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WATER FRAMEWORK DIRECTIVE ASSESSMENT
BRISKALAGH RENEWABLE ENERGY DEVELOPMENT, CO. KILKENNY

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 to accompany a planning application for the Proposed Briskalagh Renewable Energy Development, Co. Kilkenny (i.e. the Proposed Project).

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

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. HES routinely complete impact assessments for hydrology and hydrogeology for a large variety of project types including wind farms.

This WFD Compliance Assessment was prepared by Michael Gill and Conor McGettigan.

Michael Gill P.Geo (BA, BAI, Dip Geol., MSc, MIEI) is a Civil/Environmental Engineer and Hydrogeologist with over 22 years' environmental consultancy experience in Ireland. Michael has completed numerous hydrological and hydrogeological impact assessments of wind farms and renewable projects in Ireland. In addition, he has substantial experience in geological characterisation, peatland morphology, and surface water drainage design and SUDs design and surface water/groundwater interactions. Michael has worked on the EIS/EIAR for Oweninny WF, Cloncreen WF, Derrinlough WF and over 100 other wind farm related projects across the country.

Conor McGettigan (BSc, MSc) is an Environmental Scientist with 4 years' experience in the environmental sector in Ireland. Conor holds an M.Sc. in Applied Environmental Science (2020) and a B.Sc. in Geology (2016) from University College Dublin. Conor routinely prepares the hydrology and hydrogeology chapters of environmental impact assessment reports for wind farm developments. Conor has also prepared several flood risk assessments and Water Framework Directive compliance assessments for various renewable energy developments in Ireland.

1.3 WATER FRAMEWORK DIRECTIVE

The EU Water Framework Directive (2000/60/EC), as amended by Directives 2008/105/EC, 2013/39/EU and 2014/101/EU ("**WFD**"), was established to ensure the protection of the water

environment. The Directive was transposed in Ireland by the European Communities (Water Policy) Regulations 2003 (S.I. No. 722 of 2003).

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

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

The River Basin Management Plan (2018 - 2021) objectives, which have been integrated into the design of the Proposed Project, include:

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

Furthermore, the Department of Housing, Local Government and Heritage are currently in the later stages of preparing the next River Basin Management Plan (RBMP) for Ireland. The Plan is required under the Water Framework Directive for the period 2022-2027. As of September 2024, the plan has not been published while the draft plan is available to view at https://www.gov.ie/en/consultation/2bda0-public-consultation-on-the-draft-river-basin-management-plan-for-ireland-2022-2027/.

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

2. WATERBODY IDENTIFICATION & CLASSIFICATION

2.1 INTRODUCTION

This section identifies those Surface 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

2.2.1 Proposed Wind Farm

Regionally, the Proposed Wind Farm site is located in the River Nore surface water catchment within Hydrometric Area 15 of the South Eastern River Basin District. More locally, the Proposed Wind Farm is located within 2 no. WFD river sub-catchments. The vast majority of the Proposed Wind Farm is located in the Munster River sub-catchment (Munster_SC_010) whilst a small area in the northeast is mapped in the Nore_SC_090 sub-catchment.

Within the Munster River sub-catchment the Proposed Wind Farm site is mapped in 2 no. WFD river sub-basins. The north of the Proposed Wind Farm site is located in the Tullaroan Stream_020 river sub-basin whilst the majority of the Proposed Wind Farm site is mapped in the Tullaroan Stream_030 river sub-basin. The Tullaroan Stream flows to the south, dissecting the Proposed Wind Farm, and continues southwards before discharging into the Munster River ~5.7km to the south (here the Munster river forms part of the King's (Kilkenny)_030 SWB). Further downstream the Munster River discharges into the Kings River (King's (Kilkenny)_040 SWB) to the northwest of Callan (~7.7km from the Proposed Wind Farm). The Kings River (King's (Kilkenny)_050 SWB) discharges into the River Nore (Nore_210 SWB) ~17km to the southeast of the Proposed Wind Farm site. The Nore River continues to flow to the south before it becomes tidal to the north of Inistioge. The transitional waterbodies downstream of the Proposed Wind Farm include the Nore Estuary, the Barrow Nore Estuary Upper, New Ross Port, Lower Suir Estuary and the Barrow Suir Nore Estuary. The downstream coastal waterbodies include Waterford Harbour and the Eastern Celtic Sea SWBs.

More locally the Proposed Wind Farm site is drained by several tributaries of the Tullaroan Stream. Many of these streams originate within the Proposed Wind Farm site and flow downslope into the Tullaroan Stream. These watercourses are locally unnamed but have been assigned names in the EPA blueline database (www.epa.ie).

- Within the Tullaroan_020 WFD river sub-basin the Proposed Wind Farm site is drained by the EPA named Tullaroan watercourse (EPA Code: 15T22) which flows to the southwest and discharges into the Tullaroan Stream. Note that the only infrastructure associated with the Proposed Wind Farm in this sub-basin comprises of 460m of new proposed roadway.
- The vast majority of the proposed infrastructure is located in the Tullaroan_030 WFD river sub-basin. The EPA mapped tributaries of the Tullaroan Stream in this area include the Briskalagh (EPA Code: 15B98) and Knockeenglass (EPA Code: 15K44) in the east and the Foylatalure (EPA Code: 15F10) and Kilmanagh (EPA Code: 15K74) in the west.

Within the Nore_SC_090 sub-catchment the Proposed Wind Farm is mapped in the Breagh(Kilkenny)_010 WFD river sub-basin. This area is drained by the Bregagh River, however no infrastructure associated with the Proposed Wind Farm is located in this WFD river sub-basin.

Table A presents the catchment area of each waterbody downstream of the Proposed Wind Farm site as far as the River Nore. The catchment area for the waterbodies increases progressively downstream as more tributaries discharge into the Munster, Kings and Bregagh Rivers. For example, the Nore_170 and Nore_210 river waterbodies downstream of the

Bregagh and Kings Rivers respectively, have catchment areas in excess of 1,500km^2. Therefore, those waterbodies which are located in close proximity to the Proposed Wind Farm site are more susceptible to water quality impacts as a result of activities associated with the Proposed Project. The potential for the Proposed Project to impact a waterbody decreases further downstream due to the increasing catchment area to the surface waterbody and resulting increase in flow volumes.

Table A: Catchment Area Downstream of Proposed Wind Farm site

WFD River Sub-Basin	Total Upstream Catchment Area (km^2)
Munster_SC_010	
Tullaroan Stream_020	~31
Tullaroan Stream_030	~65
Munster_030	~101
Kings (Kilkenny)_SC_010	
Kings (Kilkenny)_030	~204
Kings (Kilkenny)_040	~240
Nore_SC_110	
Kings (Kilkenny)_050	~384
Nore_210	~2,220
Nore_SC_090	
Bregagh (Kilkenny)_010	~14
Bregagh (Kilkenny)_020	~46
Bregagh (Kilkenny)_030	~71
Nore_170	~1,600

2.2.2 Proposed Grid Connection Underground Cabling Route

The Proposed Grid Connection underground cabling route is located entirely within the River Nore surface water catchment and passes through a total of 4 no. WFD river sub-catchments and 8 no. WFD river sub-basins. The Proposed Grid Connection substation is mapped in the Tullaroan_030 WFD river sub-basin. There are a total of 10 no. crossings over EPA mapped watercourses along the Proposed Grid Connection underground cabling route, comprising of 7 no. existing bridge crossings, 2 no. existing culvert crossings and 1 no. proposed crossing over the River Nore. The total upstream catchment area for the waterbodies along the Proposed Grid Connection underground cabling route are detailed in **Table B**.

Figure A below is a local hydrology map of the area.

Table B: Catchment Area Downstream of Proposed Grid Connection

WFD River Sub-Basin	Total Downstream Catchment Area (km^2)
Munster_SC_010	
Tullaroan Stream_030	~65
Tullaroan Stream_020	~31
Tullaroan Stream_010	~10
Nore_SC_070	
Arigna (Kilkenny)_010	~24
Nuenna_020	~91
Nore_150	~1,233
Nore_140	~1,105
Nore_130	~1,062
Nore_SC_060	
Nore_120	~1,058

