upstream location is outside/above the forest in order to evaluate the impact of land-uses other than forestry;
- Where possible, downstream locations will be selected: one immediately below the forestry activity, the second at exit from the forest, and the third some distance from the second (this allows demonstration of no impact through dilution effect or contamination by other land-uses where impact increases at third downstream location relative to second downstream location); and,
- The above sampling strategy will be undertaken for all on-site sub-catchments streams where tree felling is proposed.

Also, daily surface water monitoring forms (for visual inspections and field chemistry measurements) will also be utilised at every works site near any watercourse. These will be taken daily and kept on site for record and inspection.

4.3.1.2 Mitigation Measures for Earthworks (Removal of Vegetation Cover, Excavations and Stock Piling) Resulting in Suspended Solids Entrainment in Surface Waters

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 9-9 of the EIAR it can be seen that all of the key areas of the Proposed Wind Farm infrastructure are located significantly further from the 50m delineated buffer zone with the exception of 9 no. existing watercourse crossing locations that are proposed for upgrade and TDR overrun areas. No works are proposed inside the 100m buffer imposed for a tributary stream of the Easky River which flows to the south of Proposed Turbine T5.

The large setback distance from sensitive hydrological features means that adequate room is maintained for the proposed drainage mitigation measures (discussed below) to be properly installed and operated effectively. The proposed buffer zone will:

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

- Source controls:
    - Interceptor drains, vee-drains, diversion drains, flume pipes, erosion and velocity control measures such as use of sand bags, oyster bags filled with gravel, filter fabrics, and
    - Small working areas, covering stockpiles, weathering off stockpiles, cessation of works in certain areas or other similar/equivalent or appropriate measures.
- In-Line controls:
    - 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:
    - 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.

It should be noted that a network of bog, forestry and roadside drains already exist at the Proposed Wind Farm, and these will be integrated and enhanced as required and used within the Proposed Project drainage system. The integration of the existing drainage network and the Proposed Project network is relatively simple. The key elements being the upgrading and improvements to water treatment elements, such as in line controls and treatment systems, including silt traps, stilling ponds and buffered outfalls.

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 Proposed Project drainage into the existing site drainage network. This will reduce the potential for 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 / tree felling is taking place, and these will be diverted into proposed interceptor drains, or culverted under/across the works area;
- Runoff from individual turbine hardstanding areas will be not discharged into the existing drain network but discharged locally at each turbine location through stilling ponds and buffered outfalls onto vegetated surfaces;
- 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; and,
- Drains running parallel to the existing roads requiring widening will be upgraded, widening will be targeted to the opposite side of the road. Velocity and silt control measures such as check dams, sand bags, oyster bags, straw bales, flow limiters, weirs, baffles, silt fences will be used during the upgrade construction works. Regular buffered outfalls will also be added to these drains to protect downstream surface waters.

Pre-commencement Temporary Drainage Works:

Prior to the commencement of new road/hardstand (or road upgrades) the following key temporary drainage measures will be installed:

- All existing dry drains that intercept the proposed works area will be temporarily blocked down-gradient of the works using temporary check dams/silt traps;
- Clean water diversion drains will be installed upgradient of the works areas;
- Check dams/silt fence arrangements (silt traps) will be placed in all existing drains that have surface water flows and also along existing roadside drains; and,
- A double silt fence perimeter will be placed down-slope of works areas that are located inside the 50m watercourse such as at watercourse crossings.

Water Treatment Train:
A final line of defence will be provided by a water treatment train such as a "Siltbuster". If the discharge water from construction areas fails to be of a high quality during regular inspections, 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 will apply for all 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 water courses 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 structures during construction phase will be carried out on a weekly basis. They will remain in place throughout the entire construction phase. Double silt fences will be placed within drains down-gradient of all construction areas inside the 50m hydrological buffer zones.

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, the majority 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, will be 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.

Settlement Ponds:
The Proposed Wind Farm infrastructure footprint has been divided into drainage catchments (based on topography, outfall locations, and catchment size) and stormwater runoff rates based on the 10-year return period rainfall event were calculated for various catchment areas in order to size the settlement ponds as shown in **Table N** below.

