APPENDIX 9.3

Gortloughra Wind Farm

County Cork

Water Framework Directive Screening Assessment

March 2025

Table 1 – Document Control

Client:	Jennings O'Donovan & Partners Limited			
Project Name:	Gortloughra Windfarm			
Document Title:	Water Framework Directive Assessment			
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03	13-03-2025	DP	AOG	Final

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Table 2 – Terms and Definitions

Acronym	Meaning
BSc.	Bachelor of Science
CEMP	Construction Environmental Management Plan
CEnv	Chartered Environmentalist
Co.	County
CSO	Central Statistics Office
DEM	Digital Elevation Model
DO	Dissolved Oxygen
DWPA	Drinking Water Protected Areas
ED	Electoral Division
EIAR	Environmental Impact Assessment Report
EPA	Environmental Protection Agency
EQS	Environmental Quality Standards
EU	European Union
GIS	Geographic Information System
GSI	Geological Survey of Ireland
GWB	Groundwater Body
HA	Hydrometric Area
HDD	Horizontal Directional Drilling
HMWBs	Heavily Modified Water Bodies
IFI	Inland Fisheries Ireland
Km	Kilometre
Kv	Kilovolt
LI	Locally Important
LIDAR	Light Detection and Ranging
LWB	Lake Waterbody
MIEMA	Member of the Institute of Environmental Management and Assessment
MIGI	Member of the Institute of Geologists of Ireland
m OD	metres above Ordnance Datum
MSc.	Master of Science
MW	Megawatt
NFGWS	National Federation of Group Water Schemes
NHA	Natural Heritage Area
OPW	Office of Public Works
pNHA	Proposed Natural Heritage Area
RBD	River Basin District
RBMP	River Basin Management Plan
RPA	Registered Protected Area
SAC	Special Area of Conservation
SC	Subcatchment
SPA	Special Protection Areas
SPR	Source-Pathway-Receptor
SWB	Surface Waterbody
T(No.)	Turbine Number
TDR	Turbine Delivery Route
TDS	Total Dissolved Solids
UWTT	Urban Wastewater Treatment Directive
WFD	Water Framework Directive

1. Introduction

EcoQuest Environmental has been appointed by Jennings O'Donovan & Partners Limited to complete a Water Framework Directive (WFD) compliance assessment for a proposed wind farm at Gortloughra, Co. Cork. The Proposed Development will comprise of the following main components:

- Erection of eight wind turbines with an overall ground to blade tip height of 175 m. The candidate wind turbine will have a rotor diameter of 150 m and a hub height of 100 m;
- Construction of site access roads, Turbine Hardstands and Turbine Foundations;
- Development of a site drainage network;
- Internal wind farm underground power and communications cabling;
- Erection of a permanent 100 m Met Mast for monitoring wind speeds;
- Construction of a Temporary Construction Compound for use during construction.1 no. borrow pit;
- Biodiversity improvements including improvement of heath habitat in fenced off lands designated for Habitat Enhancement and restriction of livestock in lands to allow establishment of heath vegetation in these areas; and,
- Recreational community improvements including the erection of 4 No. permanent information boards relating to cultural heritage and upgrades to amenity tracks across the site.

A 10-year planning permission and 40-year operational life from the date of commissioning of the entire wind farm is being sought. This EIAR also assesses the construction of an on-site 110 kV substation and 2 no. grid connection route (GCR) options along public roads:

- Option A: Dunmanway 110 kV substation or
- Option B: Carrigdangan 110 kV substation.

While not part of the planning consent for this planning application, this WFD Assessment also assesses the works at 18 No. locations along the Turbine Delivery Route (TDR) from Port of Cork to Site.

Article 4(1) of the WFD sets out the environmental objectives for natural surface, groundwater bodies and artificial or heavily modified water bodies (HMWBs). Natural surface water bodies must, by 2027, adhere to good ecological and chemical status and groundwater bodies to good quantitative and chemical status. The primary purpose of this WFD compliance assessment is to establish if any aspects of the proposed Development could result in non-compliance with the requirements of the WFD. The summarised objectives of Article 4 of the WFD for which this WFD compliance assessment will assess the proposed Development area as follows:

- No further deterioration occurs in the status of the affected surface waters and/or groundwater bodies;
- Not to contribute to a failure of a waterbody to achieve at least "*Good*" status by 2027; and
- No changes which will permanently prevent or compromise environmental objectives being met in other water bodies.

This WFD assessment report has been prepared for the construction and operational phases of the proposed Gortloughra Wind Farm. This assessment will identify the surface waters and groundwater bodies with the potential to be impacted, outline the proposed mitigation measures and conclude whether the proposed Development is in compliance with the objectives of the WFD.

2. Water Framework Directive

The EU Water Framework Directive (2000/60/EC), as amended, established a framework for community action in the field of water policy known as the Water Framework Directive (WFD).

The WFD established a framework for the protection of both surface and groundwaters. The WFD provides a mechanism to Member States for improving and/or maintaining the quality of waterbodies across the European Union (EU). The Directive requires all waterbodies (river, lakes, groundwater, transitional, coastal) to attain "*Good*" status (qualitative and quantitative) by 2027.

The WFD requires that management plans are prepared on a river basin basis and specifies a structured method for developing such plans. Ireland has published the River Basin Management Plan 2022-2027 (The Water Action Plan 2024: A River Basin Management Plan for Ireland) which defines the actions that will be taken to improve water quality and achieve "*Good*" ecological status in rivers, lakes, estuaries and coastal waters by 2027. In accordance with the river basin management planning cycle, River Basin Management Plans (RBMPs) are produced every six years. The RBMP (2022-2027) covers the third cycle of the WFD. The current RBMP includes published data on where a waterbody "*At Risk*" status has already been assigned and updated by the EPA online for the third cycle RBMP, this data has been used in the assessment. The second cycle RBMP 2018 - 2021 was published in April 2018, data from this monitoring period is also presented throughout this report in instances where it is the most updated publicly available data.

The WFD is the overarching mechanism by which water quality management areas are divided and assessed. The *European Communities Environmental Objectives (Surface Waters) Regulations 2009* (S.I. No 272 of 2009), as amended, establishes the objectives on surface water status for ecological, biological, morphological and physico-chemical status. The *European Communities Environmental Objectives (Groundwater) Regulations 2010,* as amended, establishes the objectives on groundwater status for physio-chemical threshold limits.

The WFD requires that a holistic methodology to sustainable management of the water environment is implemented by considering interactions between surface water, groundwater, and water-dependent ecosystems. Ecosystem conditions are evaluated according to interactions between classes of hydromorphological, chemical, physico-chemical and biological elements that are collectively referred to as "*Quality*" elements. The WFD requires water bodies to be classified according to their current condition (Status), and to set a series of objectives for maintaining or improving conditions so that water bodies maintain or reach at least "*Good*" status. Furthermore, in establishing whether a proposed development is compliant with the WFD objectives for a water body, the conservation objectives of any Protected Areas, such as Special Protection Areas (SPAs) designated under the Birds Directive (79/409/EEC), and Special Areas of Conservation (SACs) designated under the Habitats Directive (92/43/EEC), should also be considered.

3. Methodology

A single standardised methodology for the preparation of WFD Assessments does not exist. The complex and dynamic nature of the water environment, coupled with the extensiveness of the associated environmental legislation, necessitates that WFD assessments should be tailored for each proposed development. The potential impacts of a proposed development should be assessed on a case-by-case basis.

A staged approach that consists of the following primary elements has been adopted for the preparation of this WFD assessment:

- Screening;
- Scoping;
- Impact Assessment;
- Mitigation Measures; and
- Assessment and Conclusions.

By implementing this staged methodology, it allows for an analysis of the levels of WFD assessment that are required for each water body or protected area, and to establish the impact mitigation that is required. Implementation of this methodology also allows for the verification of whether proposed developments meet the requirements of the WFD. The primary elements in this overall WFD assessment methodology are summarised further in the following sections.

3.1 Screening

Screening is the process by which the zone of influence of a proposed development is identified. This stage examines if the activities associated with the proposed development have the potential to adversely impact waterbodies. The screening phase is also utilised to identify if there are activities associated with a proposed development that do not require additional assessment for WFD objectives. Examples of such activities may include those which have been assessed to have a negligible impact on the water environment, or activities which have been occurring prior to the current RBMP cycle, and would therefore form part of the baseline conditions. The results of the screening analysis are outlined in **Section 7**.

3.2 Scoping

Scoping is the process of identifying potential impacts that could result from the proposed Development on the identified WFD waterbodies and their quality elements. For groundwater, these elements are often referred to as "*criteria*". Baseline information from the current RBMP on the status and objectives for each waterbody are identified and summarised during the scoping phase.

The scoping process requires a review of the potential impact pathways, in this WFD Assessment, such pathways are primarily identified via site-specific source-pathway-receptor (SPR) modelling outlined in **Section 7.1.** WFD waterbodies that could potentially be adversely affected by the proposed Development are listed, the waterbodies and associated quality elements that could be adversely effected are also identified.

3.3 Impact Assessment

The impact assessment phase involves detailed assessment of waterbodies and quality elements that could potentially be impacted by the proposed development. This process seeks to identify any potential aspects of WFD non-compliance. The activities associated with the proposed development are assessed for potential positive and negative impacts.

3.4 Mitigation Measures

Section 9 of this assessment sets out the proposed mitigation measures to be implemented to ensure that the WFD compliance is demonstrated at each phase of the proposed development. The projects **Construction Environmental Management Plan** which is attached to **Appendix 2.1** of the **EIAR**, provides the overarching mechanism through which all of the proposed mitigation measures for the project will be implemented. **Section 9** of this assessment proposes only those measures aimed at protecting the water environment, implementation of these measures will ensure that WFD compliance is achieved.

3.5 Assessment and Article 4.7 of the WFD

Section 10 of this assessment considers the baseline data collected, screening, scoping, impact assessment and mitigation measures in a wholistic review of the proposed Development. In instances where the potential for deterioration of waterbodies has been identified, member states must ensure that the provisions of the WFD are adhered to, unless they meet the criteria laid out in Article 4.7 of the Directive. Article 4.7 of the WFD states the following:

"*Member states will not be in breach of this Directive when:*

- *failure to achieve good groundwater status, good ecological status or, where relevant, good ecological potential or to prevent deterioration in the status of a body of surface water or groundwater is the result of new modifications to the physical characteristics of a surface water body or alterations to the level of bodies of groundwater, or*
- *failure to prevent deterioration from high status to good status of a body of surface water is the result of new sustainable human development activities.*

and all the following conditions are met:

(a) all practicable steps are taken to mitigate the adverse impact on the status of the body of water;

(b) the reasons for those modifications or alterations are specifically set out and explained in the river basin management plan required under Article 13 and the objectives are reviewed every six years;

(c) the reasons for those modifications or alterations are of overriding public interest and/or the benefits to the environment and to society of achieving the objectives set out in paragraph 1 are outweighed by the benefits of the new modifications or alterations to human health, to the maintenance of human safety or to sustainable development; and

(d) the beneficial objectives served by those modifications or alterations of the water body cannot for reasons of technical feasibility or disproportionate cost be achieved by other means, which are a significantly better environmental option.'

The Environmental Protection Agency (EPA) is the governing body in Ireland that considered whether a derogation under Article 4.7 of the WFD is required for a particular development. In the context of the proposed Gortloughra Windfarm, a derogation under Article 4.7 of the WFD is not considered to be a necessary requirement.

4. Description of the Project

4.1 Background

Planning permission is being sought by the Developer for the construction of 8 wind turbines, a permanent met mast, 110Kv on-site substation and all ancillary works and the construction of an underground grid connection to either Carrigdangan or Dunmanway Substations, Co. Cork.

The Proposed Development will comprise of the following main components:

- Erection of eight wind turbines with an overall ground to blade tip height of 175 m. The candidate wind turbine will have a rotor diameter of 150 m and a hub height of 100 m;
- Construction of site access roads, Turbine Hardstands and Turbine Foundations;
- Development of a site drainage network;
- Internal wind farm underground power and communications cabling;
- Erection of a permanent 100 m Met Mast for monitoring wind speeds;
- Construction of a Temporary Construction Compound for use during construction.1 no. borrow pit;
- Biodiversity improvements including improvement of heath habitat in fenced off lands designated for Habitat Enhancement and restriction of livestock in lands to allow establishment of heath vegetation in these areas; and,
- Recreational community improvements including the erection of 4 No. permanent information boards relating to cultural heritage and upgrades to amenity tracks across the site.

A 10-year planning permission and 40-year operational life from the date of commissioning of the entire wind farm is being sought. This EIAR also assesses the construction of an on-site 110 kV substation and 2 no. grid connection route (GCR) options along public roads:

- Option A: Dunmanway 110 kV substation or
- Option B: Carrigdangan 110 kV substation.

While not part of the planning consent for this planning application, this WFD Assessment also assesses the works at 18 No. locations along the Turbine Delivery Route (TDR) from Port of Cork to Site.

4.2 Site Location

The proposed wind farm Development is located to the east of the townland of Gortloughra, approximately 9 kilometres north-west of Kealkill in west County Cork at the southern extent of the Shehy Mountains.

The townlands along which the two grid connection options transverse include:

- **Option A (Dunmanway):** an tSeithe Bheag (Shehy Beg), Gortloughra, Inchinroe, Cloghboola, Cornery, Garraí na Tórnóra (Garryantornora), Tuairín na Lobhar (Tooreenalour), Gort na Carraige (Gortnacarriga), Moneylea, Coolcaum, Coolmountain, Tullagh, Moneyreague, Togher, Cooranig, Keelaraheen, Neaskin, Ardcahan, Knockduff, Gurteennasowna and Ballyhalwick.
- **Option B (Carrigdangan):** an tSeithe Bheag (Shehy Beg), Gortloughra, Inchinroe, Cloghboola, Cornery, Garraí na Tórnóra (Garryantornora), Tuairín na Lobhar (Tooreenalour), Gort na Carraige (Gortnacarriga), Cooragreenane, Coolroe West, Gortnahoughtee, Derryleigh, Gortatanavally, Carrigdangan and Johnstown.

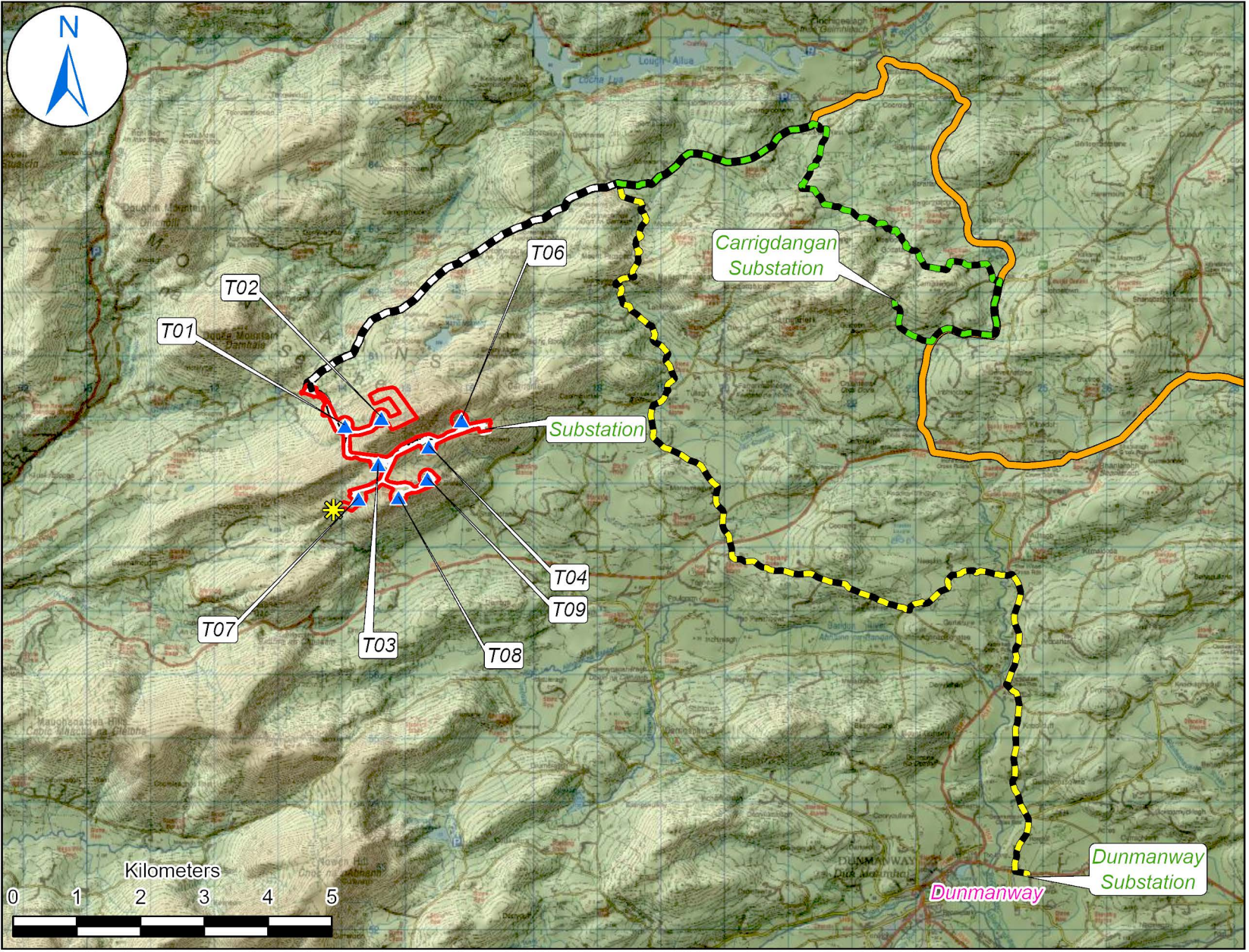
Sixteen mapped rivers or small streams were originally identified that were located either within or adjacent to the EIAR Boundary at various stages of the Project Design. A significant reduction in size of the EIAR boundary total area occurred during the Project design phase. This resulted in only four mapped rivers or small streams intersecting the finalised EIAR boundary. Multiple interconnecting artificial and natural drainage channels have also been surveyed at the Site, many of these ultimately

connect to the larger mapped rivers and streams. Given this considerable surface water interconnectivity, and the potential for sediment laden run-off to migrate down gradient towards lower altitude watercourses, all of the sixteen mapped rivers or small streams that were originally identified have been considered in this chapter, noting that twelve of these watercourses are now located outside of the EIAR boundary.

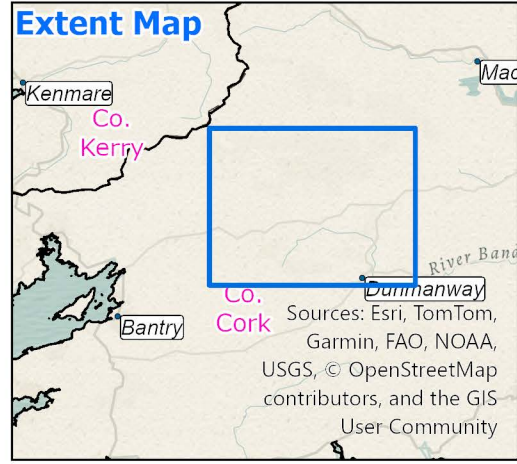
Eight streams were identified to the north of the summit of Shehy More, these watercourses are located either within or downstream of the northern portion of the Site. These watercourses are all tributaries of the Gortloughra River, which in turn is a tributary of the Owvane River. The Owvane River flows in a south-westerly direction to the north of Kealkill before ultimately draining into Bantry Bay at Ballylickey.

Eight streams were also identified to the south of the summit of Shehy More, these watercourses are located either within or downstream of the southern portion of the Site. These watercourses are all tributaries of the River Bandon which flows to Dunmanway, before turning eastward towards the villages of Ballineen and Enniskean. It then makes its way through the centre of Bandon town, and on to Innishannon and Kilmacsimon, before draining into Kinsale Harbour.

There are no lakes within the Site boundary, the closest lake to the Site is Lough Nambrackderg, which is located approximately 850m northeast of the Site boundary at the closet extent within the pre-existing Shehy More windfarm site. There are a small number of dwellings and farm buildings located beyond the Site boundary which is characteristic of the wider rural setting, there are no buildings or dwellings located within the EIAR boundary. The northern portion of the site is accessible via the L8544 local road which also forms part of the Beara Gougane Barra Cycle Route, a long-distance route from Cork City to the Beara Peninsula. The southern portion of the site is accessible via a local road off the R585 regional road.



Extent Map



Client: Jennings O'Donovan & Partners	
Project: Gortloughra Wind Farm	
Map Title: Water Framework Directive Assessment: Site Location	
Spatial Reference Name: IRENET95 Irish Transverse Mercator	
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Revision Number: 1	Prepared By: DP
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Legend

- EIAR Boundary
- Turbines
- Met Mast
- Road Layout & Hardstand Areas
- Turbine Delivery Route (TDR)

Grid Connection Route Options

- Both Grid Connection Route Options
- Dunmanway Option
- Carrigdangan Option

5. Identification and Classification of Hydrological Features

5.1 Data Sources

The EPA's GeoPortal (https://gis.epa.ie/EPAMaps/) was used to assess water bodies present within the Study Area. The EPA's GeoPortal includes the WFD ID numbers, designation and classification details of each mapped surface waterbody across Ireland. The WFD compliance mapping for groundwater risk and status assessment were also reviewed. Light Detection and Ranging (LiDAR) data has been utilised along with geographic information system (GIS) software to map the most prominent of the unmapped streams at the site.

5.2 Surface Water Network Identification

This section describes the available information on the local and regional surface water hydrological environment to assist in the WFD assessment screening phase as described in **Section 3.1**. At a regional scale, the proposed wind farm Site, and grid connection route options are located within three separate catchment areas, including the Lee, Cork Harbour and Youghal Bay Catchment Area, the Bandon-Illen Catchment Area and the Dunmanus-Bantry-Kenmare Catchment Area in Hydrometric Areas 19, 20 and 21 respectively. The Bandon-Ilen Catchment Area covers approximately 59% of the redline boundary, the Dunmanus-Bantry-Kenmare Catchment Area covers approximately 21.8% of the redline boundary and the Lee Cork Harbour and Youghal Bay Catchment Area covers approximately 19.2% of the redline boundary.

Both grid connection route options intersect the Lee, Cork Harbour and Youghal Bay Catchment Area, the Bandon-Illen Catchment Area and the Dunmanus-Bantry-Kenmare Catchment Area. The Dunmanway grid connection route option is located primarily within the Bandon-Illen Catchment Area, the Carrigdangan grid connection route options is located primarily within the Lee, Cork Harbour and Youghal Bay Catchment Area with a small section of both options being located within the Dunmanus-Bantry-Kenmare Catchment Area. The proposed wind farm Development and grid connection route option to Carrigdangan are located within three WFD sub-catchments. These include the Lee[Cork]_SC_010 sub-catchment, the Bandon_SC_010 sub-catchment and the Coomhola_SC_010 sub catchment. The proposed wind farm Development and grid connection route option to Dunmanway are located within four WFD sub-catchments. These include the Lee[Cork]_SC_010 sub-catchment, the Bandon_SC_010 sub-catchment, the Coomhola_SC_010 sub catchment and the Bandon_SC_030 sub-catchment.

All of the proposed wind farm Development and grid connection route options are located within the National River Basin District (RBD) as defined by the current 3rd cycle of the WFD. Figures outlining the catchment and sub-catchment boundaries relative to the Site and grid connection route options are outlined in **Figure 2** and **Figure 3** respectively.