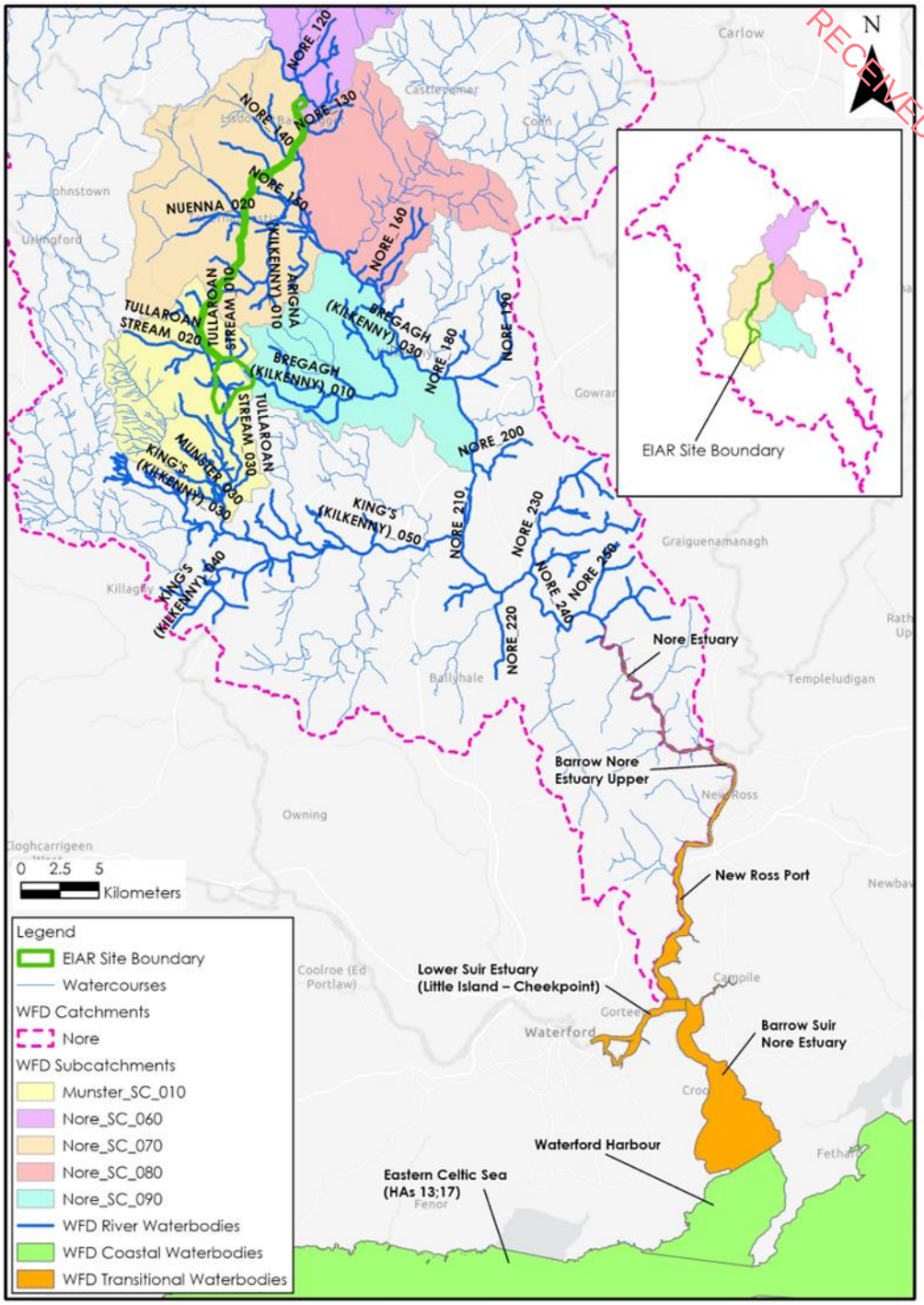

Figure A: Local Hydrology Map

2.3 SURFACE WATER BODY CLASSIFICATION

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

The Proposed Wind Farm site is drained by the Tullaroan Stream (Tullaroan Stream_020 and _030 SWBs). These SWBs achieved "Good" status in the latest WFD cycle (2016-2021). Further downstream, Munster River (Munster_030 SWB) and the Kings' River in the vicinity of its confluence with the Munster River (Kings (Kilkenny)_030 SWB) also achieved "Good" status. Further downstream the Kings (Kilkenny)_040 and Kings (Kilkenny)_050 SWBs are of "Moderate" and "Bad" status respectively. A small section of the Proposed Wind Farm site is located in the Bregagh (Kilkenny)_010 river sub-basin. This SWB achieved "Poor" status in the latest WFD cycle.

Meanwhile, along the Proposed Grid Connection underground cabling route a total of 5 no. SWBs have been assigned "Good" status. These include the Tullaroan Stream_030, Tullaroan Stream_020, Nore_130, Nore_140 and Nore_150 SWBs. Meanwhile, the Tullaroan Stream_010, the Arigna (Kilkenny)_010 and Nore_120 SWBs are of "Moderate" status. The Nuenna_020 SWB in the vicinity of Freshford achieved "Poor" status in the latest WFD cycle.

Further downstream, the River Nore typically achieved "Good" status whilst the Nore_190 and _230 SWBs achieved "Moderate status. With respect to downstream transitional and coastal waterbodies, these SWBs are typically of "Moderate" status with the Eastern Celtic Sea coastal waterbody achieving "High" status.

With regards to risk status, the waterbodies in the vicinity of the Proposed Wind Farm are deemed to be 'not at risk' of failing to meet their respective WFD objectives. The lower reaches of the King's River (Kings (Kilkenny)_040 and Kings (Kilkenny)_050 SWBs) are "at risk" of failing to meet their respective WFD objectives.

Meanwhile, along the Proposed Grid Connection underground cabling route the Arigna (Kilkenny)_010, Nuenna_020 and Nore_120 SWBs are 'at risk'.

Agriculture is a significant pressure in the Nore River catchment and has been identified as a pressure on 8 no. river waterbodies downstream of the Site. Urban wastewater is also listed as a significant pressure on the Nuenna_020 SWB along the Proposed Grid Connection underground cabling route. All pressures identified to be impacting the SWBs in the vicinity and downstream of the Site are detailed in **Table C.**

The SWB status for the 2016-2021 WFD cycle are shown on **Figure B.**

Table C: Summary WFD Information for River Water Bodies

SWB	Overall Status 2010-2015	Overall Status 2013-2018	Overall Status 2016-2021	Risk 3rd Cycle	Pressures
Tullaroan Stream_010	Unassigned	Poor	Moderate	Under review	None
Tullaroan Stream_020	Good	Good	Good	Not at risk	None
Tullaroan Stream_030	Good	Good	Good	Not at risk	None
Munster_030	Good	Good	Good	Not at risk	None
Kings (Kilkenny)_030	Good	Moderate	Good	Review	None
Kings (Kilkenny)_040	Moderate	Moderate	Moderate	At risk	Agriculture, hydromorphology & other
Kings (Kilkenny)_050	Moderate	Moderate	Bad	At risk	Agriculture & Urban Waste Water
Bregagh (Kilkenny)_010	Moderate	Poor	Poor	At risk	Agriculture
Bregagh (Kilkenny)_020	Unassigned	Moderate	Moderate	At risk	Agriculture & forestry
Bregagh (Kilkenny)_030	Poor	Poor	Moderate	At risk	Agriculture, hydromorphology & industry
Arigna (Kilkenny)_010	Good	Moderate	Moderate	At risk	Agriculture
Nuenna_020	Poor	Moderate	Poor	At risk	Agriculture & Urban Wastewater
Nore_120	Unassigned	Good	Moderate	At risk	Agriculture
Nore_130	Good	Good	Good	Not at risk	None
Nore_140	Unassigned	Good	Good	Not at risk	None
Nore_150	Good	Good	Good	Not at risk	None
Nore_160	Unassigned	Good	Good	Not at risk	None
Nore_170	Good	Good	Good	Not at risk	None
Nore_180	Good	Good	Good	Not at risk	None
Nore_190	Unassigned	Moderate	Moderate	Review	None

Nore_200	Unassigned	Moderate	Good	Review	None
Nore_210	Moderate	Good	Good	Review	None
Nore_220	Good	Moderate	Good	Review	None
Nore_230	Good	Moderate	Moderate	At risk	Urban run-off
Nore_240	Good	Moderate	Good	Review	None
Nore_250	Good	Good	Good	Not at risk	None
Nore Estuary	Moderate	Good	Moderate	At risk	Agriculture
Barrow Nore Estuary Upper	Good	Moderate	Moderate	At risk	Agriculture & Urban run-off
New Ross Port	Moderate	Moderate	Moderate	At risk	Agriculture
Lower Suir Estuary (Little Island – Cheekpoint)	Moderate	Good	Moderate	At risk	Agriculture
Barrow Suir Nore Estuary	Good	Moderate	Moderate	At risk	Agriculture
Waterford Harbour	Good	Moderate	Moderate	At risk	Agriculture & Urban run-off
Eastern Celtic Sea (Hydrometric Areas 13;17)	Unassigned	Good	High	Not at risk	None

2.4 GROUNDWATER BODY IDENTIFICATION

The Proposed Wind Farm site is mapped to be underlain by the Namurian Shales of the Killeshin Siltstone Formation (www.gsi.ie). The bedrock underlying the Proposed Wind Farm site is classified by the GSI as being a Poor Aquifer – Bedrock which is Generally Unproductive except for Local Zones.

In terms of bedrock Groundwater Bodies (GWBs), the Proposed Wind Farm site is underlain by the Ballingarry GWB which is characterised by poorly productive bedrock. According to the GSI's Characterisation Report for this GWB (GSI, 2003), groundwater flowpaths will be short and most groundwater flow will be in the upper few metres of bedrock. Discharge from this GWB will occur locally to nearby surface water features as there is no regional flow system.

