APPENDIX 9-3

WATERFRAMEWORK DIRECTIVE ASSESSMENT

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WATER FRAMEWORK DIRECTIVE ASSESSMENT
BALLIVOR WIND FARM, CO. MEATH\WESTMEATH

FINAL REPORT

Prepared for:

BORD NA MONA POWERGEN

Prepared by:

HYDRO-ENVIRONMENTAL SERVICES

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1. INTRODUCTION

1.1 BACKGROUND

Hydro-Environmental Services (HES) were requested by MKO, on behalf of Bord na Móna Powergen Ltd, to complete a Water Framework Directive (WFD) Compliance Assessment for a planning application for the proposed Ballivor wind farm, Co. Meath and Co. Westmeath. The Proposed Development comprises a 26 no. turbine windfarm and all associated site development works.

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

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

1.2 STATEMENT OF AUTHORITY

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

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

Michael Gill (P. Geo., B.A.I., MSc, Dip. Geol., MIEI) is an Environmental Engineer with over 22 years' environmental consultancy experience in Ireland. Michael has completed numerous hydrological and hydrogeological impact assessments of wind farms in Ireland. He has also managed EIAR assessments for infrastructure projects and private residential and commercial developments. In addition, he has substantial experience in wastewater engineering and site suitability assessments, contaminated land investigation and assessment, wetland hydrology/hydrogeology, water resource assessments, surface water drainage design and SUDs design, and surface water/groundwater interactions. For example, Michael has worked on the EIS/EIARs for Slievecallan WF, Cahermurphy (Phase I & II) WF, Carrownagowan WF, and Croagh WF and over 100 other wind farm related projects across the country.

Conor McGettigan (BSc, MSc) is an Environmental Scientist with 3 years' experience in the environmental sector in Ireland. Conor holds an M.Sc. in Applied Environmental Science and a B.Sc. in Geology from University College Dublin. Conor routinely completes WFD compliance assessments for a variety of proposed developments including developments on peatlands.

Jenny Law (BSc) is a master's student in Applied Environmental Geoscience. Jenny holds a BSc in Earth and Ocean Science. In recent times Jenny has assisted in the preparation of hydrological and hydrogeological impact assessments for a variety of developments.

1.3 WATER FRAMEWORK DIRECTIVE

The EU Water Framework Directive (2000/60/EC), as amended by Directives 2008/105/EC, 2013/39/EU and 2014/101/EU ("**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 Development, include:

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

Furthermore, the 3rd Cycle Draft River Basin Management Plan (2022 - 2027) is currently being prepared by the Department of Housing, Local Government and Heritage following completion of a 6-month public consultation process in March 2022.

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

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

2.1 SURFACE WATERBODY IDENTIFICATION

Regionally the proposed site is located in the River Boyne surface water catchment within Hydrometric Area 7 of the Eastern River Basin District (www.epa.ie).

On a more local scale, the majority of the proposed site is located in the River Boyne sub-catchment (Boyne_SC_050) with much of Ballivor Bog and a small section towards the southwest of Bracklin Bog located in the Boyne_040 sub-catchment. Additionally, a small area in the northwest of Bracklin Bog (*i.e.* Bracklin West) is located in the Deel[Raharney]_010 sub-catchment (we note that this area of Bracklin Bog does not form part of the proposed site).

Within the Deel[Raharney]_010 sub-catchment, the Deel River flows to the southeast approximately 1km west of Bracklin West. This area (*i.e.* Bracklin West) drains towards the Deel(Raharney)_030 and Deel(Raharney)_040 river waterbodies. The River Deel flows to the southeast entering the Boyne_040 sub-catchment to the south of Raharney village. The River Deel reaches its confluence with the River Boyne approximately 4.5km south of Ballivor village.

Within the Boyne_040 sub-catchment, the Deel River flows to the southeast approximately 1.25km southwest of Ballivor Bog. This area of the proposed site (*i.e.* the southwest of Bracklin Bog and the west of Ballivor Bog) is drained by the Deel(Raharney)_060 river waterbody which discharges into the Boyne_060 river waterbody approximately 3.5km southeast of Ballivor Bog.

As stated above, the majority of the proposed site is located in the Boyne_050 sub-catchment. The Stonyford River flows to the southeast, approximately 700m east of Lisclogher Bog before eventually discharging into the Boyne River approximately 7km east of Ballivor Bog. The north of Lisclogher Bog is drained by the Stonyford_020 and Stonyford_030 river waterbodies (refer to Section 9.3.3 of the EIAR for a description of drainage within Lisclogher Bog) with the remainder of Lisclogher Bog and the majority of Bracklin and Carranstown bogs drained by the Stonyford_040 river waterbody. Meanwhile the south of Carranstown Bog and the east of Ballivor Bog are drained by the Boyne_060 river waterbody.

The Stonyford River discharges into the Boyne_070 river waterbody approximately 5km southeast of Ballivor village. The River Boyne then flows to the northeast through the towns of Trim and Navan after which it continues eastwards before becoming tidal to the west of my M1 motorway. The Boyne flows through the Boyne Estuary transitional waterbody and discharges into the Boyne Estuary Plume Zone costal waterbody between Haven and Mornington Point.

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

Table A presents the catchment area of each waterbody downstream of the proposed site as per WFD mapping. The Deel(Raharney)_030 river waterbody in the vicinity of the Ballivor Bog Group has the smallest catchment area of 68.54km^2. The catchment area increases progressively downstream as more tributaries discharge into the Boyne River, with the final river waterbody *i.e.* Boyne_180, having a total catchment area of 2,524km^2. In addition, **Table A** presents the area of the Ballivor Bog Group draining to each waterbody as a percentage of the total catchment area for that waterbody. The percentage decreases progressively downstream of the proposed site. For example, the proposed site is 7.09% of the total catchment area of the Stonyford_040 river waterbody but only 0.66% of the total catchment draining to the Boyne_180 river waterbody. Therefore, those waterbodies which are located in

close proximity to the proposed site are more susceptible to water quality impacts as a result of activities associated with the Proposed Development.

Table A: Downstream Catchment Size (as per WFD Mapping)

WFD River Sub-Basin	Total Catchment Area (km²)	Area of Proposed Site Draining to Waterbody (km²)	Proposed Site as % Area of Catchment
Deel(Raharney)_030	68.54	0	0
Deel(Raharney)_040	103.81	0	0
Deel(Raharney)_050	118.71	0	0
Deel(Raharney)_060	153.96	4.81	3.12
Boyne_050	741.64	4.81	0.64
Boyne_060	947.67	6.73	0.71
Stonyford_030	102.83	0.31	0.3
Stonyford_040	154.67	10.97	7.09
Boyne_070	1,147.95	17.7	1.54
Boyne_080	1,343.76	17.7	1.31
Boyne_090	1,354.41	17.7	1.3
Boyne_100	1,471.87	17.7	1.2
Boyne_110	1,563.22	17.7	1.13
Boyne_120	1,666.65	17.7	1.1
Boyne_130	1,680.85	17.7	1.05
Boyne_140	2,397.15	17.7	0.74
Boyne_150	2,411.06	17.7	0.73
Boyne_160	2,468.03	17.7	0.72
Boyne_170	2,477.50	17.7	0.71
Boyne_180	2,524.54	17.7	0.7

