APPENDIX 9-2

WFD ASSESSMENT REPORT

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WATER FRAMEWORK DIRECTIVE ASSESSMENT
UMMA MORE RENEWABLE ENERGY DEVELOPMENT, CO. WESTMEATH

FINAL REPORT

Prepared for:
Umma More Ltd

Prepared by:
HYDRO-ENVIRONMENTAL SERVICES

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1. INTRODUCTION

1.1 BACKGROUND

Hydro-Environmental Services (HES) were requested by MKO, acting on behalf of Umma More Ltd, to complete a Water Framework Directive (WFD) Compliance Assessment for a planning application for the proposed Umma More Renewable Energy Development, the Proposed Development (Wind Farm Site and Grid Connection). The Wind Farm Site is located approximately 3.5km southwest of Ballymore village and 14km northwest of Athlone (distance from proposed Wind Farm Site boundary). The townlands in which the proposed Wind Farm Site is located are listed in Table 1-1 in Chapter 1 of the EIAR.

The underground electrical cabling route includes for a substation and temporary construction compound located within the Wind Farm Site and associated underground electrical cabling route situated between the proposed onsite substation and the Thornsberry 110KV substation. The underground electrical cabling route is ~31km long located along local and regional roads and the N52 road.

The full description of the Proposed Development is provided in Chapter 4 of this EIAR. As detailed in Section 1.1.1 in Chapter 1, for the purposes of this EIAR, the various project components are described and assessed using the following references: 'Proposed Development', 'the Site', 'Wind Farm Site' and 'Grid Connection'.

The purpose of this WFD assessment is to determine if any specific components or activities associated with 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 Site planning application.

1.2 STATEMENT OF AUTHORITY

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

This WFD assessment was prepared by Michael Gill, Adam Keegan, Conor McGettigan and Adrian Tanner.

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

Adam Keegan (BSc, MSc) is a hydrogeologist with three years of experience in the environmental sector in Ireland. Adam has been involved in Environmental Impact Assessment Reports (EIARs) for numerous projects including wind farms, grid connections, quarries and small housing developments. Adam holds an MSc in Hydrogeology and Water Resource Management. Adam has worked on several wind farm EIAR projects, including Croagh WF, Lyrenacarriga WF (SID), Cleanrath WF, Carrownagowan WF (SID), and Fossy WF.

Conor McGettigan (BSc, MSc) is an Environmental Scientist with two years of experience in the environmental sector in Ireland. Conor routinely prepares Environmental Impact Assessment Reports (EIARs), flood risk assessments and Water Framework Directive Assessments for a wide variety of projects including proposed wind farm developments. Conor holds an M.Sc. in Applied Environmental Science (2020) and a B.Sc. in Geology (2016) from University College Dublin.

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. 722/2003).

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.

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

We note that the River Basin Management Plan 2022-2027 was out for public consultation in 2021 and early 2022, and that process closed at the end of March 2022. No further updates are available at present (https://www.gov.ie/en/consultation/2bda0-public-consultation-on-the-draft-river-basin-management-plan-for-ireland-2022-2027/).

2. WATERBODY IDENTIFICATION & CLASSIFICATION

2.1 INTRODUCTION

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

2.2 SURFACE WATERBODY IDENTIFICATION

On a regional scale, the Wind Farm Site is located in the Upper Shannon surface water catchment within Hydrometric Area 26F of the Shannon International River Basin District.

On a more local scale the Wind Farm Site is located in the Inny [Shannon]_SC_090 sub-catchment and 3 no. WFD river sub-basins. A small area in the northwest of the Wind Farm Site is located within the Inny_110 river sub-basin while a small section in the southwest of the Wind Farm Site is mapped within the Dungolman_020 river sub-basin. The vast majority of the Wind Farm Site is situated in the Dungolman_030 river sub-basin.

Within the Dungolman_020 River sub-basin, the southwestern corner of the Wind Farm Site drains into the Dungolman_020 river waterbody. Within the Dungolman_030 river sub-basin, the Dungolman River (Dungolman_030) flows to the northeast between T4 and T5. This watercourse then flows along the EIAR Site Boundary to the east of T2 and T3 before veering to the northeast to the east of T1. Drainage in this river sub-basin is directed towards the Dungolman River via several smaller streams and drains. The Dungolman River continues to flow to the north before discharging into the Tang River approximately 5.15km north of the Wind Farm Site. Here the Tang River is located in the Inny_110 river sub-basin and forms part of the Inny_110 river waterbody. The Tang River then continues to flow to the northwest and eventually discharges into the Inny River approximately 8.3km northwest of the Wind Farm Site. The Inny River drains into the eastern side of Lough Ree.

As stated above, a small section in the northwest of the Wind Farm Site is located within the Inny_110 river sub-basin. This are of the Wind Farm Site drains to the northwest via the Ardnacrany south stream which discharges into the Dungolman River approximately 4.3km north of the Wind Farm Site.

Table A presents the total catchment area of the river waterbodies in the vicinity and downstream of the Wind Farm site. The Dungolman_030 river waterbody has a total upstream catchment of 64.11km^2. The catchment area of river waterbodies increase further downstream as more streams and rivers confluence. Downstream of the Dungolman_030 river, the Inny_110 river waterbody catchment has an area is 1,229km^2.

The Grid Connection (temporary construction compound, onsite substation and underground electrical cabling route) is located within the Upper Shannon (26) and the Lower Shannon (25A) surface water catchments.

On a more local scale, the underground electrical cabling route is located within the Inny (Shannon) SC_090, the Brosna_SC_030, Brosna_SC_020, Silver[Tullamore]_SC_010 and Tullamore_SC_010 sub-catchments and a total of 11 no. WFD river sub-basins.

The underground electrical cabling route starts from the on-site substation which is located in the south of the Wind Farm Site in WFD Dungolman_030 river sub-basin Upper Shannon (26F) surface water catchment. The underground electrical cabling route then enters the Ballynagrenia Stream_010 and _020 river sub-basins located within the Lower Shannon surface water catchment (25A). A section of the underground electrical cabling route is located in the Gageborough_030 and _020 river sub-basins. The underground electrical cabling route then enters the Brosna_070 river sub-basin west of Kilbeggan and from here travels south along the N52 road into the following WFD river sub-basins, Tonaphort_010, Durrow Abbey Stream_010,

Silver (Tullamore)_020 and ending in the WFD river sub-basin Tullamore_030, all in the WFD catchment 25A (Lower Shannon).

Within the Lower Shannon (25A) catchment all SWBs draining the proposed underground electrical cabling route drain into the Brosna River. The Ballynageira stream discharges into the Gageborough River which in turn discharges into the Brosna_080 river waterbody. Further to the south the Silver River and the Tullamore River discharge into the Brosna_100 river waterbody.

Table A presents the total catchment area of the river waterbodies in the vicinity and downstream of the proposed underground electrical cabling route. The Durrow Abbey Stream_010 river waterbody has the smallest total upstream catchment of 8.78km^2. Meanwhile downstream of its confluence with the Silver River, the Brosna has the largest total upstream catchment and will be less susceptible to potential impacts arising from works along the proposed underground electrical cabling route.