Table N: Settlement Pond Design

Pond Size W [m] x L [m] x D [m]			Track/Hardstand Catchment Size (m^2)		
Return Period	10 yrs	Storm Duration	500	1000	2000
6hr retention for coarse silt		6 hrs	3.4 x 10.6 x 1 m	4.8 x 15.0 x 1 m	6.9 x 21.0 x 1 m
11hr retention for medium silt		12 hrs	3.8 x 12.0 x 1 m	5.5 x 16.5 x 1 m	7.5 x 24.2 x 1 m
24hr retention for fine silt		24 hrs	4.2 x 13.8 x 1 m	6.2 x 18.6 x 1 m	8.6 x 27.0 x 1 m

Level Spreaders and Vegetation Filters:
Level spreaders and vegetation filters will be implemented at the settlement ponds. The purpose of level spreaders is to release treated drainage flow in a diffuse manner, and to prevent the concentration of flows at any one location thereby avoiding erosion. Level spreaders are not intended to be a primary treatment component for development surface water runoff. They are not stand-alone but occur as part of a treatment train of systems that will reduce the velocity of runoff prior to be released at the level spreader. In the absence of level spreaders, the potential for ground erosion is significantly greater than not using them.

Vegetation filters are essentially end-of-line polishing filters that are located at the end of the treatment train. In fact, vegetation filters are ultimately a positive consequence of not discharging directly into watercourses which is one of the mitigation components of the drainage philosophy. This makes use of the natural vegetation of the Site to provide a polishing filter for the Proposed Wind Farm drainage prior to reaching the downstream watercourses.

Again, vegetation filters are not intended to be a single or primary treatment component for treatment of works area runoff. They are not stand alone but are intended as part of a treatment train of water quality improvement/control systems (i.e. source controls→check dams→silt traps→settlement ponds→level spreaders →silt fences→vegetation filters).

Pre-emptive Site Drainage Management
The works programme for the entire construction stage of the Proposed Project will also take account of weather forecasts, and predicted rainfall in particular. Large excavations and movements of peat/subsoil or vegetation stripping will be suspended or scaled back if heavy rain is forecast. The extent to which works will be scaled back or suspended will relate directly to the amount of rainfall forecast.

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

- General Forecasts: Available on a national, regional and county level from the Met Eireann website (www.met.ie/forecasts). These provide general information on weather patterns including rainfall, wind speed and direction but do not provide any quantitative rainfall estimates;
- MeteoAlarm: Alerts to the possible occurrence of severe weather for the next 2 days. Less useful than general forecasts as only available on a provincial scale;
- 3-hour Rainfall Maps: Forecast quantitative rainfall amounts for the next 3 hours but does not account for possible heavy localised events;
- Rainfall Radar Images: Images covering the entire country are freely available from the Met Eireann website (www.met.ie/latest/rainfall_radar.asp). The images are a composite of radar data from Shannon and Dublin airports and give a picture of current rainfall extent and intensity. Images show a quantitative measure of recent rainfall. A 3-hour record is given and is updated every 15 minutes. Radar images are not predictive; and,
- Consultancy Service: Met Eireann provides a 24-hour telephone consultancy service. The forecaster will provide an 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 forecasting 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.

Management of Runoff from Peat and Spoil Repository Areas:

It is proposed that excavated spoil and peat will be used for landscaping where required. The excess material will then be placed in dedicated peat and spoil management areas as well as placement of peat/spoil in 3 no. proposed borrow pits once the rock is fully extracted.

All proposed peat and spoil storage areas including borrow pits have been thoroughly assessed from a geotechnical and peat stability perspective. All proposed peat and spoil management areas, including the 3 no. borrow pits are located outside of 50m and 100m watercourse buffer zones.

During the initial construction of repository/deposition areas, 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 peat 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 and peat management areas

will be sealed with a digger bucket and seeded as soon possible to reduce sediment entrainment in runoff.

Drainage from peat and spoil storage areas will ultimately be routed to an oversized swale and a number of stilling ponds pond with appropriate storage and settlement designed for a 1 in 10-year return period before being discharged to the on-site drains. Peat/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 peat/subsoil reinstatement areas will no longer be a potential source of silt laden runoff. Therefore, at each stage of the peat and spoil management area development the above mitigation measures will be deployed to ensure protection of downstream water quality.

Timing of Site Construction Works:
Construction of the site drainage system will only be carried out during periods of low rainfall, and therefore minimum runoff rates. This will minimise the risk of entrainment of suspended sediment in surface water runoff, and transport via this pathway to surface watercourses. Construction of the drainage system during this period will also ensure that attenuation features associated with the drainage system will be in place and operational for all subsequent construction works.

