APPENDIX 9-6

WATER FRAMEWORK DIRECTIVE ASSESSMENT

HYDRO ENVIRONMENTAL SERVICES

22 Lower Main St
Dungarvan
Co.Waterford
Ireland

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

WATER FRAMEWORK DIRECTIVE ASSESSMENT
PROPOSED SEVEN HILLS WIND FARM, CO. ROSCOMMON

FINAL REPORT

Prepared for:

ENERGIA RENEWABLES ROI LTD.

Prepared by:

HYDRO-ENVIRONMENTAL SERVICES

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Author:	**MICHAEL GILL CONOR MCGETTIGAN**
Signed:	 _____ **Michael Gill B.A., B.A.I., M.Sc., MIEI Managing Director – Hydro-Environmental Services**

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1. INTRODUCTION

1.1 BACKGROUND

Hydro-Environmental Services (HES) were requested by MKO, on behalf of the Applicant, to complete a Water Framework Directive (WFD) Compliance Assessment for a planning application for the proposed Seven Hills Wind Farm, Co. Roscommon.

The Proposed Development comprises a 20 no. turbine wind farm, an on-site electrical substation, meteorological mast, 2 no. temporary construction compounds, underground cabling, the provision of new access roads together with the upgrade of existing access roads and all associated development works. The Proposed Development includes an underground grid connection from the proposed on-site electrical substation to the Athlone 110kV substation at Monksland, Athlone. The Seven Hills Wind Farm can be divided into two areas, the Northern Cluster and the Southern Cluster of wind turbines. The Northern Cluster includes 7 no. turbines and is located ~2.8km northwest of the village of Ballyforan and 1.5km northeast of Dysert village, Co. Roscommon. The Southern Cluster includes a further 13 no. turbines and is located ~3km southeast of Dysert, Co. Roscommon and 12km west of Athlone town, Co. Westmeath.

The purpose of this WFD assessment is to determine whether specific components or activities associated with the Proposed Development (including the proposed Wind Farm and Grid Connection route) will compromise WFD objectives or result in a deterioration or prevent the improvement of the status of any waterbodies in the vicinity or downstream of the Proposed Development site. 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 an Appendix to Chapter 9 of the EIAR submitted as part of the Proposed Development planning application.

1.2 STATEMENT OF AUTHORITY

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

This WFD assessment was prepared by Michael Gill and Conor McGettigan.

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

Conor McGettigan (BSc, MSc) is a junior Environmental Scientist, holding an M.Sc. in Applied Environmental Science (2020) from University College Dublin. Conor has also completed a B.Sc. in Geology (2016) from University College Dublin. In recent times Conor has assisted in

the preparation of hydrological and hydrogeological impact assessments for a variety of developments.

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, 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 3002).

The Directive 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 Directive is not compromised.

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

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

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

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.

We note that the River Basin Management Plan 2022-2027 is out for public consultation presently, and that closed in March 2022.

2. WATERBODY IDENTIFICATION CLASSIFICATION

2.1 INTRODUCTION

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

2.2 SURFACE WATERBODY IDENTIFICATION

Regionally the Proposed Development site is located primarily within the Upper Shannon (26D) catchment, with a small section to the southeast of the Wind Farm site within the Upper Shannon (26G) catchment, all within Hydrometric Area 26 (Upper Shannon) of the Irish River Basin District.

On a more local scale, the majority of the Proposed Development site (Northern and Southern Clusters) is broadly contained within the River Suck sub-catchment (Suck_SC_090), with a small section in the east of the Southern Cluster (T19 & T20) contained within the Cross River sub-catchment (Shannon[Upper]_SC_100). The Grid Connection route is mostly located within the Cross River sub-catchment (Shannon[Upper]_SC_100), with a small section close to Athlone, including the Athlone 110kV Monksland substation, located in the Shannon[Upper]_SC_090 sub-catchment.

Within the Suck_090 sub-catchment, the River Suck is located ~3.5km west of the Southern Cluster, and ~3.9km west of the Northern Cluster. The Suck River flows south through the village of Ballyforan, west of Dysert, continuing south through the town of Ballinasloe before turning southeast and discharging to the River Shannon at Shannonbridge, ~20km south of the southern cluster. Within this sub-catchment much of the Proposed Development is located within the Ballyglass_010 river-sub-basin. A small area in the northwest of the Northern Cluster is mapped within the Suck_120 river sub-basin. Further south, the southern section of the Southern Cluster is located within the Killeglan_010 and the Killeglan Tributary North_010 river sub-basins. The Ballyglass and Killeglan rivers discharge into the Suck River to the west of the Wind Farm site.

Within the Cross River sub-catchment, the Cross River is situated ~3.2km east of the nearest Southern Cluster turbines and it drains a catchment that is located east of Lough Croan/Cuilleenirwan Lough and generally south of Lough Funshinagh. The headwaters of the Cross River is on the western slope of a small hill (~80mOD) in the townland of Kilcar and is mapped as a series of smaller water features near Dooloughan Lough. The Cross River flows to the southeast before discharging into the River Shannon (Shannon Upper) to the south of Athlone. Within this sub-catchment the Proposed Development is located within the Cross (Roscommon)_020 river sub-basin.

Following its confluence with the Suck River at Shannonbridge, the River Shannon (Shannon Lower) continues to flow southwards discharging into the Lough Derg lake waterbody to the south of Portumna. The Shannon then flows to the southwest entering the Limerick Dock transitional waterbody in the vicinity of Limerick City. To the west of Limerick, the River Shannon flows through the Upper and Lower Shannon estuaries before entering the Mouth of the Shannon coastal waterbody.

There are 5 no. watercourse crossings along the proposed Grid Connection route. 4 no. crossings are located at existing bridge and culvert crossings over mapped river waterbodies (Ballyglass_010, Cross (Roscommon)_020 (2 no. crossings) and Cross (Roscommon)_030 river waterbodies). An additional crossing is proposed over an unnamed local drain which is not a WFD mapped waterbody. This unmapped drain is located in the Cross(Roscommon)_020 river sub-basin.

Figure A below presents a local hydrology map of the area, highlighting those SWBs downstream of the Wind Farm site and Grid Connection route as far as Lough Derg.