Table A: Downstream Catchment Size for River Waterbodies

WFD River Sub-Basin	**Total Catchment Area (km^2)**
Wind Farm Site	
Dungolman_030	64.11
Inny_110	1,229
Grid Connection	
Ballynagrenia Stream_010	9.88
Ballynagrenia Stream_020	22.41
Gageborough_030	125.07
Gageborough_020	62.13
Brosna_070	289.44
Brosna_080	432.93
Brosna_090	470.82
Tonaphort_010	10.33
Durrow Abbey Sream_010	8.78
Silver (Tullamore) _020	41.58
Silver (Tullamore) _030	62.06
Silver (Tullamore)_040	76.94
Tullamore_030	111.24
Tullamore_040	124.51
Clodiagh Tullamore_050	253.72
Brosna_100	850.79

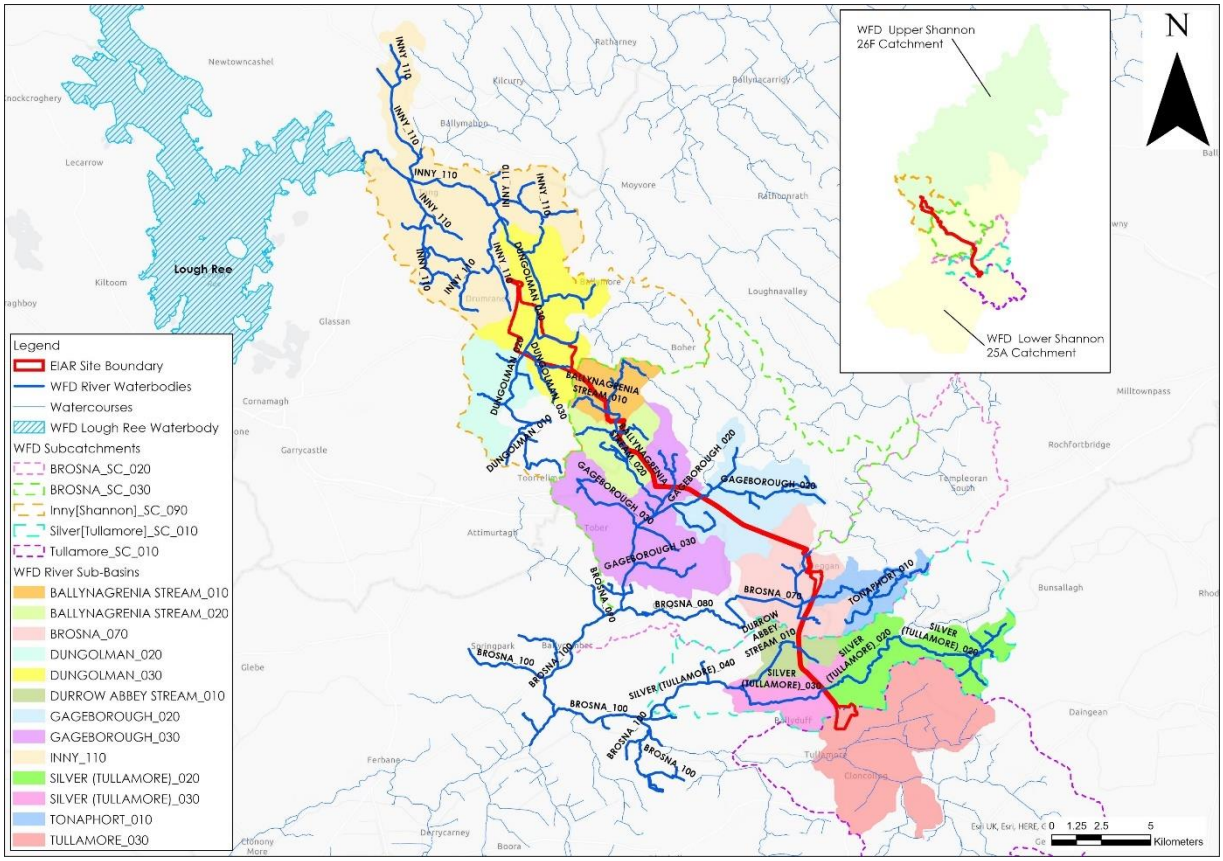

Figure A: Local Hydrology Map

2.3 SURFACE WATER BODY CLASSIFICATION

A summary of the WFD status and risk result for Surface Water Bodies (SWBs) downstream of the Wind Farm Site and the Grid Connection are shown in **Table B**. The overall status of SWBs is based on the ecological, chemical and quantitative status of each SWB. Surface water Body (SWB) status information is available from (www.catchments.ie).

As stated above the majority of the Wind Farm Site is located in the Dungolman_030 WFD river sub-basin. The Dungolman_030 SWB achieved 'Poor Status' in all 3 no. WFD cycles (2010-2015, 2013-2018 and 2016-2021) and has been deemed to be 'at risk' of failing to meet its WFD objectives. Meanwhile, the Dungolman_020 SWB previously achieved 'Good' status in both the 2010-2015 and the 2013-2018 WFD Cycles but more recently achieved 'Poor' status in the latest 2016-2021 WFD Cycle. The Dungolman_020 however, is 'not at risk' of failing to meet its WFD objectives. The Inny_011 SWB achieved 'Moderate Status' in the latest WFD cycle (2016-2021). The risk status of this SWB is currently 'under review'.

The 3rd Cycle Draft Upper Shannon Catchment Report (HA 26F) states that excess nutrients and morphological impacts are the most prevalent issues in this catchment. Urban wastewater is listed as a significant pressure on the Dungolman_030 SWB which is impacted by the Ballymore agglomeration. No significant pressures have been identified on the Dungolman_020 or the Inny_110 SWBs. Meanwhile the 3rd Cycle Draft Upper Shannon (Lough Ree) Catchment Report (HA 26E) does not identify any significant pressures on the Lough Ree lake waterbody.

The proposed underground electrical cabling route is approximately 31km in length, orientated in a south-westerly direction that ends approximately 1km northwest of Tullamore town. There are 11 no. watercourse crossings across 9 no. river waterbodies along the proposed underground electrical cabling route which are located over mapped EPA watercourses. In the vicinity of the Wind Farm Site, the Dungolman_030 SWB is of 'Poor' status and is under significant pressure from urban wastewater. Meanwhile, within the Lower Shannon surface water catchment (26F), the Ballynagrenia Stream_010, the Durrow Abbey Stream and the Tullamore_030 SWBs in the vicinity of the underground electrical cabling route achieved 'Poor' status in the latest WFD cycle whilst the Tonaphort_010 SWB achieved 'Moderate' status. Other waterbodies in the vicinity and downstream of the underground electrical cabling route, including the Brosna_070 and the Brosna_090 SWB's, the Ballynagrenia Stream_020 SWB, the Gageborough River (_020 and _030) and the Silver (Tullamore)_020 and Silver (Tullamore)_030 SWB's achieved 'Good' status. The Clodiagh Tullamore_050, Silver (Tullamore)_040, Tullamore_040, Brosna_080 and Brosna_100 SWB's downstream of the underground electrical cabling route all achieved 'Moderate' status in the latest WFD cycle (2016-2021).

The 3rd Cycle Lower Shannon (Brosna) Catchment Report (HA 25A) states that excess nutrients and morphological impacts remain the most prevalent issues in this catchment. Agriculture is identified as a significant pressure on Ballynagrenia_020, Gageborough_020, Durrow Abbey Stream, Silver (Tullamore)_040 and Tullamore_030 SWBs. The draft report states that the main issues related to farming are primarily nutrients and morphological, with diffuse sources of phosphate in poorly draining areas and pressures from farmyards. Meanwhile hydromorphology is listed as a significant pressure on the Ballynagrenia Stream_010 and the Gageborough Stream_020 SWBs in the vicinity of the underground electrical cabling route. The draft report states that these types of pressures either have the effect of degrading the habitat or the riparian zone of the waterbody.