4.3.1.3 Mitigation Measures for Surface Water Quality from Excavation Dewatering

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

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

4.3.1.4 Mitigation Measures for Hydrocarbons

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

- On site re-fuelling of machinery will be carried out using a fuel truck at a dedicated refuelling area located at the temporary construction compounds. The fuel truck will also carry fuel absorbent material and pads in the event of any accidental spillages;
- Mobile measures such as drip trays and fuel absorbent mats will be used during all refuelling operations;
- On-site refuelling will be carried out by trained personnel only;
- A permit to fuel system will be put in place;
- Fuels stored on site will be minimised. Fuel storage areas if required will be bunded appropriately for the fuel storage volume for the time period of the construction and fitted with a storm drainage system and an appropriate oil interceptor;
- The plant used during construction will be regularly inspected for leaks and fitness for purpose; and,
- An emergency plan for the construction phase to deal with accidental spillages will be included within the Construction and Environmental Management Plan. Spill kits will be available to deal with and accidental spillage in and outside the re-fuelling area.

4.3.1.5 Mitigation Measures for Wastewater

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

4.3.1.6 Mitigation Measures for Cement Based Products

- No batching of wet-cement products will occur on site. Ready-mixed supply of wet concrete products and where possible, emplacement of pre-cast elements, will take place;
- Where possible pre-cast elements for culverts and concrete works will be used;
- Where concrete is delivered on site, only the chute will be cleaned, using the smallest volume of water practicable. No discharge of cement contaminated waters to the construction phase drainage system or directly to any artificial drain or watercourse will be allowed. Chute cleaning water will be undertaken at lined cement washout ponds located outside 50m watercourse buffer zones);
- Weather forecasting will be used to plan dry days for pouring concrete; and,
- The pour site will be kept free of standing water and plastic covers will be ready in case of a sudden rainfall event.

4.3.1.7 Mitigation Measures for New Watercourse Crossing Works

- The 1 no. replacement culvert will be bottomless or clear span structure 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 Ireland[2] is incorporated into the design of the proposed crossings;
- As a further precaution, near stream construction work, will only be carried out during the period permitted by Inland Fisheries Ireland for in-stream works according to the Eastern Regional Fisheries Board (2004) guidance document "Requirements for the Protection of Fisheries Habitat during Construction and Development Works at River Sites", i.e., May to September inclusive. This time period coincides with the period of lowest expected rainfall, and therefore minimum runoff rates. This will minimise the risk of entrainment of suspended sediment in surface water runoff, and transport via this pathway to surface watercourses (any deviation from this will be done in discussion with the IFI);
- During the near stream construction work double row silt fences will be emplaced immediately down-gradient of the construction area for the duration of the construction phase. There will be no batching or storage of cement allowed in the vicinity of the crossing construction areas;
- 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; and,
- All crossings will be designed to accommodate a 100-year design flood with allowance for 300mm freeboard.

The watercourse crossings will be constructed to the specifications of the OPW bridge design guidelines 'Construction, Replacement or Alteration of Bridges and Culverts - A Guide to Applying for Consent under Section 50 of the Arterial Drainage Act, 1945', and in consultation with Inland Fisheries Ireland. Abutments will be constructed from precast units combined with in-situ foundations, placed within an acceptable backfill material.

Confirmatory inspections of the proposed new watercourse crossing location will be carried out by the Project Civil/Structural Engineer and the Project Hydrologist prior to the construction of the crossing.

In relation to the new proposed culverts and proposed culvert upgrades at forestry drain crossings, the culverts will be suitably sized (approx 900mm) for the expected peak flows in the relevant drain. All culverts will be installed with a minimum internal gradient of 1% (1 in 100). Smaller culverts will have a smooth internal surface. Larger culverts may have corrugated surfaces which will trap silt and contribute to the stream ecosystem. Depending on the management of water on the downstream side of the culvert, large stone may be used to interrupt the flow of water. This will help dissipate its energy and help prevent problems of erosion. Smaller water crossings will simply consist of an appropriately sized pipe buried in the sub-base of the road at the necessary invert level to ensure ponding or pooling does not occur above or below the culvert and water can continue to flow as necessary.

4.3.1.8 Mitigation Measures for Designated Sites

Mitigation measures for surface water quality protection (outlined below) will ensure any runoff from the Proposed Wind Farm towards the Ox Mountain Bogs SAC will be of high quality and therefore potential effects via surface water flowpath (i.e. runoff) will not occur.

On the eastern portion of the Proposed Wind Farm the upper reaches of the Dunneil River (Owenduff River) form a hydrological boundary between the Proposed Wind Farm and the

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

SAC to the south. Even though the Proposed Wind Farm infrastructure is located upslope of the SAC, there is no potential for surface water or groundwater flows towards the SAC due to the presence of the Owenduff River.