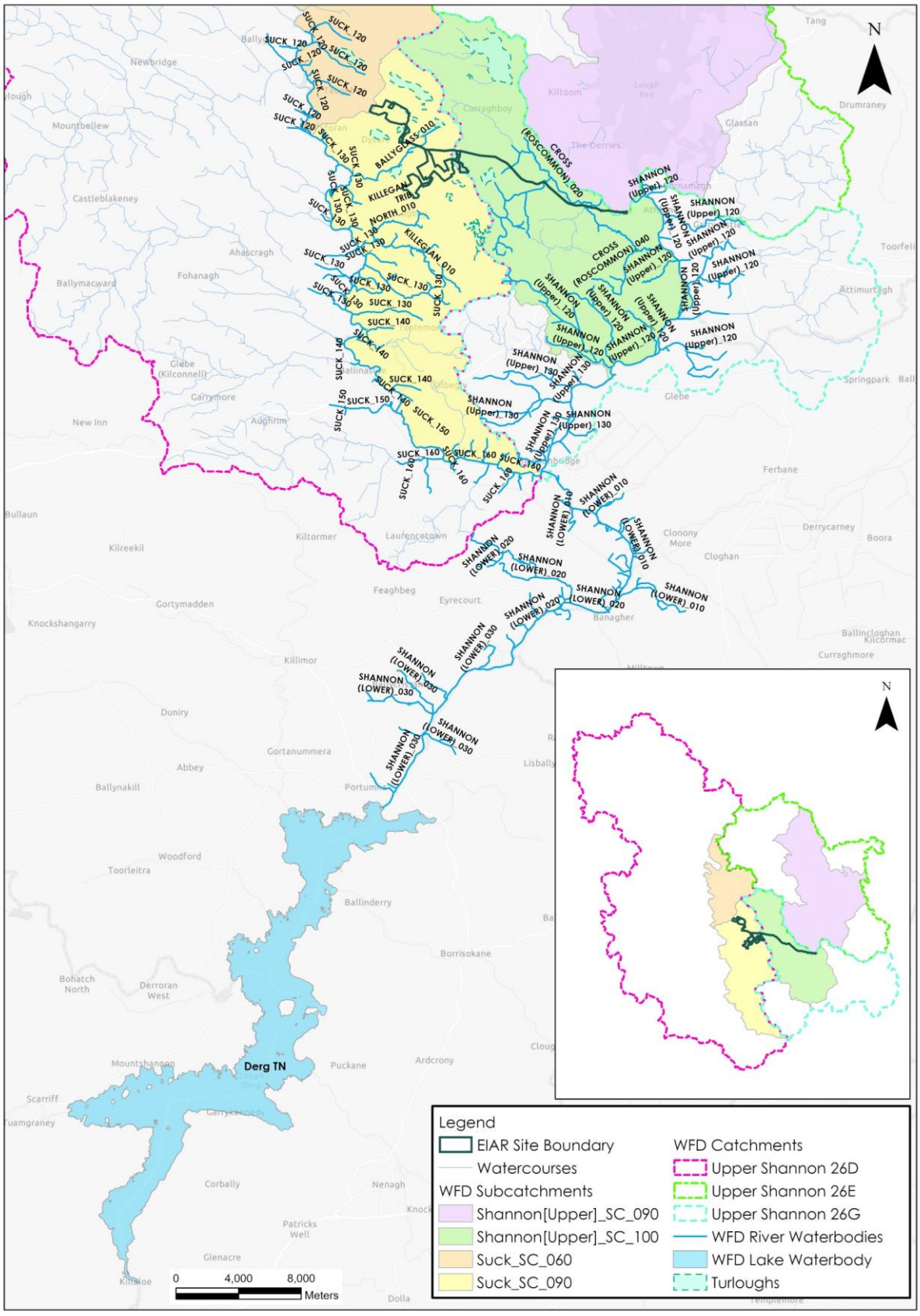

Figure A: Local Hydrology Map

2.3 SURFACE WATER BODY CLASSIFICATION

A summary of the WFD status and risk result for Surface Water Bodies (SWBs) downstream of the Proposed Development are shown in **Table A**.

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

To the west of the Wind Farm site, the Suck_120 and the Suck_130 river waterbodies achieved "Moderate" and "Good" status respectively in both the 1st (2010-2015) and 2nd (2013-2018) WFD cycles. The Ballyglass_010 (which drains the majority of the wind farm site) achieved "Good" status in the latest WFD cycle while the Killeglan Trib. North_010 river waterbody achieved "Moderate" status. The Killeglan_010 river waterbody has improved from "Poor" status in the 1st WFD cycle to "Moderate" in the 2nd WFD cycle. Further downstream, the Suck_140 and Suck_150 river waterbodies achieved "Moderate" status in both WFD cycles. Upstream of its confluence with the River Shannon, the Suck_160 river waterbody is of "Poor" status.

To the east of the Wind Farm site, the overall status of the Cross (Roscommon) river (Cross(Roscommon)_020, Cross(Roscommon)_030 and Cross(Roscommon)_040) ranges from "Moderate" to "good" status. Downstream of Athlone and its confluence with the Cross river, the River Shannon (Shannon(Upper)_120) achieved "Poor" status in both WFD cycles. Further downstream the Shannon(Upper)_130 waterbody achieved "Poor" status. Downstream of its confluence with the Suck River the Shannon(Lower)_010 river waterbody remains unassigned with regards WFD status. Further downstream the Shannon(Lower)_020 and Shannon(Lower)_030 SWBs achieved "Moderate" status in the latest WFD cycle. Meanwhile, the Lough Derg lake waterbody experienced an improvement in status, from being of "poor" status in the 1st WFD cycle to being of "Moderate" status in the 2nd WFD cycle.

The risk status of the SWBs in the vicinity and downstream of the site are largely "at risk" or "under review" and is presented in **Table A**.

The 3rd Cycle Upper Shannon Catchment (26G) Report states that morphological issues and nutrients remain the most prevalent issues in this catchment. Agriculture is a significant pressure on the Cross(Roscommon)_030 river waterbody. Urban wastewater is also listed as a significant pressure on this SWB due to the Monksland Wastewater treatment agglomeration. Peat drainage and extraction are listed as significant pressures in the Cross(Roscommon)_040 and Shannon(Upper)_120 SWBs. This has resulted in increased sediment loads which has the potential to alter habitats, morphology and hydrology.

The 3rd Cycle Upper Shannon (Suck) Catchment (26D) Report states that excess nutrients and morphological impacts are the most prevalent issues in the Suck Catchment. The main pressures downstream of the Wind Farm site are hydromorphological issues and extractive industry. The Suck_030 has been influenced by land drainage modifications. Meanwhile, peat extraction and drainage has been identified as a significant pressure on the Suck_150 and Killeglan_010 river waterbodies.

The SWB status for the 2013-2018 WFD cycle are shown on **Figure B.**

Table A: Summary WFD Information for River Water Bodies

SWB	Overall Status 2010-2015	Risk Status 2010-2015	Overall Status 2013-2018	Risk Status 2013-2018	Pressures
Suck_120	Moderate	At risk	Moderate	At risk	Hydromorphology
Suck_130	Good	Not at risk	Good	Not at risk	-
Ballyglass_010	Unassigned	Under review	Good	Under review	-
Killeglan Trib North_010	Unassigned	Under review	Moderate	Under review	Extractive industry
Killeglan_010	Poor	At risk	Moderate	At risk	Peat
Suck_140	Moderate	At risk	Moderate	At risk	Hydromorphology
Suck_150	Moderate	At risk	Moderate	At risk	Hydromorphology & Peat
Suck_160	Unassigned	Under review	Poor	Under review	Hydromorphology & extractive industry
Cross(Roscommon)_020	Good	Not at risk	Good	Under review	-
Cross(Roscommon)_030	Good	Not at risk	Moderate	At risk	Agriculture, hydromorphology & urban wastewater
Cross(Roscommon)_040	Moderate	At risk	Moderate	At risk	Hydromorphology & Peat
Shannon(Upper)_110	Unassigned	Under Review	Poor	At risk	Agriculture, atmospheric & hydromorphology
Shannon(Upper)_120	Poor	At risk	Poor	At risk	Hydromorphology & Peat
Shannon(Upper)_130	Unassigned	Under review	Poor	Under review	Industry & urban wastewater
Shannon(Lower)_010	Unassigned	Under review	Unassigned	Under review	Urban wastewater
Shannon(Lower)_020	Good	Not at risk	Moderate	At risk	-
Shannon(Lower)_030	Unassigned	Under Review	Moderate	Under review	Anthropogenic
Derg TN	Poor	At risk	Moderate	At risk	Agriculture, hydromorphology & invasive species

2.4 GROUNDWATER BODY IDENTIFICATION

According to data from the GSI database and bedrock geology series (www.gsi.ie), The Wind Farm site and the majority of the Grid Connection route are underlain by a Regionally Important Aquifer – Karstified (conduit), which consists of Visean Limestones (Undifferentiated). A small area in the east of the route, in the vicinity of Athlone 110kV substation, is underlain by a Locally Important Aquifer – Bedrock which is Moderately Productive only in Local Zones, which consists of Dinantian Pure Unbedded Limestones.