The SWB status for these waterbodies are shown on **Figure B.**

Table B: Summary WFD Information for Surface Water Bodies

SWB	Overall Status (2010-2015)	Risk Status (2nd Cycle)	Overall Status (2013-2018)	Overall Status (2016-2021)	Risk Status (3rd Cycle)	Pressures
Wind Farm Site						
Dungolman_020	Good	Not at risk	Good	Poor	Not at risk	-
Dungolman_030	Poor	At risk	Poor	Poor	At risk	Urban Wastewater
Inny_110	Unassigned	Under Review	Moderate	Moderate	Under Review	-
Lough Ree	Moderate	Not at risk	Good	Good	At risk	-
Grid Connection						
Ballynagrenia Stream_010	Moderate	At Risk	Moderate	Poor	At Risk	Hydromorphology & Agriculture
Ballynagrenia Stream_020	Good	Not at Risk	Good	Good	Not at Risk	-
Gageborough_030	Good	Not at Risk	Good	Good	Not at Risk	-
Gageborough_020	Moderate	At Risk	Good	Good	Under Review	Hydromorphology & Agriculture
Brosna_070	Good	Not at Risk	Good	Good	Not at Risk	-
Brosna_080	Moderate		Good	Moderate	Not at Risk	-
Brosna_090	Good		Good	Good	Not at Risk	-
Tonaphort_010	Unassigned	Under Review	Unassigned	Moderate	Under Review	Industry
Durrow Abbey Stream_010	Moderate	At Risk	Moderate	Poor	At Risk	Forestry & Agriculture
Silver (Tullamore) _020	Good	Not at Risk	Good	Good	Not at Risk	-
Silver (Tullamore) _030	Good	Not at Risk	Good	Good	Not at Risk	-
Silver (Tullamore)_040	Good	Not at risk	Moderate	Moderate	At risk	Agriculture
Tullamore_030	Unassigned	Under Review	Moderate	Poor	At risk	Agriculture & Urban Runoff
Tullamore_040	Poor	At risk	Moderate	Moderate	At risk	Urban Runoff
Clodiagh Tullamore_050	Poor	At risk	Poor	Moderate	At risk	Hydromorphology & Other
Brosna_100	Moderate	At risk	Moderate	Moderate	At risk	Industry & Agriculture

2.4 GROUNDWATER BODY IDENTIFICATION

According to data from the GSI database and bedrock geology series (www.gsi.ie), the Wind Farm Site is underlain by a Locally Important Aquifer (LI – Bedrock which is generally moderately productive only in local zones), which consists of Dinantian Upper Impure Limestones (DUIL).

The Inny Groundwater Body (GWB) (IE_SH_G_110) underlies the Wind Farm Site .

The underground electrical cabling route is located within several groundwater bodies, which include, from north to south, the Inny groundwater body (GWB), the Clara GWB, the Gageborough-Brosna Gravels Group 1 GWB, the Kilbeggan gravels GWB and the Tullamore GWB.

2.5 GROUNDWATER BODY CLASSIFICATION

All GWBs in the vicinity of the Wind Farm Site and along the underground electrical cabling route (Inny GWB (IE_SH_G_110), Clara GWB (IE_SH_G_240), Gageborough-Brosna Gravels Group 1 (IE_SH_G_253), Kilbeggan Gravels (IE_SH_G_242) and Tullamore GWB (IE_SH_G_232)) achieved 'Good Status' in all 3 no. WFD cycles (2010-2015, 2013-2018 and 2016-2021). This status applies to both the quantitative status and the chemical status of the GWB. These GWBs have been deemed to be 'Not at risk' of failing to meet their respective WFD objectives. The GWB status for the 2013-2018 WFD cycle are shown on **Figure B**.

Table C: Summary WFD Information for Groundwater Bodies

GWB	Overall Status (2010-2015)	Risk Status (2nd Cycle)	Overall Status (2013-2018)	Overall Status (2016-2021)	Risk Status (3rd Cycle)	Pressures
	Wind Farm Site					
Inny IE_SH_G_110	Good	Under review	Good	Good	Not At risk	-
	Grid Connection					
Clara IE_SH_G_240	Good	Not at Risk	Good	Good	Not At Risk	-
Gageborogh-Brosna Gravels Group 1 IE_SH_G_253	Good	Under review	Good	Good	Not At risk	-
Kilbeggan gravels IE_SH_G_242	Good	Under review	Good	Good	Not At risk	-
Tullamore IE_SH_G_232	Good	Not at Risk	Good	Good	Not At Risk	-

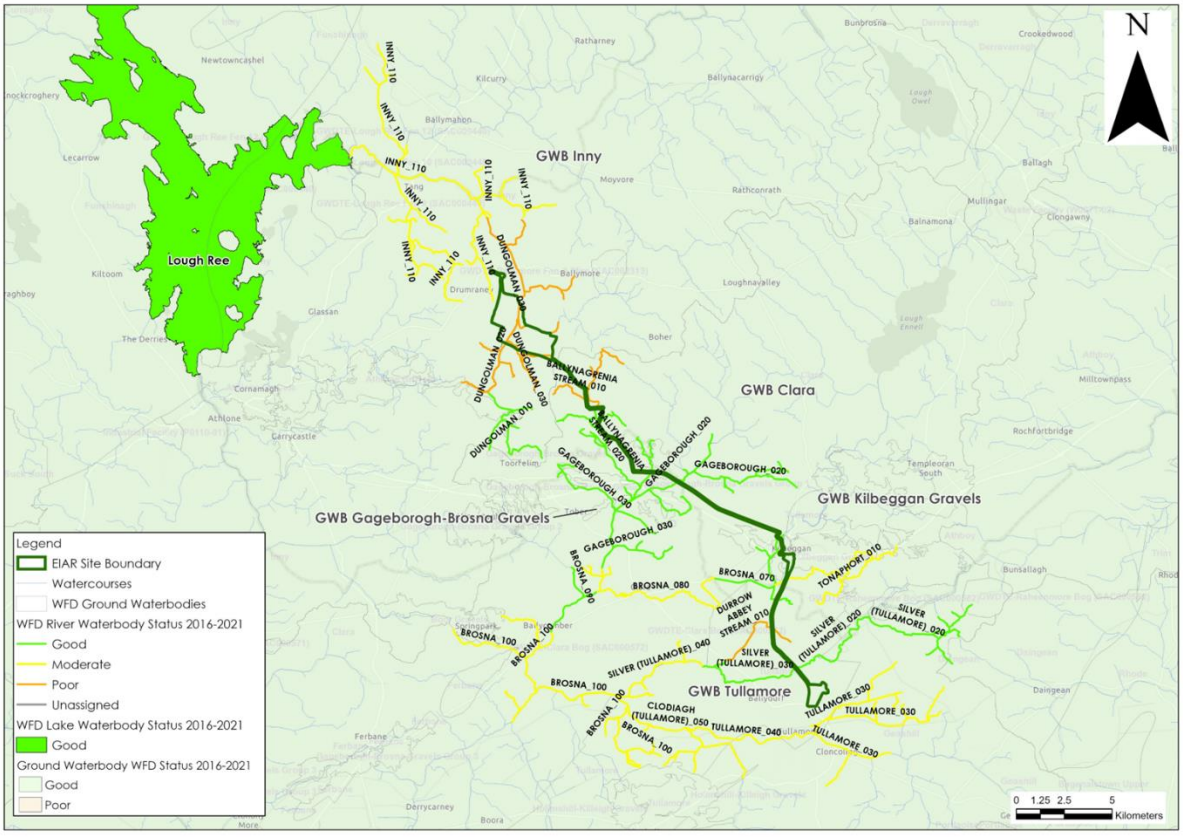

Figure B: WFD Groundwater and Surface Waterbody Status (2016-2021)

3. WFD SCREENING

3.1 WIND FARM SITE

As discussed in **Section 2**, there are a total of 3 no. river water bodies that are located in the vicinity or downstream of the Wind Farm Site. In addition, there is 1 no. lake waterbody located downstream. Furthermore, the Wind Farm Site is underlain by 1 no. groundwater body.