Designated sites downstream of the Site with regard surface water flows only include Dunneill River pNHA, Easky River pNHA, Unshin River SAC and Ballysadarre SAC.

Drainage mitigation measures for surface water quality protection during the construction phase are summarised again below: (Please refer to Sections 4.3.1.1, 4.3.1.2 & 4.3.1.3 above for the full description of these measures and how they will be applied).

- The proposed mitigation measures will include 50m buffer zones for avoidance of sensitive hydrological features (streams and rivers);
- Pre-construction drainage control measures (Section 4.3.1.2);
- Robust drainage control measures (i.e. interceptor drains, swales, settlement ponds and treatment trains such as Siltbuster) will ensure that the quality of runoff from Proposed Project areas will be very high; and,
- Best practice measures with regard use of oils, fuels (Section 4.3.1.4) and cement based compounds (Section 4.3.1.6).

4.3.1.9 Mitigation Measures for TDR works

- All works are minor and localised and cover very small areas;
- These works are distributed over a wide area;
- All works are temporary in nature;
- All areas will be reinstated shortly after the works and reseeded; and,
- Application of the Pre-Construction Drainage Measures (see Section 4.3.1.2) for surface water quality protection.

4.3.1.10 Mitigation Measures for WFD Status

Comprehensive surface water mitigation and drainage controls are outlined in Section 4.3.1.1 (Felling of Coniferous Plantations), Section 4.3.1.2 (Earthworks), Section 4.3.1.3 (Excavation Dewatering), Section 4.3.1.4 (Hydrocarbons), Section 4.3.1.6 (Cement-based Products) and Section 4.3.1.7 (Morphological Changes to Watercourses). These will ensure the protection of surface water quality and flows in all downstream receiving watercourses.

4.3.1.11 Mitigation Measures for Use of Siltbuster

Measures employed to prevent overdosing and potential chemical carryover:

- The siltbuster system comprises an electronic in-line dosing system which provides an accurate means of adding reagents, so overdosing cannot occur;
- Continued monitoring and water analysis of pre and post treated water by means of an inhouse lab and dedicated staff will be carried out, which means the correct amount of chemical is added by the dosing system;
- Dosing rates of chemical to initiate settlement is small, being in the order of 2-10 mg/L and the vast majority of the chemical is removed in the deposited sediment;
- Final effluent not meeting the discharge criteria is recycled and retreated, which has a secondary positive effect of reducing carryover; and,
- Use of biodegradable chemical will be used at very sensitive sites (i.e. upstream of SACs).

4.3.1.12 Mitigation Measures for Earthworks and Watercourse Crossings (Proposed Grid Connection Route)

Pre-commencement Temporary Drainage Works:
Prior to the commencement of the cable trenching or crossing works the following key temporary drainage measures will be installed:

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

The following mitigation measures will be implemented for the underground cabling watercourse crossing works:

- No stock-piling of construction materials will take place along the grid route;
- No refuelling of machinery or overnight parking of machinery is permitted within 100m of a watercourse crossing;
- No concrete truck chute cleaning is permitted along the Proposed Grid Connection Route;
- Works will not take place at periods of high rainfall, and will be scaled back or suspended if heavy rain is forecast;
- Local road drainage, culverts and manholes will be temporarily blocked during the works;
- Machinery deliveries will be arranged using existing structures along the public road;
- All machinery operations will take place away from the stream and ditch banks, apart from where crossings occur. Although no instream works are proposed or will occur;
- Any excess construction material will be immediately removed from the area and sent to a licenced waste facility;
- Spill kits will be available ineach item of plant required to complete the stream crossing; and,
- Silt fencing will be erected on ground sloping towards watercourses at the stream crossings if required.

Fracture Blow-out (Frac-out) Prevention and Contingency Plan for HDD:

- 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;
- One or more lines 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.

4.3.1.13 Mitigation Measures for Biodiversity Management and Enhancement Plan

All proposed habitat management and enhancement works will be in accordance with the best practice Forest Service regulation, policies and strategic guidance documents as well as Coillte, DAFM and NatureScot guidance documents to ensure minimal potential negative effects on the local peat, soil and subsoil environment. Refer also to Section 4.3.1.1 above for tree felling mitigation.