At a localised scale, sixteen mapped rivers or small streams were originally identified that were located either within or in close proximity to the EIAR Boundary at various stages of the Project Design. A significant reduction in size of the EIAR boundary total area occurred during the Project design phase. This resulted in only four mapped rivers or small streams intersecting the finalised EIAR boundary. Multiple interconnecting artificial and natural drainage channels have also been surveyed at the Site, many of these ultimately connect to the larger mapped rivers and streams. Given this considerable surface water interconnectivity, and the potential for sediment laden run-off to migrate down gradient towards lower altitude watercourses, all of the sixteen mapped rivers or small streams that were originally identified have been considered in this assessment, noting that twelve of these watercourses are now located outside of the EIAR boundary. These small channels have been numbered 1 – 16 for the purpose of ease of identification and are shown on **Figure 5.** The site also contains multiple unmapped small natural and artificial drainage channels which have been surveyed and are mapped on **Figure 5**.

Eight streams were identified to the north of the summit of Shehy More, these watercourses are located either within or downstream of the northern portion of the Site. These watercourses are all tributaries of the Gortloughra River, which in turn is a tributary of the Owvane River, which is also referred to as the "*Ouvane River*". The Owvane River flows in a south-westerly direction to the north

of Kealkill before ultimately draining into Bantry Bay at Ballylickey. The Gortloughra River has the EPA name designation of "*Inchiroe*" and has a stream order of 3. The Gortloughra River flows for approximately 4km west of the Site until it merges with the Owvane River. The Owvane River has the EPA name designation of "*Owvane (Cork)*" and has a stream order of 4. The Owvane River flows in a south-westerly direction to the north of Kealkill before ultimately draining into Bantry Bay at Ballylickey.

Eight streams were also identified to the south of the summit of Shehy More (Channels 9 – 16, inclusive), these watercourses are located either within or downstream of the southern portion of the Site. Six of these small channels have a stream order of 1 and are unnamed streams. Two of these channels have a stream order of 2 and have the EPA names of "*Shehy_Beg*" and "*Shanacrane_East*". Six channels located within or downstream of the south-eastern area of the Site all merge into the "*Shehy_Beg*" River to the south-east of the Site boundary in the townland of Tooreen. The "*Shehy_Beg"* River ultimately merges with the Bandon River approximately 4km to the south-east of the EIAR Site boundary. Two channels are located within and in close proximity to the south-west EIAR boundary, namely the "*Shanacrane_East*" and a small unnamed stream. Both of these streams ultimately merge and continue as the EPA named "*Shanacrane_East*" which merges with the Bandon River approximately 3.8km southwest of the Site boundary. The Bandon River then continues to flow in a south-easterly direction, through the Bandon River SAC and east of Dunmanway before turning eastward towards the villages of Ballineen and Enniskean. It then flows through the centre of Bandon town, and on to Innishannon and Kilmacsimon, before draining into Kinsale Harbour.

Approximately 300m east of the northern planning boundary within the existing Shehy More Windfarm site is the EPA named "*Cloghboola 19*" stream which flows in a north-easterly direction into Lough Nambrackderg, which is also located within the existing Shehy More Windfarm site. Lough Nambrackderg drains in a north-westerly direction via the EPA named "*Cloghboola 19*" stream which merges with the Sruhaunphadeen Stream which in turn merges with the Bealaphadeen Stream which ultimately flows into Lough Allua, approximately 5km northeast of the proposed site. Approximately 200m north of the Site boundary, within the existing Shehy More Windfarm site, an area of forestry plantation exists containing three channels which flow in a northerly direction to merge with another unnamed stream which ultimately merges with the Sruhaunphadeen Stream. Approximately 350m northwest of the of the Site boundary, three unnamed channels rise and merge to form Channel 6 which flows in a southerly direction before turning west and merging with the Gortloughra River.

Approximately 780m northwest of the Site, at the southern base of Douce Mountain, an unnamed stream (Channel 8) rises and flows in a southerly direction before turning west and merging with the Gortloughra River. Approximately 80m and 140m west of Channel 2, beyond the north-western Site boundary, two additional unnamed streams (Channels 3 and 4 respectively) flow in a northerly direction, near parallel to Channel 2, into which they merge, before Channel 2 in turn merges with Channels 5, 7 and ultimately the Gortloughra River.

Within the northern portion of the Site, the drainage channels are heavily influenced by the topography and generally flow in a westerly or northerly direction to merge with unnamed channels that are headwaters of the Gortloughra River. Within the southern portion of the Site, the drainage channels generally flow in a southerly or easterly direction to generally mimic the land gradient and merge with the various rivers and unnamed streams that are tributaries of the Bandon River further south. There are no lakes within the Site boundary, the closest lake to the Site is Lough Nambrackderg which is located approximately 850m northeast of the Site boundary at the closet extent and is located within the pre-existing Shehy More Windfarm Site.

The grid connection route option to Carrigdangan substation follows the road network and would traverse across eighteen watercourses along the road network, two mapped watercourses within the EIAR boundary, and four field surveyed drainage channels within the EIAR boundary. The grid connection route option to Dunmanway substation follows the road network to Dunmanway and would traverse across thirty-three mapped watercourses along the road network, two mapped watercourses within the EIAR boundary, and four field surveyed drainage channels within the EIAR boundary.

The road network between the Site entrance and the townland of Gortnacarriga is proposed to be utilised for both grid connection route options, at this point the grid connection route options diverge towards either Dunmanway or Carrigdangan substations. There are eight watercourses located along this stretch of road network that is common to both grid connection route options (between the main Site and the townland of Gortnacarriga). Horizontal directional drilling (HDD) could potentially be required at all thirty-three crossing locations along the Dunmanway option as a conservative assumption. For the purpose of conservatism, it is also assumed that all eighteen crossings along the Carrigdangan option could potentially also require HDD to be carried out. The locations where HDD may potentially be required along both grid connection route options are shown on **Figure 9.7B** in **Volume III**.

In terms of the Turbine Delivery Route (TDR), which is from the Port of Cork to the northern entrance of the site, the route crosses multiple mapped rivers and streams with minor works being carried out or laydown areas being utilised at a total of 49 individual locations. The type of minor works that would be required along the TDR include temporary road widening for overrun areas, areas to be cleared for oversail areas, vegetation clearance, checking the width of access roads and the use of fields as blade laydown areas. The locations of EPA mapped watercourse relative to the TDR are shown on **Figures 9.17** to **9.65** in **Volume III**.

The WFD requires that status be assigned to all identified surface and groundwater bodies and sets out in detail how status should be assigned. Monitoring all water bodies in Ireland is not logistically feasible. Therefore, the EPA has grouped similar water bodies together and interpolated data for the purpose of assigning status. This is allowed for by the WFD if enough water bodies are monitored within a group to provide an accurate assessment of status of that group. In Ireland, just under 60% of identified water bodies have been assigned a status based on the results of monitoring which means that 40% of waterbodies require status to be assigned by other means such as grouping and expert judgement. The WFD grouping for the named/unnamed surface waters in the vicinity of the Site, along the grid connection route options and sections of the TDR is outlined in **Table 3**.

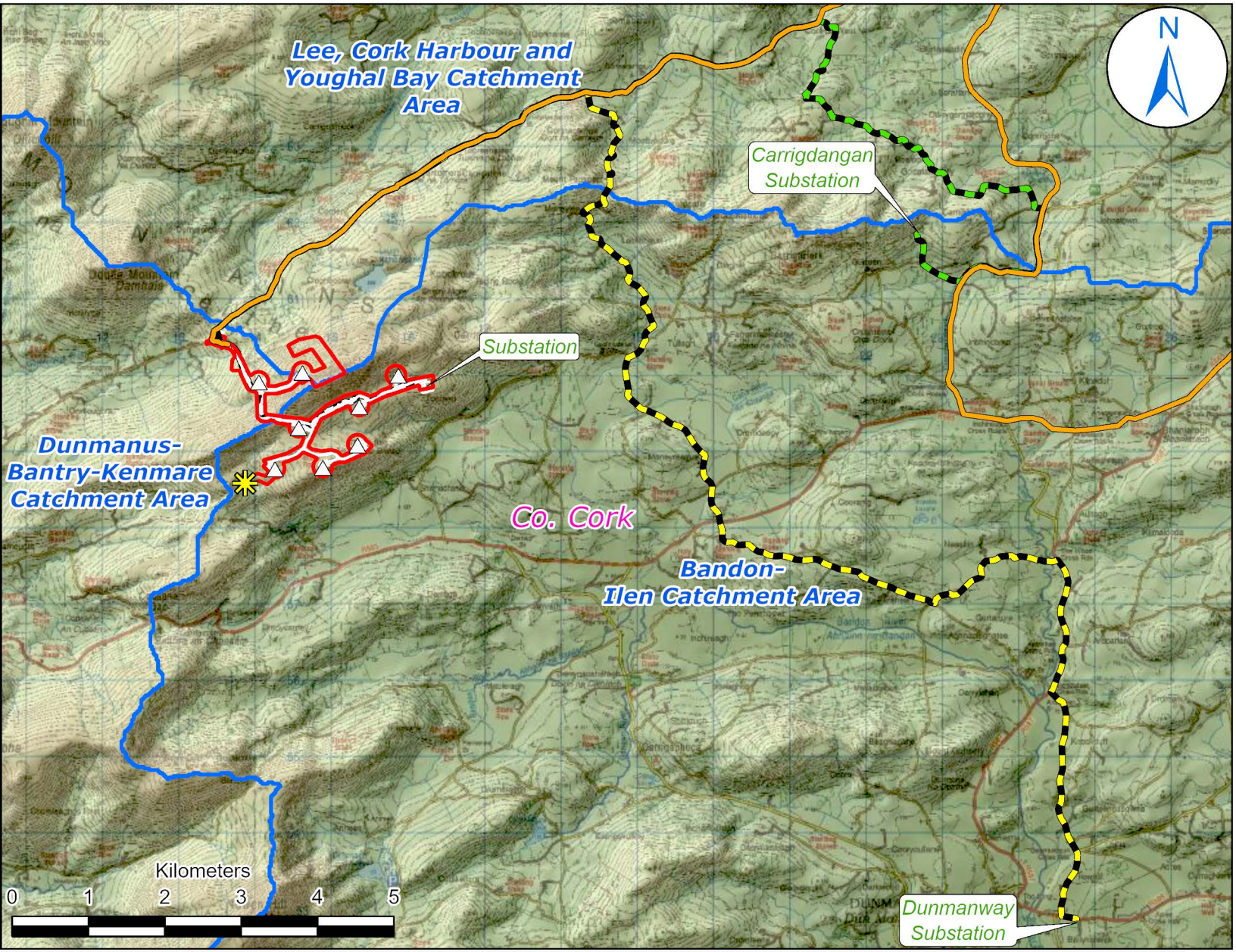
Table 3 – WFD River and Stream Groupings

Surface Waterbody ID Code	Surface Waterbody Name	WFD River/Stream Grouping in the Vicinity of the Proposed Development
IE_SW_21O070200	Owvane(Cork)_010	• Gortloughra River; and • Named and unnamed streams near the north-west extent of the Site (Channels 1 - 8).
IE_SW_20B020200	Bandon_020	• Shehy_Beg • Shanacrane_East • Named and unnamed streams near the southern extent of the Site (Channels 9 - 16). • Named and unnamed streams along the grid connection route option to Dunmanway substation, including, Cooranig, Dromdeegy, Caha River, Ardcahan, Knockduft and Gurteennasowna.
IE_SW_19L030200	Lee(Cork)_030	• Unnamed channels beyond the northern EIAR boundary at the existing Sheymore Windfarm site. • Named and unnamed channels along sections of the TDR and along both grid connection route options, including Cloghboola 19,Cornaire, Tooreenalour, Gortnarea, Gornacarriga, and Lagneeve.
IE_SW_19L030300	Lee(Cork)_040	• Named and unnamed channels along sections of the TDR and along the Carrigdangan grid connection route option, including Gortnalour, Gortaneadin and Dromnagapple.
IE_SW_20C010400	Caha_010	• Shehy_More • Unnamed streams beyond the eastern redline boundary. • Named and unnamed channels along the grid connection route option to Dunmanway, including Caha River,Coolmountain, and Tullagh 20.

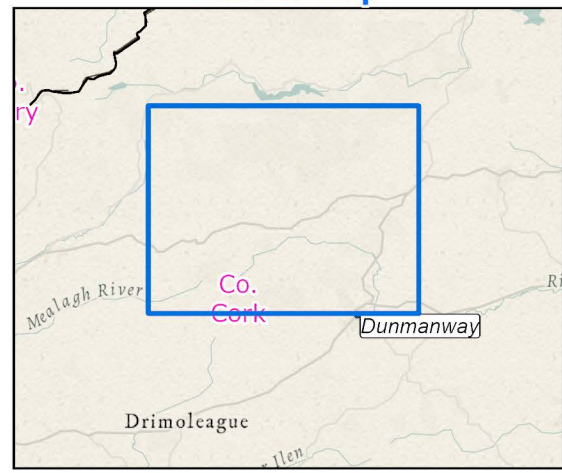
Surface Waterbody ID Code	Surface Waterbody Name	WFD River/Stream Grouping in the Vicinity of the Proposed Development
IE_SW_20C010700	Caha_020	• Named and unnamed channels along sections of the TDR and along the grid connection route option to Carrigdangan, including the Carrigdangan Stream.

In addition to the EPA named and unnamed rivers/streams discussed above, there are also numerous natural and artificial drainage ditches located within the proposed Site and its surrounds. The pre-existing artificial drainage network is more prominent in the northern portion of the Site than in the southern portion of the Site. The natural and artificial drainage channels facilitate the flow of surface water runoff into the streams and rivers located downstream of the Site. Light Detection and Ranging (LiDAR) data has been utilised along with GIS software to map the most prominent of the unmapped streams at the site. Ground surveys at the Site to physically map drainage features were also carried out on 14th/15th of June 2021, 4th/5th of April 2022, 13th/14th of June 2023 and 2nd/3rd of April 2024. The use of satellite imagery was also utilised to confirm the accuracy of the LiDAR mapping with GIS software. The LiDAR modelling returned several thousand drainage flow paths of very small drains, or micro-channels within the Site boundary. The most prominent of these are presented on **Figure 5** along with the sites inferred run-off flow directions.

Within the EIAR Site boundary and beyond, a detailed drainage basin delineation of the Site and its surrounds has also been completed utilising LiDAR data and GIS software. In hydrology, a drainage basin is an area of land drained by a river and its tributaries, a diagram of a typical basin structure and the associated interaction with groundwater is provided in **Appendix 1**. This methodology allows for runoff flow path directions and drainage patterns at the Site to be further refined. This technique enables potential impacts from the development on waterbodies to be assessed with high location data confidence and for area specific targeted mitigation measures to be implemented. There are numerous micro-basin areas located within the LiDAR coverage area, 58 of these individual drainage areas in the LiDAR coverage area have been mapped on **Figure 4.**



Extent Map



Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community

Legend

- EIAR Boundary
- Turbines
- Met Mast
- Road Layout & Hardstand Area
- WFD Catchments
- TDR

Grid Connection Route Options

- Both Grid Connection Route Options
- Dunmanway Option
- Carrigdangan Option

Client: Jennings O'Donovan & Partners.	
Project: Gortloughra Wind Farm.	
Map Title: Water Framework Directive (WFD) Catchment Areas Relative to the Site and Grid Connection Route Options.	
Spatial Reference Name: IRENET95 Irish Transverse Mercator	
Figure Number: 2	Page Size: A3
Date: 03/12/2024	Scale: 1:75,000
Revision Number: 1	Prepared By: DP
Tel: +353 (91) 897 583	Checked By: AG
Email: info@ecoquest.ie	
Web: www.ecoquest.ie	

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Kilometers
0 0.9 1.8 2.7 3.6 4.5

N

Lee[Cork] SC 010

Carrigdangan Substation

Substation

Coomhola SC 010

Bandon SC 010

Bandon SC 020

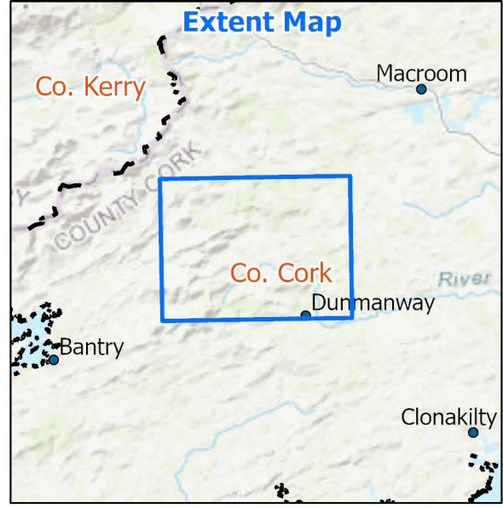
Bandon SC 030

Mealagh SC 010

Ilen SC 010

Dunmanway Substation

Extent Map



Legend

- WFD Subcatchments
- Turbines
- Met Mast
- EIAR Boundary
- Access Road Layout & Hardstand Areas
- TDR

Grid Connection Route Options

- Both Grid Connection Route Options
- Carrigdangan Option
- Dunmanway Option

Client: Jennings O'Donovan & Partners	
Project: Gortloughra Wind Farm	
Map Title: Water Framework Directive (WFD) Subcatchment Areas Relative to the Site and Grid Connection Route.	
Spatial Reference Name: IRENET95 Irish Transverse Mercator	
Figure Number: 3	Page Size: A3
Date Exported: 03/12/2024	Scale: 1:55,000
Revision Number: 1	Prepared By: DP
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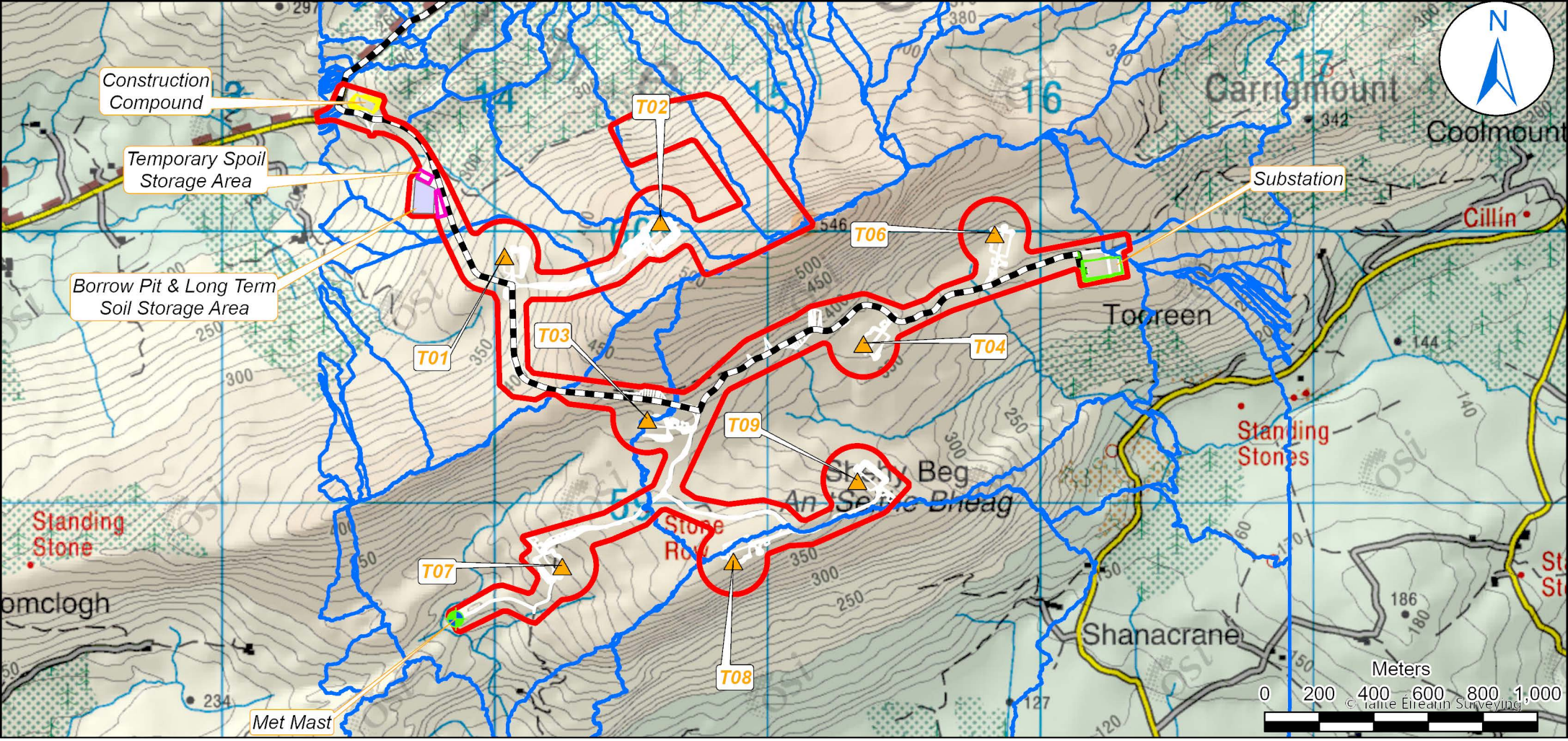
Email: info@ecoquest.ie	EcoQuest Environmental
Web: www.ecoquest.ie	



Legend

- LiDAR Derived Basin Delineation
- EIAR Boundary
- Turbines
- Substation
- Met Mast
- Borrow Pit & Long Term Soil Storage Area
- Construction Compound
- Access Road Layout & Hardstand Areas
- Both Grid Connection Route Options
- Temporary Spoil Storage Locations

Client: Jennings O'Donovan & Partners	
Project: Gortloughra Wind Farm	
Map Title: LiDAR Derived Drainage Basin Delineation at the Main Site	
Spatial Reference Name: IRENET95 Irish Transverse Mercator	
Figure Number: 4	Page Size: A3
Date: 07/03/2025	Scale: 1:20,000
Revision Number: 4	Prepared By: DP
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5.3 Surface Waterbody Status

A review of the latest available WFD surface waterbody (SWB) status and risk contained in the *3rd Cycle Lee, Cork Harbour and Youghal Bay Catchment Report (HA 19)*, (EPA, 2024), the *3rd Cycle Bandon Ilen Catchment Report (HA 20)* (EPA, 2024) and the 3rd Cycle Dunmanus-Bantry-Kenmare Catchment *Report (HA 21)* (EPA, 2024) has been carried out. This phase of the analysis assists with the overall scoping element of the WFD Assessment as is described in **Section 3.2.** A summary of the results of this review, in addition to location of the WFD assigned watercourse groupings relative to the proposed Development features is contained in **Table 4**. The results of this review are also outlined on **Figure 6** for the main Site and on **Figure 7** for SWBs in close proximity to the grid connection route options and sections of the TDR.

Eight EPA mapped channels located within or near the northern portion of the Site (Streams 1 - 8) are headwaters of the Gortloughra River which in turn is a tributary of the Owvane River (Owvane(Cork)_010). The Owvane(Cork)_010 has been classified as "*High*" status under the WFD for the 2016 – 2021 period. Eight small channels are located within or near to the southern portion of the Site (Channels 9 – 16, inclusive), all of which are headwaters of the River Bandon (Bandon_020). The Bandon_020 has been classified as "*Moderate*" status under the WFD for the 2016 – 2021 period.