3.2 GRID CONNECTION

There are a total of 34 identified watercourse and existing culvert/drain crossings along the proposed Grid Connection underground electrical cabling route, of which 11 no. are WFD mapped watercourses. The proposed underground electrical cabling route is located in 11 no. WFD River sub-basins with a total of 11 no. proposed watercourse crossings. In addition, the underground electrical cabling route is underlain by 4 no. groundwater bodies.

3.3 SURFACE WATER BODIES

With consideration for the construction, operational and decommissioning phases of the Proposed Development at the Wind Farm Site, it is considered that the Dungolman_030 and Inny_110 rivers that are located in the vicinity and downstream of the Wind Farm Site are carried through into the WFD Impact Assessment. The Proposed Development works within the Wind Farm Site must not in any way result in a deterioration in the status of these SWBs and/or prevent them from meeting the biological and chemical characteristics for good status in the future.

The Dungolman_020 SWB has been screened out of further assessment as all works associated with the Proposed Development are located downstream of this SWB. Consequently the proposed works have no potential to cause a deterioration in the status of this SWB and/or jeopardise the attainment of good surface water status.

Further downstream, the Lough Ree (IE_SH_26_750a) SWB has been screened out due to the large volumes of water within this lake waterbody and the large catchment area to Lough Ree. The Proposed Development works in the Wind Farm Site have no potential to cause a deterioration in the status of this SWB and/or jeopardise the attainment of good surface water status.

All waterbodies along the underground electrical cabling route (Ballynagrenia Stream_010, Ballynagrenia Stream_020, Gageborough_020, Gageborough_030, Brosna_070, Tonaphort_010, Durrow Abbey Sream_010, Silver (Tullamore) _020, Silver (Tullamore) _030 and Tullamore_030) are carried through to the WFD Impact Assessment. The Proposed Development works along the Grid Connection underground electrical cabling route must not in any way result in a deterioration in the status of these SWB's and/or prevent them from meeting the biological and chemical characteristics for good status in the future.

Further downstream the Brosna_080, Brosna_090, Brosna_100, Silver(Tullamore)_040, Tullamore_040 and Clodiagh Tullamore_050) SWBs have all been screened out of further assessment due to the increasing volumes of water within these SWBs, the absence of any works within their respective sub-basins and the nature of the proposed works along the underground electrical cabling route. The proposed works have no potential to cause a deterioration in the status of this SWB and/or jeopardise the attainment of good surface water status.

3.4 GROUNDWATER BODIES

With respect to groundwater bodies, the Inny GWB has been screened in due to its location directly underlying the Wind Farm Site. The Proposed Development works at the Wind Farm Site must not in any way result in a deterioration in the status of this GWB and/or prevent it from meeting the biological and chemical characteristics for good status in the future.

With respect to GWBs along the underground electrical cabling route, the Inny GWB, Clara GWB, Gageborough-Brosna Gravels Group 1 GWB, Kilbeggan Gravels GWB and Tullamore GWB have been screened in as they directly underlie the Proposed Development. The Proposed Development works along the Grid Connection underground electrical cabling route must not in any way result in a deterioration in the status of these GWB and/or prevent them from meeting the biological and chemical characteristics for good status in the future.

3.5 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	Dungolman_020	No	While a small section in the southwest of the Wind Farm Site is located in the Dungolman_020 river sub-basin, no development works are proposed in this area. The Dungolman_020 SWB is therefore located upstream of all Proposed Development works and the Proposed Development has no potential to impact the status of this SWB.
	River	Dungolman_030	**Yes**	The majority of the Proposed Development site, including all 9 no. turbines are mapped within the catchment area of the Dungolman_030. An assessment is required to consider the potential impacts of the Proposed Development on this SWB.
	River	Inny_110	**Yes**	The Inny_110 SWB is located directly downstream of the Dungolman_030 and in close proximity to the Proposed Wind Farm Site (<1km). An assessment is required to consider the potential impacts of the Proposed Development on this SWB.
	Lake	Lough Ree	No	The Lough Ree SWB has been screened out due to the large volumes of water within the SWB. The Proposed Development has no potential to impact the status of this SWB
	River	Ballynagrenia Stream_010	**Yes**	The proposed underground electrical cabling route is located within the Ballynagrenia Stream_010 river sub-basin. An assessment is required to consider the potential impacts of the Proposed Development on this SWB.
	River	Ballynagrenia Stream_020	**Yes**	The proposed underground electrical cabling route is located within the Ballynagrenia Stream_020 river sub-basin. An assessment is required to consider the potential impacts of the Proposed Development on this SWB.
	River	Gageborough_020	**Yes**	The proposed underground electrical cabling route is located within the Gageborough_020 river sub-basin. An assessment is required to consider the potential impacts of the Proposed Development on this SWB.
	River	Gageborough_030	**Yes**	The proposed underground electrical cabling route is located within the Gageborough_030 river sub-basin. An assessment is required to consider the potential impacts of the Proposed Development on this SWB.
	River	Brosna_070	**Yes**	The proposed underground electrical cabling route is located within the Brosna_070 river sub-basin. An assessment is required to consider the potential impacts of the Proposed Development on this SWB.
	River	Brosna_080	No	The Brosna_080 SWB has been screened out due to absence of any works within its river sub-basin, the nature of the upstream underground electrical cabling route works and the increasing volumes of water within this SWB, The Proposed Development has no potential to impact the status of this SWB.

	River	Brosna_090	No	The Brosna_090 SWB has been screened out due to absence of any works within its river sub-basin, the nature of the upstream underground electrical cabling route works and the increasing volumes of water within this SWB, The Proposed Development has no potential to impact the status of this SWB
	River	Tonaphort_010	**Yes**	The proposed underground electrical cabling route is located within the Tonaphort_010 river sub-basin. An assessment is required to consider the potential impacts of the Proposed Development on this SWB.
	River	Durrow Abbey Sream_010	**Yes**	The proposed underground electrical cabling route is located within the Durrow Abbey Sream_010 river sub-basin. An assessment is required to consider the potential impacts of the Proposed Development on this SWB.
	River	Silver (Tullamore) _020	**Yes**	The proposed underground electrical cabling route is located within the Silver (Tullamore) _020 river sub-basin. An assessment is required to consider the potential impacts of the Proposed Development on this SWB.
	River	Silver (Tullamore) _030	**Yes**	The proposed underground electrical cabling route is located within the Silver (Tullamore) _030 river sub-basin. An assessment is required to consider the potential impacts of the Proposed Development on this SWB.
	River	Silver (Tullamore)_040	No	The Silver (Tullamore)_040 SWB has been screened out due to the absence of any works within its river sub-basin, the nature of the upstream underground electrical cabling route works and the increasing volumes of water within this SWB, The Proposed Development has no potential to impact the status of this SWB
	River	Tullamore_030	**Yes**	The proposed underground electrical cabling route is located within the Silver (Tullamore) _030 river sub-basin. An assessment is required to consider the potential impacts of the Proposed Development on this SWB.
	River	Tullamore_040	No	The Tullamore_040 SWB has been screened out due to the absence of any works within its river sub-basin, the nature of the upstream underground electrical cabling route works and the increasing volumes of water within this SWB, The Proposed Development has no potential to impact the status of this SWB
	River	Clodiagh Tullamore_050	No	The Clodiagh Tullamore_050 SWB has been screened out due to the absence of any works within its river sub-basin, the nature of the upstream underground electrical cabling route works and the increasing volumes of water within this SWB, The Proposed Development has no potential to impact the status of this SWB
	River	Brosna_100	No	The Brosna_100 SWB has been screened out due to absence of any works within its river sub-basin, the nature of the upstream underground electrical cabling route works and the increasing volumes of water within this SWB, The Proposed Development has no potential to impact the status of this SWB
Groundwater Body	Groundwater	Inny	**Yes**	The majority of the Wind Farm site including 9 no. turbines overlies the Suck South GWB. An assessment is required to consider potential impacts of the Proposed Development to this GWB.