Given the nature of the restoration measures the following mitigation measures are proposed:

- Before any works are completed silt fences will be installed to limit the movement of entrained sediment in surface water runoff;
- Proposed off-road routes will be walked in advance of any machinery;
- All machinery operators will be experienced;
- The proposed areas will be walked before a machine goes off-road;
- Bog mats will be used where the excavator is required to travel over wet ground;
- A low ground pressure excavator with wide tracks (1.9m or greater) will be used to reduce compaction of the peat and subsoils.; and,
- Standard water quality protection mitigation as presented in Section 4.3.1.1 above will be employed.

4.3.1.14 Mitigation Measures for Freshwater Pearl Mussel Populations

As discussed above, only the western section of the Proposed Wind Farm (only 6 no. of 17 proposed turbines) is located within the Easky River catchment. This is positive in terms of potential impacts of freshwater pearl mussel populations.

The Proposed Project design team were at all times aware that freshwater pearl mussel populations existed in the downstream watercourses, and as such all proposed mitigation and drainage design proposals were designed towards providing a "best in class" drainage management proposal for the development considering the significant catchment sensitivities.

A 100m buffer will be maintained for a tributary stream of the Easky River which flows to the south of Proposed Turbine T5.

During the layout optimisation process, all surface waters at the site were classified as very sensitive/high importance. Very sensitive surface waters are receptors of high environmental importance such as designated sites (i.e. NHA or SAC) or a public drinking water supply source. The surface waters at the Proposed Project were applied the highest possible sensitivity rating.

As stated previously in the chapter, a comprehensive surface water management plan and drainage plan is proposed and this will ensure that surface water runoff from the developed areas of the Site will be of a high quality and will therefore not impact on the quality of downstream rivers.

Detailed drainage management design and pollution prevention measures proposed during the construction phase are presented above and in the EIAR Water Chapter. These proposals are best in class and in line with current best practice approaches for surface water quality protection on wind farm and forestry sites.

While settlement ponds form an important element of the drainage proposals for the site, they are not stand alone but occur as part of a treatment train of systems that will be applied in series to ensure protection of downstream watercourses. The treatment of site runoff occurs before and also continues after the settlement ponds, with the "after" treatment also utilising natural elements of the site such as the existing vegetated ground. Therefore, the final "polished" discharge effluent quality will not be achieved until the discharge passes through the last element of the treatment series train which is the vegetated ground upslope of the local watercourse (i.e. compliance point).

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) shall be used to filter and treat all surface discharge water collected in the dirty water drainage system. This will apply for all of the construction phase.

Daily inspections will be undertaken to assess the effectiveness of the water treatment trains and this will include a visual assessment of water quality and also portable probes for field hydrochemistry monitoring (turbidity, pH, electrical conductivity etc) will be used by the Ecological Clerk of Works (ECoW) to make on the spot checks.

4.3.2 Operational Phase

4.3.2.1 Mitigation Measure for the Replacement of Natural Surface with Low Permeability Surfaces

The proposed drainage philosophy states that runoff control and drainage management are key elements in terms of mitigation against impacts on surface water bodies. Two distinct methods will be employed to manage drainage water within the Proposed Project. The first being 'keeping clean water clean' and the second involving the collection of any drainage waters from work area and to route them towards stilling ponds prior to controlled diffuse release over vegetated surfaces. The second method relates to proposed design measures that will prevent road surface and other hardstand areas acting as preferential flowpaths. All development site runoff will be collected, attenuated, treated and then released in a diffuse and regular manner that does not significantly change the natural drainage regime/hydrology of the site.

The operational phase drainage system of the Proposed Project will be installed and constructed in conjunction with the road and hardstanding construction work as described below and as shown on the drainage drawings submitted with this planning application:

- Interceptor drains will be maintained up-gradient of all proposed infrastructure to collect clean surface runoff, in order to minimise the amount of runoff reaching areas where suspended sediment could become entrained. It will then be directed to areas where it will be re-distributed over the ground by means of a level spreader;

- Swales/roadside drains will be used to collect runoff from access roads and turbine hardstanding areas of the site, likely to have entrained suspended sediment, and channel it to settlement ponds for sediment settling;
- On steep sections of access road transverse drains ('grips') will be constructed in the surface layer of the road to divert any runoff off the road into swales/roadside drains;
- Check dams will be used along sections of access road drains to intercept silts at source. Check dams will be constructed from a 4/40mm non-friable crushed rock;
- Settlement ponds, emplaced downstream of road swale sections and at turbine locations, will buffer volumes of runoff discharging from the drainage system during periods of high rainfall, by retaining water until the storm hydrograph has receded, thus reducing the hydraulic loading to watercourses; and,
- Settlement ponds will be designed in consideration of the greenfield runoff rate.