The majority of the Wind Farm site is located within the Suck South GWB (18 no. turbines, 3 no. soil storage areas and 2 no. temporary construction compounds). A small area in the west of the Southern Cluster is located within the Funshinagh GWB (2 no. turbines and the proposed on-site electrical substation).

The proposed Grid Connection route is primarily located within the Funshinagh GWB, with a small section near the Wind Farm site located within the Suck South GWB. A small section in the east of the route is underlain by the Athlone West GWB.

Due to the local hydrogeological regime, there is a high connectivity between surface and groundwaters in the vicinity of the site. Several turloughs have been identified in the lands surrounding the Wind Farm site.

2.5 GROUNDWATER BODY CLASSIFICATION

Both the Suck South GWB (IE_SH_G_225), Funshinagh GWB (IE_SH_G_091) and Athlone West GWB (IE_SH_G_014) are assigned 'Good Status', which is defined based on the quantitative status and chemical status of the GWB. The risk status of the Suck South and Funshinagh GWBs is currently under review while the Athlone West GWB has been deemed to be not at risk of failing to meet its WFD objectives. No significant pressures have been identified to be impacting on these GWBs.

The GWB status for the 2013-2018 WFD cycle are shown on **Figure B.**

Table B: Summary WFD Information for Groundwater Bodies

GWB	2010-2015 Status	2010-2015 Risk Status	2013-2018 Status	2013-2018 Risk Status	Pressures
Suck South	Good	Under review	Good	Under review	-
Funshinagh	Good	Under review	Good	Under review	-
Athlone West	Good	Not at risk	Good	Not at risk	-

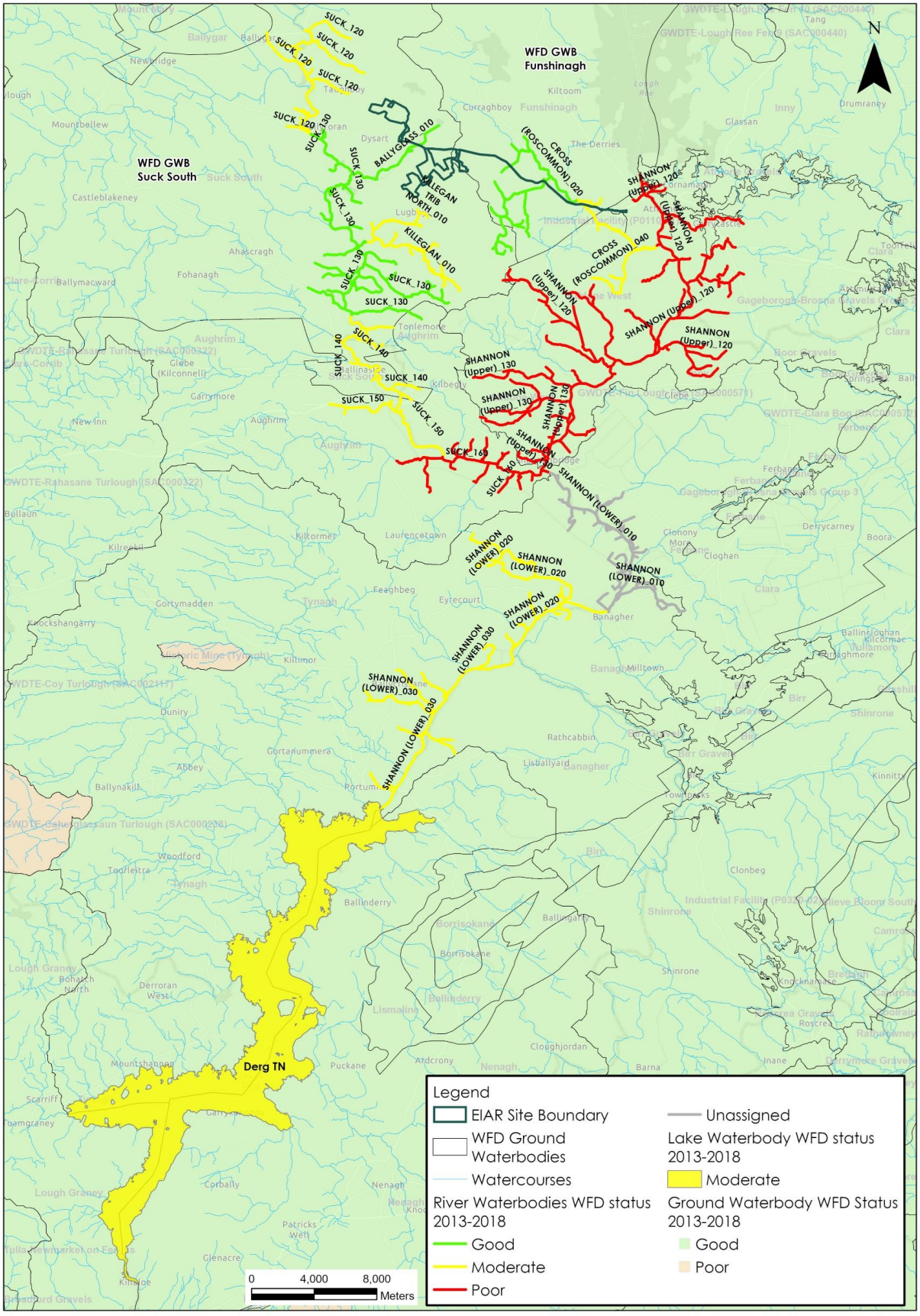

Figure B: WFD Groundwater and Surface Waterbody Status (2013-2018)

3. HYDROLOGICAL & HYDROGEOLOGICAL SITE CONDITIONS

As part of the Environmental Impact Assessment for the proposed Seven Hills Wind Farm an extensive database of geological and hydrogeological information has been accrued through site investigations and a review of available historical site investigation data. Site investigations at the Seven Hills Wind Farm site date from 2010 to 2021 and include 152 no. site investigation points (trial pits and boreholes), 114 laboratory tests (PSD, permeability and density analysis of subsoil samples) accompanied by 80 no. geophysical surveys. In terms of hydrology, 19 no. water level monitoring devices were installed in groundwater wells, with an additional 8 no. monitoring devices installed within turloughs. Local groundwater level monitoring has been completed over a period of 17 months from January 2020 to May 2021.

A conceptual site model has been development from the available site-specific data and is summarised below:

- Rainfall falling within the Wind Farm site will percolate through the relatively thick soils/subsoils and reach the underlying bedrock aquifer.
- The ability for the soils and subsoils to accept rainfall is evident from the lack of surface water courses such as minor streams and drainage channels within the Wind Farm site, as well as the lithology of the subsoils defined through the extensive site investigation.
- Once the rainfall has infiltrated and percolated through the subsoil layer, it will recharge to the underlying limestone which through site investigations has been proven to be medium hard to hard, competent and lacking any significant karst features.
- Groundwater level montoring has revealed a significant hydraulic head between the turloughs surrounding the proposed Wind Farm site and the Suck River. Water level monitoring of the turloughs reveal a gradual buildup of water during the winter months and a slow recession of groundwater levels in the spring. This hydrogeological data does not suggest the presence of fast flowing groundwater movements in enlarged fracture conduits typical of karst systems.
- Instead groundwater moves slowly through the underlying hard competent limestone i.e. there is no free-flowing karst drainage network underlying the proposed Wind Farm site. Karst features are not ubiquitous in the area of the Wind Farm site.
- Groundwater flows in a southwest direction from the highest groundwater areas (>70mOD) to the lowest areas (Ballyglass river and River Suck at ~40-45 mOD) and discharges to these surface water features.
- Where local topography varies (*i.e.* on a northwest sloping hill), the groundwater flow direction may follow this local variance for a short period, however, it will eventually normalise to the regional groundwater gradient and flow southwest.