	Groundwater	Clara	**Yes**	The proposed underground electrical cabling route overlies the Clara GWB. An assessment is required to consider potential impacts of the Proposed Development to this GWB
	Groundwater	Gageborogh-Brosna Gravels Group 1	**Yes**	The proposed underground electrical cabling route overlies the Gageborough-Brosna Gravels Group 1 GWB. An assessment is required to consider potential impacts of the Proposed Development to this GWB
	Groundwater	Kilbeggan Gravels	**Yes**	The proposed underground electrical cabling route overlies the Kilbeggan Gravels GWB. An assessment is required to consider potential impacts of the Proposed Development to this GWB
	Groundwater	Tullamore	**Yes**	The proposed underground electrical cabling route overlies the Tullamore GWB. An assessment is required to consider potential impacts of the Proposed Development to this GWB

4. WFD COMLIANCE ASSESSMENT

4.1 DEVELOMENT PROPOSAL

The Proposed Development works within the Wind Farm Site includes 9 no. turbines, 2 no. temporary construction compounds, a 110kV substation, 1 no. meteorological met mast, spoil management areas, and associated access roads (new and upgrade of existing) within the Wind Farm Site.

The Proposed Development works for the Grid Connection include the substation and construction compound within the Wind Farm Site and the underground 110kV electricity cabling connecting the proposed onsite substation to the existing 110kV Thornsbury substation near Tullamore, Co. Offaly. This will involve the excavation of a trench primarily along the public road, placement of ducting and backfilling of the trench.

The Proposed Development also includes works along the Turbine Delivery Route (TDR) and all associated site development works including tree felling, drainage infrastructure and landscaping.

Due to the nature of wind farm developments (and associated grid connections and TDR works), 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 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 (soil and subsoil particles) in site runoff during earthworks and tree felling along with cement-based compounds.

The Proposed Development includes works over and in close proximity to waterbodies. There are a number of potential adverse effects to both surface and groundwater.

The primary risks of degradation of surface water bodies include:

- Changes in surface runoff flow volumes and flow patterns;
- Entrainment of suspended solids in surface waters; and,
- Chemical pollution of surface waters by concrete, oil and or fuels.

The primary risks of degradation of groundwaters include:

- Chemical pollution of groundwaters by concrete, oils and fuels.

4.2 POTENTIAL EFFECTS

4.2.1 Construction Phase (Unmitigated)

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

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

Hydrocarbons and cement-based compounds will also be used during the construction phase. Accidental spillage during refuelling of construction plant with petroleum hydrocarbons is a significant pollution risk to surface waters at all construction. The accumulation of small spills of fuels and lubricants during routine plant use can also be a pollution risk. Hydrocarbon has a high toxicity to humans, and all flora and fauna, including fish, and is persistent in the environment. It is also a nutrient supply for adapted micro-organisms, which can rapidly deplete dissolved oxygen in waters, resulting in the death of aquatic organisms. However, no direct surface water pathways exist between the Wind Farm Site and downstream surface waterbodies. Therefore, accidental spillage of hydrocarbons within the Wind Farm Site have limited potential to impact the water quality in downstream surface watercourses.

It is also estimated that 6.4ha (hectares) in of existing forestry will be felled in the area near T4 to allow for development of the Wind Farm Site. The area to be felled as part of the Proposed Development accounts for just 0.67% of the total Wind Farm Site area. Potential water quality impacts resulting from tree felling will arise from:

- Exposure of soil and subsoils due to vehicle tracking, and skidding or forwarding extraction methods resulting in a source of suspended sediment which can become entrained in surface water runoff and enter surface watercourses;
- Entrainment of suspended sediment in watercourses due to vehicle tracking through watercourses;
- Damage to roads resulting in a source of suspended sediment which can become entrained in surface water runoff and enter surface watercourses;
- Release of sediment attached to timber in stacking areas; and,
- Nutrient release.

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. Inflows will likely require management and treatment to reduce suspended sediments.

Surface water quality impacts may also arise during the diversion, culverting, road and site underground cabling crossing of surface watercourses during the construction phase. These activities can result in morphological changes, changes to drainage patterns and alteration of aquatic habitats. Construction of structures over watercourses has the potential to significantly interfere with water quality and flows during the construction phase. It is proposed that 1 no. watercourse crossings will be constructed across the Dungolman river and 11 no. minor field drain crossings will be required to facilitate access roads within the Wind Farm Site.

The surface water receptors likely to be impacted by these activities include the Dungolman_030 SWB and the Inny_110 SWB. However, as shown in **Table A**, the Inny_110 SWB is less susceptible to potential surface water quality effects due to the large volumes of water within this SWB associated with its large upstream catchment.

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

Table E.

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

SWB	WFD Code	Current Status	Assessed Potential Status Change
Dungolman_030	IE_SH_26D060400	Poor	Bad
Inny_110	IE_SH_26I011400	Moderate	Moderate

4.2.1.2 Potential Surface Water Quality Effects on the Grid Connection

Based on the WFD mapping, there will be a requirement for 11 no. watercourse crossings along the proposed underground electrical cabling route (located at existing bridges and culverts).

No in-stream works are required at any of these watercourse crossings, however due to the close proximity of local waterbodies to the Grid Construction work at the crossing locations, there is a potential for surface water quality impacts during trench excavation work due to runoff from the road surface. This runoff may contain elevated concentrations of suspended sediment, cementitious runoff and/or hydrocarbons.

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

Construction activities along the Underground electrical cabling route have the potential to adversely impact the status of the Dungolman_030, Ballynagrenia Stream_010 and _020, Gageborough_020 and _030, Brosna_070, Tonaphort_010, Durrow Abbey Stream_010, Silver (Tullamore)_020 and _030 and Tullamore_030 SWBs.

A summary of potential status change to SWBs arising from works along the proposed underground electrical cabling route during the unmitigated construction phase are outlined in **Table F**.

Table F: Potential Surface Water Quality Effects on the Grid Connection during Construction Phase (Unmitigated)

SWB	WFD Code	Current Status	Assessed Potential Status Change
Dungolman_030	IE_SH_26D060400	Poor	Bad
Ballynagrenia Stream_010	IE_SH_25B160400	Poor	Bad
Ballynagrenia Stream_020	IE_SH_25B160600	Good	Moderate
Gageborough_020	IE_SH_25G010300	Good	Moderate
Gageborough_030	IE_SH_25G010500	Good	Moderate
Brosna_070	IE_SH_25B090450	Good	Moderate
Tonaphort_010	IE_SH_25T450930	Moderate	Poor
Durrow Abbey Sream_010	IE_SH_25D120200	Poor	Bad

Silver (Tullamore) _020	IE_SH_25S030100	Good	Moderate
Silver (Tullamore) _030	IE_SH_25S030300	Good	Moderate
Tullamore_030	IE_SH_25T030300	Poor	Bad

4.2.1.3 Potential Effects on Groundwater Quality/Quantity at the 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 on 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.

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

Table G: Potential Groundwater Quality/Quantity Effects at Proposed Wind Farm Site during Construction Phase (Unmitigated)

GWB	WFD Code	Current Status	Assessed Potential Status Change
Inny	IE_SH_G_110	Good	Moderate

4.2.1.4 Potential Effects on Groundwater Quality/Quantity on the Grid Connection

The accidental spillage of hydrocarbons, the release of effluent from wastewater treatment systems and the release of cement-based products have the potential to negatively impact on groundwater water quality along the Proposed underground electrical cabling route.