These measures will ensure all surface water runoff from upgraded roads and new road surfaces (including hardstands and turbine base areas) will be captured and treated prior to discharge/release. Settlement ponds, check dams and buffered outfalls will prevent roads acting as preferential flowpaths by providing attenuation and water quality treatment.

4.3.2.2 Mitigation Measures for Runoff

The mitigation measures outlined in Sections 4.3.1.2 and 4.3.2.1 will ensure all surface water runoff from upgraded roads and new road surfaces (including hardstand and turbine base areas) will be captured and treated prior to discharge/release. Settlement ponds, checks dams and buffered outfalls will prevent roads acting as preferential flowpaths by providing attenuation and water quality treatment.

4.3.2.3 Mitigation Measures for WFD Status

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

Similarly, there is no direct discharge to groundwaters associated with the Proposed Project. Mitigation for the protection of groundwater during the operational phase of the Proposed Project will ensure that the qualitative status of the receiving GWB will not be altered by the Proposed Project.

4.3.3 Decommissioning Phase

The potential impacts associated with decommissioning of the Proposed Project will be similar to those associated with construction but of a reduced magnitude, due to the reduced scale of the proposed decommissioning works in comparison to construction phase works. A description of the decommissioning works is contained in Ch. 4: Description of the Proposed Project of this EIAR.

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

The Site roadways will be kept and maintained following decommissioning of the turbine infrastructure, as these will be utilised by ongoing forestry works and by local farmers.

The electrical cabling connecting the site infrastructure to the on-site substation will be removed, while the ducting itself will remain in-situ rather than excavating and removing it, as this is considered to have less of a potential environmental impact, in terms of soil exposure, and thus on the possibility of the generation of suspended sediment which could enter nearby watercourses.

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

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

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

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

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

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

4.3.4 Potential Effects with the Implementation of Mitigation

In all instances, the mitigation measures described in **Section 4.3** are sufficient to meet the WFD Objectives. The assessment of WFD elements for the WFD waterbodies is summarised in **Table O** below.

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

SWB	WFD Code	Current Status	Assessed Status - Unmitigated	Assessed Status with Mitigation Measures
Easky_SC_010 river sub-catchment				
Buncrowey_010	IE_WE_35B090500	Moderate	Poor	Moderate
Easky_020	IE_WE_35E010020	High	Good	High
Easky_030	IE_WE_35E010100	High	Good	High
Easky_040	IE_WE_35E010200	High	Good	High
Carrownrush_010	IE_WE_35C660850	Good	Good	Good
Easky Estuary	IE_WE_440_0100	High	High	High
Donegal Bay Southern	IE_WE_430_0000	High	High	High
Dunmoran_SC_010 river sub-catchment				
Doonbeakin_010	IE_WE_35D090400	Good	Moderate	Good
Dunneill_010	IE_WE_35D060100	Good	Moderate	Good
Dunneill_020	IE_WE_35D060200	Moderate	Poor	Moderate
Lugdoon Stream_010	IE_WE_35L010400	Good	Moderate	Good
Kilrusheighter_010	IE_WE_35K350910	Good	Good	Good
Doonflin_010	IE_WE_35D100600	Moderate	Moderate	Moderate

Dunmoran_020	IE_WE_35D161400	Good	Good	Good
Barnabrack_010	IE_WE_35B300790	Good	Good	Good
Owenmore[Sligo]_SC_040 river sub-catchment				
Owenmore(Sligo)_080	IE_WE_35O060900	Moderate	Moderate	Moderate
Ballysodare_010	IE_WE_35B050100	Poor	Poor	Poor
Ballysadare Estuary	IE_WE_460_0300	Moderate	Moderate	Moderate
Sligo Bay	IE_WE_450_0000	Good	Good	Good
Unshin_040	IE_WE_35U010500	High	High	High
Unshin_050	IE_WE_35U010600	High	High	High
Groundwater Bodies				
Easky East	IE_WE_G_0050	Good	Good	Good
Collooney	IE_WE_G_0048	Good	Good	Good
Beltra-Sligo	IE_WE_G_0043	Good	Good	Good
Carrowmore West	IE_WE_G_0040	Good	Good	Good
Ballygawley	IE_WE_G_0039	Good	Good	Good
Lavagh-Ballintougher	IE_WE_G_0038	Good	Good	Good

4.3.5 Cumulative Effects

This section presents an assessment of the potential hydrological cumulative effects associated with the Proposed Project itself as well with other developments (existing and/or proposed) on the hydrological and hydrogeological environment.