This understanding of the hydrological and hydrogeological regime of the Proposed Development site aids in the screening of those waterbodies with the potential to be impacted by the Proposed Development and the assessment of the potential impacts on each respective waterbody.

4. WFD SCREENING

As discussed in **Section 2**, there are a total of 18 no. river water bodies located downstream of the Wind Farm site/Grid Connection route and upstream of Lough Derg. In addition, 2 no. groundwater bodies underlie the proposed Wind Farm site.

4.1 SURFACE WATER BODIES

As shown in Figure A above, there are 18 no. river water bodies located in the vicinity or downstream of the Proposed Development site.

With consideration for the construction, operational and decommissioning phases of the Proposed Development, it is considered that all sections of the Ballyglass (Ballyglass_010), Killeglan (Killeglan-010), Suck (Suck_130, _140, _150 and Suck_160) and Cross (Cross(Roscommon)_020, _030 and _040) rivers downstream of the site are carried through into the WFD Impact Assessment. The Proposed Development works within the Wind Farm site 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 Suck_120 SWB located to the northwest of the Northern Cluster has been screened out due its location upstream of all development infrastructures. Similarly, the Killeglan Trib North_010 SWB has been screened out due to the absence of key development works within the catchment of this river waterbody. The proposed works have no potential to cause a deterioration in the status of these screened out SWBs and/or jeopardise their attainment of good surface water status due to the lack of proposed development works in the upstream catchment to these waterbodies and the local hydrogeological regime described in Section 3 above.

All waterbodies along the proposed Grid Connection route (Ballyglass_010, Cross(Roscommon)_020, _030 and Shannon(Upper)_110) are carried through to the WFD Impact Assessment. The Proposed Development works along the Grid Connection route 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.

All remaining sections of the River Shannon (Shannon (Upper)_120, 130, Shannon (Lower)_010, _020 and _030) downstream of the Proposed Development, including Lough Derg, have been screened out due to the large volumes of water within these SWBS and the large catchment area draining to these SWBs. The Proposed Development has no potential to cause a deterioration in the status of these waterbodies and/or jeopardise their attainment of good surface water status in the future because of the prevailing hydrogeological conditions local to the Proposed Development (largely a groundwater dominated environment) any the scale of the downstream catchments and their relative volumetric flows in comparison to those arising from the Proposed Development site (which has to flow through a groundwater system before entering the downstream surface water system).

Note that while the Shannon(Lower)_010 river waterbody is unassigned with regards WFD status, the Proposed Development is remote from this waterbody and comprises a very small percentage of the total catchment area to this surface waterbody. In addition, there are no direct discharges to surface waters at the Wind Farm site, significantly reducing any potential impact on downstream surface waters. Therefore, irrespective of the condition of the Shannon(Lower_110) waterbody if it was categorised, and due to its distant location from the wind farm site, the Proposed Development has no potential to cause a deterioration in the status of the waterbody and/or jeopardise its attainment of good surface water status or good surface water chemical status in the future.

4.2 GROUNDWATER BODIES

With respect to groundwater bodies, Suck South (IE_SH_G_225), Funshinagh (IE_SH_G_091) and Athlone West (IE_SH_G_014) GWBs are carried through into the WFD Impact Assessment due to their location directly underlying the Proposed Development.

4.3 WFD SCREENING SUMMARY

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

While several SWBs are screened in due to their proximity to the Wind Farm site it is worth noting that no direct surface water linkages exist between the Wind Farm site, making groundwater the key receptor for the Proposed Development.

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

Type	WFD Classification	Waterbody Name/ID	Inclusion in Assessment	Justification
Surface Water Body	River	Suck_120	No	While the northwest of the Wind Farm site is mapped within the catchment area to the Suck_120 SWB, no development infrastructure is located within this sub-basin. All development works associated with the proposed Wind Farm are located downstream of the Suck_120 SWB. Therefore, the Suck_120 SWB has been screened out as the Proposed Development has no potential to impact the status of this SWB.
	River	Ballyglass_010	**Yes**	The majority of the Wind Farm site, including 16 no. turbines, is mapped within the catchment area of the Ballyglass_010 SWB. An assessment is required to consider the potential impacts of the Proposed Development on this SWB.
	River	Suck_130	**Yes**	The Suck_130 SWB is located directly downstream of the Ballyglass_010 and Killeglan_010 SWBs and in close proximity to the site (<1km). An assessment is required to consider the potential impacts of the Proposed Development on this SWB.
	River	Killeglan Trib North_010	No	A small area in the southwest of the Southern Cluster is mapped within the catchment area to the Killeglan Trib North_010 SWB. However, no key development infrastructure is located within this sub-basin. Therefore, the Killeglan Trib North_010 SWB has been screened out as the Proposed Development has no potential to impact the status of this SWB.
	River	Killeglan_010	**Yes**	Much of the south of the Southern Cluster, including 2 no. turbines, is located within the catchment area to the Killeglan_010 SWB. An assessment is required to consider the potential impacts of the Proposed Development on this SWB.
	River	Suck_140	**Yes**	The Suck_140 SWB is located directly downstream of the Suck_130 SWB and in close proximity to the site (~8.5km). An assessment is required to consider the potential impacts of the Proposed Development on this SWB.
	River	Suck_150	**Yes**	The Suck_150 SWB is located directly downstream of the Suck_140 SWB. An assessment is required to consider the potential impacts of the Proposed Development on this SWB.
	River	Suck_160	**Yes**	The Suck_160 SWB is located directly downstream of the Suck_150 SWB. An assessment is required to consider the potential impacts of the Proposed Development on this SWB.
	River	Cross(Roscommon)_020	**Yes**	The east of the Southern Cluster, including 2 no. turbines, is located within the catchment area to the Cross_020 SWB. An assessment is required to consider the potential impacts of the Proposed Development on this SWB.
	River	Cross(Roscommon)_030	**Yes**	The Cross_030 SWB is located directly downstream of the Cross_020 SWB and in close proximity to the site (~6.8km). An assessment is required to consider the potential impacts of the Proposed Development on this SWB.
	River	Cross(Roscommon)_040	**Yes**	The Cross_040 SWB is located directly downstream of the Cross_030 SWB and <10km from the site. An assessment is required to consider the potential impacts of the