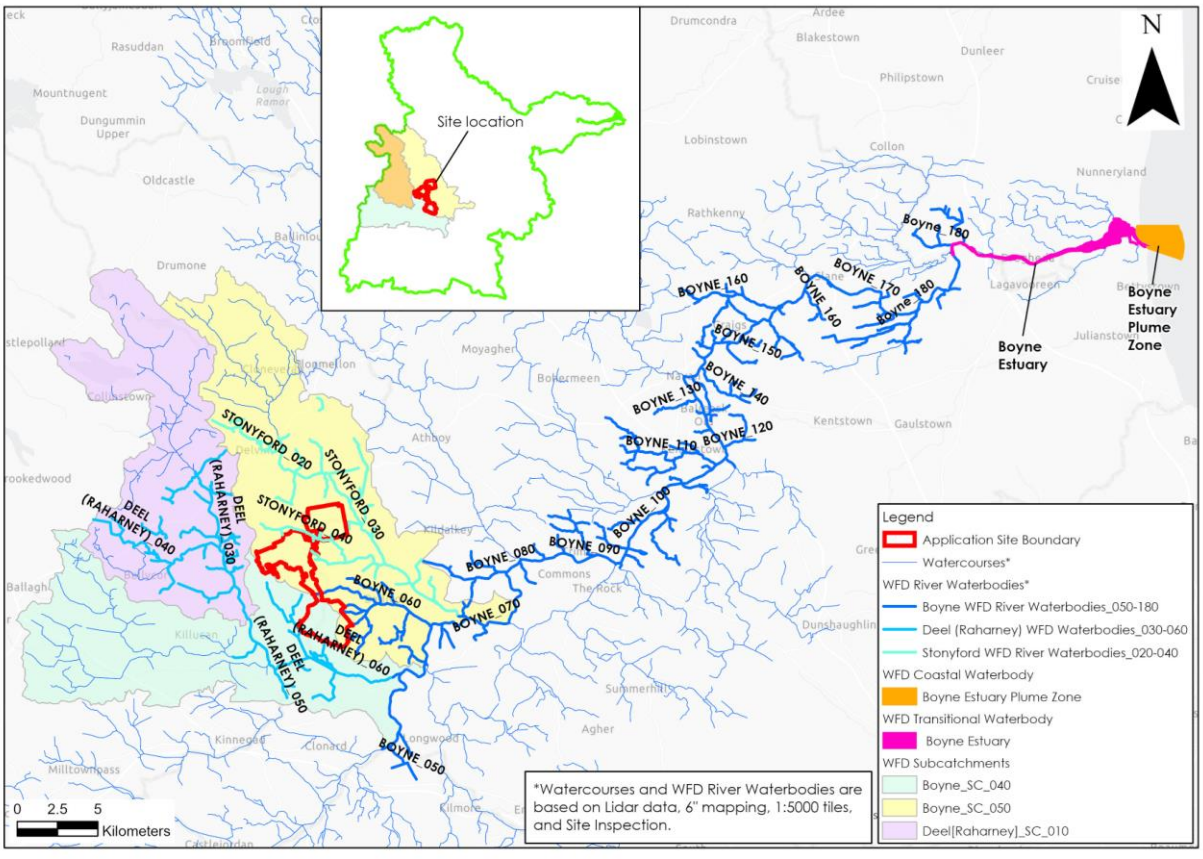

Figure A: Local Hydrology Map

2.2 SURFACE WATER BODY CLASSIFICATION

A summary of the WFD status and risk result for Surface Water Bodies (SWBs) downstream of the Ballivor Bog Group are shown in **Table B**. 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).

Bracklin West is drained by the Deel(Raharney)_030 SWB. The status of this SWB has improved from "Moderate" in the 2nd WFD cycle (2013-2018) to "Good" in the latest 3rd WFD cycle (2016-2021). Further downstream the Deel(Raharney)_040 SWB achieved "Good" status in all 3 no. WFD cycles while the Deel(Raharney)_050 SWB was assigned "Moderate" status in all 3 no. WFD cycles. The Deel(Raharney)_060 SWB, which drains the western section of Ballivor Bog, has increased from "Moderate" status in the 1st WFD cycle (2010-2015) to "Good" in the 2nd WFD cycle (2013-2018) and has remained at "Good" status in the latest WFD cycle (2016-2021). Further downstream, the Boyne_050 achieved "Good" status in all 3 no. WFD cycles.

The Boyne_060 SWB drains the eastern section of Ballivor and Carranstown Bogs. This SWB has experienced an improved status from "Moderate" in 2010-2015 to "Good" in 2013-2018 and 2016-2021. The Stonyford River drains Lisclogher and Bracklin bogs. The Stonyford_020 and 030 SWBs have consistently deteriorated in status throughout each of the WFD cycles, having "Good" status in 2010-2015, to "Moderate" in 2013-2018, to "Poor" in 2016-2021. The Stonyford_040 also experienced a deterioration in status from "Good" in 2010-2015 to "Moderate" in 2013-2018 and remained at "Moderate" status in 2016-2021. Further downstream the Boyne_070 and Boyne_080 both achieved "Moderate" status in the latest WFD round.

Further downstream the River Boyne (Boyne_090 to Boyne_180) is mostly of "Moderate" status with only 2 no. waterbodies located in it's lower reaches (Boyne_170 and _180) achieving "Good" status in the latest WFD cycle. A greater proportion of waterbodies proximal to the proposed site have achieved "Good" status in comparison to those further downstream.

The majority of the SWBs draining the proposed site or directly downstream have been deemed to be "At risk" of not meeting their WFD objectives. The significant pressures impacting on these SWBs are listed in **Table B** below.

The 3rd cycle Draft Boyne Catchment Report (EPA, 2021) states that agriculture is the most significant pressure in the Boyne Catchment. Agriculture has been identified as a significant pressure on 8 no. SWBs downstream of the proposed site. The primary issues relating to agricultural activities are phosphorus loss to surface waters, organic pollution associated with run-off from farmyards and the entrainment of sediment in surface waters due to land drainage works and bank erosion.

Hydromorphological (or physical) is also listed as a significant pressure in the Boyne Catchment, impacting 9 no. surface waterbodies downstream of the proposed site. Hydromorphological conditions including the input of excessive fine sediment and poor habitat quality are major issues for several SWBs in the vicinity of the proposed site (i.e. Deel(Raharney)_050, Deel(Raharney)_060 and Boyne_060). The River Basin Management Plan states that these SWBs have been subject to excessive modification due to the presence of drainage schemes. In addition, dams, barriers, locks and weirs were identified as a pressure on the Stonyford_020 SWB.

Meanwhile, the 3rd Cycle Draft Boyne Catchment Report (EPA, 2021) lists peat (peat drainage and extraction) as a significant pressure on 13 no. river waterbodies within the Boyne Catchment. This is a reduction from 18 no. waterbodies from the 2nd WFD Cycle. Downstream of the proposed site the Stonyford_030 SWB is listed as being under significant pressure from peat related activities in 3rd Cycle Draft Report. Meanwhile, peat was listed as a pressure on

the Boyne_060 SWB in the 2nd Cycle. This SWB has been deemed to be no longer impacted by peat related activities in the 3rd Cycle. Peat pressures are related to increased sediment loads which alter habitats, morphology and hydrology. Peat extraction activities also result fluctuation in downstream ammonia concentrations.

Domestic wastewater is listed as a significant pressure on the Boyne_150 SWB. Issues arise from unsuitable domestic wastewater treatment systems and results in nutrient enrichment and organic contamination. Meanwhile urban wastewater is a listed as a pressure on the Boyne Estuary which is located downstream of the Drogheda agglomeration.