Approximately 300m east of the northern planning boundary within the existing Shehy More Windfarm site is the EPA named "*Cloghboola 19*" stream which flows in a north-easterly direction into Lough Nambrackderg, which is also located within the existing Shehy More Windfarm site. Approximately 200m north of the Site boundary, within the existing Shehy More Windfarm site, an area of forestry plantation exists containing three channels which flow in a northerly direction to merge with another unnamed stream which ultimately merges with the Sruhaunphadeen Stream. Approximately 350m northwest of the of the Site boundary, three unnamed channels rise and merge to form Channel 6 which flows in a southerly direction into the northern site boundary before turning west and merging with the Gortloughra River. The Clogboola_19 stream, the Sruhaunphadeen stream, Lough Nambrackderg and all of the small unnamed channels located beyond the north/north-eastern EIAR boundary from part of the Lee(Cork)_30 group for the purpose of the WFD. The Lee(Cork)_30 has been classified as "*Good*" status under the WFD for the 2016 – 2021 period.

Both of the grid connection route options to Carrigdangan and Dunmanway Substations would progress from the northern extent of the main Site onto the L-8544 local road in a north-easterly direction until the two route options diverge near the townland of Gortnacarriga. As a result, many of the watercourses which would be traversed to facilitate the grid connection route are common to both grid connection route options. The TDR also follows this section of the L-8544 local road in addition to following an additional section of the Carrigdangan grid connection route option.

In terms of the grid connection route to Carrigdangan Substation, the route follows the road network to Carrigdangan Substation and would traverse across eighteen watercourses along the road network, two mapped watercourses within the EIAR boundary, and four field surveyed drainage channels within the EIAR boundary. Some of the EPA mapped watercourses along this route are unnamed, whilst the remaining named watercourses are "*Inchiroe",* "*Cloghboola 19*","*Cornaire",* "*Tooreenalour*", "*Gortnarea*", "*Gornacarriga*", "*Lagneeve*", "*Gortnalour*", "*Gortaneadin*", "*Dromnagapple*" and "*Carrigdangan*".

In terms of the grid connection route to Dunmanway Substation, the route follows the road network to Dunmanway Substation and would traverse across thirty-three mapped watercourses along the road network, two mapped watercourses within the EIAR boundary, and four field surveyed drainage channels within the EIAR boundary. Some of the EPA mapped watercourses along this route are unnamed, whilst the remaining named watercourses are, "*Inchiroe", "Cloghboola 19", "Cornaire", "Tooreenalour", "Gortnarea", "Gornacarriga", "Caha River", "Coolmountain", "Tullagh 20", "Cooranig", "Dromdeegy", "Ardcahan", "Nockduft", and "Gurteennasowna".*

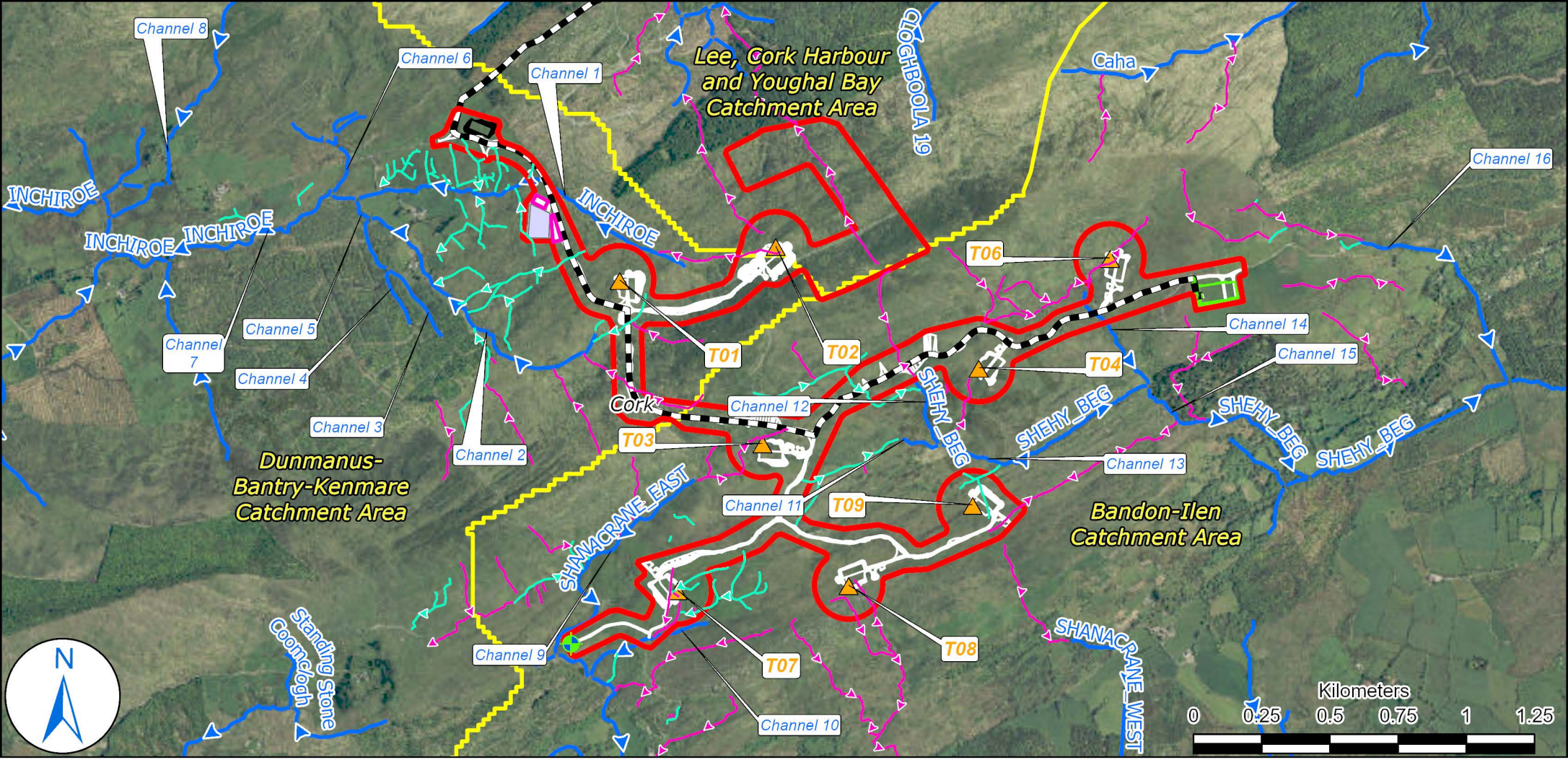
Stream orders are a way of classifying rivers and streams based on their size and how they connect to other waterways. This system helps scientists, planners, and environmentalists understand water flow, drainage patterns, and ecosystem health. First order streams are the smallest streams and

headwaters with the order number increasing as the size of the channel increases. The EPA named "*Caha*" is the Caha River, which has a stream order of 3 which increases to 4 at the southern extent of the Dunmanway grid connection route option. The EPA named "*Lagneeve*" also has a stream order of 3, whilst the remaining watercourses along both grid connection route options are all small streams, each with a stream order of 1 or 2. A summary of the SWB status for each of the waterbodies described above for the 2013 – 2018, and the 2016 – 2021 monitoring periods is outlined in **Table 4**.

Table 4 – SWB Status for 2013-2018 and 2016-2021

Surface Waterbody ID Code	Surface Waterbody Name	2013 - 2018 Water Quality Status	2013 - 2018 Significant Pressure	2016 - 2021 Water Quality Status	Risk Status of Not Meeting WFD Objectives	Location Relative to the Development
IE_SW_21O040400	Owvane(Cork)_010	High	No	High	Not at Risk	North-west extent of the Site and both grid connection route options
IE_SW_20B020200	Bandon_020	Good	No	Moderate	Not at Risk	Southern extent of the Site and the Dunmanway grid connection route option
IE_SW_19L030200	Lee(Cork)_030	Good	No	Good	Not at Risk	Beyond north-east Site Boundary, TDR and both grid connection route options
IE_SW_19L030300	Lee(Cork)_040	High	No	Good	At Risk	Along the Carrigdangan grid connection route option and TDR
IE_SW_20C010400	Caha_010	High	No	High	Not at Risk	Along both grid connection route options
IE_SW_20C010700	Caha_020	Good	Ag, For, Hymo, M+Q, Other	Good	At Risk	Along both grid connection route options and TDR

- Ag = Agriculture;
- For = Forestry;
- Hymo = Hydromorphology;
- M+Q = Mines and Quarries; and,
- Other = Abstractions, aquaculture, atmospheric, anthropogenic pressures, historically polluted sites, waste, water treatment and invasive species.



Legend

- Turbines
- EIAR Boundary
- Substation
- Met Mast
- Borrow Pit & Long Term Soil Storage Area
- Temporary Spoil Storage Locations
- Construction Compound
- Access Road Layout & Hardstand Areas
- Both Grid Connection Route Options

Hydrological Model

- Drainage Channel (Surveyed)
- Stormwater Flow Directions (Inferred)
- River Network
- WFD Catchments

Client: Jennings O'Donovan & Partners	
Project: Gortloughra Wind Farm	
Map Title: LiDAR Modelled Runoff Flow Directions and Drainage Channels	
Spatial Reference Name: IRENET95 Irish Transverse Mercator	
Figure Number: 5	Page Size: A3
Date: 07/03/2025	Scale: 1:20,000
Revision Number: 4	Prepared By: DP
Tel: +353 (91) 897 583	Checked By: AG
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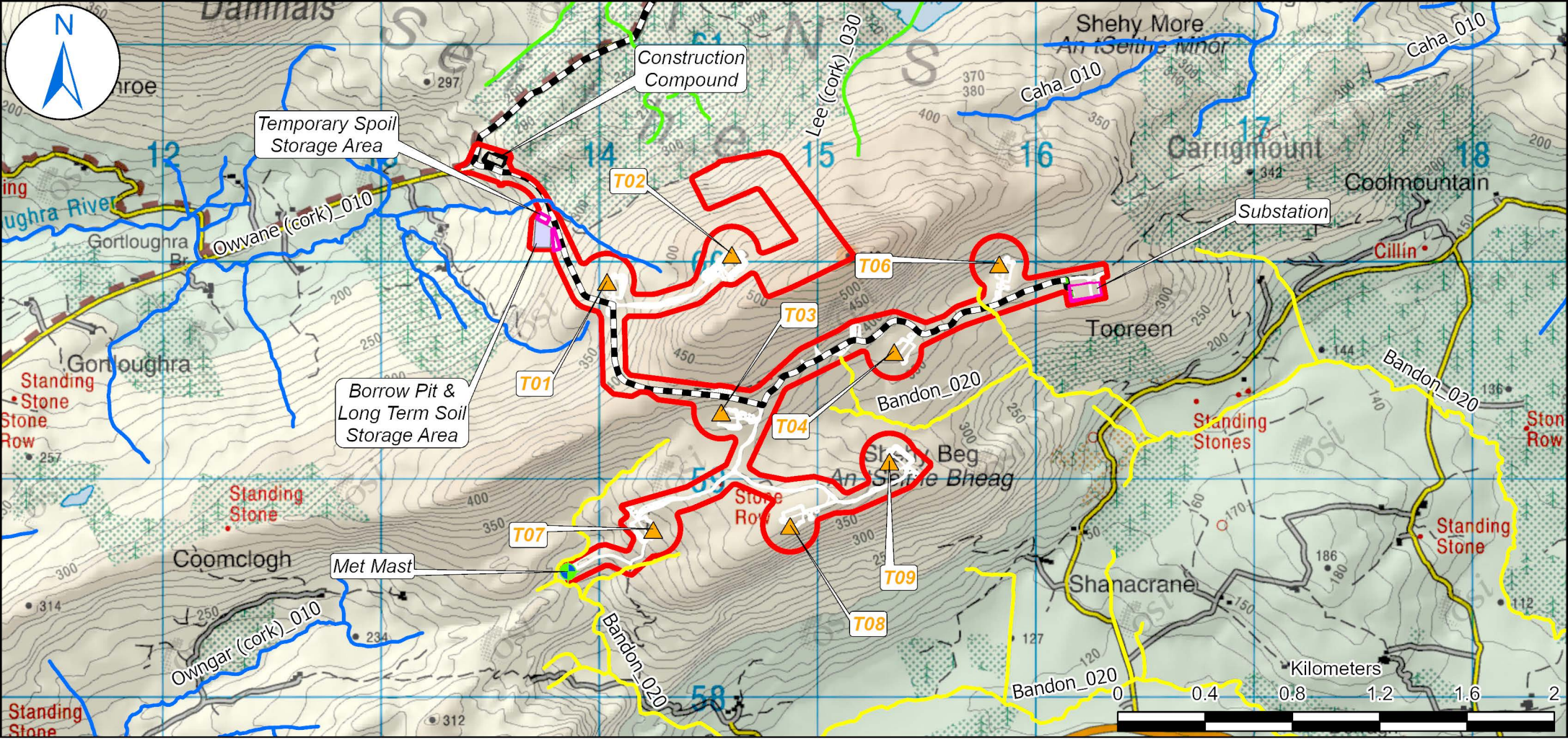

Legend

RWB Status (2016 - 2021)

- Good
- High
- Moderate

- Turbines
- EIAR Boundary
- Substation
- Borrow Pit & Long Term Soil Storage Area

- Temporary Spoil Storage Locations
- Construction Compound
- Met Mast
- Both Grid Connection Route Options

Client: Jennings O'Donovan & Partners	
Project: Gortloughra Wind Farm	
Map Title: Map Title: WFD Surface Water Classification at the Main Site.	
Spatial Reference Name: IRENET95 Irish Transverse Mercator	
Figure Number: 6	Page Size: A3
Date: 07/03/2025	Scale: 1:25,000
Revision Number: 4	Prepared By: DP
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Web: www.ecoquest.ie	

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Legend

- EIAR Boundary
- TDR

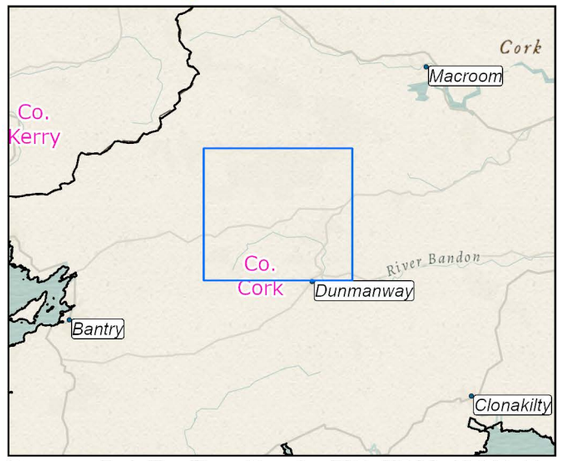
Grid Connection Route Options

- Both Grid Connection Route Options
- Carrigdangan Option
- Dunmanway Option

River Waterbody WFD Status 2016-2021

- Good
- High
- Moderate

Project Extent Map



Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community, Esri, HERE, Garmin, FAO, USGS, NGA

Client: Jennings O'Donovan & Partners	
Project: Gortloughra Wind Farm	
Map Title: Map Title: WFD Surface Water Classification Along the Grid Connection Route Options and TDR.	
Spatial Reference Name: IRENET95 Irish Transverse Mercator	
Figure Number: 7	Page Size: A3
Date Exported: 04/12/2024	Scale: 1:45,000
Revision Number: 1	Prepared By: DP
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5.4 Groundwater Body Identification

The purposes of the local and regional groundwater body identification is to assist in the WFD assessment screening phase as described in **Section 3.1.** The underlying bedrock within the Site boundary, along the grid connection route options and much of the TDR is variable, it consists of a combination of the following at a scale of 1:500,000 according to the Geological Survey Ireland (GSI):

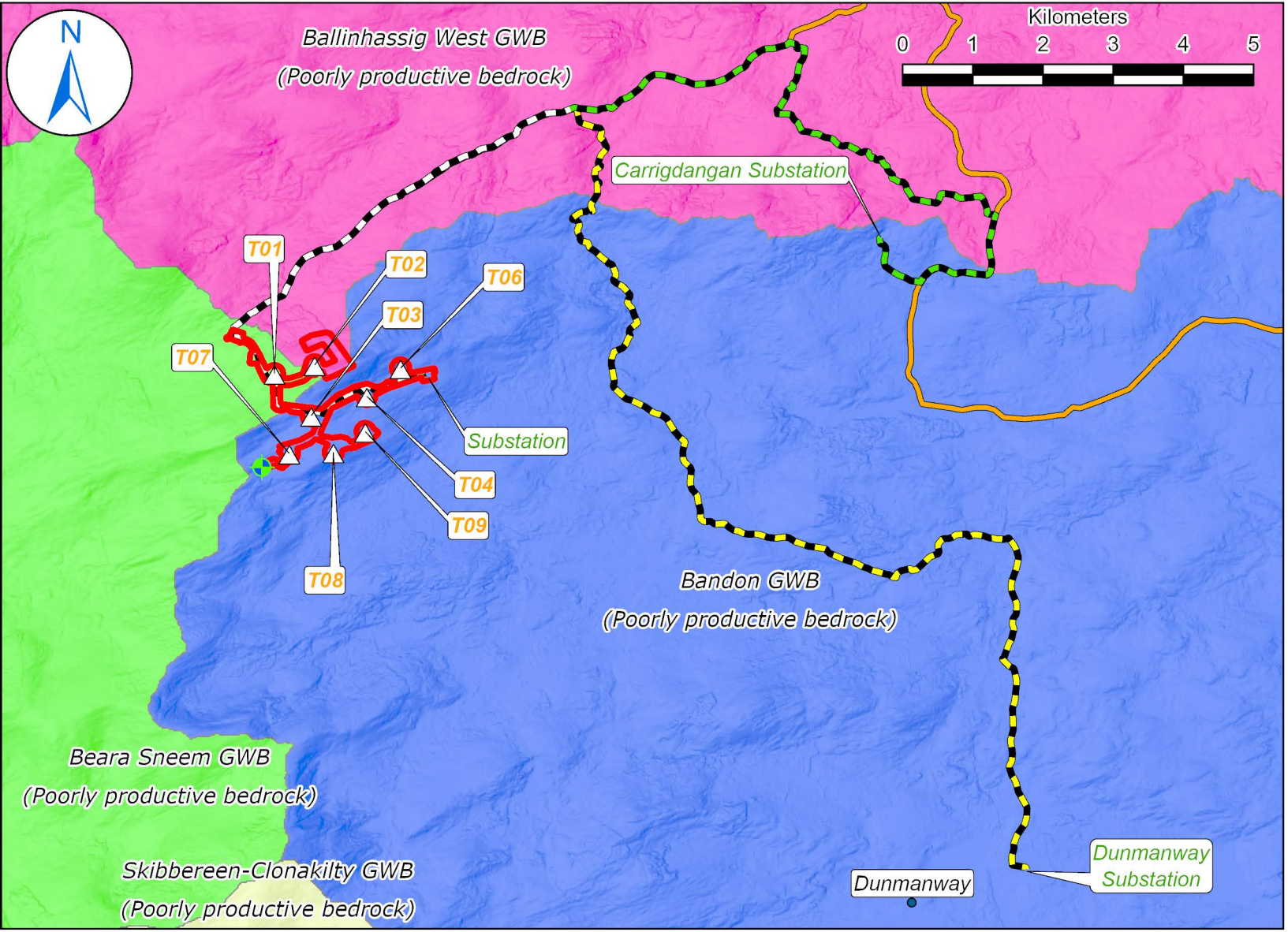
- Shallow marine, (Cork Group, Old Head Sandstone Fm); Sandstone & mudstone;
- Marine (Cork Group) (extends into the Visean); Mudstone, sandstone & thin limestone; and,
- Continental redbed facies; Sandstone, conglomerate & siltstone (in places extends into the Carboniferous).

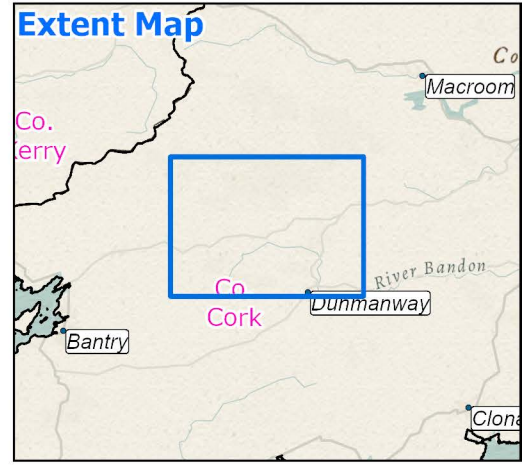
The bedrock formations underlying the Site are classified by the GSI as Locally Important (LI), bedrock which is moderately productive only in local zones. The Site, both gird connection route options and much of the TDR are spread across three underlying groundwater bodies (GWBs) which are the Bandon GWB, the Beara Sneem GWB and the Ballinhassig West GWB.

The three GWBs which underly the main Site, grid connection route options and much of the TDR share many common characteristics due to their geographical locations and topography being quite similar, especially at the main Site where the boundaries of these three GWBs meet. The rocks in these GWBs have no intergranular permeability, the aquifers are generally characterised as having low to moderate permeability. Diffuse recharge will occur via rainfall percolating through the subsoil or areas of outcropping rock. The proportion of the effective rainfall that will recharge the aquifer is determined by the permeability of the soil and subsoil, and by the slope. Due to the generally low/moderate permeability of the aquifers within these GWBs, and the multiple steep slopes at the Site, a high proportion of the recharge will discharge rapidly to surface watercourses via the upper layers of the aquifer, effectively reducing further the available groundwater resource in the underlying aquifer.

Permeability is highest in the upper few metres but generally decreases rapidly with depth. In general, groundwater flow is concentrated in the upper 15m of the aquifer, although deeper inflows form along fault zones or connected fractures can be encountered. The water table can vary from a few metres up to more than 10m below ground surface, depending upon topography. Groundwater is generally unconfined. Flow path lengths are generally short, ranging from 30-300m. Local groundwater flow directions are controlled by local topography. Groundwater discharges to the numerous streams and rivers crossing the aquifer and to small springs and seeps (GSI,2004). There is no known karst features recorded in close proximity to the Site nor along the grid connection route options or TDR. The closest evidence of karstification to the Site is recorded within an enclosed depression approximately 25km northwest of the site near the townland of Tubbrid, Co. Kerry.

The Ballinhassig West GWB is a Registered Protected Area (RPA) as it is a WFD GWB intersecting with WFD Designated Salmonid Waters under *S.I. No. 293/1988 - European Communities (Quality of Salmonid Waters) Regulations 1988*. Groundwater flow paths are expected to be generally short, ranging from 30-300m. Groundwater discharges to the numerous streams and rivers crossing the aquifer and to small springs and seeps. The nearest turbine position to a designated salmonid river in the Ballinhassig West GWB is located approximately 620m north of T02. Any potentially impacted groundwater is most likely to discharge to small springs or seeps across this distance given that groundwater flow paths are generally not anticipated to exceed a maximum of 300m. The Beara Sneem and the Bandon are RPAs for Shellfish as these GWBs intersect with coastal Designated Shellfish Zones under *S.I. No. 55/2009 European Communities (Quality of Shellfish Waters) (Amendment) Regulations 2009*. Due to the absence of proximity to coastal shellfish zones, shallow depths of intermittent trenching along the proposed grid connection route options and minor short duration works along the TDR, potential impacts on groundwater are expected to be negligible. Potential impacts on groundwater from the proposed wind farm Site are discussed in detail in subsequent sections of this assessment.