				Proposed Development on this SWB.
	River	Shannon(Upper)_110	**Yes**	The eastern section of the proposed Grid Connection works is located within the Shannon(Upper)_110 river sub-basin. An assessment is required to consider the potential impacts of the Proposed Development on this SWB.
	River	Shannon(Upper)_120	No	The Shannon(Upper)_120 SWB has been screened out due to its distant location from the site (~12.5km) and the large volumes of water within the River Shannon.
	River	Shannon(Upper)_130	No	The Shannon(Upper)_130 SWB has been screened out due to its distant location from the site (~15km), the large volumes of water within the River Shannon and the emergence of new pressures on this SWB (*i.e.* industry & urban wastewater).
	River	Shannon(Lower)_010	No	The Shannon(Lower)_010 SWB has been screened out due to its distant location from the site (~18km), the large volumes of water within the River Shannon and the emergence of new pressures on this SWB (*i.e.* urban wastewater).
	River	Shannon(Lower)_020	No	The Shannon(Lower)_020 SWB has been screened out due to its distant location from the site (~28km), the large volumes of water within the River Shannon and the emergence of new pressures on upstream SWBs.
	River	Shannon(Lower)_030	No	The Shannon(Lower)_030 SWB has been screened out due to its distant location from the site (~29km), the large volumes of water within the River Shannon and the emergence of new pressures on upstream SWBs.
	Lake	Lough Derg TN	No	The Lough Derg SWB has been screened out due to its distant location from the site (~39km) and the large volumes of water within Lough Derg.
Groundwater Body	Groundwater	Suck South	**Yes**	The majority of the Wind Farm site including 18 no. turbines overlies the Suck South GWB. An assessment is required to consider potential impacts of the Proposed Development to this GWB.
	Groundwater	Funshinagh	**Yes**	The eastern section of the Southern Cluster, including 2 no. turbines, overlies the Funshinagh GWB. Additionally, the majority of the proposed Grid Connection route overlies this GWB. An assessment is required to consider potential impacts of the Proposed Development to this GWB.
	Groundwater	Athlone West	**Yes**	The eastern section of the proposed Grid Connection route overlies the Athlone West GWB. An assessment is required to consider potential impacts of the Proposed Development to this GWB.

5. WFD COMPLIANCE ASSESSMENT

5.1 PROPOSALS

The Proposed Development includes 20 no. turbines, underground Grid Connection, 110kv electrical substation, temporary construction compounds (2 no.), overburden storage areas (6 no.), met mast, new and upgraded access roads and all associated site development works including drainage infrastructure and landscaping.

Due to the local hydrological/hydrogeological regime of the site, with a distinct absence of a surface water drainage network and relatively thick glacial soils/subsoils, rainfall falling within the site percolates to ground and into the underlying bedrock aquifer. Therefore, the underlying Suck South and Funshinagh GWBs are particularly susceptible to potential effects associated with the Proposed Development. The primary risks to groundwater at the site will be from cementitious materials and hydrocarbon spillage and leakages.

No direct surface water connections exist between the Wind Farm and downstream surface watercourses *i.e.* Ballyglass, Suck and Cross Rivers. All hydraulic connections are indirect, and via the underlying groundwater flow system. Rainfall (recharging to the ground) from the Wind Farm site will only reach these SWBs via groundwater recharge and groundwater flow. While the proposed Grid Connection route is generally distant from any hydrological features, there are 5 no. river crossings along the proposed route (1 no. crossing on the Ballyglass_010 SWB, 2 no. crossings on the Cross_020 SWB, 1 no. crossing on an unmapped drain within the Cross_020 sub-basin and 1 no. crossing along the Cross_030 SWB). The primary risk to surface waters will be entrained suspended sediments (soil particles) in site runoff during earthworks along with cement-based compounds and hydrocarbons spillage and leakages.

5.2 POTENTIAL EFFECTS

5.2.1 Construction Phase (Unmitigated)

5.2.1.1 Potential Surface Water Quality Effects from Works within Wind Farm Site

Construction phase activities including site levelling/construction and building turbine foundation excavation and the excavation of the Grid Connection trench will require earthworks resulting in removal of vegetation cover and excavation of mineral soil/subsoil (where present) and bedrock in certain areas, The main risk will be from surface water runoff from spoil storage areas and excavation drainage/dewatering during construction works. These activities can result in the entrainment of suspended solids in surface waters. However, no direct pathways exist between the Wind Farm site and downstream surface waterbodies. Therefore, construction phase activities within the Wind Farm site do not have the potential to increase the suspended sediment load or turbidity in downstream surface water receptors.

Hydrocarbons and cement-based compounds will also 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. 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. However, no direct surface water pathways exist between the Wind Farm site and downstream surface waterbodies. Therefore, accidental spillage of hydrocarbons within the wind farm site have limited potential to impact the water quality in downstream surface watercourses.

Release of effluent from wastewater treatment systems also has the potential to impact on groundwater and surface waters if site conditions are not suitable for an on-site percolation unit. There are 2 no. construction compounds proposed (1 no. within the Northern Cluster and 1 no. within the Southern Cluster).

As described above, surface water draining from an active construction site can contain elevated levels of suspended sediment, cementitious runoff and/or hydrocarbons depending on the nature of the construction activity. Additionally, any alteration of the drainage regime within a site can impact on the volume of runoff which leaves the site. These impacts can affect the quantity and quality of downstream surface waterbodies (where a flow path exists between the site and the waterbody).

However, no direct surface water pathways exist between the Wind Farm site and downgradient watercourses, and all pathways are via groundwater recharge and groundwater flow. Therefore, the proposed works within the Wind Farm site have limited potential to alter the status of downstream surface waterbodies. As such, we consider that there will be no change to the WFD status of downstream surface watercourses as a result of the construction activities within the proposed Wind Farm site.

A summary of potential status change to SWBs arising from potential water pollution (suspended solids entrainment, hydrocarbon spillage, release of cement-based products and/or wastewater) during the unmitigated construction phase are outlined in **Table D**.

Table D: Potential Surface Water Quality Effects from Works Within Wind Farm Site during Construction Phase (Unmitigated)

WFD Element	WFD Code	Current Status	Assessed Potential Status Change
Ballyglass_010	IE_SH_26B150840	Good	Good
Killeglan_010	IE_SH_26K040200	Moderate	Moderate
Suck_130	IE_SH_26S071200	Good	Good
Suck_140	IE_SH_26S071400	Moderate	Moderate
Suck_150	IE_SH_26S071500I	Moderate	Moderate
Suck_160	IE_SH_26S071550	Moderate	Moderate
Cross(Roscommon)_020	IE_SH_26C100200	Good	Good
Cross(Roscommon)_030	IE_SH_26C100300	Moderate	Moderate
Cross(Roscommon)_040	IE_SH_26C100400	Moderate	Moderate

5.2.1.2 Potential Surface Water Quality Effects along Grid Connection Route

Based on the WFD mapping, there will be a requirement for 5 no. watercourse crossings along the proposed Grid Connection route (located at existing bridges and culverts). The proposed Grid Connection route will run along the R363, which bisects the Northern and Southern Clusters, crossing the Ballyglass_010 SWB to the west of the Southern Cluster. The Grid Connection route will continue along the R363 to the east of the Southern Cluster, transitioning to the R362 near the townland of Ballymullavill. The Grid Connection route then crosses 2 no. mapped tributaries of the Cross River and an unmapped local drain within the Cross(Roscommon)_020 river sub-basin. Further to the southeast, the route crosses the Cross

River (_030) in the townland of Bellanamullia before reaching the Athlone 110 kV substation at Monksland, located within the Shannon(Upper)_110 river sub-basin.

No in-stream works are required at any of these watercourse crossings, however due to the close proximity of local waterbodies to the Grid Construction work 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.

Construction activities along the Gird Connection route have the potential to adversely impact the status of the Ballyglass_010, Cross(Roscommon)_020 and Cross(Roscommon)_030 SWBs. The status of the Shannon(Upper)_110 will not be impacted due to absence of surface watercourses in the area of the proposed Grid Connection works in this river sub-basin. Note that the closest mapped surface waterbody within the Shannon(Upper)_110 sub-basin is located in excess of 2km from the proposed Grid Connection route.

A summary of potential status change to SWBs arising from works along the proposed Grid Connection route during the unmitigated construction phase are outlined in **Table E**.