The GSI also map the presence of a Regionally Important Gravel Aquifer in the valley of the Tullaroan Stream. This aquifer forms part of the Kilmanagh Gravels GWB. The GSI's Characterisation Report (GSI, 2003) states that this GWB lies in the valley of the Tullaroan River, extending from Tullaroan to Callan. The aquifer is comprised of glacial outwash sand and gravel deposits with clays and silts more common towards Kilmanagh.

The southern section of the Proposed Grid Connection underground cabling route is underlain by poor bedrock aquifers. Meanwhile, in the vicinity of the Proposed Wind Farm site, the Proposed Grid Connection substation is underlain by the Regionally Important Gravel Aquifer in the valley of the Tullaroan Stream. Furthermore, the northern section of the Proposed Grid Connection underground cabling route, between Freshford and Ballyragget, is underlain by a Regionally Important Aquifer – karstified (diffuse). In the valley of the River Nore, the Proposed Grid Connection underground cabling route (~4.63km) is also underlain by a Regionally Important Gravel Aquifer.

In terms of GWBs, the Proposed Grid Connection is underlain by a total of 4 no. GWBs:

- The southern section, in the vicinity of the Proposed Wind Farm site, is underlain by the Kilmanagh Gravels and Ballingarry GWBs (described above).
- Further to the north the Proposed Grid Connection is underlain by the Durrow Karstic GWB.
- A section of the route in the vicinity of the River Nore is underlain by the Kilkenny-Ballynakill Gravels GWB.

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

2.5 GROUNDWATER BODY CLASSIFICATION

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

The Kilmanagh Gravels, Ballingarry and the Kilkenny-Ballynakill Gravels GWBs achieved "Good" status in the latest WFD cycle and are deemed to be "Not at risk" of failing to meet their respective WFD objectives.

Meanwhile, the Durrow GWB achieved "Poor" status in the latest WFD cycle and is "at risk" of failing to meet its WFD objectives. Agriculture has been listed as a significant pressure on this GWB.

Table D: Summary WFD Information for Groundwater Bodies

GWB	Overall Status 2010-2015	Overall Status 2013-2018	Overall Status 2016-2021	Risk Status 2013-2018	Pressures
Kilmanagh Gravels	Good	Good	Good	Not at risk	None
Ballingarry	Good	Good	Good	Not at risk	None
Durrow	Good	Poor	Poor	At risk	Agriculture
Kilkenny-Ballynakill Gravels	Good	Good	Good	Not at risk	None

2.6 PROTECTED AREA IDENTIFICATION

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

2.6.1 Nature Conservation Designations

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

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

The Proposed Wind Farm is not located within any designated conservation site, however there are downstream hydrological connections with some designated sites as described below:

- The River Barrow and River Nore SAC (Site Code: 002162) is located ~5.9km downstream of the Proposed Wind Farm and is hydrologically connected via the Tullaroan Stream. This SAC consists of the freshwater stretches of the Barrow and River Nore catchment as far upstream as the Slieve Bloom Mountains and it also includes the tidal elements and estuary.
- The River Nore SPA (Site Code: 004233) is located ~10km (straight line distance) southeast of the Proposed Wind Farm site and is hydrologically connected via the Tullaroan Stream, Munster River and King's River.

Other designated sites in close proximity to the Proposed Wind Farm include:

- Ballykeefe Wood pNHA (Site Code: 000400) is located ~1.8km southeast of the Proposed Wind Farm. There are no hydrological connections between the Proposed Wind Farm and this pNHA.

We also note that the Nore surface water catchment is noted as being a Margaritifera Sensitive Area. Meanwhile, the closest identified protected Salmonid waters are along the River Nore.

The Proposed Grid Connection underground cabling route crosses the River Barrow and River Nore SAC and the River Nore SPA at the new proposed crossing under the River Nore. All other watercourses draining the Proposed Grid Connection underground cabling route also eventually discharge into these designated sites.

Other designated sites in close proximity to the Proposed Grid Connection include:

- River Nore / Abbeyleix Woods Complex pNHA (Site Code: 002076) which is located ~300m west of the Proposed Grid Connection underground cabling route to the north of Ballyragget.
- Inchbeg pNHA (Site Code: 000836) is also located downstream of the Proposed Grid Connection underground cabling route along the River Nore.

2.6.2 Bathing Waters

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

There are no bathing waters in or directly adjacent to the catchment identified under the Bathing Water Regulations 2008.

2.6.3 Nutrient Sensitive Areas

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

Within the Nore catchment, the main channel of the River Nore (Nore_180 to Nore_250 SWB) has been identified as NSA downstream of Kilkenny City as far as Inistioge. Further downstream the Barrow Nore Estuary near New Ross is also listed as a NSA.

The EPA carried out a review of Nutrient Sensitive Areas (NSAs) downstream of large urban wastewater discharges in 2020. Once the regulations are in place, and nutrient sensitive areas have been identified, additional nutrient removal must be applied (if not already applied) to wastewater treatment plants discharging to the sensitive area. If this treatment was in place the objective was deemed to have been met. According to the 3rd Cycle Draft Catchment Report (2021, EPA) the NSA objectives are being met for the all the NSAs within the Barrow and Nore catchments.

2.6.4 Shellfish Waters

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

There are no shellfish protected areas in the direct vicinity of the Site. 50km south of the Site is the shellfish protected area of the Waterford Harbour (Cheekpoint/Arthurstown/Creadan) (IE_SE_100_0100).

2.6.5 Drinking Water

The closest Drinking Water Protected Area (DWPA) to the Proposed Wind Farm site is the Nore_220 SWB (IE_SE_15N012310), 30km downstream of the Proposed Wind Farm site (an abstraction for Mount Juliet Estate). The Nore_120 SWB in the vicinity of the Proposed Grid Connection underground cabling route is also listed as a DWPA. This is associated with the Ballyragget PWS which is sourced from an infiltration gallery.

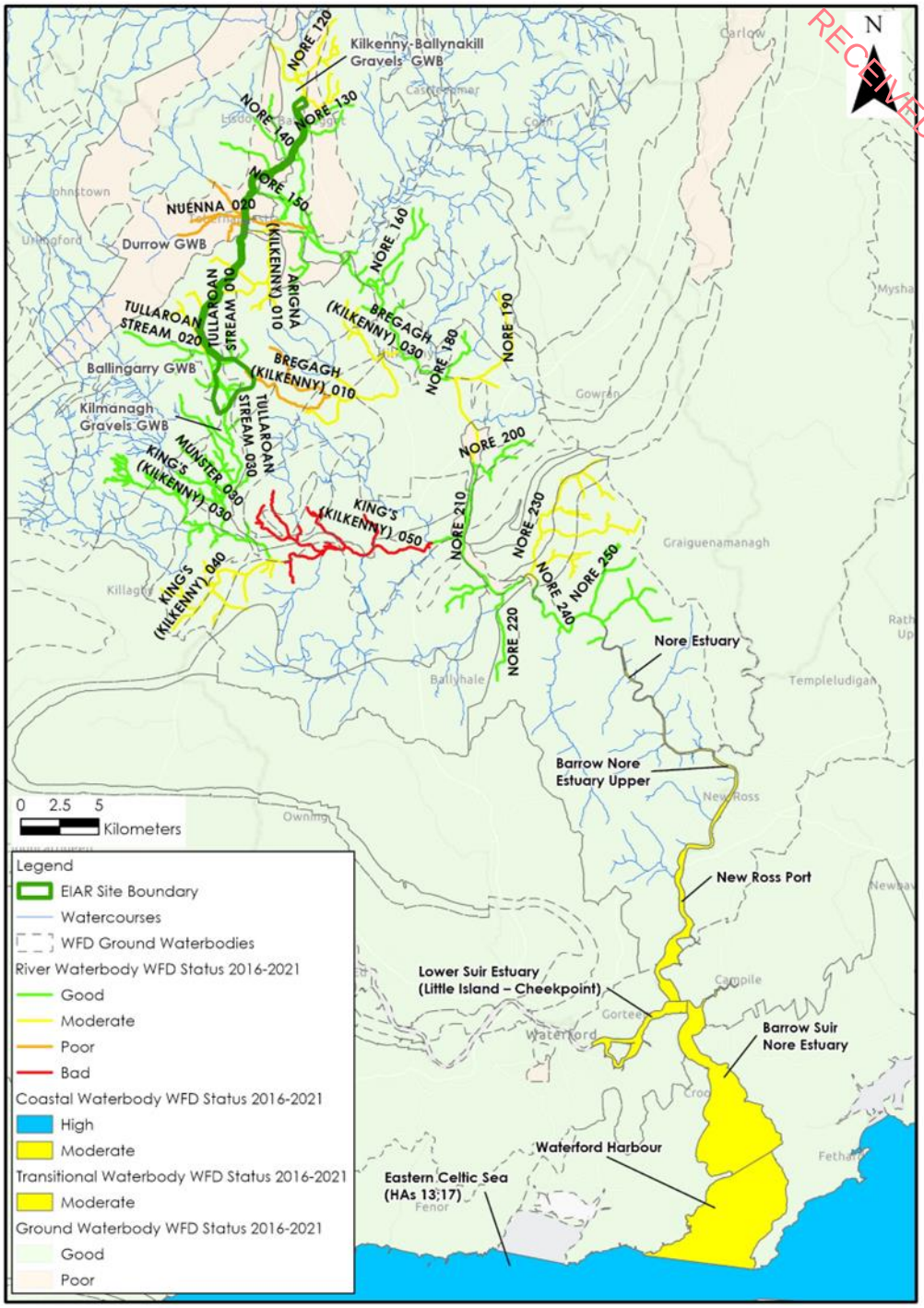

Figure B: WFD Groundwater and Surface Waterbody Status (2016-2021)

3. WFD SCREENING

As discussed in **Section 2**, there are a total of 33 no. surface waterbodies which are located in the vicinity and downstream of the Site. These include 26 no. river waterbodies, 5 no. transitional waterbodies and 2 no. coastal waterbodies. In addition, 4 no. groundwater bodies underlie the Site. Furthermore, there are a number of protected areas in the vicinity and downstream of the Site.