Some minor groundwater/surface water seepages will likely occur in trench excavations which will impact local groundwater quantity.

A summary of potential status change to GWBs arising from works along the grid connection during the unmitigated construction phase are outlined in **Table H**.

Table H: Potential Groundwater Quality/Quantity Effects on the Grid Connection during Construction Phase (Unmitigated)

GWB	WFD Code	Current Status	Assessed Potential Status Change
Inny	IE_SH_G_110	Good	Moderate
Clara	IE_SH_G_240	Good	Moderate
Gageborogh-Brosna Gravels Group 1	IE_SH_G_253	Good	Moderate
Kilbeggan gravels	IE_SH_G_242	Good	Moderate
Tullamore	IE_SH_G_232	Good	Moderate

4.2.1.5 Groundwater and Surface Water Impacts due to Temporary Junction Works

Minor haul route works are required at 7 no. locations listed below, however all proposed road works are small-scale and localised, and no significant water quality impacts are anticipated.

- Location 1 – M6 Junction 10 left slip/N55 junction in Athlone
- Location 2 – N55/R916 Cornamaddy Roundabout
- Location 3 – N55/R390 Junction in Athlone
- Location 4 – Bend on R390 at Coolteen
- Location 5 – Bends on R390 at Beechlawn
- Location 6 – R390/L5363 Junction
- Location 7 – Access Junction on L5363

Due to the shallow nature of the temporary junction works, impacts on groundwater flows and levels are not anticipated.

4.2.1.6 Surface Water Quality Impacts from Tree Felling

Tree felling will be carried out during the construction phase of the Proposed Development at the Wind Farm Site.

Potential impacts during tree felling occur mainly from:

- Exposure of soil and subsoils due to vehicle tracking, and skidding or forwarding extraction methods resulting in a source of suspended sediment which can become entrained in surface water runoff and enter surface watercourses;
- Entrainment of suspended sediment in watercourses due to vehicle tracking through watercourses;
- Damage to roads resulting in a source of suspended sediment which can become entrained in surface water runoff and enter surface watercourses;
- Release of sediment attached to timber in stacking areas; and,
- Nutrient release.

Table I: Surface Water Quality Impacts from Felling During Operational Phase (Unmitigated)

SWB	WFD Code	Current Status	Assessed Potential Status Change
Dungolman_030	IE_SH_26D060400	Poor	Bad
Inny_110	IE_SH_26I011400	Moderate	Moderate

4.2.2 Operational Phase (Unmitigated)

4.2.2.1 Increased Site Runoff and Hydromorphology Effects on River Water Bodies

Progressive replacement of the vegetated surfaces with impermeable surfaces could potentially result in an increase in the proportion of surface water runoff reaching the surface water drainage network. The site footprint and all components of the Proposed Development are listed in Chapter 4 of the EIAR. During storm rainfall events, additional runoff coupled with increased velocity of flow could increase hydraulic loading, resulting in erosion of watercourses and impact on aquatic ecosystems.

The emplacement of the proposed permanent development footprint within the Wind Farm Site, assuming emplacement of impermeable materials as a worst-case scenario, could result

in an average total site increase in surface water runoff of 2,392 m^3/month at the Wind Farm Site. This represents a potential increase of 0.29 % in the average daily/monthly volume of runoff from the study area in comparison to the baseline pre-development site runoff conditions. This is a very small increase in average runoff and results from a relatively small area of the site being developed, the Proposed Development total permanent development footprint being approximately 8.2ha, representing ~0.84 % of the total study area.

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 J**.

Table J: Potential Impact on Surface Water Flows during Operational Phase (Unmitigated)

SWB	WFD Code	Current Status	Assessed Potential Status Change
Dungolman_030	IE_SH_26D060400	Poor	Bad
Inny_110	IE_SH_26I011400	Moderate	Poor

4.2.2.2 Surface Water Quality Impacts from Site Maintenance

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

Table K: Surface Water Quality Impacts from Site Maintenance During Operational Phase (Unmitigated)

SWB	WFD Code	Current Status	Assessed Potential Status Change
Dungolman_030	IE_SH_26D060400	Poor	Bad
Inny_110	IE_SH_26I011400	Moderate	Moderate

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 during Felling Operations

All tree felling will be done in accordance with the current best practice methods.

A suite of mitigation measures relating to clear felling of coniferous plantations are summarised below. These include avoidance controls and mitigation by design which includes source controls, in-line controls, water treatment controls, and outfall controls.

In addition to these mitigation measures, drains in the vicinity and downstream of the proposed felling areas will be subject to frequent inspection both pre and post-felling. Additionally, surface water quality monitoring shall be completed before, during (if the operation is conducted over a protracted time period) and after felling operations and until the water quality has returned to pre-activity status if an impact has occurred. Daily surface water monitoring forms will also be utilised at every works location in close proximity to a watercourse.

Summary of Mitigation Measures Associated with Proposed Felling Operations

Avoidance Controls:

- 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"
- During the Wind Farm Site construction phase a buffer zone of 50m will be maintained for all streams and rivers where possible, and a 10m buffer will be applied to main drains.
- All proposed tree felling areas are located outside of imposed buffer zones. The large distance between proposed felling areas and sensitive aquatic zones means that potential poor quality runoff from felling areas can be adequately managed and attenuated prior to even reaching the aquatic buffer zone and primary drainage routes. Where tree felling is required in the vicinity of streams, the following additional mitigation measures will be employed.

Mitigation by Design:

- Machine combinations will be chosen which are most suitable for ground conditions at the time of felling, and which will minimise soils disturbance;
- Checking and maintenance of roads and culverts will be on-going through any felling operation. No tracking of vehicle through watercourses will occur, as vehicles will use road infrastructure and existing watercourse crossing points. Where possible, existing drains will not be disturbed during felling works;
- Ditches which drain from the proposed area to be felled towards existing surface watercourses will be blocked, and temporary silt traps will be constructed. No direct discharge of such ditches to watercourses will occur. Drains and sediment traps will be installed during ground preparation. Collector drains will be excavated at an acute angle to the contour (~0.3%-3% gradient), to minimise flow velocities;
- Sediment traps will be sited in drains downstream of felling areas. Machine access will be maintained to enable the accumulated sediment to be excavated. Sediment will be carefully disposed of in the spoil management 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 may be necessary to install double or triple sediment traps. This measure will be reviewed on site during construction;
- All drainage channels will taper out before entering the aquatic buffer zone. This ensures that discharged water gently fans out over the buffer zone before entering the aquatic zone, with sediment filtered out from the flow by ground vegetation within the zone. On erodible soils, silt traps will be installed at the end of the drainage channels, to the outside of the buffer zone;
- Drains and silt traps will be maintained throughout all felling works, ensuring that they are clear of sediment build-up and are not severely eroded. Correct drain alignment, spacing and depth will ensure that erosion and sediment build-up are minimized and controlled;

- Brash mats will be used to support vehicles on soft ground, reducing mineral soils 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 should be suspended during periods of high rainfall;
- Timber will be stacked in dry areas, and outside a local 50m watercourse buffer. Straw bales and check dams to be emplaced on the down gradient side of timber storage/processing sites;
- Works will be carried out during periods of no, or low rainfall, in order to minimise entrainment of exposed sediment in surface water run-off;
- Checking and maintenance of roads and culverts will be on-going through the felling operation;
- Any diesel or fuel oils stored at the temporary site compounds will be bunded. The bund capacity will be sufficient to contain 110% of the storage tank's maximum capacity;
- Refuelling or maintenance of machinery will not occur within 100m of a watercourse. 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.
- Silt traps will be strategically placed down-gradient within forestry drains near streams. The main purpose of the silt traps and drain blocking is to slow water flow, increase residence time, and allow settling of silt in a controlled manner.