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

Table B: Summary WFD Information for River Water Bodies

SWB	Overall Status (2010-2015)	2nd Cycle WFD Pressures	Overall Status (2013-2018)	Overall Status (2016-2021)	Risk Status 3rd Cycle	3rd Cycle WFD Pressures
Deel(Raharney)_030	Good	-	Moderate	Good	At risk	Agriculture
Deel(Raharney)_040	Good	-	Good	Good	Not at risk	-
Deel(Raharney)_050	Moderate	Hydromorphology	Moderate	Moderate	At risk	Hydromorphology
Deel(Raharney)_060	Moderate	Hydromorphology & agriculture	Good	Good	Under review	-
Boyne_050	Good	-	Good	Good	Not at risk	-
Boyne_060	Moderate	Hydromorphology, peat and urban wastewater	Good	Good	At risk	Agriculture & Hydromorphology
Stonyford_020	Good	-	Moderate	Poor	At risk	Agriculture & Hydromorphology
Stonyford_030	Good	-	Moderate	Poor	At risk	Agriculture & Peat
Stonyford_040	Good	-	Moderate	Moderate	At risk	Agriculture
Boyne_070	Good	-	Moderate	Moderate	At risk	Agriculture
Boyne_080	Moderate	Hydromorphology	Moderate	Moderate	At risk	Hydromorphology
Boyne_090	Moderate	Hydromorphology & urban run-off	Moderate	Moderate	At risk	Hydromorphology & urban run-off
Boyne_100	Moderate	Hydromorphology & Agriculture	Moderate	Moderate	At risk	Agriculture & Hydromorphology
Boyne_110	Unassigned	-	Good	Moderate	Under review	-
Boyne_120	Moderate	Agriculture & urban wastewater	Good	Moderate	Under review	-
Boyne_130	Unassigned	-	Good	Moderate	Not at risk	-
Boyne_140	Unassigned	-	Moderate	Moderate	Under review	-
Boyne_150	Moderate	Anthropogenic & domestic wastewater	Moderate	Moderate	At risk	Anthropogenic & domestic wastewater
Boyne_160	Moderate	Hydromorphology, agriculture, urban wastewater & domestic wastewater	Moderate	Moderate	Under review	-
Boyne_170	Good	-	Good	Good	Under review	-
Boyne_180	Good	-	Good	Good	Not at risk	-
Boyne Estuary	Moderate	Agriculture & urban wastewater	Moderate	Moderate	At risk	Agriculture & urban wastewater
Boyne Estuary Plume	Good	Anthropogenic	Moderate	Moderate	At risk	Anthropogenic & urban runoff

2.3 GROUNDWATER BODY IDENTIFICATION

According to data from the GSI database and bedrock geology series (www.gsi.ie), the majority of the proposed site is underlain by a locally Important Aquifer (LI) with a small area in the north underlain by a Poor Aquifer (PI). These bedrock aquifers comprise of Dinantian Pure Unbedded Limestones and Dinantian Upper Impure Limestones.

The proposed site is underlain by the Athboy Groundwater Body (GWB), characterised by poorly productive bedrock.

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

2.4 GROUNDWATER BODY CLASSIFICATION

The Athboy GWB (IE_EA_G_001) underlies the proposed site. This GWB has been assigned 'Good Status' in all 3 no. WFD cycles (2010-2015, 2013-2018 and 2016-2021) (**Table C**). This status is defined based on the quantitative status and chemical status of the GWB. The Athboy GWB is deemed to be "At risk" of not meeting its WFD objectives.

While no significant pressures were identified in Cycle 2, the 3rd Cycle Draft Boyne Catchment Report (EPA, 2021) lists identifies agriculture as a significant pressure impacting this GWB.

Table C: Summary WFD Information for Groundwater Bodies

GWB	Overall Status (2010 - 2015)	2nd Cycle WFD Pressures	Overall Status (2013-2018)	Overall Status (2016-2021)	Risk Status (2013-2018)	3rd Cycle WFD Pressures
Athboy	Good	-	Good	Good	At risk	Agriculture

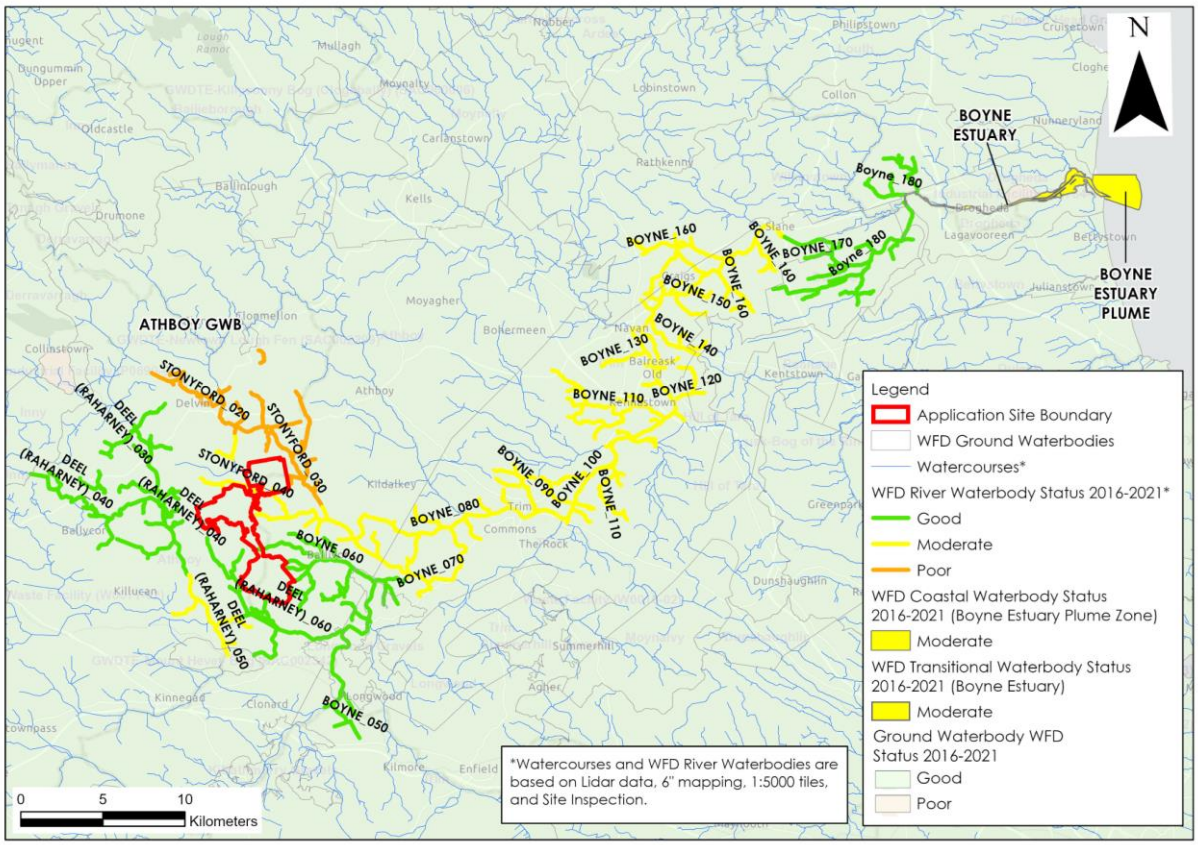

Figure B: WFD Groundwater and Surface Waterbody Status (2016-2021)

2.5 PROTECTED AREA IDENTIFICATION

The WFD requires that activities are also in compliance with other relevant legislation, as considered below.