Table E: Potential Surface Water Quality Effects along Grid Route during Construction Phase (Unmitigated)

WFD Element	WFD Code	Current Status	Assessed Potential Status Change
Ballyglass_010	IE_SH_26B150840	Good	Moderate
Cross(Roscommon)_020	IE_SH_26C100200	Good	Moderate
Cross(Roscommon)_030	IE_SH_26C100300	Moderate	Poor
Cross(Roscommon)_040	IE_SH_26C100400	Moderate	Moderate
Shannon(Upper)_110	IE_SH_26S021660	Poor	Poor

5.2.1.3 Potential Effects on Groundwater Quality/Quantity and Flow Patterns

As described in **Section 5.2.1.1** and **Section 5.2.1.2**, 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 water quality at the Proposed Development (Wind Farm site and Grid Connection route). Due to the absence of a surface water drainage network and the permeable nature of the underlying glacial soils and subsoils, groundwater underlying the Wind Farm site is susceptible to pollution from construction related activities. Groundwater quality along the Grid Connection route will also be vulnerable to pollution during construction activities but to a lesser extent than at the wind farm site due to the scale of the works.

In addition, groundwater quantity and flows underlying the Proposed Development have the potential to be impacted:

The alteration of groundwater recharge rates due to the activation of karst features: A comprehensive site investigation dataset has been accrued between 2010-2021 within the Seven Hills Wind Farm site. The collated site data has not identified any significant karst features within the underlying bedrock, described as generally medium hard to hard Limestone. The bedrock below the proposed Seven Hills Wind Farm Site does not contain an abundance of karst flow systems. In addition, groundwater levels have been found to be

below the level of emplacement of the turbine bases in both the Northern and Southern Clusters.

Effects on groundwater levels due to excavation dewatering: Temporary dewatering of turbine bases during construction has the potential to impact on local groundwater levels. Groundwater levels across the proposed Wind Farm site (Northern and Southern Clusters) are well defined through monitoring of numerous groundwater wells, site investigation boreholes and turloughs. Known winter groundwater levels are significantly below the proposed formation levels of all turbines, and as such we can confirm there will be no groundwater dewatering requirements during turbine base construction. No groundwater level impacts are anticipated from the construction of the Grid Connection underground cabling trench due to the shallow nature of the excavation (i.e. ~1.2m), the excavation of the trench within the road carriageway and the unsaturated nature of the subsoil/bedrock to be excavated.

Therefore, the Proposed Development works will not affect the groundwater quantity or flow patterns in the underlying Suck South, Funshinagh or Athlone West GWBs.

However as stated above, unmitigated construction phase activities will potentially result in a deterioration in groundwater quality at the Wind Farm site and along the proposed Grid Connection route.

A summary of potential status change to GWBs arising from construction phase activities during the unmitigated construction phase are outlined in **Table F**.

Table F: Potential Effects on Groundwater Quality/Quantity during Construction Phase (Unmitigated)

WFD Element	WFD Code	Current Status	Assessed Potential Status Change
Suck South GWB	IE_SH_G_225	Good	Moderate
Funshinagh GWB	IE_SH_G_091	Good	Moderate
Athlone West GWB	IE_SH_G_014	Good	Moderate

5.2.2 Operational Phase (Unmitigated)

5.2.2.1 Increased Runoff due to Replacement of Natural Surfaces with Lower Permeability Surfaces

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

Due to the local hydrological/hydrogeological regime the most sensitive receptor to changes in runoff volumes is the Suck South GWB. However, given the small scale of the development footprint in comparison to the total area of the Suck South and Funshinagh GWBs no significant affect will occur. Runoff from emplaced access tracks and turbine bases will recharge to ground at the edges of the works areas (only short distances from where it would have recharge in the pre-development scenario).

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

Table G: Potential Effect of Increased Runoff during Operational Phase (Unmitigated)

SWB	WFD Code	Current Status	Assessed Potential Status Change
Ballyglass_010	IE_SH_26B150840	Good	Good
Killeglan_010	IE_SH_26K040200	Moderate	Moderate
Suck_130	IE_SH_26S071200	Good	Good
Suck_140	IE_SH_26S071400	Moderate	Moderate
Suck_150	IE_SH_26S071500I	Moderate	Moderate
Suck_160	IE_SH_26S071550	Moderate	Moderate
Cross(Roscommon)_020	IE_SH_26C100200	Good	Good
Cross(Roscommon)_030	IE_SH_26C100300	Moderate	Moderate
Cross(Roscommon)_040	IE_SH_26C100400	Moderate	Moderate
Suck South GWB	IE_SH_G_225	Good	Good
Funshinagh GWB	IE_SH_G_091	Good	Good

5.2.2.2 Surface Water Quality Impacts from Site Maintenance

During the operational phase, the potential for silt-laden runoff is much reduced compared to the construction phase.

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.

However as described above, no direct surface water pathways exist between the Wind Farm site and downgradient watercourses, and all pathways are via groundwater recharge and groundwater flow. Therefore, any works required during the operational phase of the Proposed Development will have limited potential to alter the status of downstream surface waterbodies.

A summary of potential status change to SWBs arising from surface water quality impacts during the operation stage of the Proposed Development in the unmitigated scenario are outlined in **Table H**.

Table H: Surface Water Quality Impacts from Site Maintenance during Operational Phase (Unmitigated)

SWB	WFD Code	Current Status	Assessed Potential Status Change
Ballyglass_010	IE_SH_26B150840	Good	Good
Killeglan_010	IE_SH_26K040200	Moderate	Moderate
Suck_130	IE_SH_26S071200	Good	Good
Suck_140	IE_SH_26S071400	Moderate	Moderate
Suck_150	IE_SH_26S071500I	Moderate	Moderate
Suck_160	IE_SH_26S071550	Moderate	Moderate
Cross(Roscommon)_020	IE_SH_26C100200	Good	Good
Cross(Roscommon)_030	IE_SH_26C100300	Moderate	Moderate
Cross(Roscommon)_040	IE_SH_26C100400	Moderate	Moderate

5.2.2.3 Groundwater Quality Impacts from Site Maintenance

The risks to groundwater quality are the same as those described in **Section 5.2.1.3** but of a lesser extent than during the construction phase due to the limited activity at the Wind Farm site with only minor maintenance required during the operational phase. There will be no groundwater quality impacts along the proposed Grid Connection route.

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

Table I: Groundwater Quality Impacts During Operational Phase (Unmitigated)

WFD Element	WFD Code	Current Status	Assessed Potential Status Change
Suck South GWB	IE_SH_G_225	Good	Moderate
Funshinagh GWB	IE_SH_G_091	Good	Moderate
Athlone West GWB	IE_SH_014	Good	Good

5.3 MITIGATION MEASURES

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

5.3.1 Construction Phase

5.3.1.1 Mitigation Measures for Suspended Solids Entrainment in Drainage Recharge

Surface watercourses are absent within the EIAR Site Boundary, however potential impacts in relation to potential overland flow towards surface water bodies such as turloughs will nonetheless be mitigated against, as well as surface water runoff that will occur at site infrastructure that will need to be recharged locally into subsoils. This recharge water will occur close to source and can migrate vertically to groundwater below the site. No discharge to surface waterbodies will occur within the Wind Farm site.

The proposed drainage management plan has been prepared in order to control the erosion of sediment within the Proposed Development site and prevent the entrainment of suspended solids in local runoff (prior to recharge) during the construction phase. The drainage management plan has been designed with the knowledge of the sites hydrological and hydrogeological conditions.

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

A key mitigation measure adopted during the design phase of the Proposed Development is the avoidance of infrastructure close to turloughs and surface water features. The closest turbine to a surface water feature is T4, located ~60m from Gortaphuill turlough which is a temporary waterbody and as with all turloughs near the site, does not exist between May and November. The buffer zone will avoid physical damage to turloughs, avoid excavation in close proximity to turloughs and avoid the entry of suspended sediment into turlough water bodies.