Client: Jennings O'Donovan & Partners	
Project: Gortloughra Wind Farm	
Map Title: GSI Groundwater Body Mapping of the Site and Grid Connection Route	
Spatial Reference Name: IRENET95 Irish Transverse Mercator	
Figure Number: 8	Page Size: A3
Date: 23/01/2025	Scale: 1:85,000
Revision Number: 1	Prepared By: DP
Tel: +353 (91) 897 583	Checked By: AG
Email: info@ecoquest.ie	
Web: www.ecoquest.ie	

EcoQuest Environmental

Legend

- Turbines
- EIAR Boundary
- Met Mast
- TDR

Grid Connection Route Options

- Both Grid Connection Route Options
- Carrigdangan Option
- Dunmanway Option

WFD Groundwater Body Boundaries

- Ballinhassig West
- Bandon
- Beara Sneem
- Skibbereen-Clonakilty

5.5 Groundwater Body Status

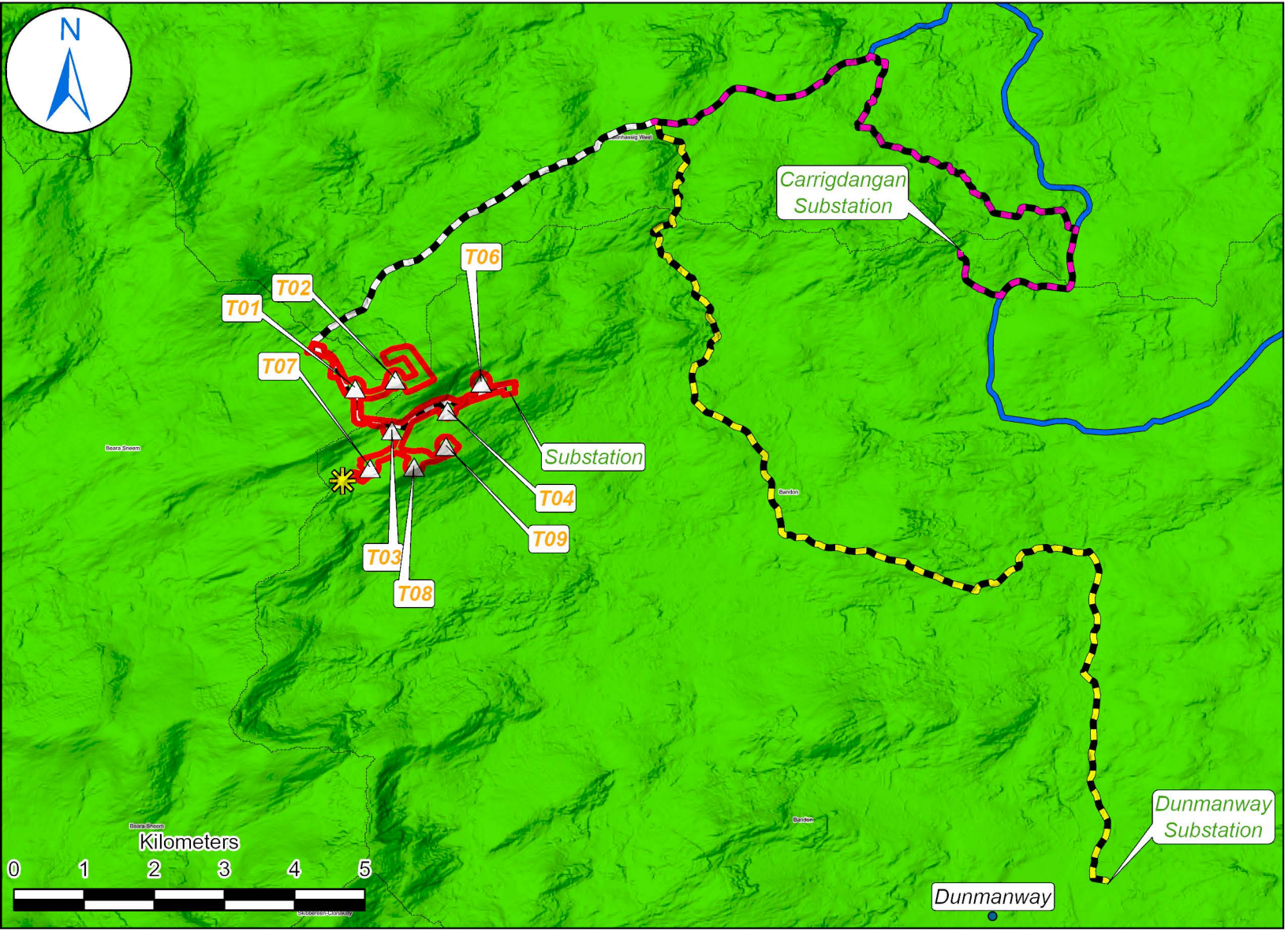
This phase the analysis assists with the overall scoping element of the WFD Assessment as is described in **Section 3.2.** The three groundwater bodies which underly the EIAR Site boundary, the grid connection route options and much of the TDR have been assigned "*Good*" status under the 3rd cycle of the WFD which is based on an assessment of the chemical and quantitative status of the GWB. The status is derived from representative monitoring points selected specifically for the WFD groundwater monitoring programme. The Beara Sneem GWB (IE_SW_G_019), the Ballinhassig West GWB (IE_SW_G_005) and the Bandon GWB (IE_SW_G_086) which underly the Site have been categorised as "*Not at Risk*" of failing to meet their WFD objectives by 2027.

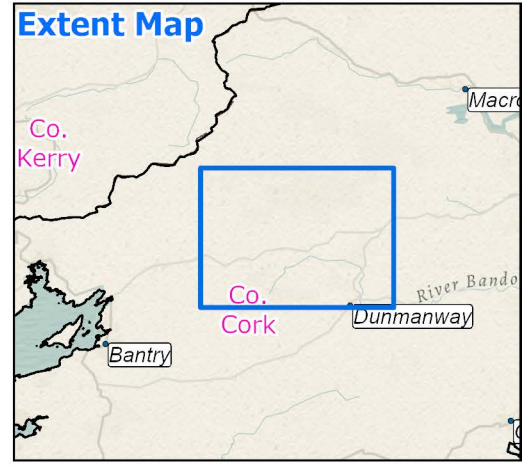
The risk of not meeting WFD objectives is determined by assessment of monitoring data, data on the pressures and data on the measures that have been implemented. Waterbodies may be categorised as "*Review*" either because additional information is needed to determine their status before resources and more targeted measures are initiated or measures have already been undertaken although the outcome hasn't yet been measured/monitored. The GWBs which underly the site, the grid connection route options and much of the TDR are not categorised as "*Review*" under the 3rd cycle of the WFD. Groundwater bodies that are "*At Risk*" are prioritised for implementation of additional measures and resources to mitigate potential impacts. The implementation of such additional measures do not apply to the GWBs underlying the proposed Site, gird connection route options and sections of the TDR where minor short duration woks will be required.

A review of the *3rd Cycle Lee, Cork Harbour and Youghal Bay Catchment Report (HA 19), (EPA, 2024)*, the *3rd Cycle Bandon Ilen Catchment Report (HA 20) (EPA, 2024)* and the *3rd Cycle Dunmanus-Bantry-Kenmare Catchment Report (HA 21) (EPA, 2024)* has confirmed that no significant pressures have been idented within any of the GWBs that underlie the proposed Development. The status of each GWB that underlies the proposed Development, for the 2013 – 2018 and the 2016 – 2021 monitoring periods is presented in **Table 5**.

Table 5 – Groundwater Body Status 2013 – 2018 and 2016 – 2021

Surface Waterbody ID Code	Groundwater Body Name	2013 - 2018 Status	2013 - 2018 Significant Pressure	2016 - 2021 Status	Risk Status of Not Meeting WFD Objectives by 2027	Location Relative to the Development
IE_SW_G_019	Beara Sneem	Good	None	Good	Not at Risk	Main Site, Both Grid Connection Options, and TDR on L-8776
IE_SW_G_005	Ballinhassig West	Good	None	Good	Not at Risk	Main Site, Both Grid Connection Route Options and TDR
IE_SW_G_086	Bandon	Good	None	Good	Not at Risk	Main Site, Both Grid Connection Route Options and TDR





Client: Jennings O'Donovan & Partners	
Project: Gortloughra Wind Farm	
Map Title: WFD Groundwater Body Status 2016-2021	
Spatial Reference Name: IRENET95 Irish Transverse Mercator	
Figure Number: 9	Page Size: A3
Date: 23/01/2025	Scale: 1:85,000
Revision Number: 1	Prepared By: DP
Tel: +353 (91) 897 583	Checked By: AG
Email: info@ecoquest.ie	
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EcoQuest Environmental

Legend

- Turbines
- Met Mast
- EIAR Boundary
- TDR

Grid Connection Route Options

- Both Grid Connection Route Options
- Carrigdangan Option
- Dunmanway Option

Ground Waterbody WFD Status 2016-2021
- Good
- Poor

6. WFD Register of Protected Areas

In accordance with the requirements of the WFD, and the associated national regulations, the EPA have compiled the Register of Protected Areas. While the overall objective of the Water Framework Directive is to achieve good status for all waterbodies by 2027, some waterbodies require additional protection by virtue of their location in a protected area, or their function as drinking or bathing water. Under Article 6 of the WFD, ANNEX IV Protected Areas are identified as those requiring special protection under existing national or European Legislation, either to protect their surface water or groundwater, or to conserve habitats or species that directly depend on those waters. The register of protected areas required under Article 6 includes the following types of protected areas:

- Designated areas for the protection of habitats or species where the maintenance or improvement of the status of water is an important factor in their protection, including relevant Natura 2000 sites designated under Directive 92/43/EEC (1) and Directive 79/409/EEC (2);
- Designated areas for the abstraction of water intended for human consumption under Article 7;
- Designated areas for the protection of economically significant aquatic species;
- Bodies of water designated as recreational waters, including areas designated as bathing waters under Directive 76/160/EEC; and,
- Nutrient-sensitive areas, including areas designated as vulnerable zones under Directive 91/676/EEC and areas designated as sensitive areas under Directive 91/271/EEC.

As part of the screening and scoping methodology outlined in **Sections 3.1** and **3.2** respectively, each of these types of protected areas are individually identified and assessed in the following sections in the context of the proposed Development and the associated potential impacts.

6.1 Designated Sites and Habitats

Special Areas of Conservation (SACs) and Special Protection Areas (SPAs), often referred to as "*European Sites*" or "*Natura 2000 Sites*", are the means by which European legislation protects threatened or rare habitats and species. Candidate Sites (i.e. cSAC or cSPA) have the same level of protection as fully designated sites under Irish Law. Candidate Sites are those that are currently under consideration by the Commission of the European Union for SAC or SPA status in accordance with the Habitats Directive. Natural heritage areas (NHAs) are designated areas that are protected under the *Wildlife Act 2000* for areas considered important for the habitats present or which hold species of plants and animals whose habitat needs protection.

Proposed natural heritage areas (pNHAs) are sites not yet offered the same statutory protection as NHAs but which may become NHAs in due course and are sites of significance for wildlife and habitats. The proposed Site is not located within any of the aforementioned categories of designated areas of conservation.

All of the surface waters at the Site located south of the Shehy More mountain uppermost ridgeline and summit ultimately flow into the Bandon River (Bandon_020), which in turn flows into the Bandon River SAC (Site Code 002171). The downstream distance from the nearest design elements, to the Bandon River SAC, is approximately 10.5km via the EPA named "*Shehy_Beg*" river which merges with the Bandon River near the townland of Togher, Co. Cork. Multiple other rivers and streams merge with the "*Shey_Beg*" river prior to its confluence with the Bandon River. Given the considerable ~10.5km downstream distance from the Site to the Bandon River SAC, in addition to the dilution effect of multiple other merging rivers and streams, hydrological connectivity from the Site to the Bandon River SAC is considered to be highly tenuous.

The grid connection route option to Dunmanway follows the existing road network which already traverses through the Bandon River SAC. Approximately 455m west of the existing substation at Dunmanway is the Bandon Valley South of Dunmanway pNHA through which the Bandon River SAC also flows. With the exception of horizontal directional drilling locations along both grid connection route options, only shallow trenching along the existing roadway is proposed to facilitate the construction of the grid connection route, the shallow trenching is not expected to breach the groundwater table. In the unlikely event that a brecciated or fractured formation were to occur, it could potentially result in the loss of drilling fluid through cracks, voids and fractures. If test pits and

boreholes were located directly on, or extended through the proposed alignment, these areas could act as weak points that may serve as conduits where inadvertent fluid returns or frac out occurs.

However, if a frac-out occurs, there will be a loss in drilling pressure, this is a signal to the operator that an issue has arisen with the drilling process and the drilling would be immediately ceased. The method for reducing the drilling fluid losses and thereby control the consumption of water and drilling fluid products, is to identify the point of losses and seal the area off. Clearbore drilling fluid will be used during the drilling process which is not toxic to aquatic organisms, and it is biodegradable which further reduces the potential for adverse impacts in the event of frac-out occurring. Due to the vast majority of the grid connection route option to Dunmanway requiring shallow trenching which will be backfilled, the temporary nature of the construction works, the established HDD technique with controls and use of non-toxic fluids, the potential impacts on Bandon River SAC are expected to be negligible.

Approximately 4.5km west of the site is the Conigar Bog NHA. However, the closet hydrological distance from the Site to the Conigar Bog NHA is approximately 25km in an overall upstream direction. Given that pollutants do not migrate or flow upstream, and the considerable hydrological distance of 25km, any hydrological connectivity between the Site and the Conigar Bog NHA is considered to range from highly tenuous to almost non-existent. Approximately 11.5km north-west of the Site boundary is the Slaheny River Bog NHA. There is no hydrological connectivity between the Site and the Slaheny Bog NHA. Other NHAs in the wider region north of the Site include the Doughill Bog NHA and the Sillahertnage Bog NHA which are not hydrologically connected to the Site.

Approximately 9km west of the north-western Site boundary is the Derryclogher (Knockboy) Bog SAC. None of the surface waters which drain the Site are hydrologically connected to the Derryclogher (Knockboy) Bog SAC. Approximately 4.8km north-east of the Site is the Lough Allua pNHA. None of the surface waters which drain the Site are hydrologically connected to the Lough Allua pNHA. Approximately 6.3km north-west of the Site is the Gouganebarra Lake pNHA and the Ballagh Bog pNHA. None of the surface waters which drain the Site are hydrologically connected to the Gouganebarra Lake pNHA or the Ballagh Bog pNHA.

The grid connection route option to Carrigdangan follows the existing road network to Carrigdangan Substation which does not traverse through any Natura 2000 sites. The closest designated site to the grid connection route is the Bandon River SAC, which is located approximately 4.3km downstream at the closet extent via the Carrigdangan, Cummernamart and Caha Rivers. Potential impacts on Natura 2000 sites that could potentially occur as a result of the Carrigdangan grid connection route option being the chose option are expected to be negligible.

With the exception of the Dunmanway grid connection route option, there is an absence of direct proximity to designated sites and habitats, the downstream hydrological connectivity to such sites ranges from generally highly tenuous to non-existent. With the implementation of mitigation measures as described in **Section 9**, potential impacts on designated sites are expected to be negligible. The designates sites in the wider region surrounding the proposed Site and grid connection route options are shown on **Figure 10**.

Gouganebarra Lake pNHA
Ballagh Bog pNHA
Ballagh Bog pNHA
Conigar Bog NHA
Lough Allua pNHA
Temporary Spoil Storage Area
Substation
Carrigdangan Substation
Construction Compound
Borrow Pit & Long Term Soil Storage Area
Met Mast
Bandon River SAC
Bandon Valley South Of Dunmanway pNHA
Dunmanway Substation
Dunmanway
Lee [Cork]
Lee [Cork]
Doughill Mountain
Douce Mountain
Maughanaclea Hills
Kilometers
0 1 2 3 4 5

Extent Map

Client: Jennings O'Donovan & Partners	
Project: Gortloughra Wind Farm	
Map Title: Protected Areas Relative to the Site and Grid Connection Route Options.	
Spatial Reference Name: IRENET95 Irish Transverse Mercator	
Figure Number: 10	Page Size: A3
Date Exported: 07/03/2025	Scale: 1:70,000
Revision Number: 4	Prepared By: DP
Tel: +353 (91) 897 583	Checked By: AG
Email: info@ecoquest.ie	EcoQuest Environmental
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Legend

- Special Area of Conservation (SAC)
- Proposed Natural Heritage Area (pNHA)
- Salmonid River Regs (S.I. 293 only)
- River Network
- Turbines
- EIAR Boundary
- Substation
- Met Mast
- Borrow Pit & Long Term Soil Storage Area
- Temporary Spoil Storage Locations
- TDR

6.2 Abstraction of Water Intended for Human Consumption

All of the rivers and streams at the Site located to the south of the summit of Shehy More Mountain are designated as river drinking water protected areas (DWPA) from which there is a known qualifying abstraction of water for human consumption as defined under Article 7 of the WFD. The rivers and streams located beyond the north-eastern Site boundary are also designated as Drinking Water Rivers. In terms of the grid connection route options, and much of the TDR where works will be carried out, these routes follow the existing road network to the northeast of the site would cross multiple watercourses that are designated as a Drinking Water Rivers. The Bandon River, which the grid connection route option to Dunmanway traverses across is also designated as a Drinking Water River in accordance with the *European Communities (Drinking Water) Regulations 2023 (S.I. No, 99/2023)* in addition to multiple other rivers and streams along this grid connection route option that are tributaries of the Bandon River.

All of the rivers identified above are designated as Drinking Water Rivers in accordance with *the European Communities (Drinking Water) Regulations 2023 (S.I. No, 99/2023)*. As a result, these rivers and streams, along with all rivers and streams at the Site, along the grid connection route options and TDR, should be considered to be highly sensitive in terms of potential chemical pollution and/or sediment laden runoff.

The EPA maintains a register of water abstractions in accordance with the *Water Environment (Abstractions and Associated Impoundments) Act 2022 (S.I. No. 48 of 2022)*. All persons that abstract a volume of 25 cubic metres (25,000 litres) per day or more from rivers, lakes and groundwater are required to register. The EPA does not publish a detailed public abstraction register as it may contain personal or commercially sensitive information or other information that could jeopardise the security of water supplies. A limited publicly available version of the abstraction register is available from the EPA upon request. This request was made on July 7th, 2023. The data received does not include information on water abstractions where the abstraction purpose has been identified as being for drinking water. Additionally, grid references are rounded to the nearest kilometre to protect the identity of individual households and businesses, who may also use the abstracted water for private domestic use.

The publicly available abstraction register was received from the EPA on July 13th, 2023. The publicly available register indicates that there are no registered abstraction points located within 5km of the Site. The closest registered abstraction point to the Site is located approximately 6km west of the Site near the townland of Lackareagh. The primary abstraction purpose at this Site is for hydropower. This hydropower site is located in an overall upstream direction relative to the proposed Site, potential impacts on hydropower at this site would therefore be negligible.

Consultation with local residents in the wider area has indicated that residents in the townland of Coolmountain do extract water from an unnamed stream that is a tributary of the Shehy_Beg River as their drinking water supply. This small unnamed channel has been labelled as "*Channel 16*" for the purposes of ease of identification and is shown on **Figure 5.** Channel 16 is located beyond the eastern site boundary; the closest design element would be the proposed Substation location which is approximately 500m to the west of Channel 16. Any potential run-off from the Substation location is modelled to flow toward the Shehy_Beg River and not towards Channel 16. Any potential impacts on the drinking wate supply at Channel 16 are therefore expected to be negligible.

There are no registered abstraction points located along or within the vicinity of the proposed grid connection route option to Carrigdangan. The closest registered abstraction point to this grid connection route option is located approximately 9km east of the existing substation at Carrigdangan where the primary abstraction purpose is for quarrying. There are no registered abstraction points located along or within the vicinity of the proposed grid connection route option to Dunmanway. The closest registered abstraction point to this grid connection route option is located approximately 2.2km south of the existing substation at Dunmanway where the primary abstraction purpose is for mining or quarrying. The proposed grid connection route options are both expected to have a negligible impact on these regional abstraction points since only shallow trenching that is not expected to breach the water table will be carried out along the chosen grid connection route option.

In terms of the TDR, there are no abstraction points located in close proximity to any proposed works locations along the TDR. Therefore, potential impacts on abstractions points resulting from works associated with the TDR are expected to be negligible.

The GSI well databases indicate that there are no known groundwater abstraction wells located within the Site boundary, with the closest being located approximately 2.4km to the northeast of the Site boundary, or approximately 580m west of the Dunmanway grid connection route option, in the townland of Coolcaum. This borehole is classified as being utilised for agricultural and domestic use and has been drilled to a depth of 40m. For the remainder of the Dunmanway grid connection route option, there is one GSI mapped well located approximately 1km east of this option at the closet extent in the townland of Acres, or approximately 1.2 km north-east of the existing substation in Dunmanway.

In terms of the Carrigdangan grid connection route option, a registered borehole is located approximately 900m northeast of the route in the townland of Scrahan where the primary use is registered as agricultural and domestic. Given that the nature of the proposed Development is expected to result in limited impact with groundwater, combined with the generally short groundwater flow paths in the region that are generally between 30-300m long, potential impacts on all of these wells are expected to be negligible.

There are no mapped wells located in close proximity to where any works will be caried out along the TDR with the closest being located approximately 150m east of a blade laydown area near the townland of Castlemore. Given this considerable distance and the limited use of this area as a laydown area, potential impacts on the nearest wells are expected to be negligible.

There are no mapped holy wells located within the site boundary nor in close proximity to the grid connection route options or TDR. The closest mapped holy well to the proposed development is located approximately 3.8km south-east of the site in the townland of Togher. This holy well is located approximately 520m southwest of the existing road along which the Dunmanway grid connection route option would traverse. Given that the nature of the proposed Development is expected to result in limited impact with groundwater, combined with the generally short groundwater flow paths in the region that are generally between 30-300m long, potential impacts on all of these wells are expected to be negligible.

Consultation with Uisce Éireann has confirmed that there are no known public water supplies (PWS) in existence in the area surrounding the Site or along the grid connection route options. Uisce Éireann maintains records of Water Supply Zones (WSZ's) through which water is delivered to each tap from a particular WSZ. A WSZ is a defined supply area served by a single source or group of connected sources. There are no WSZs located within the main Site boundary nor along the Carrigdangan gird connection route option according to Uisce Éireann's publicly available WSZ data for west Cork which was last updated in August 2024. Approximately 600m east of the L-4607 local road along which the Carrigdangan grid connection route would traverse is the Johnstown WSZ. Since only shallow backfilling that is not expected to breach the water table will be carried out, coupled with the approximate 600m distance at the closest extent, potential impacts on the Johnstown WSZ are expected to be negligible.

A small portion of the Dunmanway grid connection route option traverses through the Dunmanway WSZ as it follows the road network to Dunmanway. Due to the shallow trenching nature of the grid connection works that will be backfilled, no impacts on the Dunmanway WSZ are anticipated.

The turbine delivery route (TDR) also slightly intersects the Coppeen WSZ along the L-8684 local road near the townland of Moneygaff West, the Crookstown WSZ along the R-585 regional road near the townland of Farranduff and the Cork Harbour and City WSZ to the east of Crookstown along the N22 national road. No works will be carried out at any of these locations that is considered to have potential to impact on the these WSZs. Potential impacts on any WSZ as a consequence of works being undertaken along the TDR are therefore expected to be negligible.