The main likelihood of cumulative effects is assessed to be hydrological (surface water quality) rather than hydrogeological (groundwater). Due to the local hydrogeological setting (i.e. poorly productive bedrock and localised groundwater flowpaths) and the near-surface nature of construction activities, cumulative effects with regard to groundwater quality or quantity arising from the Proposed Project are assessed as not likely.

The potential for cumulative effects will typically be much higher during the construction phase of the Proposed Project as this is when earthworks and excavations will be undertaken at the Site. Similarly, when assessing other developments for cumulative effects (i.e. proposed wind farms in the same catchment where the construction phase could overlap with the construction phase of the Proposed Project), the construction phase will be the worst-case period for potential effects.

The potential for cumulative effects during the operational phase of the Proposed Project will be significantly reduced as there will be no exposed excavations, there will be no sources of sediment to reach watercourses, there will be no use of cementitious materials and fuels/oil will be kept to a minimum at the site. During the decommissioning phase, the potential cumulative effects are similar to the construction phase, but to a much lesser degree with less ground disturbance.

The cumulative Water Study area for the Proposed Wind Farm is the Easky River, Dunneill River, Buncrowney River, Doonbeakin River, Lugdoon Stream.

The cumulative Water Study area for the Proposed Grid Connection Route is Easky River, Dunneill River, Buncrowney River, Doonbeakin River, Lugdoon Stream, Kilrusheighter Stream, Doonflin Stream, Dunmoran River, Barnabrack Stream, Ballysodare River, Owenmore River and Unshin River.

The fact that the Proposed Project is spread across these several catchments is very positive from a hydrological cumulative impact scenario as works are not concentrated in one catchment. This is a significant mitigating factor against significant cumulative effects occurring.

4.3.5.1 Cumulative Effects of the Proposed Project

The potential for cumulative effects with regard elements of the Proposed Project itself (i.e. Proposed Wind Farm, Proposed Grid Connection Route, Existing Turbine Removal, TDR Works and BMEP) is significantly diminished because the Proposed Project is spread across several catchments and not concentrated in one catchment.

The Proposed Grid Connection Route and Proposed Wind Farm exist together only in 5 no. catchments (namely, Easky, Buncrowney, Dunnill, Doonbeakin and Lugdoon). Only approximately 10km of the total proposed 41.5km of Proposed Grid Connection Route underground cabling is situated within these catchments. The other 31.5km of underground cabling has no potential to contribute to cumulative with regard the Proposed Project.

Also, the fact that the Proposed Grid Connection Route is along public roads, the lack of in-stream works, the intermittent and transient nature of the trenching excavations, the Proposed Grid Connection Route is not expected to contribute to hydrological cumulative effects within the catchments it is located.

The proposed TDR accommodation works near the Proposed Wind Farm are located in the Balllymooney River catchment (i.e. Carrownrush_010 sub-basin). There is no other Proposed Project infrastructure located in the Carrownrush_010 sub-basin other than the TDR works and therefore no cumulative effects can occur.

The Existing Turbine Removal works will occur in advance of the Proposed Wind Farm construction. The Existing Turbine are located in the Dunneill River where 9 no. of the Proposed Turbines are located. The construction works will therefore not overlap, meaning no cumulative effects within the Dunneill River catchment are likely.

Finally, the BMEP works, which are located in the Easky River and Dunneill River catchments, require largely non-invasive ground works and therefore are not likely to contribute to cumulative effects.

No significant cumulative effects on the hydrological and hydrogeological environment are envisaged during the construction phase of the Proposed Project.

4.3.5.2 Cumulative effects with Other Wind Farm Developments

A list of other wind farm developments in the Proposed Wind Farm Water Study Area is shown in **Table P** below.

Other than the Existing Wind Farm (i.e. Dunneill and Kingsmountain) there are no other existing, permitted or proposed wind farm developments in the Dunneil River catchment. The proposed removal of the existing turbines is cumulatively assessed in Section 4.3.5.1 above.

There are 5 no. existing wind farm developments in the Easky River catchment as shown in **Table P** below. Because these wind farms are existing and operational there is no potential for construction phase overlaps with the Proposed Project.

There is only one permitted wind farm (Firlough WF) in the Easky River catchment, but only 1 no. of its 13 no. turbine is located in the Easky River catchment and cumulative effects are not likely even if construction phase overlaps with the Proposed Project.

Therefore, it can be concluded with high confidence (based on the information available to date) that the Proposed Project is not likely to contribute to cumulative effects with regard other wind farm developments in the Water Study Area.