As stated, surface watercourses are absent within the Wind Farm site, with rainfall falling within the site infiltrating into the soil/subsoils and recharging to groundwater. The proposed drainage management plan will utilise the natural site conditions whereby the existing vegetation and soils will filter and clean runoff from the work areas prior to recharge to ground. There will be no direct discharges to surface waters. During the construction phase all runoff from works areas (i.e., potential dirty water) will be attenuated and treated to a high quality prior to being allowed to slowly percolate to ground. This is how rainfall enters the local groundwater system in the baseline condition.

During the construction phase of the Proposed Development, excavations will be limited to minimise the generation of spoil. For example, site access roads will be constructed on top of the current ground surface where ground conditions are good, hence avoiding unnecessary excavations. The roads will be constructed on a geotextile membrane which will prevent direct discharge to ground. This road construction methodology will:

- Reduce the quantity of soil/subsoil to be excavated and stored at the site;
- Allow clean water to pass from uphill to downhill unimpeded;
- Will treat dirty water at the source of dirty water generation (no requirement for dirty water drains); and,
- Reduce the volume of water requiring treatment at settlement ponds.

Sediment will be generated where excavations are required (turbine and substation foundations) and dirty water from these work areas will be routed via drains to settlement ponds for treatment and removal of suspended solids prior to diffuse discharge over the vegetated land surface. Where pumping water from turbine foundation excavations is required the pumping rate will be limited to 5.8l/s to prevent overuse of the settlement ponds. In addition, hard stands will be lined with Terram geotextile to limit direct discharge to the underlying subsoils and bedrock.

Excess sediment generated during the construction phase will be stored at 7 no. overburden storage areas and 15 side casted areas. The spoil storage areas will be sealed with a digger bucket and vegetated as soon as possible to reduce sediment entrainment in runoff. Once revegetated and stabilised these areas will no longer be a potential source of sediment laden runoff.

Finally, regular inspection and maintenance for the on-site drainage system will be completed regularly during the construction phase. This will be a particular importance following periods of heavy rainfall to check for blockages in any drains and any excess build-up of silt within settlement ponds which will decrease the effectiveness of the drainage system unless removed.

Table J: Summary of Drainage Mitigation & their Application

Management Type	Description of SuDs drainage control method	Applicable Works Area
Avoidance Controls:	• Avoidance of infrastructure close to turloughs and surface water features; • Using small working areas; • Minimising excavations (road construction methodology); • Seasonal works (e.g. at T4); • Working in appropriate weather and suspending certain work activities in advance of forecasted wet weather.	Construction work areas where sediment is being generated.
Source Controls:	• Use of interceptor drains upstream of works areas where excavations are required; • Dirty water drains will collect dirty water from work areas and transfer to settlement ponds for treatment. • Pumping from excavations will be limited to 5.8l/s; • Hardstands will be lined with geotextile;	Construction work areas where sediment is being generated.
	• Using small working areas; • Minimise excavations; • Covering stockpiles; • Weathering off / sealing stockpiles and promoting vegetation growth.	Stockpiles areas
In-Line Controls:	• Drains; • Erosion and velocity control measures including check dams; • Settlement ponds; and, • Where a proposed turbine is located near an existing turlough i.e. T4, 3 no. lines of Terrastop silt fence will be erected to trap all water flowing downhill from the works area.	Interceptor and collection drainage systems
Treatment Systems:	• Settlement ponds.	Surface water treatment locations
Outfalls Controls:	• Discharge to ground over existing vegetated surface.	All water will recharge to ground. No surface water discharge.

5.3.1.2 Mitigation Measures to Protect Groundwater Flows and Levels

The construction of the turbines, met mast, access roads and other ancillary features of the Proposed Development could impact groundwater flows within the Wind Farm site, if a particular pathway e.g. karst conduit, existed near the development, however based on all the available site investigation data no reasonable pathways have been identified. The identification and avoidance of any potential karst features has been a key aim of the intrusive and extrusive site investigations and is considered to be the most rational method of mitigating against effecting flow paths, by avoiding any potential karst areas. The site data outlined within Chapters 8 and 9 of the EIAR provides sufficient scientific data to say, with a high degree of certainty, that the construction of the turbine bases, met mast, site access roads, substation and other relatively near surface constructs, will not interact with or alter the existing groundwater recharge, and underlying groundwater flow, regimes.

As mentioned above, the critical driver of groundwater levels and the potential to affect them is through groundwater recharge. The drainage design of the Seven Hills Wind Farm site has been designed to mimic the existing hydrological regime within the site, whereby surface water pathways are generally short and rainfall readily percolates to ground. The drainage design incorporates check dams to reduce velocities, two chamber settlement ponds with baffle plates and over topping weirs and outflow from the drains being dispersed over a wide area of vegetation. The net effect of the drainage design will be that all rainfall falling within the Seven Hills Wind Farm site will remain on the site and infiltrate to ground and will not exit the site as runoff to surface watercourses.

5.3.1.3 Mitigation Measures to Protect Downgradient Surface Waterbodies

The primary mitigating factor in relation to downgradient surface water bodies is the distinct lack of surface water courses which drain the Seven Hills Wind Farm site and the surrounding area. The rainfall falling on the site recharges to the underlying groundwater aquifer. There are no small streams (10-50 l/s) which would typically be seen on upland slopes. Instead, the only surface water bodies which exist in proximity to the site are the small-medium rivers (Ballyglass River, Killeglan River, Cross River). All these rivers are fed by groundwater, either through drainage of a groundwater body (Cuilleenirwan and Ballyglass River) or through the emergence of groundwater springs as occurs at Killeglan.

To ensure the continuation of the existing hydrological regime, whereby rainfall percolates to ground and does not discharge as surface water runoff, the drainage design has incorporated natural attenuation of flows and allows for collected rainwater to be recharged back into the underlying aquifer rather than leaving the site through man-made drains. The drainage design also includes mitigation measures to ensure that any collected surface water is treated prior to discharge/recharge back into the ground, and therefore will not contain suspended sediment. There will be no discharge to downstream surface waterbodies.

5.3.1.4 Mitigation Measures to Protect Against the Release of Hydrocarbons

Mitigation measures proposed to avoid the release of hydrocarbons at the wind farm site and along the grid connection route include:

- Minimal refuelling or maintenance of vehicles or plant will take place on-site. Off-site refuelling will occur where possible;
- On site re-fuelling of machinery will be carried out using a mobile double skinned fuel bowser;
- The fuel bowser, a double-axel custom-built refuelling trailer will be re-filled off site, and will be towed around the site by a 4x4 jeep to where machinery is located.
- The 4x4 jeep will also carry fuel absorbent material and pads in the event of any accidental spillages.

- The fuel bowser will be parked on a level area in the construction compound when not in use and only designated trained and competent operatives will be authorised to refuel plant on site.
- Mobile measures such as drip trays and fuel absorbent mats will be used during all refuelling operations;
- Onsite refuelling will be carried out by trained personnel only;
- Fuels stored on site will be minimized and will be appropriately bunded;
- Surface water runoff from temporary construction compounds will be collected and drained via silt traps and hydrocarbons interceptors prior to recharge to ground;
- 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 is included within the Construction and Environmental Management Plan;
- Spill kits will be available to deal with any accidental spillage in and outside the re-fuelling area.

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

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

- During the construction phase, a self-contained port-a-loo with an integrated waste holding tank will be used at each of the site construction compounds, maintained by the providing contractor, and removed from site on completion of the construction works;
- Water supply for the site office and other sanitation will be brought to site and removed after use from the site to be discharged at a suitable off-site treatment location; and,
- No water or wastewater will be sourced on the site, nor discharged to the site.