The potential effect of the Proposed Development on nature conservation designations, bathing waters, nutrient sensitive areas (NSAs), shellfish areas and drinking water protected area's (DWPAs) are also included as part of the WFD Compliance Assessment.

2.5.1 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 site is not located within a Ramsar site or a designated site of national (Natural Heritage Area (NHA) / Proposed Natural Heritage Area (pNHA)) or European importance (Special Area of Conservation (SAC) / Special Protection Area (SPA).

However, there are downstream hydrological connections with some Natura 2000 sites within the River Boyne surface water catchment. Designated sites that lie downstream of the proposed site include:

- River Boyne and River Blackwater SAC (Site Code: 002299), is hydrologically linked within the proposed site as the Deel (Raharney), Stonyford and Boyne rivers are included within the SAC;
- River Boyne and River Blackwater SPA (Site Code: 004232), is hydrologically linked within the proposed site as the Deel (Raharney), Stonyford and Boyne rivers are included within the SAC;
- Boyne Woods pNHA (Site Code: 001592), 26km northeast of Lisclogher Bog and to the east of Navan Town along the River Boyne;
- Crewbane March pNHA (Site Code: 000553), 35km northeast of Lisclogher Bog along the River Boyne;
- Dowth Wetland pNHA (Site Code: 001861), 40km northeast of Lisclogher Bog;
- Boyne River Islands pNHA (Site Code: 001862), 42km northeast of Lisclogher Bog and to the west of Drogheda; and,
- Boyne Coast and Estuary SAC and pNHA(Site Code: 001957), 48km northeast of the Lisclogher Bog.

Other protected sites located in the vicinity of the proposed site but are not directly linked via surface water pathways are considered below:

- Mount Hevey Bog SAC and Mount Hevey Bog pNHA is located approximately 3.4km west of the proposed site.
- The Royal Canal pNHA is located approximately 1.3km southwest of the proposed site.

2.5.2 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 water sites located in the vicinity of the proposed site. The closest protected bathing waters are located at Portrane - Brook Beach (IEEABWC020_0000_0200), ~60km west (as the crow flies) of proposed site.

2.5.3 Nutrient Sensitive Areas

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

The Boyne River NSA (IERI_EA_1994_0001) and the Boyne Estuary NSA (IE_EA_010_0100) are mapped downstream of the proposed site. The Boyne River NSA is mapped to begin within the Boyne_100 river sub-basin, approximately 16km downstream of the proposed site. 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 Boyne Catchment Report (2021, EPA) the NSA objectives are being met for the River Boyne and Boyne Estuary within the catchment.

2.5.4 Shellfish Area

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 areas located in the vicinity of the proposed site. The proposed site is ~60km west (as the crow flies) of Balbriggan\Skerries (IE_EA_020_0000), the nearest protected shellfish area.

2.5.5 Drinking Water

According to the 3rd Cycle Draft Boyne Catchment Report (EPA, 2021) there are 12 no. surface waterbodies in the catchment identified as Drinking Water Protected Areas (DWPAs).

The Stoneyford_040 (IE_EA_07S020400) SWB mapped within the proposed site is identified as a DWPA. Further downstream the Boyne_100 SWB (IE_EA_07B041500), the Boyne_120 SWB (IE_EA_07B041700) and the Boyne_180 SWB (IE_EA_07B042200) are also recognised as DWPA's.

Meanwhile, all GWBs within the catchment, including the Athboy GWB, are listed as DWPAs.

3. WFD SCREENING

As discussed in **Section 2**, there are a total of 22 no. surface water bodies that are located in the vicinity or downstream of the proposed site. In addition, 1 no. groundwater body underlies the proposed site. Furthermore there are several protected areas within the vicinity and downstream of the proposed site including a number of nature conservation designated sites, NSA's and DWPA's.

3.1 SURFACE WATER BODIES

As shown in **Figure A** above, there are 20 no. river water bodies, 1 no. transitional waterbody and 1 no. coastal waterbody located downstream of the proposed site.

With consideration for the construction, operational and decommissioning phases of the Proposed Development, it is considered that due to their proximal location to the proposed site and the occurrence of proposed infrastructure within their respective catchments, that the Deel(Raharney)_060 and Stonyford River (Stonyford_020, 030 and _040) are carried through to the WFD Impact Assessment. The Deel(Raharney)_030 _040 and _050 SWBs have been screened out due to the lack of Proposed Development infrastructure in their upstream catchments.

Furthermore all sections of the Boyne River downstream of the proposed site and upstream of Trim (i.e. Boyne_050 to _080) will be carried through to the WFD Impact Assessment. The southern section of the proposed site drains directly to the Boyne_060 SWB. Meanwhile the Boyne_050 and Boyne_070 and _080 SWBs lie downstream and in close proximity (<10km) from the proposed site.

The Boyne River downstream of the town of Trim has been screened out due to its distant location (>10km) from the proposed site and the increasing volumes of water within the Boyne River. In addition the Boyne Estuary transitional waterbody and the Boyne Estuary Plume coastal waterbody have been screened out due to their distant location, the large volumes of water within these surface waterbodies and the saline nature of these waters. The Proposed Development has no potential to cause a deterioration in the status of these surface waterbodies and/or jeopardise the attainment of good surface water status in the future.

Regarding the SWBs which have been screened in the potential for the Proposed Development to impact these waterbodies will vary. This will be dependent on the nature of the activities within the upstream catchment area to a specific waterbody. As shown in **Table A** the waterbodies with the greatest potential to be impacted by the Proposed Development are the Stonyford_040 and Deel(Raharney)_060 SWBs.

3.2 GROUNDWATER BODIES

With respect to groundwater bodies, the Athboy GWB will be carried through to the WFD Impact Assessment due to its proximal location directly underlying the Ballivor Bog Group.

3.3 PROTECTED AREAS

The proposed site is hydrologically connected to the River Boyne and River Blackwater SAC and SPA via several drains and streams which flow from the bog areas into the Deel (Raharney), Stonyford and Boyne rivers. With consideration for the construction, operational and decommissioning phases of the Proposed Development, it is considered that the River

Boyne and River Blackwater SAC and SPA are carried through into the WFD Impact Assessment.

Several other designated sites, listed in **Section 2.5.1**, are located further downstream along the River Boyne and are therefore also hydrologically connected with the proposed site. However, these designated sites are located significant distances (>25km) from the proposed site. Therefore, there is no potential for the Proposed Development to impact any of these designated sites and so have been screened out. Consequently, the River Boyne and River Blackwater SAC/SPA remain the primary sensitive receptors due to their proximity to the proposed site and the direct hydrological linkage.

The Mount Hevey Bog SAC and Mount Hevey Bog pNHA is a raised bog and is located upgradient of any drainage from the proposed site. In addition, the River Deel acts as a hydraulic barrier between the proposed site and Hevey Bog. Therefore no hydrological or hydrogeological impacts will occur on this designated site as a result of the Proposed Development.

The Royal Canal pNHA is located approximately 1.3km southwest of the proposed site. The River Deel acts as a hydraulic barrier between the proposed site and this pNHA. Therefore, no hydrological or hydrogeological impacts will occur on this designated site as a result of the Proposed Development.

The Boyne River NSA downstream of the town of Trim has been screened out due to its distant location (>10km) from the proposed site and the increasing volumes of water within the Boyne River. In addition, the Boyne Estuary NSA has been screened out due to its distant location, the large volumes of water within the surface waterbody and the saline nature of these waters. The Proposed Development has no potential to cause a deterioration in the status of these NSAs.