There are no National Federation of Group Water Schemes (NFGWS) located within 5km of the Site or the grid connection route options or along the TDR, with the closest being located approximately 5.2km north of the Site which is not hydrologically connected to the site. The nearest public supply source protection area is located approximately 9.3km north of the Site at the townland of

Carrignadoura. This area comprises both an inner and an outer source protection area, neither of which is hydrologically connected to the Site. As a result, no adverse impacts on NFGWS are expected to occur as a result of the proposed Development.

The Site is divided across three separate locate Electoral Divisions (ED) of Garrown, Douce and Bealanageary. The published census data from the Central Statistics Office (CSO) relating to water supply data in private households from the year 2016 has been reviewed. A breakdown of the reported water supply type in the three Electoral Divisions that intersect the Site is outlined in **Table 6**. There may be some uncertainty or errors in the census data which the general republic responded to. Nevertheless, the data strongly indicates that the majority of households in the localised region are utilising a "Other Private Source" for their drinking water supply. There are no dwellings located within or on the EIAR boundary. Given the rural location, it is considered that private groundwater wells are likely to account for a large portion of these private sources.

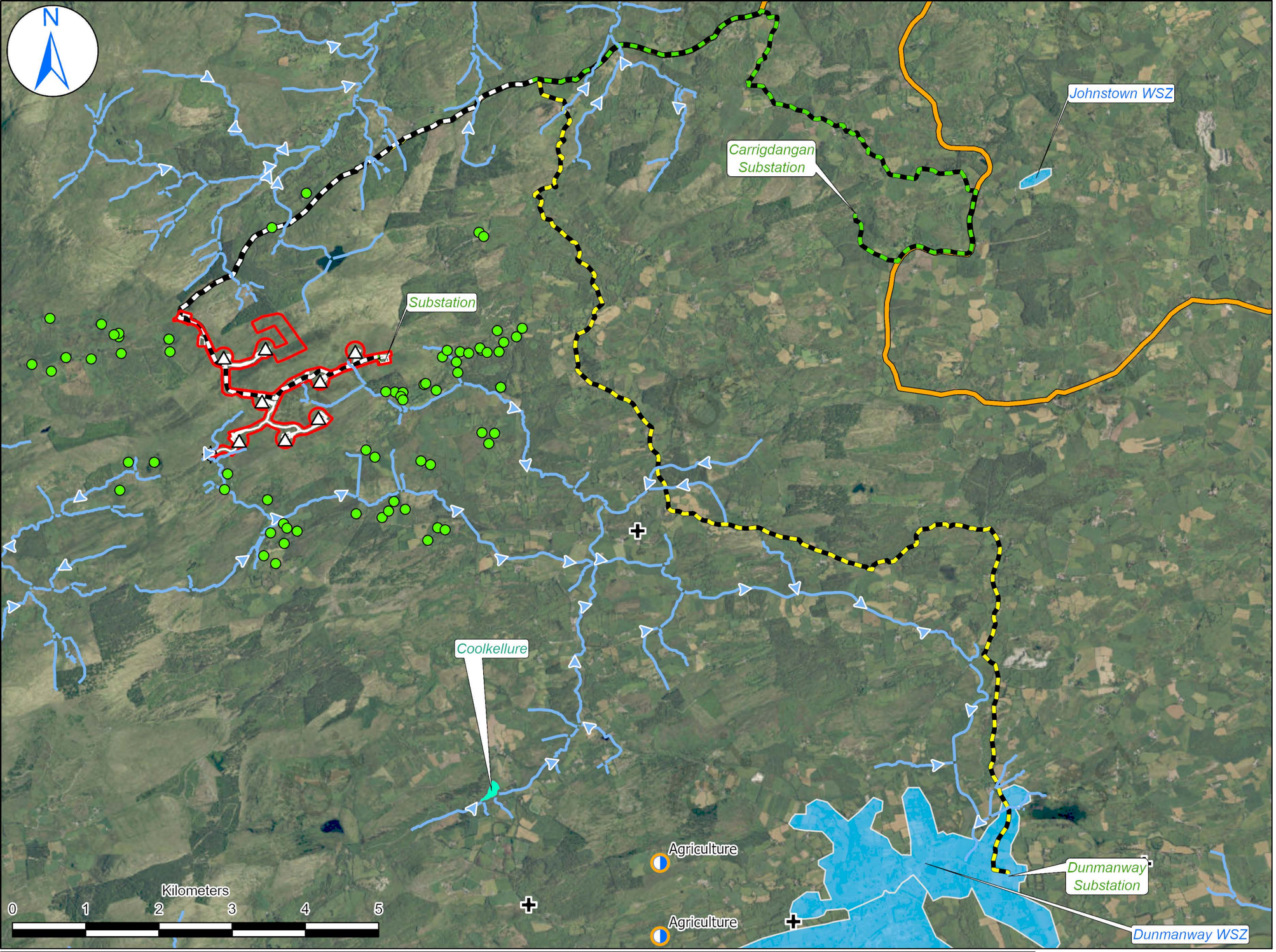
Table 6 – 2016 Census Data Water Supply by Type in Electoral Divisions at the Site

Electoral Division	No. of Permeant Private Households	Public Main	Group Scheme With Public Source	Group Scheme With Private Source	Other Private Source	None	Not Stated
Garrown	**91**	0 (0%)	0 (0%)	3 (3.3%)	87 (95.6%)	0 (0%)	1
Douce	**95**	8 (8.4%)	0 (0%)	1 (1.1%)	84 (88.4%)	1 (1.1%)	1
Bealanageary	**64**	11 (17.2%)	8 (12.5%)	9 (14.1%)	34 (53.1%)	2 (3%)	0

No dwellings are located within 300m of the design elements such as turbine locations, substation, access roads, met mast and construction compound etc. Due to the absence of private dwellings within 300m of the main development features, any potential impacts on local private wells is expected to be negligible. Any potential impacts to groundwater would most likely discharge to a surface water prior to impacting upon private wells in the region. Along both of the gird connection route options, only shallow trenching will be carried out to facilitate the cable installation, groundwater is most unlikely to be intercepted along either of the gird connection route options. Only minor short duration works that are not expected to intercept groundwater will be required along the TDR. Potential impacts associated with groundwater along either of the grid connection route options and the TDR are therefore expected to be negligible.

All Water Framework Directive GWBs nationally have been identified as Drinking Water Protected Areas (DWPA) due to the potential for qualifying abstractions of water for human consumption as defined under Article 7 of the WFD. The nature of the proposed Development as a wind farm will necessitate near surface construction activities which would generally result in negligible groundwater impacts. Although all groundwater associated with the Site is protected as a source of drinking water, the bedrock aquifer underlying the Site and surrounding area is likely to be a poorly permeable aquifer and can support only local scale flow systems. As the proposed construction works at the Site will not be located within close proximity to any dwellings, the risk of potential adverse impacts to groundwater will be highly limited to localised zones. Furthermore, it is considered that the majority of any potential contaminants such as fuel/chemical spills or seepage from cementitious materials would likely partially or fully infiltrate to surface water systems rather than recharge via percolation into groundwater. Potential impacts during the construction phase are common to all construction Sites. All potential contamination sources will be carefully managed during the construction and operational phases.

The locations of water supply zones, dwellings near the Site, GSI/EPA mapped boreholes, wells, springs and holy wells; relative to the proposed Site, the grid connection route options and TDR, are mapped on **Figure 11**.



Legend

- Turbines
- EIAR Boundary
- Met Mast
- Access Road Layout & Hardstand Areas
- Dwellings near the Site
- Holy Wells
- EPA Abstraction Register
- Water Supply Zones

WFD RPAs - Drinking Water

- Drinking Water - Rivers
- Drinking Water -Surface Waterbodies
- TDR

Grid Connection Route Options

- Both Grid Connection Route Options
- Carrigdangan Option
- Dunmanway Option

Client: Jennings O'Donovan & Partners	
Project: Gortloughra Wind Farm	
Map Title: Dwellings Near the Site and Water Resources Relative to the Site and Grid Connection Route Options.	
Spatial Reference Name: IRENET95 Irish Transverse Mercator	
Figure Number: 11	Page Size: A3
Date Exported: 03/12/2024	Scale: 1:55,000
Revision Number: 1	Prepared By: DP
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The EPA/GSI Wells and Springs databases are not comprehensive. The locations of records have different precisions depending on the source data and may vary from 10m to 1km (townland accuracy).

6.3 Designated Areas for the Protection of Economically Significant Aquatic Species

The Ballinhassig West GWB is a Registered Protected Area (RPA) as it is a WFD GWB intersecting with WFD Designated Salmonid Waters under *S.I. No. 293/1988 - European Communities (Quality of Salmonid Waters) Regulations 1988.* Groundwater flow paths are expected to be generally short, ranging from 30-300m. Groundwater discharges to the numerous streams and rivers crossing the aquifer and to small springs and seeps. The nearest turbine position to a designated salmonid river in the Ballinhassig West GWB is located approximately 620m north of T02. Any potentially impacted groundwater is most likely to discharge to small springs or seeps across this distance given that groundwater flow paths are generally not anticipated to exceed a maximum of 300m.

None of the surface waters which drain the Site are classified as WFD Designated Salmonid Waters under *S.I. No. 293/1988 - European Communities (Quality of Salmonid Waters) Regulations 1988* nor do they intersect any waters under this designation. The rivers and streams located beyond the north-eastern Site boundary, in the Lee, Cork Harbour and Youghal Bay Catchment Area, are classified as waters which do intersect designated Salmonid Waters. As can be seen on **Figure 4**, none of the proposed turbine positions, hardstand areas or access roads etc. are modelled to fall within the drainage basin of the Salmonid Waters within the Lee, Cork Harbour and Youghal Bay Catchment Area. Any potential run-off or groundwater flow directions from the proposed Development are modelled to flow towards the Dunmanus-Bantry-Kenmare Catchment Area. As a result, potential impacts from the main site, on waters classified as waters which intersect designated Salmonid Waters, are expected to be negligible.

In terms of potential impacts from the grid connection route options, the existing road along which both route options would follow does intersect WFD Designated Salmonid Waters under *S.I. No. 293/1988 - European Communities (Quality of Salmonid Waters) Regulations 1988*. HDD could potentially be required at an upper maximum of eight WFD Designated Salmonid Waters along the Dunmanway Grid Connection route option and at potentially an upper maximum of thirteen WFD Designated Salmonid Waters along the Carrigdangan Grid Connection route option. The number of locations where HDD would be required along both grid connection route option was unknown at the time of preparing this assessment. As a conservative approach, it has been assumed that all watercourses along both routes would require HDD, which is unlikely to be the case. The use of well-established HDD techniques, with control measures, including the use of non-toxic fluids will be in place regardless of the grid connection route option that is chosen.

In terms of the TDR, minor short duration works such as vegetation clearing, checking road widths, use of oversail areas and temporary road widening along the existing road network will be carried out at seven locations that are in close proximity to WFD Designated Salmonid Waters under *S.I. No. 293/1988 - European Communities (Quality of Salmonid Waters) Regulations 1988*. With appropriate mitigation measures in place, the potential impacts on WFD Designated Salmonid Waters under *S.I. No. 293/1988 - European Communities (Quality of Salmonid Waters) Regulations 1988* are expected to be negligible

The Beara Sneem and the Bandon are RPAs for Shellfish as these GWBs intersect with coastal Designated Shellfish Zones under *S.I. No. 55/2009 European Communities (Quality of Shellfish Waters) (Amendment) Regulations 2009*. Due to the absence of proximity to coastal shellfish zones, shallow depths of trenching along the proposed grid connection route options and minor short duration works along the TDR, potential impacts on groundwater are expected to be negligible. Potential impacts on groundwater from the proposed wind farm Site are discussed in detail in subsequent sections of this assessment.

6.4 Bodies of Water Designated as Recreational Waters, Including Areas Designated as Bathing Waters Under Directive 76/160/EEC.

The Bathing Water Directive (2006/7/EC) is the legal instrument for managing environment and reducing health risk at bathing in natural waters. Its aim is to protect human health and preserve, protect, and improve the quality of the environment. Bathing Water Quality Regulations were adopted in March 2008 transposing the *EU Bathing Water Directive of 2006* into Irish law.

There are no bathing waters located in close proximity to the Site, TDR or the grid connection route options. The closest designated bathing waters are located approximately 25km south of the Site at Rosscarbery Bay. Potential impacts from the proposed development on any designated bathing water site are expected to be negligible.

6.5 Nutrient-Sensitive Areas

Nutrient sensitive areas consist of areas designated as vulnerable zones under the *Nitrates Directive (91/676/EEC)* and areas designated as sensitive areas under the *Urban Wastewater Treatment Directive (UWWTD) (91/271/EEC)*. The Nitrates Directive aims to improve water quality by protecting water against pollution caused by nitrates from agricultural sources such as from animal manures, chemical nitrogen fertilisers and other nitrogen-containing materials spread onto land. The proposed Development will not result in the management or spread of animal manures, fertilisers or nitrogen containing materials. The disturbance of land through vehicle movements and excavations could potentially exacerbate nutrient loading to the surface water network at the site if such activities are not adequately controlled.

Nutrient sensitive catchments are those catchments where nutrient sensitive points, rivers or waterbodies exist. The proposed Site, grid connection route options and much of the TDR fall within two nutrient sensitive catchments which are the Bandon Estuary Upper and the Lee Estuary / Lough Mahon nutrient sensitive areas. The Upper Bandon Estuary is located approximately 38km south-east of the Site. The Lee Estuary / Lough Mahon is located approximately 50km north-east of the Site. There are no nutrient sensitive rivers located along either of the proposed grid connection route options. The are no nutrient sensitive points such as designated lakes or sewage outfalls located within 18km of the Site or either grid connection route option. Given the absence of proximity to nutrient sensitive estuaries, rivers or points, and the nature of the Development as a non-agricultural or wastewater related development, potential nutrient impacts are expected to be negligible.

The Bandon GWB, which underlies much of the Site, both grid connection route options and much of the TDR is designated as groundwater in a nutrient sensitive area. Groundwater flow path lengths are generally short, ranging from 30-300m. Local groundwater flow directions are controlled by local topography. Groundwater discharges to the numerous streams and rivers crossing the aquifer and to small springs and seeps. Given that groundwater is expected to rapidly discharge to surface waters, and the nature of the Development as a non-agricultural or wastewater related development, potential nutrient impacts on groundwater are expected to be negligible.

The *Urban Wastewater Treatment Directive (UWWTD) (91/271/EEC*) aims to protect the environment from the adverse effects of the collection, treatment and discharge of urban wastewater. 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. There are no urban wastewater emission points or treatment plants located in the vicinity of the Site, the proposed grid connection route options or along the TDR where works will be carried out. The closet urban wastewater emission point or treatment plant to the Site is located over 6km north of the Site at Ballingeary. The proposed Development will not require the treatment or discharge of wastewater during the construction or operation phases. All wastewater will be transported off-site by a licensed waste haulage contractor for disposal at an appropriately licensed facility. As a result, potential impacts associated with wastewater are expected to be negligible.

7. Screening and Scoping

An analysis of the surface waterbodies and groundwater bodies that could potentially be impacted by the proposed Development has been carried out in order to determine which waterbodies required further assessment.

7.1 Source-Pathway-Receptor Model for Surface Water Runoff

To assess potential surface water impacts, such as sediment laden runoff, or chemical spills from each individual turbine and hardstand area, a LiDAR sourced digital elevation model (DEM) was utilised with GIS software to map unmapped small streams and the generalised runoff flow direction from the proposed Development areas to the nearest surface waterbodies. The purpose of this type of analysis is a form of Source-Pathway-Receptor (SPR) model which is useful when applying the risk concept to waterbody protection and vulnerability.

The source is the Development and activity that pose a threat to waterbodies, namely, the construction, operation and decommissioning of the proposed Gortloughra Windfarm in this case. Determining the most likely source points of release is a critical reference point for waterbody vulnerability assessment and mapping. All turbine locations, hardstand areas, substation, site access roads, borrow pit, soil storage areas, and horizontal directional drilling locations along the grid connection route options have been identified in the SPR model as the most likely source points for release of potential contaminants to SWBs. Minor road improvement works along the TDR, and short duration shallow trenching works along the existing roadway of either of the grid connection route options, that are considerably distant from surface waters, have been screened out as these locations are considered to be unlikely point sources in the SPR model.

The pathway includes all surface features and land uses between the source and the receptor such as the drainage networks which act as a vector and the surrounding topography which dictates the fate of the runoff flow direction. The pathway is from the point of release of contaminants across overland flows to the downstream surface waterbody (receptor). Under real-time physical conditions, the runoff pathway is influenced by factors such as groundwater recharge rates and evapotranspiration.

The SPR modelling for the purpose of this WFD assessment assumes that groundwater recharge and evapotranspiration does not occur as a precautionary worst-case scenario in assessing potential impacts on WFD surface waters. In simple terms, this SPR model assumes that after or during heavy rainfall events, contaminants would flow downstream from a point source at the site via the path of least resistance as runoff to the nearest WFD surface waterbody without being recharged to groundwater or undergoing evapotranspiration. The receptor in this instance is the WFD surface waterbody which could potentially be impacted by pollutants contained in runoff and which must be identified for protection. The results from the SPR surface water runoff modelling is visually represent in **Figure 5** and are outlined in tabular form in **Table 7**. The results of the SPR surface water runoff analysis have infirmed the assessment of the potential impacts on WFD surface waterbodies which is outlined in **Table 8**.

Table 7 – Source-Pathway-Receptor Model for Surface Water Runoff

Potential Surface Water Runoff Source Location	Generalised Potential Pathway Description	WFD Surface Water Receptor
Turbine 1 (T1)	North-westerly runoff flow direction across moderately sloping terrain.	Owvane(Cork)_10
T1 Hardstand Area	North-westerly runoff flow direction across moderately sloping terrain.	Owvane(Cork)_10
T1 Access Road	North-westerly runoff flow direction across moderately sloping terrain.	Owvane(Cork)_10
Turbine 2 (T2)	North-westerly runoff flow direction across steep to moderately sloping terrain.	Owvane(Cork)_10
T2 Hardstand Area	North-westerly runoff flow direction across steep to moderately sloping terrain.	Owvane(Cork)_10
T2 Access Road	North-westerly runoff flow direction across steep to moderately sloping terrain.	Owvane(Cork)_10
Turbine 3 (T3)	South-easterly runoff flow direction across lightly sloping terrain.	Bandon_020
T3 Hardstand Area	South-easterly runoff flow direction across lightly sloping terrain.	Bandon_020
T3 Access Road	Mainly south-westerly runoff flow direction with some north-westerly drainage also across light to moderately sloping terrain in both instances.	Bandon_020 and Owvane(Cork)_10
Turbine 4 (T4)	South-easterly run-off flow direction across light to moderately sloping terrain.	Bandon_020
T4 Hardstand Area	South-easterly run-off flow direction across light to moderately sloping terrain.	Bandon_020
T4 Access Road	South to south-easterly run-off flow direction across light to moderately sloping terrain.	Bandon_020
Turbine 6 (T6)	South-westerly run-off flow direction across light to moderately sloping terrain.	Bandon_020
T6 Hardstand Area	South-westerly run-off flow direction across light to moderately sloping terrain.	Bandon_020
T6 Access Road	South-westerly run-off flow direction across light to moderately sloping terrain.	Bandon_020
Turbine 07 (T07)	South-westerly run-off flow direction across moderately sloping terrain.	Bandon_020
T7 Hardstand Area	South-westerly run-off flow direction across moderately sloping terrain.	Bandon_020
T7 Access Road	South to south-westerly run-off flow direction across moderately sloping terrain.	Bandon_020
Turbine 8 (T8)	Southerly run-off flow direction across steep sloping terrain.	Bandon_020
T8 Hardstand Area	Southerly run-off flow direction across steep sloping terrain.	Bandon_020
T8 Access Road	Southerly run-off flow direction across steep sloping terrain.	Bandon_020
Turbine 9 (T9)	North-easterly run-off flow direction across moderately sloping terrain.	Bandon_020
T9 Hardstand Area	North-easterly run-off flow direction across moderately sloping terrain.	Bandon_020
T9 Access Road	North-easterly run-off flow direction across moderately sloping terrain and to the south across steeply sloped terrain.	Bandon_020
Substation	Southerly run-off flow direction across steep sloping terrain.	Bandon_020
Temporary Site Compound	Southerly run-off flow direction across moderately sloping terrain.	Owvane(Cork)_10

Potential Surface Water Runoff Source Location	Generalised Potential Pathway Description	WFD Surface Water Receptor
Borrow Pit and Soil Storage Areas	South westerly flow direction across moderately sloping terrain.	Owvane(Cork)_10
Grid Connection Route Option to Carrigdangan and associated HDD locations	South westerly flow direction across steep terrain to Owvane(Cork)_10, northerly flow direction across moderate terrain to (Lee Cork)_030 and (Lee Cork)_040, southerly flow direction across relatively flat terrain to Caha_020.	Owvane(Cork)_10 (Lee Cork)_030, (Lee Cork)_040 and Caha_020
Grid Connection Route Option to Dunmanway and associated HDD locations	Multiple flow direction across widely varying terrain across the wider region surrounding the site and Dunmanway.	Bandon_020, Owvane(Cork)_10 (Lee Cork)_030 Caha_010 Caha_020

7.2 WFD Screening

The results of the SPR surface water runoff modelling outlined in **Table 7** have been utilised to further refine and identify the surface waterbodies which do and do not require further assessment. This screening analysis, and the accompanying justification for each determination is outlined in **Table 8**.

Table 8 – Analysis of WFD Surface Waterbodies Requiring Further Assessment

Surface Waterbody ID Code	Surface Waterbody Name	Screening Outcome	Rationale
IE_SW_21O040400	Owvane(Cork)_ 010	Screened In	Two turbine positions, hardstand areas and their access roads (T01, T02), plus a portion of the T3 access road, borrow pit, soil storage areas and both grid connection route options are located within the drainage basin of the Owvane(Cork)_010. Further assessment is required to determine the extent of potential impacts on the Owvane(Cork)_010 waterbody which could occur as a consequence of the proposed Development.
IE_SW_20B020200	Bandon_020	Screened In	Six turbine positions, hardstand areas and their access roads (T03, T04,T06,T07,T08. T09), plus the substation are located within the drainage basin of the Bandon_020. The Dunmanway grid connection route option also intersects the Bandon_020 where horizontal directional drilling will be carried out. Further assessment is required to determine the extent of potential impacts on the Bandon_020 waterbody which could occur as a consequence of the proposed Development.
IE_SW_19L030200	Lee(Cork)_030	Screened In	According to the EPA sub-catchment maps, the T02 position and a portion of the T02 hardstand area, marginally fall within the Lee[Cork]_SC_010 sub-catchment area. Detailed basin delineation mapping with LiDAR as shown **Figure 4** shows that all of the T02 design elements fall within the drainage basin of the Owvane(Cork)_010. None of the proposed turbine positions, hardstand areas or access roads are contained within the drainage basin of the Lee(Cork)_030. Both grid connection route options, and associated HDD locations, do intersect surface water bodies in the Lee(Cork)_030 group. Further assessment is required to determine the extent of potential impacts on the Lee(Cork)_030 waterbody which could occur as a consequence of the proposed Development.
IE_SW_19L030300	Lee(Cork)_040	Screened In	None of the proposed turbine positions, hardstand areas or access roads are contained within the drainage basin of

Surface Waterbody ID Code	Surface Waterbody Name	Screening Outcome	Rationale
			the Lee(Cork)_040. The Carrigdangan grid connection route option, and associated HDD locations, do intersect surface water bodies in the Lee(Cork)_040 group. Further assessment is required to determine the extent of potential impacts on the Lee(Cork)_040 waterbody which could occur as a consequence of the proposed Development.
IE_SW_20C010400	Caha_010	Screened In	The Dunmanway grid connection route option, and associated HDD locations intersect the Caha_10 waterbody. Further assessment is required to determine the extent of potential impacts on the Caha_10 waterbody which could occur as a consequence of the proposed Development.
IE_SW_20C010700	Caha_020	Screened In	Both of the grid connection route options intersect the Caha_20 waterbody where HDD will be carried out. Further assessment is required to determine the extent of potential impacts on the Caha_20 waterbody which could occur as a consequence of the proposed Development.