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

Best practice methods for cement-based compounds:

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

5.3.1.1 Mitigation Measures to Protect Surface Water Quality along Grid Connection Route

Silt Fences/Roadside Drain Blocking:

Silt fences will be placed down-gradient of the proposed Grid Connection route during construction work. Silt fences are effective at removing larger particle sized 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 the construction phase is critical to their functioning to stated purpose. They will remain in place throughout the entire construction phase. Double silt fences will be placed down-gradient of all construction areas inside the hydrological buffer zones (i.e., near stream crossings). Any roadside drains will be temporarily blocked using sandbags in the area where trenching works is taking place.

Surplus Excavated Spoil:

Excavated spoil emanating from the cut for the trenches, where appropriate (i.e. when trenching within private tracks or the public road verge) will be used to backfill the trenches. Any excess will be disposed at an appropriate licenced facility. All excavated material emanating from trenches within the public road will be disposed at an appropriate licenced facility.

Timing of Site Construction Works:

Excavation of the cable trench shall be undertaken during the summer months and during a period of low rainfall. This will minimise the risk of entrainment of suspended sediment in surface water runoff and transport via this pathway to surface watercourses. The Ballyglass_010 SWB is ephemeral and it is recommended to complete works when this SWB has no flow and is dry.

Hydrocarbons:

Mitigation measures relating to hydrocarbon usage are outlined in **Section 5.3.1.4** and include refuelling off-site where possible, the appropriate safe use and handling of hydrocarbons along the Grid Connection route where necessary including fuel bunds.

Cement-Based Products:

Mitigation measures to prevent the release of concrete runoff are outlined in **Section 5.3.1.6.** No instream works are proposed along the Grid Connection route.

5.3.2 Operational Phase

5.3.2.1 Increased Site Runoff and Hydromorphology Effects

The measures for control of runoff and sediment release relate primarily to the construction phase. During the operation phase, there is no particular risk of sediment runoff due to the lack of earthworks. Runoff from roads will continue to be discharges diffusely to over the existing vegetated land which will filter and clean the water. Any drains, check dams and settlement ponds required during the construction phase will continue to operate during the operational phase, ensuring that runoff continues to be attenuated and dispersed across existing vegetation. There will be no increase in runoff from the Wind Farm site.

5.3.2.2 Mitigation Measures to Protect Groundwater and Surface Water Quality

During the operational phase, the only plant which will be required on site will be maintenance/inspection vehicles (jeeps/vans/quads). These will be refuelled off site, thus preventing hydrocarbon spills. There will be no discharge of wastewater during the operational phase.

Mitigation measures relating to hydrocarbons, cementitious materials and wastewater disposal, as outlined in **Sections 5.3.1.4**, **5.3.1.6** and **5.3.1.5** will continue to provide adequate protection to groundwater and surface water quality during the operational phase and ensure that groundwater quality will not be impacted, thus protecting the groundwater quality of any hydraulically downgradient turloughs.

Any hydrocarbons (oil) stored within the substation will be enclosed within a bund with 110% capacity.

Any works that may require soil movement will take place in the summer months. Mitigation measures relating to the entrainment of suspended solids in waters are outlined above in **Section 5.3.1.1**.

5.3.3 Decommissioning Phase

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

During the decommissioning phase there would be increased trafficking and an increased risk of disturbance to underlying soils at the Wind Farm site. Any such potential impacts would be less than during the construction stage as the drainage system would be fully mature and would provide additional filtration of runoff. Any diesel or fuel oils stored on site would be bunded.

Following decommissioning of the Wind Farm site, turbine foundations, hardstanding areas and site tracks will be rehabilitated, i.e. left in place, covered over with local soils/subsoils and allowed to re-vegetate naturally, if required. The internal site access tracks may be left in place, subject to agreement with Roscommon County Council and the landowners. It is considered that leaving these areas in-situ will cause less environmental damage than removing and recycling them.

The potential removal of this infrastructure (hardstanding areas, foundations *etc.*) would result in considerable disturbance to the local environment in terms of disturbance to underlying soils and an increase in erosion, sedimentation, dust, noise, traffic and an increased possibility of contamination of the local water table. However, if removal is deemed to be required all infrastructure will be removed with mitigation measures similar to those in place during the construction phase being employed. These measures will ensure the protection of water reaching the underlying aquifer, through the implementation mitigation measures related to suspended sediment, hydrocarbons, cement-based materials.

t is proposed that underground cables within the Wind Farm site will be cut back and left in place. The onsite electrical substation will remain in place as it will be under the ownership of the ESB. There are no impacts associated with this.

The cabling along the Grid Connection route will also remain in place and as such there will be no impacts associated with this.

With the implementation of the mitigation measures outlined above no significant effects on the hydrological and hydrogeological environment will occur during the decommissioning stage of the Proposed Development.

5.3.4 Potential Effects with the Implementation of Mitigation

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

Table K: Summary WFD Status of Unmitigated and Mitigated Scenarios

SWB	WFD Code	Current Status	Assessed Status - Unmitigated	Assessed Status – with Mitigation Measures
Ballyglass_010	IE_SH_26B150840	Good	Moderate	Good
Killeglan_010	IE_SH_26K040200	Moderate	Moderate	Moderate
Suck_130	IE_SH_26S071200	Good	Good	Good
Suck_140	IE_SH_26S071400	Moderate	Moderate	Moderate
Suck_150	IE_SH_26S071500I	Moderate	Moderate	Moderate
Suck_160	IE_SH_26S071550	Moderate	Moderate	Moderate
Cross(Roscommon)_020	IE_SH_26C100200	Good	Moderate	Good
Cross(Roscommon)_030	IE_SH_26C100300	Moderate	Poor	Moderate
Cross(Roscommon)_040	IE_SH_26C100400	Moderate	Moderate	Moderate
Shannon(Upper)_110	IE_SH_26S021660	Poor	Poor	Poor
Suck South GWB	IE_SH_G_225	Good	Moderate	Good
Funshinagh GWB	IE_SH_G_091	Good	Moderate	Good
Athlone West GWB	IE_SH_014	Good	Moderate	Good

6. WFD ASSESSMENT 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.

There is no direct discharge from the development site to downstream surface watercourses. The hydrological and hydrogeological regime of the wind farm site is characterized by a distinct absence of surface water features, with rainfall percolating through the glacial subsoils and recharging to the underlying bedrock aquifer. However, there is a high degree of connectivity between surface and groundwaters in this area. All rivers in the vicinity of the site (Ballyglass River, Killeglan River and Cross River) are fed by groundwater, either through drainage of a groundwater body or through the emergence of groundwater springs.

There are 2 no. groundwater bodies underlying the proposed Wind Farm site *i.e.* Suck South GWB and Funshinagh GWB. Due to the local hydrogeological regime these GWBs are the most sensitive receptors to the Proposed Development. Surface watercourses downstream of the wind farm site will not be susceptible to effects from the Proposed Development due to the lack surface water pathways between the site and these downstream receptors. However, a total of 4 no. watercourse crossings are proposed along the Grid Connection route and these surface waterbodies are more at risk due to their proximal location to the Proposed Development works.

Mitigation proposed for the protection of ground and surface waters during the construction, operation and decommissioning phases of the Proposed Development will ensure the qualitative and quantitative status of the receiving groundwaters waters will not be altered by the Proposed Development.

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

As such, the Proposed Development:

- 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 9.1.4 of EIAR Chapter 9).

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