With consideration for the construction, operational and decommissioning phases of the Proposed Development, it is considered that the Stonyford_040 DWPA is carried through into the WFD Impact Assessment due to its proximal location to the proposed site and the occurrence of proposed infrastructure within the Stonyford_040 sub basin.

The bathing waters at Portrane, the Brook Beach and Shellfish areas at Balbriggan\Skerries, have been screened out due to their distal location from the proposed site. The Proposed Development has no potential to cause a deterioration to these bathing or shellfish protected areas.

3.4 WFD SCREENING SUMMARY

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

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

Type	WFD Classification	Waterbody Name/ID	Inclusion in Assessment	Justification
Surface Water Body	River	Deel(Raharney)_030	No	While the northwest of Bracklin Bog (i.e. Bracklin West) is located in the Deel(Raharney)_030 river sub-basin, no Proposed Development infrastructure is located in the catchment to this SWB. All works associated with the Proposed Development are located downstream of the Deel(Raharney)_030 SWB. Therefore, the Deel(Raharney)_030 SWB has been screened out as the Proposed Development has no potential to impact the status of this SWB.
	River	Deel(Raharney)_040	No	A small area in the northwest of Bracklin Bog (i.e. Bracklin West) is also mapped in the Deel(Raharney)_040 river sub-basin. However, no Proposed Development infrastructure is located in the catchment to this SWB. All works associated with the Proposed Development are located downstream of the Deel(Raharney)_040 SWB. Therefore, the Deel(Raharney)_040 SWB has been screened out as the Proposed Development has no potential to impact the status of this SWB.
	River	Deel(Raharney)_050	No	The Deel(Raharney)_050 SWB is located directly downstream of the Deel(Raharney)_040 SWB. No works associated with the Proposed Development are located in the upstream catchment to this SWB. Therefore, the Deel(Raharney)_050 SWB has been screened out as the Proposed Development has no potential to impact the status of this SWB.
	River	Deel(Raharney)_060	**Yes**	The southwest of the proposed site (the southwest of Bracklin Bog and the west of Ballivor Bog) is located within the Deel(Raharney)_060 river sub-basin. In terms of proposed infrastructures a total of 9 no. turbines, 1 no. met mast, 1 no. borrow pit and 2 no. construction compounds are located within this sub-basin. An assessment is required to consider the potential impacts of the Proposed Development on this SWB.
	River	Boyne_050	**Yes**	The Boyne_050 SWB is located directly downstream of the Deel(Raharney)_060 SWB and in close proximity to the proposed site (~3.5km). An assessment is required to consider the potential impacts of the Proposed Development on this SWB.
	River	Stonyford_020	**Yes**	The northwest of Lisclogher Bog drains to the north into the Stonyford_020 SWB (refer to Section 9.3.3 of the EIAR). Therefore, an assessment is required to consider the potential impacts of the Proposed Development on this SWB.
	River	Stonyford_030	**Yes**	The north of Lisclogher Bog is located within the catchment of the Stonyford_030 SWB. In terms of proposed infrastructures, 1 no. turbine is located within this sub-basin. An assessment is required to consider the potential impacts of the Proposed Development on this SWB.
	River	Stonyford_040	**Yes**	A large area of the proposed site, including the majority of Lisclogher, Bracklin and Carranstown bogs, is located within the Stonyford_040 river sub-basin. In terms of proposed infrastructure a total of 13 no. turbines, 3 no. construction compounds, 1 no. substation, 1 no. met mast, 2 no. borrow pits and an amenity car park are located in this sub-basin. An assessment is required to consider the potential impacts of the Proposed Development on this SWB.
	River	Boyne_060	**Yes**	The south of Carranstown Bog and the east of Ballivor Bog are located within the catchment of the Boyne_060 SWB. In terms of proposed infrastructures a total of 3 no. turbines are located

				within this river sub-basin. An assessment is required to consider the potential impacts of the Proposed Development on this SWB.
	River	Boyne_070	**Yes**	The Boyne_070 SWB is located directly downstream of the Stonyford_040 and Boyne_060 SWBs and in close proximity to the proposed site (~6.8km). An assessment is required to consider the potential impacts of the Proposed Development on this SWB.
	River	Boyne_080	**Yes**	The Boyne_080 SWB is located directly downstream of the Boyne_070 SWB and in close proximity to the proposed site (~10km). An assessment is required to consider the potential impacts of the Proposed Development on this SWB.
	River	Boyne_090	No	The Boyne_090 SWB has been screened out due to its distal location from the proposed site (~13km) and the increasing volumes of water within the River Boyne associated with its increasing upstream catchment area. Therefore the Proposed Development has no potential to impact the status of this SWB.
	River	Boyne_100	No	The Boyne_100 SWB has been screened out due to its distal location from the proposed site (~16km) and the increasing volumes of water within the River Boyne associated with its increasing upstream catchment area. Therefore the Proposed Development has no potential to impact the status of this SWB.
	River	Boyne_110	No	The Boyne_110 has been screened out due to its distal location from the proposed site (~20km) and the increasing volumes of water within the River Boyne associated with its increasing upstream catchment area. Therefore the Proposed Development has no potential to impact the status of this SWB.
	River	Boyne_120	No	The Boyne_120 SWB has been screened out due to its distal location from the proposed site (~23km) and the increasing volumes of water within the River Boyne associated with its increasing upstream catchment area. Therefore the Proposed Development has no potential to impact the status of this SWB.
	River	Boyne_130	No	The Boyne_130 SWB has been screened out due to its distal location from the proposed site (~23km) and the increasing volumes of water within the River Boyne associated with its increasing upstream catchment area. Therefore the Proposed Development has no potential to impact the status of this SWB.
	River	Boyne_140	No	The Boyne_140 SWB has been screened out due to its distal location from the proposed site (~22.5km) and the increasing volumes of water within the River Boyne associated with its increasing upstream catchment area. Therefore the Proposed Development has no potential to impact the status of this SWB.
	River	Boyne_150	No	The Boyne_150 SWB has been screened out due to its distal location from the proposed site (~24km) and the increasing volumes of water within the River Boyne associated with its increasing upstream catchment area. Therefore the Proposed Development has no potential to impact the status of this SWB.
	River	Boyne_160	No	The Boyne_160 SWB has been screened out due to its distal location from the proposed site (~29km) and the increasing volumes of water within the River Boyne associated with its increasing upstream catchment area. Therefore the Proposed Development has no potential to impact the status of this SWB.