Table P: List of Other Wind Farm Developments Assessed for Hydrological Cumulative Effects

Catchment	Development (Status)	Total Turbine No.	Turbine No. Catchment (Water Study Area
Easky River	Black Lough WF (Existing)	4	2
	Carrrowleagh 1 WF (Existing)	13	11
	Cloonkeelaun Single Wind Turbine (Existing)	1	1
	Cloonkeelaun Wind Farm (Carrowleagh WF Extension) Existing	3	3
	Cloonkeelaun 2 Wind Turbine (Existing)	2	2
	Firlough WF (Permitted)	13	1
Total for Easky Catchment		**36**	**20**

Dunneill River	Dunneill WF (Existing)	13	13
	King Mountain WF (Existing)	10	10
Total for Dunneill Catchment		**23**	**23**

4.3.5.3 Cumulative effects with Agriculture

According to Corine land cover mapping (www.epa.ie) (2018) the Water Study Area catchments are largely agricultural catchment.

Agricultural practices such as the movement of soil and the addition of fertilizers and pesticides can lead to nutrient losses and the entrainment of suspended solids in local surface watercourses. This can have a negative effect on local and downstream surface water quality.

In an unmitigated scenario the Proposed Project would have the potential to interact with these agricultural activities and contribute to a deterioration of downstream surface water quality through the emissions of elevated concentrations of suspended solids and ammonia.

However, the mitigation measures detailed in **Section 4.3** for the construction, operation and decommissioning phases of the Proposed Project will ensure the protection of downstream surface water quality.

For these reasons, we consider that there will not be a significant cumulative effect associated with agricultural activities.

4.3.5.4 Cumulative effects with Commercial Forestry

The most common water quality problems arising from forestry relate to the release of sediment and nutrients to the aquatic environment, and impacts from acidification. Forestry works can also give rise to modified stream flow regimes caused by associated land drainage.

However, the mitigation measures detailed for the construction, operation and decommissioning phases of the Proposed Project will ensure the protection of downstream surface water quality.

With regard to non-wind farm related forestry activities at the Site and the potential for cumulative impacts, it is proposed that all scheduled tree felling or replanting will not take place the same time as the Proposed Project construction phase in order to prevent hydrological cumulative impacts. No scheduled tree felling will occur in the same local catchment where the Proposed Project construction is taking place.

4.3.5.5 Cumulative effects with Turbary Peat Cutting Activities

Private peat cutting on turbary plots will likely continue in the vicinity of the Proposed Project site and in the wider cumulative area. The construction phase of the Proposed Project is likely to interact with these turbary activities and result in a deterioration of downstream surface water quality through the emissions of elevated concentrations of suspended solids and ammonia.

However, the areas of private peat cutting will be small, significantly limiting the potential for cumulative effects to arise with the Proposed Project. Nevertheless, the mitigation measures detailed for the construction, operational, and decommissioning phases of the Proposed Project will ensure the protection of downstream surface water quality.

For these reasons outlined above we consider that there will not be a significant cumulative effect associated with turbary activities.

4.3.5.6 Cumulative effects with Other Developments

A detailed cumulative assessment has been carried out for all planning applications (granted and awaiting decisions) within the cumulative assessment area described above.

There are applications for new dwellings or renovations of existing dwellings, as well as for the erection of farm buildings. Based on the scale of the works, their proximity to the Site and the temporal period of likely works, no cumulative effects will occur as a result of the Proposed Project (construction, operation and decommissioning phases).

Easky Lough water supply water treatment plant is located immediately to the north of the Site. Given the nature of the treatment plant (purification for drinking water), there are no licenced discharges (trade effluent) that could potentially contribute to cumulative effects.

5. SUMMARY AND CONCLUSION

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

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

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

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

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

As such, the Proposed Project:

- will not cause a deterioration in the status of all surface and groundwater bodies assessed;
- will not jeopardise the objectives to achieve 'Good' surface water/groundwater status;
- does not jeopardise the attainment of 'Good' surface water/groundwater chemical status;
- does not jeopardise the attainment of 'Good' surface water/groundwater quantity status;
- does not permanently exclude or compromise the achievement of the objectives of the WFD in other waterbodies within the same river basin district;
- is compliant with the requirements of the Water Framework Directive (2000/60/EC); and,
- is consistent with other Community Environmental Legislation including the EIA Directive (2014/52/EU), the Habitats Directive (92/43/EEC) and the Birds Directive (2009/147/EC) (Note that a full list of legislation complied with in relation to hydrology and hydrogeology is included in Section 9.1.5 of EIAR Chapter 9).

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