In terms of WFD GWBs, the location of the various components of the development have been assessed against the locations of the underlying GWBs to establish which GWBs required further assessment. The results of this analysis are outlined in **Table 9**.

Table 9 – Analysis of WFD Groundwater Bodies Requiring Further Assessment

GWB ID Code	GWB Name	Screening Outcome	Rationale
IE_SW_G_019	Beara Sneem	Screened In	The Beara Sneem GWB underlies T01 and it's hardstand area, borrow pit, both grid connection route options, soil storage areas, temporary compound, a small section of the TDR, in addition to most of the T02 hardstand area. The T01, T02 and part of the T03 access roads are also underlain by the Beara Sneem GWB. Further assessment is required to determine the extent of potential impacts on the Beara Sneem GWB which could occur as a consequence of the proposed Development.
IE_SW_G_005	Ballinhassig West	Screened In	Both grid connection route options,T02 position and a small portion of the T02 hardstand area are underlain by the Ballinhassig West GWB. Further assessment is required to determine the extent of potential impacts on the Ballinhassig West GWB which could occur as a consequence of the proposed Development.
IE_SW_G_086	Bandon	Screened In	T03, T04, T06, T07, T08, T09, their associated hardstand areas and access roads, the substation and both of the grid connection route options are underlain by the Bandon GWB. Further assessment is required to determine the extent of potential impacts on the Bandon GWB.

7.3 Screening of Protected Areas

Section 6 provides an assessment of the EPA's list of WFD Register of Protected Areas and the potential for the proposed development to impact on each identified area. **Table 10** outlines the results of the screening assessment for the regional designates sites, habitats and protected areas.

Table 10 – Screening Assessment of Protected Sites

Site Code	Site Name	Screening Outcome	Rationale
002171	Bandon River SAC	Screened Out	The grid connection route option to Dunmanway follows the existing road network to Dunmanway which already traverses through the Bandon River SAC. With the exception of potentially an upper maximum of three HDD locations along this grid connection route option within the Bandon River SAC, only shallow trenching along the existing roadway is proposed to facilitate the construction of the grid connection route. The shallow trenching is not expected to breach the groundwater table. If a frac-out occurs during HDD, there will be a loss in drilling pressure, this is a signal to the operator that an issue has arisen with the drilling process and the drilling would be immediately ceased. The method for reducing the drilling fluid losses and thereby control the consumption of water and drilling fluid products is to identify the point of losses and seal the area off. Clearbore drilling fluid will be used during the drilling process which is not toxic to aquatic organisms and is biodegradable which further reduces the potential for adverse impacts in the event of frac-out occurring. Due to the vast majority of the grid connection route option to Dunmanway requiring shallow trenching which will be backfilled, the temporary nature of the construction works, the established HDD technique with controls and use of non-toxic fluids is expected, with appropriate mitigation measures in place, the potential impacts on Bandon River SAC are expected to be negligible.
002386	Conigar Bog NHA	Screened Out	The closet hydrological distance from the Site to the Conigar Bog NHA is approximately 25km in an overall upstream direction. Given that pollutants do not migrate or flow upstream, and the considerable hydrological distance of 25km, any hydrological connectivity between the Site and the Conigar Bog NHA is considered to range from highly tenuous to almost non-existent.
000383	Slaheny River Bog NHA	Screened Out	The Slaheny River Bog NHA is located approximately 11.5km north-west of the Site boundary. There is no hydrological connectivity between the Site and the Slaheny Bog NHA.
001873	Derryclogher (Knockboy) Bog SAC	Screened Out	The Derryclogher (Knockboy) Bog SAC is located approximately 11.5km north-west of the Site boundary. There is no hydrological connectivity between the Site and the Derryclogher (Knockboy) Bog SAC.
001065	Lough Allua pNHA	Screened Out	Approximately 4.8km north-east of the Site is the Lough Allua pNHA. None of the surface waters which drain the Site are hydrologically connected to the Lough Allua pNHA. Both grid connection route options will follow the existing road network and will utilise existing bridges, culverts or the HDD method and associated mitigation measures described in **Section 6.1**.
001057	Gouganebarra Lake pNHA	Screened Out	Approximately 6.3 km north-west of the Site is the Gouganebarra Lake pNHA. None of the surface waters which drain the Site are hydrologically connected to the Gouganebarra Lake pNHA.
001886	Ballagh Bog pNHA	Screened Out	Approximately 6.3 km north-west of the Site is the Ballagh Bog pNHA. None of the surface waters which drain the Site are hydrologically connected to the Ballagh Bog pNHA.

7.4 Screening of Abstraction of Water Intended for Human Consumption

Section 6.2 provides an assessment of the potential impacts on waters abstracted where the intended use if for human consumption. Potential impacts on these waters have been screened out for the following reasons:

- The closest registered abstraction point to the Site is located approximately 6km west of the Site near the townland of Lackareagh. The primary abstraction purpose at this Site is for hydropower;
- The closest registered abstraction point to the Carrigdangan grid connection route option is located approximately 9km east of the existing substation at Carrigdangan where the primary abstraction purpose is for quarrying;
- The proposed grid connection route options are expected to have a negligible impact on this abstraction point since only shallow trenching that is not expected to breach the water table will be carried out along the grid connection route;
- There are no registered abstraction points located along or within the vicinity of the proposed grid connection route option to Dunmanway. The closest registered abstraction point to this grid connection route option is located approximately 2.2km south of the existing substation at Dunmanway where the primary abstraction purpose is for mining or quarrying;
- There are no known groundwater abstraction wells located within the Site boundary with the closest being located approximately 2.4km to the northeast of the Site boundary, or approximately 580m west of the Dunmanway grid connection route option, in the townland of Coolcaum;
- For the remainder of the Dunmanway grid connection route option, there is one GSI mapped well located approximately 1km east of this option at the closet extent in the townland of Acres, or approximately 1.2 km north-east of the existing substation in Dunmanway.
- In terms of the Carrigdangan grid connection route option, there is one GSI mapped well approximately 900m northeast of the route in the townland of Scrahan;
- In terms of the TDR, there are no abstraction points located in close proximity to any proposed works locations along the TDR. Therefore, potential impacts on abstractions points resulting from works associated with the TDR are expected to be negligible;
- There are no mapped holy wells located within the site boundary nor in close proximity to the grid connection route or TDR works locations. The closest mapped holy well to the proposed Development is located approximately 3.8km south-east of the site in the townland of Togher. This holy well is located approximately 520m southwest of the existing road along which the Dunmanway grid connection route option would traverse;
- Consultation with Uisce Éireann has confirmed that there are no known public water supplies (PWS) in existence in the area surrounding the Site or along the grid connection route.
- There are no WSZs located within the main Site boundary nor along the Carrigdangan gird connection route option according to Uisce Éireann's publicly available WSZ data for west Cork which was last updated in August 2024;
- A small portion of the Dunmanway grid connection route option traverses through the Dunmanway WSZ as it follows the road network to Dunmanway. Due to the shallow trenching nature of the grid connection works that will be backfilled, no impacts on the Dunmanway WSZ are anticipated;
- There are no National Federation of Group Water Schemes (NFGWS) located within 5km of the Site or the grid connection route with the closest being located approximately 5.2km north of the Site which is not hydrologically connected to the site;
- The nearest public supply source protection area is located approximately 9.3km north of the Site at the townland of Carrignadoura; and,
- Given the rural location, it is considered that private groundwater wells are likely to account for a large portion of private water sources in the wider region. Due to the absence of private dwellings within 300m of the main development features, any potential impacts on local private wells are expected to be negligible. Any potential impacts to groundwater would most likely discharge to a surface water prior to impacting upon private wells in the region.

7.5 Screening of Designated Areas for the Protection of Economically Significant Aquatic Species

Section 6.3 provides an assessment of the potential impacts on designated areas for the protection of economically significant aquatic species. Potential impacts on these waters have been screened out for the following reasons:

- The Beara Sneem and the Bandon are RPAs for Shellfish as these GWBs intersect with coastal Designated Shellfish Zones under *S.I. No. 55/2009 European Communities (Quality of Shellfish Waters) (Amendment) Regulations 2009*. Due to the absence of proximity to coastal shellfish zones, shallow depths of trenching along the proposed grid connection route options and minor short duration works along the TDR, potential impacts on groundwater are expected to be negligible;
- The Ballinhassig West GWB is a Registered Protected Area (RPA) as it is a WFD Designated Salmonid Waters under *S.I. No. 293/1988 - European Communities (Quality of Salmonid Waters) Regulations 1988*. Groundwater flow paths are expected to be generally short, ranging from 30-300m. Groundwater discharges to the numerous streams and rivers crossing the aquifer and to small springs and seeps. The nearest turbine position to a designated salmonid river in the Ballinhassig West GWB is located approximately 620m north of T02. Any potentially impacted groundwater is most likely to discharge to small springs or seeps;
- None of the proposed turbine positions, hardstand areas or access roads etc. are modelled to fall within the same drainage basin as surface waters that are classified Salmonid Waters under *S.I. No. 293/1988 European Communities (Quality of Salmonid Waters) Regulations 1988*. As a result, potential impacts on waters classified as waters which intersect designated salmonid waters are expected to be negligible;
- In terms of potential impacts from the grid connection route options, the existing road along which both route options would follow does intersect WFD Designated Salmonid Waters under *S.I. No. 293/1988 - European Communities (Quality of Salmonid Waters) Regulations 1988*. HDD could potentially be required at an upper maximum of eight WFD Designated Salmonid Waters along the Dunmanway Grid Connection route option and at potentially an upper maximum of thirteen WFD Designated Salmonid Waters along the Carrigdangan Grid Connection route option. The number of locations where HDD would be required along both grid connection route options was unknown at the time of preparing this report. As a conservative approach, it has been assumed that all watercourses along both routes would require HDD which is unlikely to be the case. The use of well-established HDD techniques, with control measures, including the use of non-toxic fluids will be in place regardless of the grid connection route option that is chosen.
- In terms of the TDR, minor short duration works such as vegetation clearing, checking road widths, use of oversail areas and temporary road widening along the existing road network will be carried out at seven locations that are in close proximity to WFD Designated Salmonid Waters under *S.I. No. 293/1988 - European Communities (Quality of Salmonid Waters) Regulations 1988*. With appropriate mitigation measures in place, the potential impacts on WFD Designated Salmonid Waters under *S.I. No. 293/1988 - European Communities (Quality of Salmonid Waters) Regulations 1988* are expected to be negligible.

7.6 Screening of Bodies of Water Designated as Recreational Waters

Section 6.4 provides an assessment of the potential impacts on bodies of water designated as recreational waters, including areas designated as bathing waters. There are no bathing waters located in close proximity to the Site, TDR work areas or the grid connection route options. The closest designated bathing waters are located approximately 25km south of the Site at Rosscarbery Bay. Potential impacts from the proposed development on any designated bathing water site have been screened out.

7.7 Screening of Nutrient Sensitive Areas

Section 6.5 provides an assessment of the potential impacts on nutrient sensitive areas. Potential impacts on these areas have been screened out for the following reasons:

- The proposed Development will not result in the management or spread of animal manures, fertilisers or nitrogen containing materials;
- The Upper Bandon Estuary, a nutrient sensitive area in the same catchment as the Site, is located approximately 38km south-east of the Site;
- The Lee Estuary, a nutrient sensitive area in the same catchment as the Site, is located approximately 50km north-east of the Site;
- There are no nutrient sensitive rivers located along either of the proposed grid connection route options or TDR work areas. The are no nutrient sensitive points such as designated lakes or sewage outfalls located within 18km of the Site or either grid connection route option;
- Given the absence of proximity to nutrient sensitive estuaries, rivers or points, and the nature of the Development as a non-agricultural or wastewater related development, potential nutrient impacts on surface waters have been screened out;
- Groundwater is expected to rapidly discharge to surface waters, the nature of the Development as a non-agricultural and a non-wastewater related development, potential nutrient impacts on groundwater have been screened out;
- There are no urban wastewater emission points or treatment plants located in the vicinity of the Site or the proposed grid connection route options with the closet being located over 6km north of the Site at Ballingeary. The proposed Development will not require the treatment or discharge of wastewater during the construction or operation phases. All wastewater will be transported off-site by a licensed waste haulage contractor for disposal at an appropriately licensed facility. As a result, potential impacts associated with wastewater on nutrient sensitive areas have been screened out.

7.8 Screening for Hydromorphological Impacts

Hydromorphology considers the physical character and water content of water bodies. Good hydromorphological conditions support aquatic ecosystems. Hydromorphological elements such as water flow and substrate provide physical habitat for biota such as fish, invertebrates and aquatic macrophytes. In terms of rivers, hydromorphology refers to:

- The amount of water flowing in a river, its speed and how it rises and falls during floods and droughts; and,
- The physical habitat of a river, including the type of channel bed materials, the variation in channel width, depth, the type of riverbanks and the vegetation that grows along the slopes and tops of riverbanks.

Good hydromorphological conditions in rivers, lakes and estuaries can facilitate good conditions for plants and animals. Hydromorphology pressures are anything that impacts negatively on the form or flow of a river. Hydromorphology pressures may include abstraction, impoundment such as dams and weirs that impeded fish passage, channelisation, land drainage, navigation structures, increased runoff rates or flood risk, flood defence structures and embankments.

Potential hydromorphology impacts resulting from the proposed Development have been screened out for the following reasons:

- Abstraction of surface water or groundwater will not be carried out during the construction, operational or decommissioning phase of the proposed development;
- The proposed Development will not require the construction of the features described above such as dams or weirs that impeded fish passage, channelisation, land drainage, navigation structures, flood defence structures or embankments etc.;
- The course of all naturally occurring EPA mapped watercourses will remain unchanged and will not be diverted, only small pre-existing drainage channels or ditches at the Site will require slight diversions;
- Direct discharge of dewatered loads to surface waters will not be permitted under any circumstances;
- Flood risk identification and water balance calculations have been carried out as part of **Chapter 9: Hydrology and Hydrogeology**. No flood risks have been identified for the

current or future scenarios at the Site or to downstream receptors as a result of the proposed Development. The increased runoff rates have been calculated to be slight or not significant;

- Careful planning of culvert sizing and the drainage diversion methodology detailed in the **Surface Water Management Plan** will ensure that the crossing of small drainage channels at the Site will result in anticipated negligible hydromorphological impacts. The drainage design will ensure that surface water run-off from the proposed Site will not increase the risk of flooding to downstream receptors. The drainage design will in turn also aid in ensuring that any potential hydromorphological impacts are minimised;
- The use of existing infrastructure at bridges, horizontal directional drilling under watercourses and/or the replacement of some exiting culverts with appropriately sized new culverts along the grid connection route will be carried out to facilitate the construction of the grid connection route; and,
- Short duration temporary shallow trenching will be carried out along the reminder of the chosen grid connection route option. None of these activities are considered likely to increase the risk or hydromorphology pressures on any water course at the Site or along the existing road network.

8. Assessment of WFD Compliance in an Unmitigated Scenario

8.1 Description of Proposed Works

The proposed Development includes the construction of 8 wind turbines with associated hardstand areas, a permanent met mast, 110Kv on-site substation, TDR works and all ancillary works and the construction of an underground grid connection to Carrigdangan Substation, or grid connection to Dunmanway Substation, Co. Cork. The proposed Development will also require the construction of crane hardstand areas and turbine foundations, construction of new internal site access roads and upgrade of existing site roads, to include passing bays and all associated drainage. One on-site borrow pit, a temporary construction compound and soil storage area would be developed during the construction phase.

8.2 Potential Sources of Impacts on Surface Waters

The potential for adverse impacts on SWBs to arise could potentially occur due to the following activities:

- The potential release of elevated suspended solids to surface waters during earthworks in the form of sediment laden runoff;
- Increased hydraulic loading due to replacement of natural surfaces with impermeable materials resulting in the potential for increased erosion and associated sedimentation within the localised surface water network;
- Potential accidental release of highly alkaline cementitious materials to surface waters resulting in physicochemical alterations to the surface water network with potential for associated adverse effects on sensitive downstream receptors; and,
- Potential accidental release of hydrocarbons or other chemicals to SWBs resulting in physicochemical alterations to the surface water network with potential for associated adverse effects on sensitive downstream receptors.

8.3 Potential Impacts During Construction Without Mitigation

8.3.1 Surface Water Quality

In the absence of mitigation measures, there is potential for a reduction in surface water quality to occur primarily due to the earthwork activities that will be required for the construction of the proposed Development. There is also potential for accidental spillages of hydrocarbon-based fuels and oils, wastewater, other liquid chemicals or sanitation products, paints or sealants and/or the accidental release of cementitious materials. In the absence of mitigation measures, HDD works could also potentially result in a temporary WFD status change to the Owvane(Cork)_010, Bandon_020, Lee(Cork)_030, Lee(Cork)_040, Caha_010 and the Caha_020 WFD waterbodies. It is considered that there are viable surface water pathways from the proposed work areas to the Owvane(Cork)_010 and Bandon_020. The potential requirement for HDD on the Bandon_020, Lee(Cork)_030, Lee(Cork)_040, Caha_010 and Caha_020 could potentially result in temporary short duration changes to these WFD SWBs in the absence of mitigation measures. An overview of the potential WFD status changes that could potentially occur within the surrounding surface water network during construction in the unmitigated scenario is outlined in **Table 11**.

Table 11 – Assessment of Potential WFD Surface Water Body Status Changes in the Absence of Mitigation Measures During Construction

Surface Waterbody ID Code	Surface Waterbody Name	2016 - 2021 Water Quality Status	Assessment of Potential WFD Status Change
IE_SW_21O040400	Owvane(Cork)_010	High	Good
IE_SW_19L030200	Lee(Cork)_030	Good	Moderate
IE_SW_19L030300	Lee(Cork)_040	Good	Moderate
IE_SW_20B020200	Bandon_020	Moderate	Poor
IE_SW_20C010400	Caha_010	High	Good
IE_SW_20C010700	Caha_020	Good	Moderate

8.3.2 Groundwater Quality and Quantity

The nature of the proposed Development is such that deep excavation works will not be required. Potential adverse impacts on groundwater are generally not expected to arise with surface waters being the most likely receptor for potential adverse impacts due to the near surface nature of the proposed Development. Nevertheless, the potential for adverse impacts on groundwater could potentially arise due to an accidental surface spill(s) of hydrocarbons or other liquid chemicals and/or the potential seepage of cementitious materials into the underlying GWB. Although considerably less likely to occur, the potential impacts on groundwater are therefore similar to the potential impacts on surface waters with the exception of increased sediment loading which is not expected to be a likely potential impact on groundwater.

The proposed Development will not require the installation of boreholes for groundwater extraction purposes during the construction, operational or decommissioning phases. All fresh water required during the construction phase of the project will be delivered to the Site via tank trucks. There will be no impacts on groundwater quantity at any stage across the lifecycle of the proposed Development.

The blanket peat, sandstone shales and till, which constitute the dominant surface layers at the Site normally form in areas where the underlying bedrock is characterised by low to moderate permeability as is the case at the Site. In areas where blanket peat exists at the Site, the overlying bog typically forms part of a fully saturated perched aquifer system. In these areas of the Site, the water table is generally either at or just below the surface, particularly during the wetter winter months but also throughout most of the year due to the high rainfall levels which occur at the Site. The presence of this perched water table at or very near the surface was observed in some areas when gouge cores were advanced at turbine locations, gouge coring at turbine locations is discussed in **Chapter 8: Soils and Geology**.

Much of the Site is characterised by steep slopes, these areas are likely to have a very low groundwater level since less time is allowed for stormwater to infiltrate, thus rainfall is easily converted to runoff and rapidly flows down the slope. Baseflow contribution to streams is expected to be low, particularly in summer as the groundwater cannot sustain summer baseflows due to low storativity within the aquifer. Since areas of steep slopes, shallow subsoils, blanket peat and bedrock outcrops make up the majority of the Site's areas, the depth to groundwater is not anticipated to exceed more than approximately five metres at any area of the Site.

An overview of the potential WFD status changes that could potentially occur within the WFD GWBs in the unmitigated scenario during construction is outlined in **Table 11**. The potential for adverse impacts to occur within each individual GWB is discussed in the following sections.

8.3.1 Beara Sneem GWB

Approximately 21.8% of the EIAR boundary is underlain by the Beara Sneem GWB. The Beara Sneem GWB underlies T01 and it's hardstand area, borrow pit, both grid connection route options, soil storage areas, a small section of the TDR, in addition to most of the T02 hardstand area. The T01, T02 and part of the T03 access roads are also underlain by the Beara Sneem GWB.

Given that the underlying sandstone and mudstone bedrock formations are not typically highly permeable, groundwater flow direction to the underlying aquifer is expected to strongly mimic the local topography. In other words, the groundwater flow paths are expected to be from topographic high points to lower elevated discharge points at streams, springs and rivers. Utilising this conceptual model of groundwater flow, the generalised flow direction of groundwater flow can be modelled and will be similar to that of runoff flow directions outlined on **Figure 5**.

The north-western extent of the Site and its surrounds are characterised by an expanse of grasslands, heath, shallow peat soils, forestry, natural and artificial drainage channels that generally drain in a north-westerly direction towards the Gortloughra River. Similar to most upland areas, the north-western area of the Site exhibits areas of moderate to steep sloping terrain, and its underlying geology dictates that the area has limited capacity for storing groundwater.

Peat probes, hand-held shear vanes, hand-dug trial holes and gouge cores were carried out at or in close proximity to T01, T01 hardstand area, borrow pit, soil storage areas and theT02 hardstand area as is discussed in **Chapter 8: Lands, Soil and Geology**. Bedrock was encountered at a maximum depth of up to 1.7 metres at areas of the site that are underlain by the Beara Sneem GWB. Bedrock was typically encountered at less than 0.5m across the vast majority of survey locations in areas of the Site underlain by the Beara Sneem GWB.

Other than occasional perched water table observations, groundwater was not encountered in any of the trial pits at areas of the Site that are underlain by the Beara Sneem GWB. It is anticipated that groundwater typically circulates rapidly and discharges to the upland slopes where the water table intersects the ground surface or to upland streams such as the headwaters of the Gortloughra River. As a result, the north-western extent of the Site is anticipated to have groundwater flows that predominantly flow in a north-westerly direction where they discharge to the tributaries of the Gortloughra River. Given that the bedrock is generally less than 0.5m deep in this area of the Site, and that groundwater is expected to rapidly discharge to the surface water network, potential impacts on the Beara Sneem GWB are expected to be negligible.