	River	Boyne_170	No	The Boyne_170 SWB has been screened out due to its distal location from the proposed site (~33km) and the increasing volumes of water within the River Boyne associated with its increasing upstream catchment area. Therefore the Proposed Development has no potential to impact the status of this SWB.
	River	Boyne_180	No	The Boyne_180 SWB has been screened out due to its distal location from the proposed site (~36km) and the increasing volumes of water within the River Boyne associated with its increasing upstream catchment area. Therefore the Proposed Development has no potential to impact the status of this SWB.
	Transitional	Boyne Estuary	No	The Boyne Estuary transitional waterbody has been screened out due to its distal location from the proposed site, the large volume of water within the estuary and the saline nature of its water. Therefore the Proposed Development has no potential to impact the status of this SWB.
	Coastal	Boyne Estuary Plume	No	The Boyne Estuary Plume coastal waterbody has been screened out due to its distal location from the proposed site, the large volumes of water within the surface waterbody and the saline nature of its water. Therefore the Proposed Development has no potential to impact the status of this SWB.
Groundwater Body	Groundwater	Athboy	**Yes**	The proposed site and all associated infrastructure immediately overlies the Athboy GWB. An assessment is required to consider the impacts of the Proposed Development on this GWB.
Protected Areas	Nature Conservation Designations	River Boyne and River Blackwater SAC & SPA	**Yes**	The proposed site is hydrologically connected to the River Boyne and River Blackwater SAC and SPA via several drains and streams which flow from the bog areas into the Deel (Raharney), Stonyford and Boyne rivers. An assessment is required to consider the potential impacts of the Proposed Development on this designated site.
		Boyne Woods pNHA	No	The Boyne Woods pNHA has been screened out due to its distal location from the proposed site (>25km). Therefore the Proposed Development has no potential to impact the pNHA.
		Crewbane March pNHA	No	The Crewbane March pNHA has been screened out due to its distal location from the proposed site (>25km). Therefore the Proposed Development has no potential to impact the pNHA.
		Dowth Wetland pNHA	No	The Dowth Wetland pNHA has been screened out due to its distal location from the proposed site (>25km). Therefore the Proposed Development has no potential to impact the pNHA.
		Boyne River Islands pNHA	No	The Boyne River Islands pNHA has been screened out due to its distal location from the proposed site (>25km). Therefore the Proposed Development has no potential to impact the pNHA.
		Boyne Coast and Estuary SAC & pNHA	No	The Boyne Coast and Estuary SAC and pNHA has been screened out due to its distal location from the proposed site (>25km). Therefore the Proposed Development has no potential to impact the designated site.
		Mount Hevey Bog SAC & pNHA	No	Mount Hevey Bog SAC & pNHA is located upgradient of the proposed site. In addition, the River Deel acts as a hydraulic barrier between the proposed site and Hevey Bog. Therefore no hydrological or hydrogeological impacts will occur on this designated site.
		Royal Canal pNHA	No	The Royal Canal pNHA is located approximately 1.3km southwest of the proposed site. The River Deel acts as a hydraulic barrier between the proposed site and the pNHA. Therefore, no hydrological or hydrogeological impacts will occur on this designated site.
	Bathing Waters	Portrane, the Brook Beach	No	Portrane, the Brook Beach bathing waters have been screened out due to its distal location from the proposed site (>60km). The Proposed Development has no potential to

				impact these Bathing Waters
	Nutrient Sensitive Areas	Boyne River NSA	No	The Boyne River NSA has been screened out due to its distal location from the proposed site (~16km) and the increasing volumes of water within the River Boyne. Therefore the Proposed Development has no potential to impact the status of this NSA.
		Boyne Estuary NSA	No	The Boyne Estuary NSA has been screened out due to its distal location from the proposed site, the large volume of water within the estuary and the saline nature of its water. Therefore the Proposed Development has no potential to impact the status of this NSA.
	Shellfish Areas	Balbriggan\Skerries	No	Balbriggan\Skerries shellfish area has been screened out due to its distal location from the proposed site (>60km). The Proposed Development has no potential to impact this Shellfish Area.
	Drinking Water Protected Areas.	Stonyford_040	**Yes**	A large area of the proposed site, including the majority of Lisclogher, Bracklin and Carranstown bogs, is located within the Stonyford_040 river sub-basin. In terms of proposed infrastructure a total of 13 no. turbines, 3 no. construction compounds, 1 no. substation, 1 no. met mast, 2 no. borrow pits and an amenity car park are located in this sub-basin. An assessment is required to consider the potential impacts of the Proposed Development on this DWPA.
		Boyne_100	No	The Boyne_100 DWPA has been screened out due to its distal location from the proposed site (~16km) and the increasing volumes of water within the River Boyne. Therefore the Proposed Development has no potential to impact the status of this DWPA.
		Boyne_120	No	The Boyne_120 DWPA has been screened out due to its distal location from the proposed site (~23km) and the increasing volumes of water within the River Boyne. Therefore the Proposed Development has no potential to impact the status of this DWPA.
		Boyne_180	No	The Boyne_180 DWPA has been screened out due to its distal location from the proposed site (~36km) and the increasing volumes of water within the River Boyne. Therefore the Proposed Development has no potential to impact the status of this DWPA.

4. WFD COMPLIANCE ASSESSMENT

4.1 PROPOSALS

The Proposed Development consists of 26 no. wind turbines and associated infrastructure including hardstands, 2 no. meteorological masts, 4 no. temporary construction compounds, 2 no. borrow pits, a 110kV substation, 3 no. permanent amenity carparks as well as access roads and all associated development and drainage works. Please refer to Chapter 4 of the EIAR for a full description of the Proposed Development.

Due to the nature of wind farm developments 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 at the proposed site will be from cementitious materials, hydrocarbon spillage and leakages, and potential piling works.

The primary risk to surface waters will be entrained suspended sediments (peat and soil particles) in site runoff during earthworks and tree felling along with chemical pollution of surface waters by concrete, oil and or fuels.

4.2 POTENTIAL EFFECTS

4.2.1 Construction Phase (Unmitigated)

4.2.1.1 Potential Surface Water Quality Effects During Earthworks

Construction phase activities including access road construction, turbine base/hardstanding construction, construction compound construction, meteorological mast construction, substation and grid connection construction, internal cable route excavations, amenity paths construction, entrance locations and amenity car parks will require varying degrees of earthworks resulting in excavation of peat and mineral subsoil where present. These activities can result in the release of suspended solids to surface water and could result in an increase in the suspended sediment load, resulting in increased turbidity which in turn could affect the water quality in downstream water bodies.

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

The release of effluent from on-site temporary staff welfare facilities has the potential to effect downstream surface water quality.

Therefore, construction phase activities could result in an increase in the suspended sediment load, resulting in increased turbidity, increased pH and contamination which could affect the water quality and fish stocks of downstream water bodies such as the Stonyford, Deel(Raharney) and Boyne Rivers.

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

Table E: Surface Water Quality Effects During Construction Phase (Unmitigated)

SWB	WFD Code	WFD Status (2016-2021)	Assessed Potential Status Change
Deel(Raharney)_060	IE_EA_07D010600	Good	Moderate
Boyne_050	IE_EA_07B040800	Good	Good
Boyne_060	IE_EA_07B040900	Good	Moderate
Stonyford_020	IE_EA_07S020075	Poor	Bad
Stonyford_030	IE_EA_07S020100	Poor	Bad
Stonyford_040	IE_EA_07S020400	Moderate	Poor
Boyne_070	IE_EA_07B041000	Moderate	Moderate
Boyne_080	IE_EA_07B041200	Moderate	Moderate

4.2.1.2 Groundwater Quality Effects

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

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

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

Table F: Groundwater Quality Effects During Construction Phase (Unmitigated)

GWB	WFD Code	WFD Status (2013-2018)	Assessed Potential Status Change
Athboy	IE_EA_G_001	Good	Moderate

4.2.1.3 Groundwater Quantity Effects

Temporary dewatering may be required during the construction phase of the Proposed Development during the excavation of turbine base foundations as well as the excavations to facilitate the construction of the substations and construction compounds. Dewatering will also be required at the proposed borrow pit locations. These dewatering works have the potential to impact local groundwater levels.

No groundwater level impacts are anticipated from the construction of the underground cabling trench between the proposed turbines and the substation due to the shallow nature of the excavation (i.e. ~1.2m).

A summary of potential status change to GWBs arising from potential groundwater quantity impacts during the construction phase of the Proposed Development in the unmitigated scenario are outlined in **Table G**.