Drain Inspection and Maintenance:
The following items shall be carried out during inspection pre-felling and after:

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

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

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

- Avoid man-made ditches and drains, or watercourses that do not have year round flows, i.e. avoid ephemeral ditches, drains or watercourses;
- Select sampling points upstream and downstream of the forestry activities;

- It is advantageous if the upstream location is outside/above the forest in order to evaluate the impact of land-uses other than forestry;
- Where possible, three downstream locations should be selected: one immediately below the forestry activity, the second at exit from the forest, and the third some distance from the second (this allows demonstration of no impact through dilution effect or contamination by other land-uses where impact increases at third downstream location relative to second downstream location); and,
- The above sampling strategy will be undertaken for all on-site sub-catchments streams where tree felling is proposed

4.3.1.2 Mitigation Measures to Protect Surface Water Quality during Excavation Dewatering and Potential Impacts on Surface Water Quality

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

The key mitigation measure during the construction phase is the avoidance of sensitive aquatic areas where possible, by application of suitable buffer zones (i.e. 50m to main watercourses, and 10m to main drains). From Figure 9-4, it can be seen that all of the key Proposed Development areas within the Wind Farm Site are located significantly away from the delineated 50m watercourse buffer zones with the exception of the upgrading of the existing watercourse crossing, new drain crossing and upgrades to existing site tracks. Spoil management areas for removed soil/subsoil will be localised to turbine locations outside of these buffer zones and will be designed and constructed with the minimal amount of surface area exposed. In these spoil management areas, the vegetative top-soil layer will be removed and re-instated where applicable. In certain areas where reinstated of the vegetative top-soil layer is not possible, these areas will be reseeded directly after construction, allowing for rapid re-vegetation which will mitigate against erosion. Additional control measures, which are outlined further on in this section, will be undertaken at the proposed watercourse and drain crossing locations.

It should be noted that an extensive network of agricultural and forestry drains already exists, and these will be integrated and enhanced as required and used within the Wind Farm Site drainage system. The integration of the existing drainage network and the Wind Farm Site network is relatively simple. The key elements being the upgrading and improvements to water treatment elements, such as in line controls and treatment systems, including silt traps, settlement ponds and buffered outfalls.

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

- Apart from interceptor drains, which will convey clean runoff water to the downstream drainage system there will be no direct discharge (without treatment for sediment reduction, and attenuation for flow management) of runoff from the Wind Farm Site drainage into the existing site drainage network where possible. This will reduce the potential for any increased risk of downstream flooding or sediment transport/erosion;
- Silt traps will be placed in the existing drains upstream of any streams where construction works / tree felling is taking place, and these will be diverted into proposed interceptor drains, or culverted under/across the works area;
- Buffered outfalls which will be numerous over the site which will promote percolation of drainage waters across vegetation and close to the point at which the additional runoff is generated, rather than direct discharge to the existing drains of the site; and,
- Drains running parallel to the existing roads requiring widening will be upgraded. Velocity and silt control measures such as check dams, sand bags, oyster bags, straw bales, flow limiters, weirs, baffles, silt fences will be used during the upgrade construction works.

Water Treatment Train:
If the discharge water from construction areas fails to be of a high quality, then a filtration treatment system (such as a 'siltbuster' or similar equivalent treatment train (sequence of water treatment processes)) will be used to filter and treat all surface discharge water collected in the dirty water drainage system. This will apply for all of the construction phase.

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

Silt Bags:
Silt bags will be used where small to medium volumes of water need to be pumped from excavations. As water is pumped through the bag, most of the sediment is retained by the geotextile fabric allowing filtered water to pass through. Silt bags will be used with natural vegetation filters.

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

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

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

Using the safe threshold rainfall values will allow work to be safely controlled (from a water quality perspective) in the event of forecasting of an impending high rainfall intensity event.

Works will be suspended if forecasting suggests any of the following is likely to occur, or if on-site monitoring indicates any of the following has occurred:

- >10 mm/hr (i.e. high intensity local rainfall events);

- >25 mm in a 24 hour period (heavy frontal rainfall lasting most of the day); or,
- >half monthly average rainfall in any 7 days.
- Prior to, and after, works being suspended the following control measures will be undertaken:
- All open excavations will be secured and sealed off;
- Provide temporary or emergency drainage to prevent back-up of surface runoff; and,
- Avoid working during heavy rainfall and for up to 24 hours after heavy events to ensure drainage systems are not overloaded.

Management of Runoff from Soil and Subsoil Storage Areas:
It is proposed that excavated soil will be used for landscaping where required.

During the initial construction of roads, silt fences, straw bales and biodegradable geogrids will be used to control surface water runoff from works areas.

Where required temporary soil/subsoil storage areas will be sealed with a digger bucket and vegetated as soon possible to reduce sediment entrainment in runoff.

Management of Runoff from existing road upgrade areas:
Where construction is undertaken along sections of proposed access road or existing roads requiring upgrade, the Wind Farm Site drainage infrastructure (as outlined above) will be in place to manage and control runoff from the trench excavation area. Where the cable trench is to be constructed off-road (within the Wind Farm Site) or along public roads surface water control measures such as silt fences will be employed when work is required within hydrological buffer zones.

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

Monitoring:
An inspection and maintenance plan for the on-site drainage system will be prepared in advance of commencement of any works. Regular inspections of all installed drainage systems will be undertaken, especially after heavy rainfall, to check for blockages, and ensure there is no build-up of standing water in parts of the systems where it is not intended. Inspections will also be undertaken after tree felling.

Any excess build up of silt levels at dams, the settlement pond, or any other drainage features that may decrease the effectiveness of the drainage feature, will be removed.

During the construction phase field testing and laboratory analysis of a range of parameters with relevant regulatory limits and EQSs should be undertaken for each primary watercourse, and specifically following heavy rainfall events (i.e. weekly, monthly and event based).

4.3.1.3 Mitigation Measures to Protect Against the Release of Hydrocarbons during Construction and Storage

Mitigation measures proposed to avoid the release of hydrocarbons at the Wind Farm Site and Grid Connection include:

- Onsite 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 (Wind Farm Site and 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 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 site 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 Construction Environmental Management Plan (CEMP). Spill kits will be available to deal with accidental spillages.

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

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

- The site compound(s) for the Wind Farm Site will be used for the construction of the underground electrical cabling route;
- Port-a-loos with an integrated waste holding tank will be used at the site compounds, maintained by the providing contractor, and removed from Wind Farm Site on completion of the construction works;
- Water supply for the Wind Farm Site office and other sanitation will be brought to site and removed after use from the Wind Farm Site to be discharged at a suitable off-site treatment location; and,
- No water will be sourced on the Wind Farm Site, or discharged to the Wind Farm Site.

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

Best practice methods for cement-based compounds will be implemented throughout the construction phase. Mitigation measures include:

- No batching of wet-cement products will occur on site/along the grid route works or near other ancillary construction activities. 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;
- No washing out of any plant used in concrete transport or concreting operations will be allowed on-site;
- Where concrete is delivered on site, only the chute will need to 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 is to be directed into a dedicated concrete wash out pit. Decommissioning of this pit will occur at the end of the construction phase and water and solids will be tanked and removed from the site to a suitable, non-polluting, discharge location;
- All concrete will be paced in shuttering and will not be in contact with soils or groundwater until after it has set;
- Use weather forecasting to plan dry days for pouring concrete; and,
- Ensure pour site is free of standing water and plastic covers will be ready in case of sudden rainfall event.