3.1 SURFACE WATER BODIES

The SWBs in the immediate vicinity and downstream of the Site are shown in **Figure A** and described in **Section 2.2** above.

With consideration for the construction, operational and decommissioning phases of the Proposed Project, it is considered that all sections of the Tullaroan Stream (Tullaroan Stream__020, _030), the Munster River (Munster_030) and the Kings' River (Kings' Kilkenny_030, _040 and _050) downstream of the Proposed Wind Farm site are carried through into the WFD Compliance Assessment. These SWBs have been included for further assessment due to their proximal location to Proposed Project works. The proposed works within the Proposed Wind Farm site 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.

Downstream of the confluence of the King's River and the River Nore, the River Nore has been screened out due to its distant location from the Proposed Wind Farm site. As detailed in Table A the catchment area for the River Nore downstream of the King's River is >2,000km^2. The potential for the Proposed Project to impact a waterbody decreases further downstream due to the increasing catchment area to the surface waterbody and resulting increase in flow volumes.

Meanwhile, the Bregagh River (Bregagh (Kilkenny)_010, 020 and _030) has been screened out due to the absence of any proposed works or infrastructure in this river sub-basin. There are no drainage pathways between the Proposed Project works areas and this SWB. 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.

Along the Proposed Grid Connection underground cabling route, the Tullaroan_020, Tullaroan_010, Arigna (Kilkenny)_010, Nuenna_020, Nore_120, Nore_130, Nore_140 and Nore_150 SWBs have been screened in due to their close proximity to the Proposed Grid Connection underground cabling route and the occurrence of proposed works within their catchments and within close proximity to mapped watercourses. The Proposed Project 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.

Further downstream the River Nore has not been included in the assessment due to the large volumes of water within this river (associated with its large upstream catchment) and its distant location from proposed works.

The Nore Estuary, Upper Barrow Estuary, New Ross Port, Lower Suir Estuary (Little Island - Cheekpoint) and the Barrow Suir Nore Estuary transitional waterbodies have been screened out due to the large volumes of water within these transitional waterbodies and the saline nature of these waters. The Proposed Project has no potential to cause a deterioration in status of these coastal waterbodies and/or jeopardise the attainment of good surface water status in the future.

The Waterford Harbour and Eastern Celtic Sea (HAs 13;17) coastal waterbodies have also been screened out due to the large volumes of water within these coastal waterbodies and

the saline nature of these waters. The Proposed Project has no potential to cause a deterioration in status of these coastal waterbodies and/or jeopardise the attainment of good surface water status in the future.

3.2 GROUNDWATER BODIES

With respect to GWBs, the Kilmanagh Gravels and Ballingarry GWB will be carried through to the WFD Impact Assessment due to their location directly underlying the Proposed Wind Farm site.

The Durrow and Kilkenny-Ballynakill GWBs will also be will also be brought through to the WFD Compliance Assessment as they are underlying the Proposed Grid Connection underground cabling route.

3.3 PROTECTED AREAS

The River Barrow and River Nore SAC and the River Nore SPA are hydrologically connected to the Proposed Wind Farm site. In addition, the Proposed Grid Connection underground cabling route crosses these designated sites at the new proposed crossing over the River Nore. The surface water connections from the Site could transfer poor quality surface water that may affect the conservation objectives of these designated sites. The River Barrow and River Nore SAC is more susceptible to potential effects given its close proximity to the Proposed Wind Farm site (hydrological flow path of ~5.9km). The River Nore / Abbeyleix Woods Complex pNHA and the Inchbeg pNHA will also be included in the assessment due to their proximal location to the Proposed Grid Connection underground cabling route.

All other downstream designated sites have been screened out of the assessment due to their distant location from the Proposed Project and the increasing volumes of water within these downstream waterbodies which will dilute any potential effects associated with the Proposed Project. Furthermore, other nearby designated sites such as the Ballykeefe Woods pNHA have been screened out of the impact assessment due to the lack of hydrological and hydrogeological connectivity.

The NSA's downstream of the Proposed Project have been screened out of the compliance assessment due to their distant location from the Proposed Project and the large volumes of water within these rivers and estuaries means that the proposed works have no potential to cause a deterioration in the status of these NSA's.

The Waterford Harbour (Cheekpoint/Arthurstown/Creadan)(IE_SE_100_0100) shellfish area has been screened out due to its significant downstream distance from the Site. The Proposed Project works have no potential to cause a deterioration in the status of this shellfish protected area.

With respect to DWPA, the Nore_120 SWB is included in the assessment due to its proximal location with respect to the Proposed Grid Connection underground cabling route. Meanwhile, the Nore_220 SWB is screened out due the large volumes of water in the river and its distant location from the proposed works.

3.4 WFD SCREENING SUMMARY

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

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

Type	WFD Classification	Waterbody Name/ID	Inclusion in Assessment	Justification
Surface Water Bodies	River	Tullaroan Stream_010	**Yes**	The Proposed Grid Connection underground cabling route, including 2 no. watercourse crossings, are mapped in this river sub-basin. Therefore, an assessment is required to consider the potential impacts that the Proposed Project will have on this SWB.
	River	Tullaroan Stream_020	**Yes**	The northwest of the Proposed Wind Farm site and Proposed Grid Connection underground cabling route, including 1 no. watercourse crossings, are mapped in this river sub-basin. Therefore, an assessment is required to consider the potential impacts that the Proposed Project will have on this SWB.
	River	Tullaroan Stream_030	**Yes**	The Proposed Wind Farm site and a section of the Proposed Grid Connection underground cabling route are drained by this SWB. Therefore, an assessment is required to consider the potential impacts that the Proposed Project will have on this SWB.
	River	Munster_030	**Yes**	The Munster_030 SWB lies downstream of the Tullaroan Stream_030 and is located in close proximity to the Proposed Wind Farm site. Therefore, an assessment is required to consider the potential impacts that the Proposed Project will have on this SWB.
	River	Kings (Kilkenny)_030	**Yes**	The Kings (Kilkenny)_030 SWB lies downstream of the Munster_030. Therefore, an assessment is required to consider the potential impacts that the Proposed Project will have on this SWB.
	River	Kings (Kilkenny)_040	**Yes**	The Kings (Kilkenny)_040 SWB lies downstream of the Kings (Kilkenny)_030. Therefore, an assessment is required to consider the potential impacts that the Proposed Project will have on this SWB.
	River	Kings (Kilkenny)_050	**Yes**	The Kings (Kilkenny)_050 SWB lies downstream of the Kings (Kilkenny)_040. Therefore, an assessment is required to consider the potential impacts that the Proposed Project will have on this SWB.
	River	Bregagh (Kilkenny)_010	No	No infrastructure associated with the Proposed Project is located within the catchment of the Bregagh River. Therefore, the Proposed Project has no potential to impact the status of this SWB.
	River	Bregagh (Kilkenny)_020	No	No infrastructure associated with the Proposed Project is located within the catchment of the Bregagh River. Therefore, the Proposed Project has no potential to impact the status of this SWB.
	River	Bregagh (Kilkenny)_030	No	No infrastructure associated with the Proposed Project is located within the catchment of the Bregagh River. Therefore, the Proposed Project has no potential to impact the status of this SWB.
	River	Arigna (Kilkenny)_010	**Yes**	The Proposed Grid Connection underground cabling route, including 2 no. watercourse crossings, is located in this river sub-basin. Therefore, an assessment is required to consider the potential impacts that the Proposed Project will have on this SWB.
	River	Nuenna_020	**Yes**	The Proposed Grid Connection underground cabling route, including 3 no. watercourse crossings, is located in this river sub-basin. Therefore, an assessment is required to consider the potential impacts that the Proposed Project will have on this SWB.
	River	Nore_120	**Yes**	The Proposed Grid Connection underground cabling route, including 1 no. watercourse crossings, is located in this river sub-basin. Therefore, an assessment is required to consider the