Table G: Groundwater Quantity Effects During Construction Phase (Unmitigated)

GWB	WFD Code	WFD Status (2013-2018)	Assessed Potential Status Change
Athboy	IE_EA_G_001	Good	Moderate

4.2.1.4 Potential Effects on the River Boyne and River Blackwater SAC & SPA

The surface water connections from the proposed site to the Deel, Stoneyford and Boyne rivers could transfer poor quality surface water that may affect the conservation objectives of the designated sites.

The qualifying interests of the SAC, as listed below, have the potential to be affected as these are associated directly with the river system.

- [7230] Alkaline Fens
- [91E0] Alluvial Forests
- [1099] River Lamprey (Lampetra fluviatilis)
- [1106] Atlantic Salmon (Salmo salar)
- [1355] Otter (Lutra lutra)

However, with regards the SPA, it is noted that even if some material was to enter the local watercourses of the Deel, Stoneyford and Boyne rivers, the actual Special Conservation Interests of the SPA, as listed below, would not be affected as the species are not associated with watercourses:

- • A229 Kingfisher

It can be concluded that the Proposed Development may have the potential to affect the qualifying interests of the River Boyne and River Blackwater SAC in an unmitigated scenario throughout the construction phase.

4.2.1.5 Potential Effects on the Stonyford_040 DWPA

Construction phases activities as described above in **Section 4.2.1.1,** could result in an increase in the suspended sediment load, resulting in increased turbidity, increased pH and contamination which could affect the water quality in the Stonyford River, therefore impacting on the Stonyford_040 DWPA.

4.2.2 Operational Phase (Unmitigated)

4.2.2.1 Increased Site Runoff and Hydromorphology Effects on Surface Water Bodies

Progressive replacement of the soil, peat or vegetated surface with impermeable surfaces could potentially result in an increase in the proportion of surface water runoff reaching the surface water drainage network. This could potentially increase runoff from the proposed site and increase flood risk downstream of the development. In reality, the access roads will have a higher permeability than the underlying peat.

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 stage of the Proposed Development in the unmitigated scenario are outlined in **Table H**.

Table H: Potential Effect on Surface Water Flows During Operational Phase (Unmitigated)

SWB	WFD Code	WFD Status (2016-2021)	Assessed Potential Status Change
Deel(Raharney)_060	IE_EA_07D010600	Good	Moderate
Boyne_050	IE_EA_07B040800	Good	Good
Boyne_060	IE_EA_07B040900	Good	Moderate
Stonyford_020	IE_EA_07S020075	Poor	Bad
Stonyford_030	IE_EA_07S020100	Poor	Bad
Stonyford_040	IE_EA_07S020400	Moderate	Poor
Boyne_070	IE_EA_07B041000	Moderate	Moderate
Boyne_080	IE_EA_07B041200	Moderate	Moderate

4.2.2.2 Surface Water Quality Effects from Site Maintenance

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

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

Table I: Surface Water Quality Effects During Operational Phase (Unmitigated)

SWB	WFD Code	WFD Status (2016-2021)	Assessed Potential Status Change
Deel(Raharney)_050	IE_EA_07D010400	Moderate	Poor
Deel(Raharney)_060	IE_EA_07D010600	Good	Moderate
Boyne_050	IE_EA_07B040800	Good	Good
Boyne_060	IE_EA_07B040900	Good	Moderate

Stonyford_020	IE_EA_07S020075	Poor	Bad
Stonyford_030	IE_EA_07S020100	Poor	Bad
Stonyford_040	IE_EA_07S020400	Moderate	Poor
Boyne_070	IE_EA_07B041000	Moderate	Moderate
Boyne_080	IE_EA_07B041200	Moderate	Moderate

4.2.2.3 Groundwater Quality Effects from Operational Site Maintenance

The risks to groundwater quality are the same as those described in **Section 4.2.1.2** but of a lesser extent than during the construction phase due to the limited activity at the proposed site with only minor maintenance required during the operational phase. There will be no groundwater quality impacts along the proposed Grid Connection route.

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

Table J: Groundwater Quality Effects During Operational Phase (Unmitigated)

GWB	WFD Code	WFD Status (2016-2021)	Assessed Potential Status Change
Athboy	IE_EA_G_001	Good	Good

4.2.2.4 Potential River Boyne and River Blackwater SAC & SPA Impacts

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

Therefore, the risk of surface water connections from the proposed site to the Deel, Stoneyford and Boyne rivers that could transfer poor quality surface water that may affect the conservation objectives of the designated sites is reduced.

4.2.2.5 Potential Stonyford_040 DWPA Impacts

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

Therefore, the risk of surface water connections from the proposed site to the Stoneyford_040 DWPA is reduced.

4.3 MITIGATION MEASURES

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

4.3.1 Construction Phase

4.3.1.1 Mitigation Measures to Protect Surface Water Quality

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

During the construction phase of the Proposed Development, excavations will be limited to minimise the generation of spoil. Sediment will be generated where excavations are required (turbine and substation foundations) and dirty water from these work areas will be routed via drains to settlement ponds for treatment and removal of suspended solids prior to release into the existing bog drainage network. There will be no direct or untreated discharge from construction work areas into the existing bog drainage network.

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

Table K: Summary of Drainage Mitigation & their Application

Management Type	Description of SuDs drainage control method	Applicable Works Area
Avoidance Controls:	• Application of 50m buffer zones to natural watercourses where possible; • Application of 10m buffer zones to main drains where possible; • Using small working areas; • 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, diversion drains and culvert pipes; • Erosion and velocity control measures such as: o sand bags; o oyster bags filled with gravel; o filter fabrics; and o other similar/equivalent or appropriate systems • Using small working areas.	Construction work areas where sediment is being generated.
	• Using small working areas; • Surrounding temporary stockpiles with silt fencing; • Weathering off / sealing peat stockpiles.	Stockpiles areas
In-Line Controls:	• Interceptor drains and/or collector drains/OTE drainage; • Erosion and velocity control measures such as: o sand bags; o oyster bags filled with gravel; o silt fences / filter fabrics; o check dams / weirs or baffles; o and/or other similar/equivalent or appropriate systems; • In stream sedimats; • Collection sumps, temporary sumps, pumping systems; • Attenuation ponds; • Sediment traps, stilling / settlement ponds.	Interceptor and collection drainage systems
Water Treatment Controls:	• Silt fencing; • Temporary sumps / Attenuation ponds;	Surface water treatment locations

	• Sediment traps, Stilling / Settlement ponds; • Proprietary settlement systems such as Siltbuster, and/or other similar/equivalent or appropriate systems; • Silt dewatering bags.	
Outfall Controls:	• Levelspreaders; • Buffered outfalls; • Vegetation filters; • Silt dewatering bags; • Flow limiters and weirs.	Drainage run outfalls and overland discharge points

Each element of the wind farm development (*i.e.,* access roads, turbines and borrow pits etc.) will have an array of drainage control measures to ensure protection of downstream watercourses. Surface water quality protection is not reliant on just one element of the proposed drainage management system. Each drainage control element is not stand alone but occurs as part of a treatment train of control systems (i.e., check dams, silt traps, settlement ponds etc).