4.3.1.6 Mitigation Measures to Prevent Morphological Changes to Surface Water Crossing and Drainage Patterns

The proposed mitigation measures include:

- Where possible all proposed new stream crossings will be bottomless culverts and the existing banks will remain undisturbed. No in-stream excavation works are proposed and therefore there will be no impact on the stream at the proposed crossing location;
- Within the Wind Farm Site where the underground electrical cabling route runs adjacent to a proposed access road or an existing access road proposed for upgrade, the underground electrical cabling route cable will pass over the culvert (where one exists or is proposed) within the access road;
- Within the Wind Farm Site, where a proposed access road crosses an existing field drain, the crossing will include a suitably sized pipe at the correct invert level to maintain the existing flow regime and prevent ponding;
- Where a underground electrical cabling route cable stream crossing is required, the cable will pass over the watercourse via suspended ducting thereby avoiding any morphological impacts;
- Any guidance / mitigation measures proposed by the OPW or the Inland Fisheries Ireland will be incorporated into the design of the proposed crossings. A 10m buffer is applied to main drains to allow for future OPW maintenance;
- Works will be completed in accordance with the requirements of "*Inland Fisheries Ireland (2016): Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters";* and,
- All access road river/stream crossings will require a Section 50 application (Arterial Drainage Act, 1945). The river/stream crossings will be designed in accordance with OPW guidelines/requirements on applying for a Section 50 consent.

4.3.1.7 Mitigation Measures to Protect Potential Groundwater and Surface Water Impacts due to Temporary Junction Works

Proposed Mitigation Measures:

Mitigation by Avoidance:
A constraint/buffer zone will be maintained for all upgrade works locations where possible, whereby all watercourses will be fenced off. In addition, measures which are outlined below will be implemented to ensure that silt laden or contaminated surface water runoff from the excavation work does not discharge directly to the watercourse.

The purpose of the constraint zone is to:

- Avoid physical damage to surface water channels;
- Provide a buffer against hydraulic loading by additional surface water run-off;
- Avoid the entry of suspended sediment and associated nutrients into surface waters from excavation and earthworks;
- Provide a buffer against direct pollution of surface waters by pollutants such as hydrocarbons; and,
- Provide a buffer against construction plant and materials entering any watercourse.

General Best Practice Pollution Prevention Measures will also include

- Protection of the riparian zone watercourses by implementing a constraints zone around stream crossings, in which construction activity will be limited to the minimum, i.e. works solely in connection with duct laying at the stream crossing;

- No stock-piling of construction materials will take place within the constraints zone. 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 shall not take place at periods of high rainfall, and shall be scaled back or suspended if heavy rain is forecast;
- Plant will travel slowly across bare ground at a maximum of 5km/hr.
- Machinery deliveries shall be arranged using existing structures along the public road;
- All machinery operations shall take place away from the stream and ditch banks, although no instream works are proposed or will occur;
- Any excess construction material shall be immediately removed from the area and taken to a licensed waste facility;
- No stockpiling of materials will be permitted in the constraint zones;
- Silt fencing will be erected on ground sloping towards watercourses at the stream crossings if required.

Mitigation Measures relating to the use and storage of fuels and chemicals in terms of groundwater protection:

- Onsite re-fuelling of machinery will be carried out using a mobile double skinned fuel bowser. No maintenance of construction vehicles or plant will take place along the temporary junction works areas;
- The plant used will be regularly inspected for leaks and fitness for purpose; and,
- Spill kits will be available to deal with accidental spillage.

4.3.2 Operational Phase

4.3.2.1 Increased Site Runoff and Hydromorphology Effects

Mitigation by Design:

- The operational phase drainage system will be installed and constructed in conjunction with the road and hardstanding construction work as described below:
- Runoff from individual turbine hardstanding areas will not be discharged into the existing drain network, but discharged locally at each turbine location through settlement ponds and buffered outfalls onto vegetated surfaces;
- 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 where appropriate 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 will be designed in consideration of the greenfield runoff rate.

4.3.2.2 Surface Water Quality from Site Maintenance

During the operational phase, plant will be required on site for maintenance of the wind farm. These vehicles will be refuelled off site, thus preventing hydrocarbon spills. There will be no discharge of wastewater during the operational phase.

Mitigation measures relating to hydrocarbons, wastewater disposal and cement-based materials, as outlined in **Sections 4.3.1.3**, **4.3.1.4** and **4.3.1.5** will continue to provide adequate protection to groundwater and surface water quality during the operational phase.

4.3.3 Decommissioning Phase Potential Impacts

Wind Farm Site
In the event of decommissioning of the Wind Farm Site, similar activities to the construction phase are carried out.

Potential impacts would be similar to the construction phase but to a lesser degree. There would be increased trafficking and an increased risk of disturbance to underlying soils at the Wind Farm Site, during the decommissioning phase, in this instance, leading to the potential for silt laden run-off entering receiving watercourses from the wheels of vehicles. Any such potential impacts would be likely to be less than during the construction stage as the drainage swales would be fully mature and would provide additional filtration of runoff. Any diesel or fuel oils stored on site would be bunded. In the event of decommissioning of the Umma More Renewable Energy Development, the proposed access tracks may be used in the decommissioning process.

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

Removal of this infrastructure would result in considerable disturbance to the local environment in terms of disturbance to underlying soils and an increased sedimentation (if turbine foundations, access tracks and hardstandings are being reinstated there is a risk of silt laden run-off entering the receiving watercourses), erosion, dust, noise, traffic and an increased possibility of contamination of the local water table. However, if removal is deemed to be required all infrastructure will be removed with mitigation measures similar to those during construction being employed.

Grid Connection

The onsite substation will remain in place as it will be under the ownership of the ESB. There are no impacts associated with this.

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

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 of each of the screened in Surface Water Bodies and Groundwater Bodies. 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	Current Status (2016-2021)	Assessed Potential Status Change - Unmitigated	Assessed Status with Mitigation Measures
Dungolman_030	IE_SH_26D060400	Poor	Bad	Poor
Inny_110	IE_SH_26I011400	Moderate	Poor	Moderate
Ballynagrenia Stream_010	IE_SH_25B160400	Poor	Bad	Poor
Ballynagrenia Stream_020	IE_SH_25B160600	Good	Moderate	Good
Gageborough_020	IE_SH_25G010300	Good	Moderate	Good
Gageborough_030	IE_SH_25G010500	Good	Moderate	Good
Brosna_070	IE_SH_25B090450	Good	Moderate	Good
Tonaphort_010	IE_SH_25T450930	Moderate	Poor	Moderate
Durrow Abbey Stream_010	IE_SH_25D120200	Poor	Bad	Poor
Silver (Tullamore)_020	IE_SH_25S030100	Good	Moderate	Good
Silver (Tullamore)_030	IE_SH_25S030300	Good	Moderate	Good
Tullamore_030	IE_SH_25T030300	Poor	Bad	Poor
Inny GWB	IE_SH_G_110	Good	Moderate	Good
Clara GWB	IE_SH_G_240	Good	Moderate	Good
Gageborogh-Brosna Gravels Group 1 GWB	IE_SH_G_253	Good	Moderate	Good
Kilbeggan Gravels GWB	IE_SH_G_242	Good	Moderate	Good
Tullamore GWB	IE_SH_G_232	Good	Moderate	Good

5. WFD ASSESSMENT CONCLUSION

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

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

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

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

There will be no change in GWB or SWB status in the underlying GWB 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 SWBs are protected from any potential deterioration.

In the event where the current status of the waterbody is Poor (i.e. Dungolman_030, Ballynagrenia Stream_010, Durrow Abbey Stream_010 and Tullamore_030) the Proposed Development will not prevent them from achieving Good Status in the future.

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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