8.3.2 Bandon GWB

Approximately 59% of the EIAR boundary, and both grid connection route options are underlain by the Bandon GWB. T03, T04, T06, T07, T08, T09, their associated hardstand areas and access roads, the substation, and the majority of the TDR are underlain by the Bandon GWB.

All areas of the Site underlain by the Bandon GWB are located south of the uppermost ridge of Shehy More Mountain. Similar to the northern extent of the Site, the areas to the south of the summit of Shehy More Mountain are also characterised by moderate to steep sloping terrain. The underlying sandstone and mudstone bedrock formations are not typically highly permeable, groundwater flow direction to the underlying aquifer is expected to strongly mimic the local topography. In the case of the Bandon GWB, the surface runoff flow path from this area has been modelled to flow in a southerly direction towards the Bandon_020 surface waterbody, it is anticipated that groundwater flow paths are short and that they rapidly discharge to the surface in this area on account of the steep topography.

Peat probes, hand-held shear vanes, hand-dug trial holes and gouge cores were carried out at T03, T04, T06, T07, T08, T09, their associated hardstand areas and access roads, the substation, and both grid connection route options underlain by the Bandon GWB.

Bedrock was encountered at a maximum depth of up to 3.6 metres at areas of the site that are underlain by the Bandon GWB. Similar to the Bear Sneem and Ballinhassig West GWBs described above, bedrock was typically encountered at less than 0.5m across the vast majority of survey locations in areas of the Site underlain by the Bandon GWB.

Other than occasional perched water table observations, groundwater was not encountered in any of the trial pits at areas of the Site that are underlain by the Bandon GWB. As is the case for all other areas of the Site, it is anticipated that groundwater typically circulates rapidly and discharges to the upland slopes where the water table intersects the ground surface or to upland streams. Given that the bedrock is generally less than 0.5m deep in this area of the Site and that groundwater is expected to rapidly discharge to the surface water network, potential impacts on the Bandon GWB at the Site are expected to be negligible.

Shallow trenching which will be backfilled will be carried out along the chosen grid connection route within the Bandon GWB. The shallow trenching is not expected to breach the groundwater table and will be excavated upon the overburden. HDD is a drilling technique whereby a hole is drilled under a feature so that the cable installation avoids disturbance of the feature. HDD will be carried out

potential maximum of three locations along the grid connection route within the Bandon GWB if the Carrigdangan grid connection route option is chosen, and at twenty-four in the Bandon GWB if the Dunmanway grid connection route option is chosen.

The HDD methodology requires the excavation of two pits; a launch pit and a reception pit. Pipes and ducts are brought through the drilled hole to a receiving pit on the opposite side of the hole to the launch pit. The crossings will comprise 4 x 110 mm High Performance Polyethylene (HPPE) pipes/ducts each directionally drilled. Two separate excavations will be made to a depth of 2 metres to accommodate the directional drilling launch and reception pits in the road on either side of the crossing. Spoil arisings will be loaded onto trucks for disposal off-site as soil is excavated. The excavation launch and reception pits will be reinstated using compacted layers of crushed stone on completion of drilling and jointing operations. During the HDD process, there is potential for groundwater to be encountered. However, given the anticipated shallow depths of the HDD at just 2 metres deep, and the HDD location at rivers, any groundwater flows that may be momentarily encountered during the HDD process is expected to rapidly discharge to the river network. Therefore, potential adverse impacts to groundwater within the Bandon GWB resulting from HDD are not expected to occur.

8.3.1 Ballinhassig West GWB

Approximately 19.2% of the EIAR boundary is underlain by the Ballinhassig West GWB. The T02 position, and a small portion of the T02 hardstand area, both grid connection route options and a section of the TDR where minor works will be carried out are the only design elements that are underlain by the Ballinhassig West GWB.

Similar to the Beara Sneem GWB described above, the underlying sandstone and mudstone bedrock formations are not typically highly permeable, groundwater flow direction to the underlying aquifer is expected to strongly mimic the local topography. In the case of the Ballinhassig West GWB, the T02 position and hardstand area located near the base of steep slope at the northern extent of Shehy More mountain. The surface runoff flow path from this area has been modelled to flow in a south-westerly direction towards the Owvane(Cork)_010 surface waterbody. It is anticipated that groundwater flow paths are short and that they rapidly discharge to the surface via seeps or springs in this area on account of the steep topography.

Peat probes, hand-held shear vanes, hand-dug trial holes and gouge cores were carried out at T02 and the T02 hardstand area. Bedrock was encountered at a maximum depth of up to 1.1 metres at areas of the site that are underlain by the Ballinhassig West GWB. Bedrock was typically encountered at less than 0.5m across the vast majority of survey locations in areas of the site underlain by the Ballinhassig West GWB.

Other than occasional perched water table observations, groundwater was not encountered in any of the trial pits at areas of the Site that are underlain by the Ballinhassig West GWB. It is anticipated that groundwater typically circulates rapidly and discharges to the upland slopes where the water table intersects the ground surface or to upland streams. Given that the bedrock is generally less than 0.5m deep in this area of the site and that groundwater is expected to rapidly discharge to the surface water network, potential impacts on the Ballinhassig West GWB are expected to be negligible.

Shallow trenching which will be backfilled will be carried out along the chosen grid connection route within the Ballinhassig West GWB. The shallow trenching is not expected to breach the groundwater table and will be excavated upon the overburden. HDD is a drilling technique whereby a hole is drilled under a feature so that the cable installation avoids disturbance of the feature. HDD will be carried out potential maximum of fifteen locations along the grid connection route within the Ballinhassig West GWB if the Carrigdangan grid connection route option is chosen, and at eleven locations in the Ballinhassig West GWB if the Dunmanway grid connection route option is chosen. Similar to the Bandon GWB as described above, the anticipated shallow depths of the HDD at just 2 metres deep, and the HDD location at rivers, any groundwater flows that may be momentarily encountered during the HDD process is expected to rapidly discharge to the river network. Therefore, potential adverse impacts to groundwater within the Ballinhassig West GWB resulting from HDD are not expected to occur.

Table 12 – Assessment of Potential WFD GWB Status Changes in the Absence of Mitigation Measures During Construction

Surface Waterbody ID Code	Groundwater Body Name	2016 - 2021 Water Quality Status	Assessment of Potential WFD Status Change
IE_SW_G_019	Beara Sneem	Good	Moderate
IE_SW_G_005	Ballinhassig West	Good	Moderate
IE_SW_G_086	Bandon	Good	Moderate

8.4 Potential Impacts on Surface Water Quality During Operation Without Mitigation

Upon completion of construction works, impermeable surfaces could be partially in place at the Site which in some areas would replace the baseline environment surfaces of soil and vegetation. This replacement has the potential to result in increased hydraulic loading to the surrounding surface water network which in turn has the potential to result in increased erosion of riverbanks and associated sedimentation in the downstream surface water network. In an unmitigated scenario, increased hydraulic loading also has the potential to increase the potential for flooding downstream of the Site. The presence of impermeable surfaces during the operational phase is referenced as a worst-case scenario in accordance with the precautionary principle. The actual surfaces that will be in place during the operational phase will generally have a permeability that will be similar to or greater than that of the pre-existing baseline soil and vegetated surfaces at the Site.

Multiple turbine positions and associated hardstand areas are located within the drainage basin of the Owvane(Cork)_10, Bandon_020, Caha_010 and Caha_020 WFD SWBs. In the absence of mitigation measures, the WFD status of the Owvane(Cork)_10 and the Caha_010 could potentially be reduced from "*High*" to "*Good*" during the operational phase. In the unmitigated scenario, the WFD status of the Bandon_020 and the Caha_020 could potentially be reduced from "*Good*" to "*Moderate*" during the operational phase. The only potential design elements that are located within the drainage basis of the Lee(Cork)_030 and Lee(Cork)_040 SWBs is the potential grid connection route options which will be backfilled underground and are not expected to result in any operational phase impacts on the Lee(Cork)_030 or Lee(Cork)_040 SWBs. In an unmitigated scenario, minor short duration works along the TDR are expected to have a negligible impact on surface waters during the operational phase.

The potential for the reduction in surface water quality during the operational phase is primarily due to the potential for increased hydraulic loading resulting from the replacement of existing natural surfaces with impermeable surfaces. The potential for accidental hydrocarbon spills or elevated sediment laden runoff to be released to the surface network during the operational phase is greatly reduced as earthworks will have been completed during the construction phase. Occasional and infrequent routine minor maintenance works to ensure that access roads and hardstand areas are maintained may be required during the operational phase. It is considered that the potential for hydrocarbon spills or sediment laden runoff to surface waters to occur during such works is most unlikely. An overview of the potential WFD status changes that could potentially occur within the surrounding surface water network during the operational phase in the unmitigated scenario is outlined in **Table 13**.

Table 13 – Assessment of Potential WFD Surface Water Body Status Changes in the Absence of Mitigation Measures During Operation

Surface Waterbody ID Code	Surface Waterbody Name	2016 - 2021 Water Quality Status	Assessment of Potential WFD Status Change
IE_SW_21O040400	Owvane(Cork)_010	High	Good
IE_SW_19L030200	Lee(Cork)_030	Good	Good
IE_SW_19L030300	Lee(Cork)_040	Good	Good
IE_SW_20B020200	Bandon_020	Moderate	Poor
IE_SW_20C010400	Caha_10	High	Good
IE_SW_20C010700	Caha_20	Good	Moderate

8.5 Potential Impacts During Operation Without Mitigation on Groundwater Quality

The potential for accidental hydrocarbon, wastewater or chemical spills to be released to GWBs during the operational phase is greatly reduced as all mobile plant and construction equipment will be demobilised from Site following the construction phase. Occasional and infrequent routine minor maintenance works to ensure that access roads, wind turbines and hardstand areas are maintained may be required during the operational phase. It is considered that the potential for hydrocarbon or chemical spills to GWBs during such works is most unlikely. An overview of the potential WFD status changes that could potentially occur within the underlying GWBs during the operational phase in the unmitigated scenario is outlined in **Table 14**.

Table 14 – Assessment of Potential WFD GWB Status Changes in the Absence of Mitigation Measures During Operation

Surface Waterbody ID Code	Groundwater Body Name	2016 - 2021 Water Quality Status	Assessment of Potential WFD Status Change
IE_SW_G_019	Beara Sneem	Good	Good
IE_SW_G_005	Ballinhassig West	Good	Good
IE_SW_G_086	Bandon	Good	Good

9. Mitigation Measures

The Development has associated potential impacts as described in the previous sections of this report. The following sections outline mitigation measures to be implemented during the design, construction, operational and decommissioning phases of the Development.

9.1 Mitigation by Avoidance

The fundamental mitigation measure to be implemented during each stage of the proposed Development will be avoidance of sensitive hydrological or hydrogeological receptors wherever possible, this key principle is referred to as "*mitigation by avoidance*". This principle has been adopted during the design of the turbine and associated infrastructure layout across multiple design iterations. Hydrological constraints maps have been developed which identified areas of the Site where surface water, groundwater and drainage constraints resulted in areas of the Site being deemed less suitable for development. The final Site layout plan has been identified as the optimal layout design available for protecting the existing hydrological regime of the Site, while at the same time incorporating and overlaying engineering and other environmental constraints.

9.2 Constraints

As part of mitigation by avoidance principles applied during the design phase of the Development, a self-imposed 50m buffer zone around surface waters and significant drainage features was implemented wherever possible. The 50m buffer zone is intended to inform the design process by minimising or avoiding the risk to surface water receptors and by restricting construction disturbance to outside these zones. The buffer zone will in turn provide enhanced potential for filtering capacity of runoff and will protect riparian zone vegetation. The implementation of 50m surface water buffer zones is not a legislative requirement, particularly for unmapped surface water features. However, it has been employed for identified areas of the Development which pose an elevated risk in terms of sensitive surface water receptors. A self-imposed 50m buffer zone can therefore be viewed as a conservative approach.

The layout of the Development itself is inherently restricted due to the proposed infrastructure requirements, such as the proposed turbines require a minimum distance from each other to ensure the potential for wind turbulence impacting on downwind locations is minimised. The vast majority of the proposed Development features will be situated outside of the 50m buffer zone, with the exception of the following unique and unavoidable circumstances:

- Where the grid connection route traverses existing bridges that are already located within the 50m buffer zone, horizontal directional drilling will be carried out at a potential maximum of eighteen watercourses for the Carrigdangan grid connection option, or a potential maximum of thirty-three watercourses for the Dunmanway grid connection option;
- Along the TDR, the route crosses multiple mapped rivers and streams with minor works being carried out or laydown areas being utilised at eleven locations in close proximity to a watercourse. The type of minor works that would be required along the TDR include temporary road widening for overrun areas, areas to be cleared for oversail areas, vegetation clearance, checking the width of access roads and the use of fields as blade laydown areas. The locations of watercourse relative to the TDR are shown on **Figures 9.17** to **9.65** in **Volume III**.
- Where small drains at site will be culverted or diverted, such as for the borrow pit, site access road and the T09 hardstand area; and,
- Where pre-existing unpaved access tracks at the Site will be utilised in locations that are already within the 50m buffer zone of rivers. This includes areas immediately adjacent to the existing access tracks such as the borrow pit and the temporary spoil storage areas.

Careful consideration and special attention to planning is required for the identified locations within the surface water 50m buffer zone. The **Surface Water Management Plan** attached as **Appendix 2.1** to the EIAR details multiple mitigation measures for works proposed within the 50m buffer zone. Each proposed construction location will possess unique characteristics and will require assessment on a case-by-case basis to ensure adequate measures are implemented.

9.3 Earthworks Mitigation Measures

Mitigation measures to reduce the potential for adverse impacts arising from earthworks and management of spoil include the following:

- Management of excavated material will adhere to the measures related to the management of temporary stockpiles outlined in **Chapter 8: Soils and Geology** of the EIAR;
- No permanent or semi-permanent stockpiles will remain at non designated areas of the Site during the construction or operational phase of the Development. Excess spoil is to be taken to the designated borrow pit and/or soil storage areas at the Site;
- Suitable locations for temporary stockpiles will be identified on an individual basis. The suitability of any particular location will consider Site specific characteristics, including;
    - The location of drainage networks in the vicinity;
    - The slope, incline and topography of the downgradient area;
    - Any other relevant characteristics which are likely to facilitate or increase the potential for entrainment by surface water runoff; and
    - Construction activities will not be carried out during periods of sustained significant rainfall events, or directly after such events. This will allow sufficient time for work areas to drain excessive surface water loading and discharge rates to be reduced;
- Following heavy rainfall events, and before construction works recommence, the Site will be inspected, and any required corrective measures will be implemented;
- An emergency response plan will be developed for the construction phase of the project. The plan, at a minimum, will involve 24-hour advanced meteorological forecasting linked to a trigger-response system. When a pre-determined rainfall trigger level is exceeded such as a very heavy rainfall at >25mm/hr, planned responses will be undertaken. These responses will include cessation of construction until the storm event, including storm runoff, has ceased;
- Sediment fencing will be erected along proximal and paralleling areas of watercourses, channels and drains spanned by the works to reduce the potential for sediment laden run-off to reach sensitive receptors;
- No direct flow paths between stockpiles and watercourses will be permitted at the Site; and,
- Excavated material will be backfilled to the excavation area or transported to the spoil storage area as soon as is reasonably practicable to prevent long duration storage at the Site which increases the risk of adverse effects on aquatic environments.

9.4 Dewatering Mitigation Measures

Mitigation measures to reduce the potential for adverse impacts arising from dewatering activities include the following:

- Management of excavations will adhere to the measures outlined in **Chapter 8: Soils and Geology** of the EIAR. Areas of subsoils to be excavated will be drained ahead of excavation works. This will reduce the volumes of water encountered during excavation works and will therefore reduce the volume of water that is required to be dewatered whilst excavations are being carried out;
- Engineered drainage and attenuation features outlined in the **Surface Water Management Plan** attached as **Appendix 2.1** of the EIAR will be established ahead of excavation works;
- Dewatering pumping rates will be controlled by an inline gate valve or similar infrastructure which will facilitate a reduction of loading on the receiving environment, thus enhancing the attenuation and settlement of suspended solids;
- The direct discharge of dewatered loads to surface waters will not be permitted under any circumstances;
- All dewatering will follow a strict procedure of pumping to a settlement tank and then to a dewatering bag, or settlement ponds prior to discharging to receiving environment for overland flow;
- Geofabric lined settlement ponds will buffer the run-off discharging from the drainage system which will reduce the hydraulic loading to watercourses. Settlement ponds will be designed to reduce flow velocity to 0.3 m/s at which velocity silt settlement generally occurs. In areas of the Site where the placement of settlement ponds is not feasible, other mitigation measures described below will be implemented;
- Check dams will be constructed across drains and will reduce the velocity of run-off which will in turn promote settlement of solids upstream of potential surface water receivers. An additional benefit of check dams is that they will reduce the potential for erosion of drains.

Rock filter bunds may be used for check dams. Wood or hay bales can also be used if properly anchored. It is recommended that multiple check dams are installed, particularly in areas immediately down gradient of construction areas;

- Overland flow paths of the final dewatered discharge will be maximised to the greatest practical extent to avoid prematurely draining to drainage channels or surface waters. This approach will allow for enhanced settling out of suspended solids entrained in the run-off;
- All pumps, tanks, settlement ponds, dewatering bags and check dams used in the dewatering process will be regularly inspected and maintained as necessary to ensure surface water run-off is appropriately treated;
- Sediment fencing will be installed up gradient of water courses which may receive the final overland flow;
- The final treated dewatered discharge will be directed towards heavily vegetated areas to allow for further natural filtration of suspended solids;
- A programme of water quality monitoring will be implemented during the construction phase;
- No extracted or pumped water will be discharge directly to the surface water network associated with the Site (this in accordance with the *Local Government (Water Pollution) Act 1977* as amended); and
- Any discharges of sediment treated water should meet the requirements of the *Surface Water Regulations 2009*, as amended.

9.5 Release and Transport of Suspended Solids Mitigation Measures

The following mitigation measures to reduce potential impacts from the release of suspended solids to the surface waters will be implemented:

- Collector drains and soil berms will be implemented to direct and divert surface water runoff from construction areas such as temporary stockpiles into established settlement ponds, buffered discharge points and other surface water runoff control infrastructure. This planning and placement of these control measures will be of fundamental importance, especially for the areas where works within the 50m buffer zone will be unavoidable;
- Sediment control fences will be implemented significantly upgradient of potential receiving waters and as part of the drainage network. Sediment control fences will also be established upgradient of the Site's pre-existing natural and artificial drains. This practice will reduce the potential for elevated suspended solids entrained in surface water runoff to discharge to surface waters;
- Multiple silt fences will be used in drains discharging to the surface water network. This will be especially important for the areas where works within the 50m buffer zone will be unavoidable;
- The drainage, attenuation and other surface water runoff management systems will be installed prior to the commencement of construction activities. Whenever possible, drainage and attenuation control measures will be installed during seasonally dry conditions to limit the potential for sediment laden run-off to discharge to surface waters during the installation of these measures;
- Surface water runoff will be discharged to land via buffered drainage outfalls that will contain hardcore material of similar composition to the geology of the bedrock at the Site. This mitigation measure will promote the capture and retention of suspended sediment;
- Buffered drainage outfalls also promote sediment percolation through vegetation in the buffer zone, reducing sediment loading to adjacent watercourses and avoiding direct discharge to the watercourse;
- Buffered drainage outfalls will be placed outside of the 50m buffer zone and will not be positioned in areas with extensive erosion and degradation;
- A relatively high number of discharge points will be established to decrease the loading on any one particular outfall;
- Discharging at regular intervals mimics the natural hydrology by encouraging percolation and by decreasing individual hydraulic loadings from discharge points;
- A site-specific Construction Environmental Management Plan (CEMP) appended to the EIAR in **Technical Appendix 2.1** has been developed which mandates regular inspections and maintenance of pollution control measures. Contingency measures outlining urgent protocols

to repair or backup any breaches of designed mitigation measures are incorporated into the site-specific CEMP;
- In the event that mitigation measures are failing to reduce suspended solids to acceptable levels, construction works will cease until remediation works are completed;
- If fine solids or colloidal particles are very slow to settle out of waters, coagulant or flocculant will be used to promote the settlement of finer solids prior to discharging to surface water networks. Flocculant gel blocks can be placed in drainage channels, these are passive systems that are self-dosing, self-limiting and are environmentally friendly. Flocculant gel blocks bind elevated levels of silt and associated contaminants into masses that are easily separated, captured and then removed from the water; and,
- Surface water runoff controls will be checked and maintained on a regular basis and as soon as any signs of deterioration become visible. Surface water runoff controls, check dams and settlement ponds will be maintained and emptied on a regular basis and as soon as any signs of deterioration become visible.

9.6 Horizontal Directional Drilling Mitigation Measures

The following mitigation measures to reduce potential impacts associated with horizontal directional drilling will be implemented:

- A drilling fluid that is not toxic to aquatic organisms and is biodegradable will be the drilling fluid used;
- Mud mixing will be monitored to suit the ground conditions encountered and will initially be based on a mud programme developed by the specialised HDD Contractor, the drilling fluid supplier and an Environmental Clerk of Works;
- The drilling fluids will be constantly monitored, any changes required to the mix will be performed on site by a specialised HDD Contractor upon consultation with the drilling fluid supplier and Environmental Clerk of Works;
- Mud testing equipment will be available at all times during drilling operations to monitor key mud parameters;
- All equipment will be carefully checked on a daily basis by the Site Supervisor prior to use to ensure plant and machinery is in good working order with no leaks or potential for spillages;
- Spill kits, including an appropriate hydrocarbon boom, will be available on the site in the event of any unforeseen hydrocarbon spillages and all staff shall be trained in their use;
- All plant, materials and wastes will be removed from site following the HDD works;
- The launch pit will be reinstated to the original land surface condition and the normal duct trench will continue from this point;
- Should any dewatering be required, it will be carried out in accordance with the site-specific CEMP; and,
- Test pits and boreholes will not be located directly on, or extend through, the proposed alignment, as these weak points may serve as conduits where inadvertent fluid returns or frac outs occur. At least a 3m offset will be provided between the boreholes and pipe alignment.

9.7 Release of Hydrocarbons Proposed Mitigation Measures

The following mitigation measures to reduce potential impacts from the environmental release of hydrocarbons and other harmful chemicals to the surface waters will be implemented:

- Refuelling of vehicles will be carried out off site to the greatest practical extent. This refuelling policy will mitigate the potential for impacts by avoidance. Due to the remote location and nature of the Site, it is unlikely that implementation of this refuelling policy will be practical in all circumstances. In instances where refuelling of vehicles on Site is unavoidable, a designated and controlled refuelling area will be established at the Site. The designated refuelling area will enable low risk refuelling and storage practices to be carried out during the works. The designated refuelling area will contain the following attributes and mitigation measures as a minimum requirement:
    - The designated refuelling area will be located a minimum distance of 50m from any surface waters or Site drainage features;
    - The designated refuelling area will be bunded to 110% volume capacity of fuels stored at the Site;

- The bunded area will be drained by an oil interceptor that will be controlled by a pent stock valve that will be opened to discharge storm water from the bund;
- Management and maintenance of the oil interceptor and associated drainage will be carried out by a suitably licensed contractor on a regular basis;
- Any oil contaminated water will be disposed of at an appropriate oil recovery plant or licensed tip site;
- Any minor spillage during this process will be cleaned up immediately;
- Vehicles will not be left unattended whilst refuelling; and
- All machinery will be checked regularly for any leaks or signs of wear and tear;
- Containers will be properly secured to prevent unauthorised access and misuse. An effective spillage procedure will be put in place with all staff properly briefed. Any waste oils or hydraulic fluids will be collected, stored in appropriate containers and disposed of offsite in an appropriate manner.