				potential impacts that the Proposed Project will have on this SWB.
	River	Nore_130	**Yes**	The Proposed Grid Connection underground cabling route is located in this river sub-basin. Therefore, an assessment is required to consider the potential impacts that the Proposed Project will have on this SWB.
	River	Nore_140	**Yes**	The Proposed Grid Connection underground cabling route, including 1 no. watercourse crossings, is located in this river sub-basin. Therefore, an assessment is required to consider the potential impacts that the Proposed Project will have on this SWB.
	River	Nore_150	**Yes**	The Proposed Grid Connection underground cabling route, including 2 no. watercourse crossings, is located in this river sub-basin. Therefore, an assessment is required to consider the potential impacts that the Proposed Project will have on this SWB.
	River	Nore_160	No	No infrastructure associated with the Proposed Project is proposed in this river sub-basin. This SWB is located downstream of the Proposed Grid Connection underground cabling route, however due to the large flow volumes in the River Nore and the lack of any proposed works within this river sub-basin, this SWB has been screened out of the WFD Compliance Assessment. Therefore, the Proposed Project has no potential to impact the status of this SWB.
	River	Nore_170	No	No infrastructure associated with the Proposed Project is proposed in this river sub-basin. This SWB is located downstream of the Proposed Grid Connection underground cabling route, however due to the large flow volumes in the River Nore and the lack of any proposed works within this river sub-basin, this SWB has been screened out of the WFD Compliance Assessment. Therefore, the Proposed Project has no potential to impact the status of this SWB.
	River	Nore_180	No	No infrastructure associated with the Proposed Project is proposed in this river sub-basin. This SWB is located downstream of the Proposed Grid Connection underground cabling route, however due to the large flow volumes in the River Nore and the lack of any proposed works within this river sub-basin, this SWB has been screened out of the WFD Compliance Assessment. Therefore, the Proposed Project has no potential to impact the status of this SWB.
	River	Nore_190	No	No infrastructure associated with the Proposed Project is proposed in this river sub-basin. This SWB is located downstream of the Proposed Grid Connection underground cabling route, however due to the large flow volumes in the River Nore and the lack of any proposed works within this river sub-basin, this SWB has been screened out of the WFD Compliance Assessment. Therefore, the Proposed Project has no potential to impact the status of this SWB.
	River	Nore_200	No	No infrastructure associated with the Proposed Project is proposed in this river sub-basin. This SWB is located downstream of the Proposed Grid Connection underground cabling route, however due to the large flow volumes in the River Nore and the lack of any proposed works within this river sub-basin, this SWB has been screened out of the WFD Compliance Assessment. Therefore, the Proposed Project has no potential to impact the status of this SWB.
	River	Nore_210	No	No infrastructure associated with the Proposed Project is proposed in this river sub-basin. This SWB is located downstream of the Proposed Grid Connection underground cabling route and downstream of the Proposed Wind Farm site. However due to the increasing flow volumes in the River Nore, the lack of any proposed works within this river sub-basin and its distant location from the Site, this SWB has been screened out of the WFD Compliance Assessment. Therefore, the

				Proposed Project has no potential to impact the status of this SWB.
	River	Nore_220	No	No infrastructure associated with the Proposed Project is proposed in this river sub-basin. This SWB is located downstream of the Proposed Grid Connection underground cabling route and downstream of the Proposed Wind Farm site. However, due to the increasing flow volumes in the River Nore, the lack of any proposed works within this river sub-basin and its distant location from the Site, this SWB has been screened out of the WFD Compliance Assessment. Therefore, the Proposed Project has no potential to impact the status of this SWB.
	River	Nore_230	No	No infrastructure associated with the Proposed Project is proposed in this river sub-basin. This SWB is located downstream of the Proposed Grid Connection underground cabling route and downstream of the Proposed Wind Farm site. However, due to the increasing flow volumes in the River Nore, the lack of any proposed works within this river sub-basin and its distant location from the Site, this SWB has been screened out of the WFD Compliance Assessment. Therefore, the Proposed Project has not potential to impact the status of this SWB.
	River	Nore_240	No	No infrastructure associated with the Proposed Project is proposed in this river sub-basin. This SWB is located downstream of the Proposed Grid Connection underground cabling route and downstream of the Proposed Wind Farm site. However, due to the increasing flow volumes in the River Nore, the lack of any proposed works within this river sub-basin and its distant location from the Site, this SWB has been screened out of the WFD Compliance Assessment. Therefore, the Proposed Project has not potential to impact the status of this SWB.
	River	Nore_250	No	No infrastructure associated with the Proposed Project is proposed in this river sub-basin. This SWB is located downstream of the Proposed Grid Connection underground cabling route and downstream of the Proposed Wind Farm site. However, due to the increasing flow volumes in the River Nore, the lack of any proposed works within this river sub-basin and its distant location from the Site, this SWB has been screened out of the WFD Compliance Assessment. Therefore, the Proposed Project has no potential to impact the status of this SWB.
	Transitional	Nore Estuary	No	The Nore Estuary has been screened out as this SWB is distant from the Site, contains large flow volumes and saline waters. Therefore, the Proposed Project has no potential to impact the status of this SWB.
	Transitional	Barrow Nore Estuary Upper	No	The Barrow Nore Estuary has been screened out as this SWB is distant from the Site, contains large flow volumes and saline waters. Therefore, the Proposed Project has no potential to impact the status of this SWB.
	Transitional	New Ross Port	No	The New Ross Port Estuary has been screened out as this SWB is distant from the Site, contains large flow volumes and saline waters. Therefore, the Proposed Project has no potential to impact the status of this SWB.
	Transitional	Lower Suir Estuary (Little Island – Cheekpoint)	No	The Lower Suir Estuary (Little Island – Cheekpoint) has been screened out as this SWB is distant from the Site, contains large flow volumes and saline waters. Therefore, the Proposed Project has no potential to impact the status of this SWB.
	Transitional	Barrow Suir Nore Estuary	No	The Barrow Suir Nore Estuary has been screened out as this SWB is distant from the Site, contains large flow volumes and saline waters. Therefore, the Proposed Project has no potential to impact the status of this SWB.

	Coastal	Waterford Harbour	No	The Waterford Harbour coastal waterbody has been screened out as this SWB is distant from the Site, contains large flow volumes and saline waters. Therefore, the Proposed Project has not potential to impact the status of this SWB.
	Coastal	Eastern Celtic Sea (HAs 13;17)	No	The Eastern Celtic Sea (HAs 13;17) coastal waterbody has been screened out as this SWB is distant from the Site, contains large flow volumes and saline waters. Therefore, the Proposed Project has no potential to impact the status of this SWB.
Groundwater Body	GWB	Kilmanagh Gravels	**Yes**	The Kilmanagh Gravels GWB lies directly underneath the Proposed Wind Farm site and a section of the Proposed Grid Connection underground cabling route. Therefore, an assessment is required to consider the potential impacts that the Proposed Project will have on this GWB.
	GWB	Ballingarry	**Yes**	The Ballingarry GWB lies directly underneath the Proposed Wind Farm site and a section of the Proposed Grid Connection underground cabling route. Therefore, an assessment is required to consider the potential impacts that the Proposed Project will have on this GWB.
	GWB	Durrow	**Yes**	The Durrow GWB lies directly underneath a section of the Proposed Grid Connection underground cabling route. Therefore, an assessment is required to consider the potential impacts that the Proposed Project will have on this GWB.
	GWB	Kilkenny-Ballynakill Gravels	**Yes**	The Kilkenny-Ballynakill Gravels GWB lies directly underneath a section of the Proposed Grid Connection underground cabling route. Therefore, an assessment is required to consider the potential impacts that the Proposed Project will have on this GWB.
Designated Sites	SPA	River Nore SPA	**Yes**	This SPA will be included within the WFD Impact Assessment as it lies ~14.1km downstream of the Proposed Wind Farm site. The Proposed Grid Connection underground cabling route also crosses this SPA at the new proposed crossing over the River Nore. Therefore, an assessment is required to consider the potential impacts that the Proposed Project will have on this SPA.
	SAC	River Barrow and River Nore SAC	**Yes**	This SAC lies ~5.9km downstream of the Proposed Wind Farm site. The Proposed Grid Connection underground cabling route also crosses this SAC at the new proposed crossing over the River Nore. Therefore, an assessment is required to consider the potential impacts that the Proposed Project will have on this SAC.
	pNHA	Ballykeefe Woods	No	Ballykeefe Woods is not hydrologically connected to the Site. Therefore, the Proposed Project has no potential to impact the status of this SWB.
	pNHA	River Nore / Abbeyleix Woods Complex	**Yes**	The Proposed Grid Connection underground cabling route crosses this pNHA at the new proposed crossing over the River Nore. Therefore, an assessment is required to consider the potential impacts that the Proposed Project will have on this pNHA.
	pNHA	Inchbeg pNHA	**Yes**	This pNHA is located ~2.34km downstream of the Proposed Grid Connection underground cabling route. Therefore, an assessment is required to consider the potential impacts that the Proposed Project will have on this pNHA.
Nutrient Sensitive Areas	River	River Nore (_180 to _250)	No	The River Nore (from Nore_180 to Nore_250) is deemed by the EPA to be an NSA. This NSA has been screened out of the WFD Compliance Assessment due to its distant location from the Site and the increasing volumes of water in the River Nore. Therefore, the Proposed Project has no potential to impact the status of this NSA.
Shellfish Protected Area	Transitional	Waterford Harbour	No	The Waterford Harbour Shellfish Area been screened out of the WFD Compliance Assessment due to its distant location from the Site, the large volumes of water within this coastal waterbody

				and the saline nature of these waters. Therefore, the Proposed Project has no potential to impact the status of this designated shellfish protected area.
Drinking Water	River	Nore_220	No	The Nore_220 SWB is designated as a DWPA. This relates to the Ballyragget PWS abstraction. The Nore_220SWB is distant from the Site and has been screened out due to the large volumes of water in the River Nore at this location. Therefore, the Proposed Project has no potential to impact the status of this DWPA.
	River	Nore_120	**Yes**	The Proposed Grid Connection underground cabling route, including 1 no. watercourse crossings, is located in this river sub-basin. Therefore, an assessment is required to consider the potential impacts that the Proposed Project will have on this DWPA