4.3.1.2 Mitigation Measures to Protect Against the Release of Hydrocarbons

The potential pollution of ground and surface water 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 they are leak free and in good working order prior to use on 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 or truck will be re-filled off site and will be towed/driven around the proposed site to where machinery is located. The 4x4 jeep/fuel truck will also carry fuel absorbent materials for the event of any accidental spillages. The fuel bowser will be parked in a designated location on a level area in the construction compound when not in use and only designated trained and competent operatives will be authorised to refuel plant on site. Mobile measures such as drip trays and fuel absorbent mats will be available during all refuelling operations and used when required;
- Fuel volumes stored on site will be minimised. Any storage areas will be bunded appropriately for the fuel storage volume during the construction phase;
- An emergency plan for the construction phase to deal with accidental spillages will be contained within the Construction Environmental Management Plan. Spill kits will be available to deal with accidental spillages.

4.3.1.3 Mitigation Measures to Prevent Release of Cement-Based Products

Best practice methods for cement-based compounds:

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

4.3.1.4 Mitigation Measures to Prevent the Release of Wastewater

The best practice methods for wastewater management at the 4 no. proposed on-site 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 site construction compounds, maintained by the providing contractor, and removed from the proposed site on completion of the construction works;
- Water supply for the site office and other sanitation will be brought to the proposed site and removed after use from the proposed site to be discharged at a suitable off-site treatment location; and,
- No water or wastewater will be sourced at the proposed site, nor discharged to the proposed site.

4.3.1.5 Mitigation to Prevent the Release of Cement-Based Products

Best practice methods for cement-based compounds:

- No batching of wet-cement products on-site is proposed. Ready-mixed supply of wet concrete products and where possible, emplacement of pre-cast elements, will be the design approach;
- Where possible pre-cast elements for culverts and concrete works will be used;
- No washing out of the main body of any plant used in concrete transport or concreting operations will be allowed on-site;
- Where concrete is delivered on site, only the concrete truck chute will be cleaned, using the smallest volume of water possible. No discharge of cement contaminated waters to the construction phase drainage system or directly to any artificial drain or watercourse will be allowed. Chute cleaning water will be isolated in temporary lined wash-out pits located near proposed site compounds. These temporary lined wash-out pits will be removed from the proposed site once their utility is no longer required or at the end of the construction phase;
- Any washing out of concrete pumping plant will also be into the temporary lined wash-out pits.
- Weather forecasts will be used to plan dry days for pouring concrete; and,
- Construction contractors will ensure each concrete pour site is free of standing water and plastic covers will be available in case of a sudden rainfall event.

4.3.1.6 Mitigation Measures to Protect River Boyne and River Blackwater SAC & SPA

The potential for elevated levels on suspended solids and other pollutants such as hydrocarbons to enter the local surface water network is negligible as mitigation controls, described in **Sections 4.3.1** above, will be implemented during the construction phase. These mitigation measures include the use of interceptor drains, collector drains, silt fences, silt traps, check dams and settlement ponds. Mitigation measures will also be implemented to precent the release of hydrocarbons.

With the implementation of these mitigation measures and with adherence to best practice methods during the construction of the Proposed Development, the potential for the project to effect the qualifying interests of the River Boyne and River Blackwater SAC & SPA is not significant.

4.3.1.7 Mitigation Measures to Protect Stonyford_040 DWPA

The potential for elevated levels on suspended solids and other pollutants such as hydrocarbons to enter the local surface water network is negligible as mitigation controls, described in **Sections 4.3.1** above, will be implemented during the construction phase. These

mitigation measures include the use of interceptor drains, collector drains, silt fences, silt traps, check dams and settlement ponds. Mitigation measures will also be implemented to precent the release of hydrocarbons.

With the implementation of these mitigation measures and with adherence to best practice methods during the construction of the Proposed Development, the potential for the project to effect the Stonyford_040 DWPA is not significant.

4.3.2 Operational Phase

4.3.2.1 Increased Site Runoff and Hydromorphology Effects

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

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

4.3.2.2 Mitigation Measures to Protect Surface Water Quality

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

Mitigation measures for oils and fuels during the operational phase of the Proposed Development are the same as those outlines in **Section 4.3.1.2** above.

4.3.2.3 Mitigation Measures to Protect Groundwater Quality

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

4.3.2.4 Mitigation Measures to Protect River Boyne and River Blackwater SAC & SPA

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

Mitigation measures for oils and fuels during the operational phase of the Proposed Development are the same as those outlines in **Section 4.3.1.2** above.

It can be concluded that with best practice methods adhered to during the operation phase of the Proposed Development, the potential for the project to impact upon the qualifying interests of the River Boyne and River Blackwater SAC & SPA is not significant.

4.3.2.5 Mitigation Measures to Protect Stonyford_040 DWPA

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

Mitigation measures for oils and fuels during the operational phase of the Proposed Development are the same as those outlines in **Section 4.3.1.2** above.

It can be concluded that with best practice methods adhered to during the operation phase of the Proposed Development, the potential for the project to impact upon the Stonyford_040 DWPA is not significant.

4.3.3 Decommissioning Phase

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

During 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.

The proposed site roadways will be kept and maintained following decommissioning of the wind farm infrastructure, as these will be utilised for amenity and recreational purposes.

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

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

Other impacts such as possible 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 4.3.1.2 and 4.3.1.3 for the construction stage 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 Development in place where appropriate. The turbine bases will be rehabilitated by covering with local topsoil/peat in order to regenerate vegetation which will reduce runoff and sedimentation effects.

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

4.3.4 Potential Effects with the Implementation of Mitigation

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

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

SWB	WFD Code	WFD Status (2013-2018)	Assessed Status – Unmitigated	Assessed Status – with Mitigation Measures
Deel(Raharney)_050	IE_EA_07D010400	Moderate	Poor	Moderate
Deel(Raharney)_060	IE_EA_07D010600	Good	Moderate	Good
Boyne_050	IE_EA_07B040800	Good	Good	Good
Boyne_060	IE_EA_07B040900	Good	Moderate	Good
Stonyford_020	IE_EA_07S020075	Poor	Bad	Poor
Stonyford_030	IE_EA_07S020100	Poor	Bad	Poor
Stonyford_040	IE_EA_07S020400	Moderate	Poor	Moderate
Boyne_070	IE_EA_07B041000	Moderate	Moderate	Moderate
Boyne_080	IE_EA_07B041200	Moderate	Moderate	Moderate
Athboy	IE_EA_G_001	Good	Moderate	Good

5. SUMMARY AND CONCLUSION

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

1 no. groundwater body underlies the proposed site *i.e.,* Ardboy GWB. Due to the local hydrogeological regime, characterized by high runoff rates and low rates of groundwater recharge, this GWB is less susceptible to potential effects arising from the Proposed Development than nearby surface waterbodies. Surface watercourses downstream of the proposed site will be susceptible to effects from the Proposed Development due to the presence of surface water pathways between the proposed site and these downstream receptors.

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

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

Furthermore, with the implementation of the proposed mitigation measures, there will be no potential effects on any downstream protected areas as a result of the Proposed Development.

As such, the Proposed Development:

- will not cause a deterioration in the status of all surface and groundwater bodies assessed;
- will not jeopardise the objectives to achieve 'Good' surface water/groundwater status;
- does not jeopardise the attainment of 'Good' surface water/groundwater chemical status;
- does not jeopardise the attainment of 'Good' surface water/groundwater quantity status;
- does not permanently exclude or compromise the achievement of the objectives of the WFD in other waterbodies within the same river basin district;
- is compliant with the requirements of the Water Framework Directive (2000/60/EC); and,
- is consistent with other Community Environmental Legislation including the EIA Directive (2014/52/EU), the Habitats Directive (92/43/EEC) and the Birds Directive (2009/147/EC) (Note that a full list of legislation complied with in relation to hydrology and hydrogeology is included in Section 9.1.4 of EIAR Chapter 9).

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