Notwithstanding the management of refuelling and fuel storage at the designated refuelling area, the potential risk of hydrocarbon spills from plant and equipment or other general chemical spills at other areas of the Site remains. To mitigate against potential spills at other areas of the Site, the following mitigation measures will be implemented:

- Oil absorbent booms and spill kits will be available adjacent to all surface water features associated with the Development. The controls will be positioned downstream of each construction area and at principal surface water drainage features. Oil booms deployed will have sufficient absorbency relative to the potential hazard;
- Spill kits will also be available at construction areas such as at turbine locations, the temporary site compound, on-site substation, spoils storage area, borrow pit and met mast location etc.;
- Spill kits will contain a minimum of oil absorbent pads, oil absorbent booms, oil absorbent granules, and heavy-duty refuse bags for collection and appropriate disposal of contaminated matter;
- Should an accidental spill occur during the construction or operational phase of the Development, such incidents will be addressed immediately, this will include the cessation of works in the area of the spillage until the issue has been resolved;
- Spill kits will be kept in each vehicle at the Site and will be readily available to all operators;
- No materials, contaminated or otherwise will be left on the Site;
- Suitable receptacles for hydrocarbon contaminated materials will also be available at the Site; and,
- A detailed spill response plan forms part of the site-specific CEMP appended to **Technical Appendix 2.1** of this EIAR.

Implementation of the above mitigation measures will significantly reduce the risk of hydrocarbon contamination being released to the surface water network. Nevertheless, the potential risk cannot be entirely eradicated. Therefore, precautionary measures and emergency response protocols will be established and are included in the site-specific CEMP appended to the EIAR in **Technical Appendix 2.1**.

9.8 Construction and Cementitious Materials Mitigation Measures

The following mitigation measures to reduce potential impacts posed by the use of concrete and the associated effects on surface water in the receiving environment are proposed:

- The procurement, transport and use of any cement or concrete will be planned fully in advance and supervised by appropriately qualified personnel at all times;
- Vehicles transporting cement or concrete to the Site will be visually inspected for signs of excess cementitious material prior to being granted access to the Site. This will prevent the likelihood of cementitious material being accidentally deposited on the Site Access Tracks or elsewhere at the Site;
- Drivers of such vehicles will be instructed to ensure that all vehicles are washed down in a controlled environment prior to the departure of the source site, such as at concrete batching plants;

- Precast concrete will be used wherever possible, although the use of pre-cast concrete is not a viable option for large structures such as turbine foundations and so concrete will be delivered to the Site;
- Concrete will not be poured during periods of rainfall or if any kind of precipitation is forecast. This policy will limit the potential for freshly poured concrete to adversely impact on surface water runoff;
- Raw or uncured waste concrete will be disposed of by removal from the Site;
- Washout of concrete trucks shall be strictly confined to the batching facility and shall not be located within the vicinity of watercourses or drainage channels. Only the chutes will be cleaned prior to departure from Site, and this will take place at a designated area at the temporary site compound;
- Spill kits will be readily available to Site personnel, and any spillages or deposits will be cleaned up immediately and disposed of appropriately;
- Pouring of concrete into standing water within excavations will be avoided;
- Excavations will be prepared before pouring of concrete by pumping standing water out of excavations to the buffered surface water discharge systems in place;
- Any surplus concrete will not be stored or deposited anywhere on Site and will be returned to the source location or disposed of appropriately at a suitably licensed facility; and,
- Any required shuttering installed to contain the concrete during pouring will be fully secured around its perimeter to minimise any potential for leaks.

9.9 Watercourse Crossings Mitigation Measures

The following mitigation measures will be implemented as minimum requirements to ensure any potential impacts of drainage feature crossings are minimised:

- The design of the proposed crossings and a method statement for the proposed construction will be prepared in advance of works taking place;
- This design of all crossings will adhere to relevant available guidance and will be reviewed through consultation with the OPW which will mitigate against any significant impact on surface water flow and in turn the risk of localised or downstream flooding;
- Crossings will be designed to minimise, in so far as practical and to the extent deemed acceptable by the competent authority, the disturbance or alteration of water flow, erosion and sedimentation patterns and rates;
- A Construction Environmental Management Plan has been prepared and is appended to the EIAR in **Technical Appendix 2.1**. Adherence to this plan, which will be mandatory throughout the construction of the watercourse crossings, will include comprehensive details of the culvert design and construction methodology, including the environmental risk/s involved which have been identified and assessed in this EIAR. Detailed site-specific mitigation measures and best practice techniques will be contained in the construction management plan and Risk Assessment Method Statement (RAMS) for any proposed crossings of small unmapped drains;
- Vehicles used in the construction of small drain crossings will only be refuelled at the Site's bunded and designated refuelling area. No refuelling will be permitted within 50m of any watercourse at the Site; and,
- To mitigate against the potential risk of accidental leaks or spillages from plant and equipment, an emergency response plan for such incidents is contained in the CEMP appended to the EIAR in **Technical Appendix 2.1**. Multiple spill kits will be maintained on the Site at all times within the cabs of vehicles and placed strategically at environmentally sensitive locations across the Site. Spill kits will be routinely inspected to ensure that they are fully stocked with oil absorbent booms and pads at all times. Oil absorbent booms will be installed downstream of channel crossing work areas within 25m of the works location, prior to the commencement of works.

9.10 Groundwater Contamination Mitigation Measures

In order to mitigate against potential groundwater contamination by hydrocarbons, implementation of the following mitigation measures is proposed:

- In the first instance, no fuel storage will occur at the Site whenever feasible and refuelling of plant and equipment will occur off Site at a controlled fuelling station;
- In instances where on Site refuelling is unavoidable, then the bunded on-Site designated refuelling area must be used. The designated refuelling area must be bunded to 110% volume capacity of fuels stored at the Site;
- The bunded area will be drained by an oil interceptor that will be controlled by a pent stock valve that will be opened to discharge storm water from the bund;
- Management and maintenance of the oil interceptor and associated drainage will be carried out by a suitably licensed contractor on a regular basis;
- Any oil contaminated water will be disposed of at an appropriate oil recovery plant or licensed tip site;
- Any minor spillage during this process will be cleaned up immediately;
- Vehicles will not be left unattended whilst refuelling;
- A site-specific CEMP appended to the EIAR in **Technical Appendix 2.1** will be enforced to ensure that equipment, materials and chemical storage areas are inspected and maintained as required on a regular basis; and,
- The mitigation measures outlined for the protection of surface waters as set out above will also be implemented which will inadvertently serve to protect groundwater from potential hydrocarbon contamination.

The following mitigation measures are proposed in relation to non-hydrocarbon potential contamination of groundwater:

- All other liquid-based chemicals such as paints, thinners, primers and cleaning products etc. will be stored in locked and labelled bunded chemical storage units;
- Temporary sanitation facilities such as portaloos used during the construction phase will be self-contained and supplied with water by tank trucks. Portaloos will contain water storage tanks and separate wastewater storage tanks which will be routinely emptied by vacuum removal for offsite disposal via a tank truck. All temporary sanitation facilities will be removed from the Site following the completion of the construction phase;
- The controlled attenuation of suspended solids in settlement ponds and check dams etc. will result in inorganic nutrients (if present in elevated concentrations) such as phosphorus and nitrogen being absorbed and retained by the solids in the water column. This will allow for a reduction of peak inorganic discharges in a controlled and stable run off rate. It is noted that the presence of elevated contaminants were not detected during any of the three surface water quality monitoring rounds;
- It is considered that there is a low risk of mobilising trace metals that may naturally be present in low concentrations in the baseline environment. The potential for mobilising trace metals is most likely to result from enhanced water percolation associated with excavated bedrock substrate. To mitigate against this potential impact, water quality will be monitored for trace metal concentrations prior to, during and after the construction phase; and
- The potential for livestock such as cattle and sheep which have been observed grazing at the Site to cause bacteriological contamination of groundwater will be controlled through the implementation of strict grazing control zones, site perimeter fencing and exclusion zones around all open excavations.

The mitigation measures outlined for the protection of surface waters as set out above will also be implemented which will inadvertently serve to protect groundwater from potential non-hydrocarbon contamination.

9.11 Water Quality Monitoring Mitigation Measures

The following Site monitoring recommendations will be implemented to mitigate against potential impacts on the surface water and groundwater receiving environment:

- A programme of water quality monitoring outlining the selected parameters and monitoring frequency should be agreed with Inland Fisheries Ireland and Cork City and County Council prior to the commencement of construction;
- In order to assist in the detection of any deviations from the baseline hydrochemistry conditions at the Site, regular periodic monitoring of the Site's surface waters will be carried out prior to and during construction;

- It is proposed that a programme of operational phase water quality monitoring is also implemented at a monitoring frequency agreed with the competent authority in order to aid the detection of any potential operational phase impacts on surface water quality;
- As a minimum requirement, field-measured parameters such as pH, conductivity, total dissolved solids (TDS), temperature, dissolved oxygen (DO) and turbidity will be included in the water quality monitoring programme. The results should be compared to the applicable EQS to determine if adverse impacts on water quality are occurring;
- It is also recommended that laboratory analyses for parameters such as total suspended solids, nitrogen, phosphorous, biochemical oxygen demand and trace metals etc. is implemented during and after the construction phase;
- Water quality monitoring locations will include both upstream and downstream points relative to the works locations. The locations of the water quality monitoring points will be flexible and will be moved as the construction phase progresses so that monitoring points remain representative of the most likely construction impact receptor points;
- The downstream monitoring locations will be positioned as close as possible downstream of the works location and another positioned further downstream. This approach will allow for an assessment of the dilution of potential contaminations (if present) as the distance from the point of diffuse source location increases;
- Watercourses which do not have year-round flows, such as artificial drains, ditches or ephemeral streams, will be avoided as water quality monitoring locations;
- During the construction phase, daily visual inspections of excavations, dewatering procedure, settlement ponds, silt traps, buffered outfalls and drainage channels etc. will be carried out by a suitably qualified person. Any excess build-up of sediment at settlement ponds, drains or at any other drainage features that may decrease the effectiveness of the drainage feature will be promptly removed;
- During the construction phase of the Development, all development areas will be monitored on a daily basis for evidence of groundwater seepage, water ponding and wetting of previously dry spots;
- Following the completion of the construction phase, silt traps, buffered outfalls and drainage channels will be periodically inspected during maintenance visits to the Site when the operational phase water quality monitoring will also be carried out;
- Any proposed crossings of small unmapped drains will be monitored daily during construction and during each site visit during the operational phase. These small culvert crossings will be monitored in terms of their impacts (if any) on the receiving watercourses and in terms of their structural integrity to identify any signs of erosion or potential for sediment release;
- It is proposed that a handheld turbidity meter is available at the Site to accurately measure the quality of water discharging from the Site. The meter will be maintained and calibrated before each use by a qualified Environmental Clerk of Works; and,
- Any discharges of sediment treated water should meet the requirements of the *Surface Water Regulations 2009*, as amended.

9.12 Emergency Response Mitigation Measures

The following is a non-exhaustive list of potential emergencies and respective emergency responses:

- Spill or leak of hazardous substances (less than 20 litres);
    - All spill incidents will be dealt with immediately as they arise;
    - Spill kits will be prepared and available in vehicles associated with the construction phase of the Development;
    - Spill kits will also be prepared and made available at primary work areas such as at proposed turbine, hardstand, substation, met mast, borrow pit, soil storage area and construction compound locations;
    - Disposal receptacles for hydrocarbon contaminated materials will also be available at the Site.
- Major spill of hazardous or toxic substance off Site, or to environmentally sensitive areas;
    - Immediate escalation measures will be implemented for all major spill events;
    - Escalation measures may include installation of temporary sumps or drains to control the flow or migration of hydrocarbons or other chemicals;

    - Attempts to be made to limit or contain the spill using sandbags to construct a bund wall, use of absorbent material, temporary sealing of cracks or leaks in containers, use of geotextile or silt fencing to contain the spill;
    - Excavation and disposal of contaminated material will be immediately carried out following any such incidents;
    - Evacuation procedures will be implemented to remove non-essential personnel from the area;
    - Data gathering and an investigation will commence immediately after the emergency is contained;
    - If a significant hydrocarbon spillage does occur, the contractor on behalf of the developer must have an approved and certified clean-up consultancy available on 24-hour notice to contain and clean-up the spill;
    - All major spills of this nature will be reported to the competent authority immediately following such instances;
- Flooding of low lying areas of the Site;
    - Immediately remove all chemicals, fuels and other hazardous substances from low lying areas of the Site;
    - Immediately remove plant and equipment from low lying areas;
    - Recover materials washed from Site including sediment and other waste;
    - Review and address the potential for excess water entering the Site;
    - Review and maintain erosion and sedimentation controls;
- Spills of cementitious material;
    - Cement / concrete contamination incidents will be cleaned up immediately as they arise;
    - Spill kits will also be established at key construction areas and they will also be readily available in the cabs of plant and equipment; and
    - Suitable receptacles for cementitious materials will also be available at the Site.

Emergency responses, including methodologies and all relevant contact details are specified in the site-specific CEMP appended to the EIAR in **Technical Appendix 2.1**.

9.13 Operational Phase Mitigation Measures

In a worst-case scenario, the proposed Development will lead to an increase in impermeable surface area through the construction of hard stand areas within the Site. This in turn would lead to an increase in hydraulic loading by surface water runoff. However, preliminary water balance calculations outlined in **Chapter 9** of the EIAR indicate that the worst-case net increase in surface water runoff volumes will result in a slight, or not significant impact.

As a consequence of the estimated low significance of the impact of hydraulic loading during the operational phase, mitigation measures to facilitate a reduction in surface water runoff are limited to ensuring that pre-existing and newly established drainage infrastructure is sufficiently maintained for the discharge rates associated with all areas of the Site. Once identified, any and all blockages which may adversely impact upon the drainage regime at the Site will be immediately removed during the operational phase of the proposed Development. No other additional impacts are anticipated during the operational phase of the Development.

9.14 Decommissioning Phase Mitigation Measures

The decommissioning phase of the project will result in the removal of Site infrastructure such as wind turbines and the Met Mast etc. No new additional mitigation measures are required for the decommissioning phase of the proposed Development. The decommissioning phase and associated removal of major infrastructure components is anticipated to result in similar potential risks to surface water and groundwater as those that will be encountered during the construction phase of the proposed Development.

The excavation of soil is not expected to be required during the decommissioning phase. In addition, the movement of plant, vehicles and equipment on any unpaved surfaces is not expected to be required or will be minimal during the decommissioning phase since all of the project's hardstand

areas will be pre-existing by the time the decommissioning phase is being carried out. As a result, the risk of elevated suspended solids being discharged in surface water run-off to the downstream receiving environmental is expected to be low. However, the potential risk remains for spills of fuels or hazardous chemicals which is a common risk to all developments. The mitigation measures outlined in this assessment for the construction phase will be implemented during the decommissioning phase to reduce the potential for such impacts.

10. Assessment of WFD Compliance with Mitigation Measures in Place

An overview of the potential WFD status changes that could potentially occur within the surrounding SWBs during construction and operation in the mitigated scenario is outlined in **Table 15**. An overview of the potential WFD status changes that could potentially occur within the underlying GWBs during construction and operation in the mitigated scenario is outlined in **Table 16**. It is considered that the mitigation measures described in **Section 7** are sufficient to ensure that the WFD Objectives are not compromised.

Table 15 – Assessment of Potential WFD Surface Water Body Status Changes with Mitigation Measures in Place During Construction and Operational Phases

Surface Waterbody ID Code	Surface Waterbody Name	2016 - 2021 Water Quality Status	Assessment of Potential WFD Status Change
IE_SW_21O040400	Owvane(Cork)_010	High	High
IE_SW_19L030200	Lee(Cork)_030	Good	Good
IE_SW_19L030300	Lee(Cork)_040	Good	Good
IE_SW_20B020200	Bandon_020	Moderate	Moderate
IE_SW_20C010400	Caha_10	High	High
IE_SW_20C010700	Caha_20	Good	Good

Table 16 – Assessment of Potential WFD GWB Status Changes with Mitigation Measures in Place During Construction and Operational Phases

Surface Waterbody ID Code	Groundwater Body Name	2016 - 2021 Water Quality Status	Assessment of Potential WFD Status Change
IE_SW_G_019	Beara Sneem	Good	Good
IE_SW_G_005	Ballinhassig West	Good	Good
IE_SW_G_086	Bandon	Good	Good

11. Conclusion

The WFD status for surface water bodies and groundwater bodies with hydrological connectivity to the site have been reviewed and are described in this report. The potential impacts on the identified WFD waterbodies have been assessed in terms of potential adverse effects to occur in unmitigated and mitigated scenarios.

Directed discharges to groundwater or surface waters will not occur during the construction, operational or decommissioning phases of the Development. The implementation of mitigation measures outlined in **Section 9** for the protection of SWBs and GWBs during the construction, operation and decommissioning phases will ensure that the qualitative status of the receiving waters at and further downstream of the Site will not be changed as a consequence of the proposed Development.

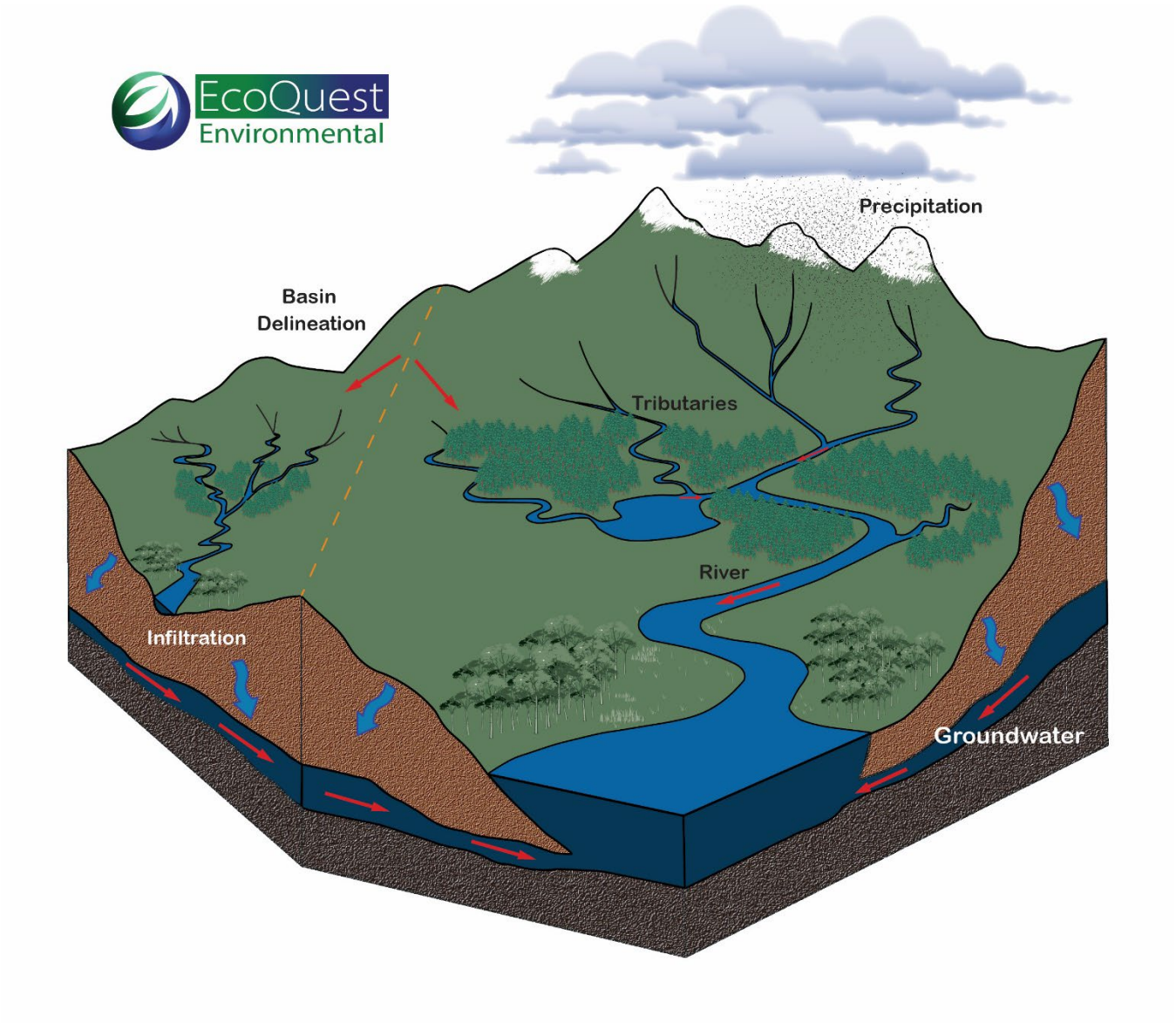
The proposed Development will not require the abstraction of groundwater. Stream diversion works of EPA mapped watercourses will not occur. Only the alteration or slight diversion of six small pre-existing natural or artificial drains will be required, noting that some of these drains are ephemeral and are likely to be dry for much of the year. The increase in hydraulic loading as a consequence of the Development will be slight, or not significant. As a result, the quantitative status to the receiving waters will not change during the construction, operational and decommissioning phases of the proposed Development.

In conclusion, the proposed Development will not impact upon any WFD surface waterbody or groundwater body to an extent that would cause a deterioration of the status of the WFD body in question.

12. References

- Department of Housing, Planning and Local Government (2019) Draft Revised Wind Energy Guidelines;
- Office of Public Works (OPW) (2019), Environmental Guidance: Drainage Maintenance and Construction;
- National Roads Authority (NRA) (2008) Guidelines for the Crossing of Watercourses During the Construction of National Road Schemes;
- CIRIA (2006) Control of Water Pollution from Linear Construction Projects – Technical Guidance;
- GSI (2004) Bandon GWB: Summary of Initial Characterisation;
- GSI (2004) Ballinhassig GWB: Summary of Initial Characterisation;
- GSI (2004) GSI (2004) Beara Sneem GWB: Summary of Initial Characterisation;
- Environmental Protection Agency (2024) 3rd Cycle Bandon Ilen Catchment Report;
- Environmental Protection Agency (2024) 3rd Cycle Dunmanus-Bantry-Kenmare Catchment Report;
- Environmental Protection Agency (2023) 3rd Cycle Lee, Cork Harbour and Youghal Bay Catchment Report;
- Department of Housing, Planning and Local Government (2018) River Basin Management Plan for Ireland, 2018 – 2021;
- Department of Housing, Local Government and Heritage (2024) The Water Action Plan 2024: A River Basin Management Plan;
- EPA Map Viewer, Water Framework Directive (WFD), surface water and hydrogeological features (https://gis.epa.ie/EPAMaps/Water);
- Ordnance Survey Ireland, Map Viewer (http://map.geohive.ie/mapviewer.html);
- National Parks and Wildlife Service (NPWS), Protected Sites Map-Viewer (https://www.npws.ie/protected-Sites);
- The Geological Survey of Ireland (GSI), groundwater data and maps (https://www.gsi.ie/en-ie/data-and-maps/Pages/Groundwater.aspx);
- Catchments.ie (https://www.catchments.ie/)

Appendix 1 – Drainage Basin Delineation Overview



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