4. WFD COMPLIANCE ASSESSMENT

4.1 DEVELOPMENT PROPOSALS

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

The Proposed Project includes 7 no. proposed wind turbines, an onsite 38kV substation, temporary construction compounds, a permanent meteorological mast, spoil management areas, new site access roads, upgrades to existing site access roads, an underground grid connection to the existing Ballyragget 110kV substation and associated works.

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

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

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

4.2 POTENTIAL EFFECTS

4.2.1 Construction Phase (Unmitigated)

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

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

Hydrocarbons and cement-based compounds will be used during the construction phase. Accidental spillage during refuelling of construction plant with 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 forestry plantations is also proposed over 4.7ha in the vicinity of T07 Additional felling of linear vegetation such as hedgerows will also be completed. Potential surface water quality effects from tree felling include the release of elevated concentrations of suspended solids and nutrient release which has the potential to effect downstream surface water quality.

There are also 6 no. crossings proposed over natural watercourses in the Proposed Wind Farm site (3 no. crossings over EPA mapped watercourses and an additional 3 no. crossings over

non-mapped watercourses which were identified during walkover surveys). These works have the potential to result in morphological changes to watercourses.

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

The SWB likely to be most impacted by these activities is the Tullaroan Stream_030 SWB. Further downstream, the potential for water quality effects will decrease downstream due to the increasing volumes of water within the respective SWBs (due to the increasing size of the drainage catchment).

A summary of potential status change to SWBs arising from surface water quality effects within the Proposed Wind Farm site during the construction phase of the Proposed Project in the unmitigated scenario are outlined in **Table F**.

Table F: Surface Water Quality Effects Downstream of the Proposed Wind Farm site During Construction Phase (Unmitigated)

SWB	WFD Code	Current Status	Assessed Potential Status Change
Tullaroan Stream_020	IE_SE_15T020250	Good	Moderate
Tullaroan Stream_030	IE_SE_15T020450	Good	Moderate
Munster_030	IE_SE_15M030700	Good	Good
Kings (Kilkenny)_030	IE_SE_15K020560	Good	Good
Kings (Kilkenny)_040	IE_SE_15K020600	Moderate	Moderate
Kings (Kilkenny)_050	IE_SE_15K020910	Bad	Bad

4.2.1.2 Potential Surface Water Quality Effects Associated with the Proposed Grid Connection

The proposed onsite 38kV substation associated with the Proposed Grid Connection is located in the Tullaroan_030 river sub-basin within the Proposed Wind Farm site.

There will be a requirement for 10 no. watercourse crossings over EPA mapped waterbodies along the Proposed Grid Connection underground cabling route. In addition, there are 3 no. crossings over unmapped natural watercourses. These crossings are at existing bridge and culvert crossings with the exception of a new proposed crossing under the River Nore.

Due to the close proximity of local waterbodies 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 require management and treatment to reduce suspended sediments.

Construction activities along the Proposed Grid Connection underground cabling 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 underground cabling route during the construction phase of the Proposed Project in the unmitigated scenario are outlined in **Table G**.

Table G: Potential Surface Water Quality Effects Associated with the Proposed Grid Connection During Construction Phase (Unmitigated)

SWB	WFD Code	Current Status	Assessed Potential Status Change
Tullaroan Stream_010	IE_SE_15T020200	Moderate	Moderate
Tullaroan Stream_020	IE_SE_15T020250	Good	Good
Tullaroan Stream_030	IE_SE_15T020450	Good	Good
Arigna (Kilkenny)_010	IE_SE_15A010400	Moderate	Moderate
Nuenna_020	IE_SE_15N020400	Poor	Poor
Nore_120	IE_SE_15N011400	Moderate	Moderate
Nore_130	IE_SE_15N011500	Good	Good
Nore_140	IE_SE_15N011600	Good	Good
Nore_150	IE_SE_15N011700	Good	Good

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

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 groundwater water quality at the Proposed Wind Farm site.

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

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

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 Wind Farm to alter the overall status of the underlying GWBs. The potential for the Proposed Project to impact the status of the overall GWB is limited given the scale of the Proposed Project in comparison to the overall size of the Kilmanagh Gravels GWB (28km^2) and the Ballingarry GWB (412km^2).

Piled foundations may be required at T7 as no site investigation data is available at that location due to the existing tree cover. The requirement for piling at T7 is dependent on the ground conditions encountered during post-consent ground investigations. While piling works are not envisaged at other turbine locations, we have included an assessment of same as this was an issue raised by 3rd parties during consultation. Piling works would have the potential to impact on local groundwater quality.

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

Table H: Potential Groundwater Effects at the Proposed Wind Farm site during Construction Phase (Unmitigated)

GWB	WFD Code	Current Status	Assessed Potential Status Change
Kilmanagh Gravels	IE_SE_G_083	Good	Good
Ballingarry	IE_SE_G_009	Good	Good

4.2.1.4 Potential Groundwater Quality/Quantity Effects Associated with the Proposed Grid Connection

Accidental spillage during refuelling of construction plant with 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 works along the Proposed Grid Connection underground cabling route, there is no potential for any effects during earthworks and excavation works on the qualitative status of the overall GWBs (due to the scale of the Proposed Project in comparison with the overall area of the GWBs).

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

Table I: Potential Groundwater Effects Associated with the Proposed Grid Connection during Construction Phase (Unmitigated)

GWB	WFD Code	Current Status	Assessed Potential Status Change
Kilmanagh Gravels	IE_SE_G_083	Good	Good
Ballingarry	IE_SE_G_009	Good	Good
Durrow	IE_SE_G_156	Poor	Poor
Kilkenny-Ballynakill Gravels	IE_SE_G_163	Good	Good
Clifden	IE_SE_G_038	Good	Good

4.2.1.5 Potential Effects on Protected Areas

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

River Barrow and River Nore SAC: This SAC is located ~5.9km downstream of the Proposed Wind Farm site and the Proposed Grid Connection underground cable route crosses this SAC. Any potential deterioration in surface water quality has the potential to affect this SAC.

River Nore SPA: This SAC is located ~14.1km downstream of the Proposed Wind Farm site and the Proposed Grid Connection underground cable route crosses this SPA. Any potential deterioration in surface water quality has the potential to affect this SPA.

Inchbeg pNHA: This pNHA is located downstream of the Proposed Grid Connection underground cabling route. The potential for effects is limited given the minor and transient nature of the proposed works.

River Nore / Abbeyleix Woods Complex pNHA: The Proposed Grid Connection underground cabling route crosses this pNHA. Any potential deterioration in surface water quality has the potential to affect this pNHA. The potential for effects is limited given the minor and transient nature of the proposed works.

Nore 120 DWPA: The Proposed Grid Connection underground cabling route crosses this DWPA associated with the Ballyragget PWS. Any potential deterioration in surface water quality has the potential to affect this DWPA. The potential for effects is limited given the minor and transient nature of the proposed works.

4.2.2 Operational Phase (Unmitigated)

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

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

4.2.2.1 Potential Surface Water Quantity Effects Downstream of the Proposed Wind Farm site

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 developed areas and increase flood risk downstream of the Proposed Project.

During storm rainfall events, additional runoff coupled with increased velocity of flow could increase hydraulic loading, resulting in erosion of watercourses and causing hydromorphological effects.

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

Table J: Potential Surface Water Quantity Effects Downstream of the Proposed Wind Farm site during Operational Phase (Unmitigated)

SWB	WFD Code	Current Status	Assessed Potential Status Change
Tullaroan Stream_020	IE_SE_15T020250	Good	Good
Tullaroan Stream_030	IE_SE_15T020450	Good	Good
Munster_030	IE_SE_15M030700	Good	Good

Kings (Kilkenny)_030	IE_SE_15K020560	Good	Good
Kings (Kilkenny)_040	IE_SE_15K020600	Moderate	Moderate
Kings (Kilkenny)_050	IE_SE_15K020910	Bad	Bad

4.2.2.2 Potential Surface Water Quality Effects from Operational Wind Farm Site Drainage

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

Any leakage of oils at the Proposed Wind Farm site, associated with the transformers in the turbines and the substation, would have the potential to impact on local surface water quality.

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

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

SWB	WFD Code	Current Status	Assessed Potential Status Change
Tullaroan Stream_020	IE_SE_15T020250	Good	Good
Tullaroan Stream_030	IE_SE_15T020450	Good	Good
Munster_030	IE_SE_15M030700	Good	Good
Kings (Kilkenny)_030	IE_SE_15K020560	Good	Good
Kings (Kilkenny)_040	IE_SE_15K020600	Moderate	Moderate
Kings (Kilkenny)_050	IE_SE_15K020910	Bad	Bad

4.2.2.3 Potential Groundwater Quality/Quantity Effects at the Proposed Wind Farm Site

The potential for effects on groundwater quality is reduced in comparison with the construction phase. Any leakage of oils at the Proposed Wind Farm site, associated with the transformers in the turbines and the substation, would have the potential to impact on local groundwater quality. However, due to the nature of the operational phase and the overall scall of the underlying GWBs, there is little potential for the overall qualitative status to be impacted.

The potential piling works will not result in any significant changes to regional groundwater flowpaths or groundwater levels due to the small footprint of any potential piles and the large areas covered by the underlying GWBs. Furthermore, the water supply at the substation will be very small, comparable to a domestic well supplying a single household (<1m^3/day).There is no potential for the Proposed Project to alter the quantitative status of the underlying GWBs.

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

Table L: Potential Groundwater Effects at the Proposed Wind Farm site during Construction Phase (Unmitigated)

GWB	WFD Code	Current Status	Assessed Potential Status Change
Kilmanagh Gravels	IE_SE_G_083	Good	Good
Ballingarry	IE_SE_G_009	Good	Good

4.2.2.4 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. Minor maintenance works may pose a small risk with regards to the release of hydrocarbons from site vehicles.

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

4.2.3 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.

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

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 vegetation to encourage vegetation growth and reduce run-off and sedimentation.

Other impacts such as possible soil entrainment in surface waters 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. Similar mitigation as outlined in **Sections 4.3.1** for the construction phase will be implemented during the decommissioning phase to ensure no impacts of receiving waters.

Some of the potential impacts of water bodies will be avoided by leaving elements of the Proposed Project in place where appropriate. The substation will be retained by ESB as a permanent part of the national grid. The turbine bases will be rehabilitated by covering with local topsoil 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.

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

4.3 MITIGATION MEASURES

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

4.3.1 Construction Phase

4.3.1.1 Mitigation Measures to Protect Surface Water Quality During Earthworks

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

During the construction phase of the Proposed Project, excavations will be limited to minimise the generation of spoil. Sediment will be generated where excavations are required (turbine 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 release into the existing drainage network. There will be no direct or untreated discharge from construction work areas into the existing drainage network.

Finally, regular inspection and maintenance for the on-site drainage system will be completed regularly during the construction phase. This will be of 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 M: Summary of Drainage Mitigation and their Application

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

	• Sediment traps, stilling / settlement ponds.	
Water Treatment Controls:	• Temporary sumps; • Attenuation ponds; • Temporary storage lagoons; • Sediment traps, Stilling / Settlement ponds, silt bags; • Proprietary settlement systems such as Siltbuster, and/or other similar/equivalent or appropriate systems.	Surface water treatment locations
Outfall Controls:	• Levelspreaders; • Buffered outfalls; • Vegetation filters; • Silt bags; • Flow limiters and weirs.	Drainage run outfalls and overland discharge points

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

Where works are proposed within the delineated hydrological buffer zone, the following additional mitigation measures will be implemented to ensure there are no effects on surface water quality:

- Double or triple silt fences will be placed downgradient of all work locations within the hydrological buffer zones.
- All works will be completed during the dry summer months and works will be postponed in the event of rainfall.

4.3.1.2 Mitigation Measures to Protect Against Release of Hydrocarbons

The potential pollution of groundwater during the construction phase will be mitigated by the provision of appropriate controls and working methods. These include best practice methods for storage and handling of fuels and chemicals and include:

- All plant will be inspected and certified to ensure that they are leak free and in good working order prior to use at the Site.
- 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 (Proposed Wind Farm site and Proposed Grid Connection), 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 temporary 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:
- Refuelling or maintenance of machinery will not occur within 100m of a watercourse;
- Fuels stored on Site will be minimised;
- Any diesel or fuel oils stored at the temporary construction compound will be bunded. The bund capacity will be sufficient to contain 110% of the storage tank's maximum capacity;
- The plant used 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 contained within the Construction and Environmental Management Plan (Appendix 4-2). Spill kits will be available to deal with accidental spillages.

4.3.1.3 Mitigation Measures to Prevent Release of Wastewater

The best practice methods for wastewater management at the proposed on-site temporary construction compounds during the construction phase include:

- During the construction phase, a self-contained port-a-loo with an integrated waste holding tank will be used at each of the temporary 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 at the Proposed Wind Farm site.

4.3.1.4 Mitigation Measures to Prevent Release of Cement-Based Products

Best practice methods for cement-based compounds includes:

- 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 a sudden rainfall event.

4.3.1.5 Mitigation Measures for Clear-Felling

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

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

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

- Machine combinations will be chosen which are most suitable for ground conditions at the time of felling, and which will minimise soils disturbance. The harvester and the forwarder are designed specifically for the forest environment and are low ground pressure machines;
- All machinery will be operated by suitably qualified personnel;
- Checking and maintenance of roads and culverts will be on-going through any felling operations. No tracking of vehicle through watercourses will occur, as vehicles will use

road infrastructure and existing watercourse crossing points. Where possible, existing drains will not be disturbed during felling works;
- These machines will traverse the Site along specified off-road routes (referred to as racks);
- The location of racks will be chosen to avoid wet and potentially sensitive areas;
- Brash mats will be placed on the racks to support the vehicles on soft ground, reducing mineral soil disturbance and erosion and avoiding the formation of rutted areas, in which surface water ponding can occur. Brash mat renewal should take place when they become heavily used and worn. Provision should be made for brash mats along all off-road routes, to protect the soil from compaction and rutting. Where there is risk of severe erosion occurring, extraction will be suspended during periods of high rainfall;
- Silt fences will be installed at the outfalls of existing drains downstream of felling areas. No direct discharge of such drains to watercourses will occur. Sediment traps and silt fences will be installed in advance of any felling works and will provide surface water settlement for runoff from work areas and will prevent sediment from entering downstream watercourses. Accumulated sediment will be carefully disposed of at pre-selected disposal areas. Where possible, all new silt traps will be constructed on even ground and not on sloping ground;
- In areas particularly sensitive to erosion it will be necessary to install double or triple sediment traps and increase buffer zone width. These measures will be reviewed on site during construction;
- Double silt fencing will also be put down slope of felling areas which are located in close proximity to streams and/or relevant watercourses;
- Drains and silt traps will be maintained throughout all felling works, ensuring that they are clear of sediment build-up and are not severely eroded;
- Timber will be stacked in dry areas, and outside watercourse buffer zones. Straw bales and check dams to be emplaced on the down gradient side of timber storage/processing sites;
- Works will be carried out during periods of no, or low rainfall, in order to minimise entrainment of exposed sediment in surface water runoff;
- Refuelling or maintenance of machinery will not occur within 50m of an aquatic zone. Mobile bowser, drip kits, qualified personnel will be used where refuelling is required; and,
- Branches, logs or debris will not be allowed to build up in aquatic zones. All such material will be removed when harvesting operations have been completed, but care will be taken to avoid removing natural debris deflectors.

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

4.3.1.6 Mitigation Measures to Prevent Morphological Changes to Surface Watercourses within the Proposed Wind Farm site

The Proposed Project design has been optimised to utilise the existing infrastructure (roads and hardstands) where practicable. This design prevents the unnecessary disturbance of the existing site drainage network prevents the requirement for widespread instream works.

The Proposed Project design has been optimised to utilise the existing infrastructure (i.e. existing site roads) where practicable. Only 4 no. new crossings are proposed. This design prevents the unnecessary disturbance of the existing site drainage network prevents the requirement for widespread instream works across the Proposed Wind Farm site.

Mitigation measures for the crossings are detailed below:
- The proposed new stream crossings and upgrade of an existing crossing will be clear span bridge crossings and the existing banks will remain undisturbed. No in-stream excavation works are proposed at these locations and therefore there will be no

direct impact on the stream at the proposed crossing locations. Abutments will be constructed from precast units combined with in-situ foundations;
- All guidance / mitigation measures required by the OPW and/or the Inland Fisheries Ireland (IFI) is incorporated into the design of the proposed crossings;
- All drainage measures will be installed in advance of the works;
- Plant and equipment will not be permitted to track across the watercourse;
- Access to the opposite side of the watercourse for excavation and foundation installation will require the installation of a temporary pre-cast concrete or metal bridge;
- Once the foundations have been completed at both sides of the watercourse, the pre-cast concrete box culvert will be installed using a crane and there will be no contact with the watercourse;
- Where the box culvert is installed in sections, the joint will be sealed to prevent granular material entering the watercourse;
- As a further precaution, near stream construction work, will only be carried out during the period permitted by IFI for in-stream works according to the IFI (2016) guidance document "Guidelines on protection of fisheries during construction works in and adjacent to waters", i.e., July 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);
- Where works are necessary inside the 50m buffer double row silt fences will be emplaced immediately down-gradient of the construction area for the duration of the construction phase; and,
- All new river/stream crossings will be designed in accordance with OPW guidelines/requirements on applying for a Section 50 consent.

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.

4.3.1.7 Mitigation Measures to Prevent Morphological Changes to surface watercourses along the Proposed Grid Connection Route

Prior to the commencement of cable trenching or crossing works the following key temporary drainage measures will be installed:

- All existing roadside drains 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 will also be temporarily blocked;
- A double silt fence perimeter will be placed along the road verge on the down-slope side of works areas that are located inside the watercourse 50m buffer zone.
- No stockpiling of construction materials will take place along the Proposed Grid Connection underground cabling route;
- No refuelling of machinery or overnight parking of machinery is permitted in this area;
- No concrete truck chute cleaning is permitted in this area;
- Works will not take place at periods of high rainfall, and will be scaled back or suspended if heavy rain is forecast;
- 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 in each item of plant required to complete the stream crossing; and,
- Silt fencing will be erected on ground sloping towards watercourses at the stream crossings if required.

Horizontal directional drilling (HDD) will be used at 4 crossings along the Proposed Grid Connection underground cabling route. The following mitigation measures will be implemented:

- Although no in-stream works are proposed, the HDD works will only be done over a dry period between July and September (as required by IFI for in-stream works) to avoid the salmon spawning season and to have more favourable (dryer) ground conditions;
- The crossing works area will be clearly marked out with fencing or flagging tape to avoid unnecessary disturbance;
- There will be no storage of material / equipment or overnight parking of machinery inside the 15m buffer zone;
- Before any ground works are undertaken, double silt fencing will be placed upslope of the watercourse channel along the 15m buffer zone boundary;
- Additional silt fencing or straw bales (pinned down firmly with stakes) will be placed across any natural surface depressions / channels that slope towards the watercourse;
- Silt fencing will be embedded into the local soils to ensure all site water is captured and filtered;
- The area around the bentonite batching, pumping and recycling plant will be bunded using terram (as it will clog) and sandbags in order to contain any spillages;
- Drilling fluid returns will be contained within a sealed tank / sump to prevent migration from the works area;
- Spills of drilling fluid will be clean up immediately and stored in an adequately sized skip before been taken off-site;
- If rainfall events occur during the works, there will be a requirement to collect and treat small volumes of surface water from areas of disturbed ground (i.e. soil and subsoil exposures created during site preparation works);
- This will be completed using a shallow swale and sump down slope of the disturbed ground; and water will be pumped to a proposed percolation area at least 50m from the watercourse;
- The discharge of water onto vegetated ground at the percolation area will be via a silt bag which will filter any remaining sediment from the pumped water. The entire percolation area will be enclosed by a perimeter of double silt fencing;
- Any sediment laden water from the works area will not be discharged directly to a watercourse or drain;
- Works shall not take place during periods of heavy rainfall and will be scaled back or suspended if heavy rain is forecasted;
- Daily monitoring of the compound works area, the water treatment and pumping system and the percolation area will be completed by a suitably qualified person during the construction phase. All necessary preventative measures will be implemented to ensure no entrained sediment, or deleterious matter is discharged to the watercourse;
- If high levels of silt or other contamination is noted in the pumped water or the treatment systems, all construction works will be stopped. No works will recommence until the issue is resolved and the cause of the elevated source is remedied;
- On completion of the works, the ground surface disturbed during the site preparation works and at the entry and exit pits will be carefully reinstated and re-seeded at the soonest opportunity to prevent soil erosion;
- The silt fencing upslope of the river will be left in place and maintained until the disturbed ground has re-vegetated;

- There will be no batching or storage of cement allowed at the watercourse crossing;
- There will be no refuelling allowed within 100m of the watercourse crossing; and,
- All plant will be checked for purpose of use prior to mobilisation at the watercourse crossing.

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

- 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.

4.3.1.8 Mitigation Measures to Protect Water Quality During Excavation Dewatering

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

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

4.3.1.9 Mitigation Measures For Piling

The proposed mitigation measures designed for the protection of downstream surface water quality and groundwater quality will be implemented at all construction work areas.

- Mitigation measures for sediment control are detailed in **Section 4.3.1.1**.

- Mitigation measures for the control of hydrocarbons during construction works are detailed in **Section 4.3.1.2**.
- Mitigation measures for the control of cement-based products during construction works are detailed in **Section 4.3.1.4**.

Proposed mitigation measures relative to piling works will comprise:

- Where driven piles are used, they will have a cross section without re-entrant angles;
- Strict QA/QC procedures for piling works will be followed;
- Piles will be kept vertical during piling works;
- Good workmanship will be employed during all piling works; and,
- Where required use bentonite seal to prevent upward/downward movement of surface water/groundwater.

4.3.1.10 Mitigation Measures for Protected Areas

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

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

4.3.2 Operational Phase

4.3.2.1 Increased Site Runoff and Hydromorphology Effects

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

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

The operation of the Proposed Grid Connection underground cabling route will not result in any likely hydrological or water quality effects and therefore do not require mitigation measures.

4.3.2.2 Mitigation Measures for Hydrocarbons

- Onsite re-fuelling of normal operational vehicles machinery will not be carried out during the operational phase of the development. These vehicles All plant/machinery will be refuelled offsite;

- Fuels stored on site will be minimised and any hydrocarbons stored on-site will be bunded. The bund capacity will be sufficient to contain 110% of the storage tank's maximum capacity;
- The substation will be bunded appropriately to the volume of oils likely to be stored, and to prevent leakage of any associated chemicals and to groundwater or surface water. The bunded area will be fitted with a storm drainage system and an appropriate oil interceptor;
- Oil in the turbine transformers will be fully bunded within the enclosed turbine and as such, there is no potential pathway to the water environment i.e. the pathway has been blocked;
- Any plant used during the operational phase will be regularly inspected for leaks and fitness for purpose; and,
- Spill kits will be available to deal with accidental spillages.

4.3.2.3 Mitigation Measures to Protect Surface Water Quality

The mitigation measures to protect against poor quality runoff during the operational phase of the Proposed Project are detailed in **Section 4.3.2.1** above.

Mitigation measures for oils and fuels during the operational phase of the Proposed Project the same as those outlined in **Section 4.3.2.2** above.

4.3.2.4 Mitigation Measures to Protect Groundwater Quality

It is proposed to manage wastewater from the staff welfare facilities in the control buildings by means of a sealed storage tank, with all wastewater being tankered off site by permitted waste collector to wastewater treatment plants. Mitigation from hydrocarbons will also be implemented as outlined in **Section 4.3.2.2** above.

4.3.2.5 Mitigation for Protected Areas

The mitigation measures to protect against poor quality runoff during the operational phase of the Proposed Project are the same as those outlined in **Section 4.3.2.1** above.

Mitigation measures for oils and fuels during the operational phase of the Proposed Project the same as those outlined in **Section 4.3.2.2** above.

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

4.3.3 Potential Effects with the Implementation of Mitigation

In all instances, the mitigation measures described in **Section 4.2.3** are sufficient to meet the WFD Objectives. The assessment of WFD elements for the WFD waterbodies is summarised in **Table N** below.

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

SWB	WFD Code	Current Status	Assessed Status - Unmitigated	Assessed Status with Mitigation Measures
Surface Waterbodies				
Tullaroan Stream_010	IE_SE_15T020250	Good	Good	Good
Tullaroan Stream_020	IE_SE_15T020250	Good	Moderate	Good
Tullaroan Stream_030	IE_SE_15T020450	Good	Moderate	Good
Munster_030	IE_SE_15M030700	Good	Good	Good
Kings (Kilkenny)_030	IE_SE_15K020560	Good	Good	Good
Kings (Kilkenny)_040	IE_SE_15K020600	Moderate	Moderate	Moderate
Kings (Kilkenny)_050	IE_SE_15K020910	Bad	Bad	Bad
Arigna (Kilkenny)_010	IE_SE_15A010400	Moderate	Moderate	Moderate
Nuenna_020	IE_SE_15N020400	Poor	Poor	Poor
Nore_120	IE_SE_15N011400	Moderate	Moderate	Moderate
Nore_130	IE_SE_15N011500	Good	Good	Good
Nore_140	IE_SE_15N011600	Good	Good	Good
Nore_150	IE_SE_15N011700	Good	Good	Good
Ground Waterbodies				

Kilmanagh Gravels	IE_SH_G_157	Good	Moderate	Good
Ballingarry	IE_SH_G_229	Good	Moderate	Good
Durrow	IE_SE_G_156	Poor	Poor	Poor
Kilkenny-Ballynakill Gravels	IE_SE_G_163	Good	Good	Good

5. SUMMARY AND CONCLUSIONS

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

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

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

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

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

As such, the Proposed Project:

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