Appendix 9.3 WFD Compliance Report

1. Introduction

CDM Smith Ireland Ltd (CDM Smith) was requested by MKO, on behalf of Glenora Wind Farm DAC, to complete a Water Framework Directive (WFD) Compliance Assessment for the planning application for the Proposed Development.

The Proposed Development comprises, inter alia, 22 no. turbines and grid connection as set out in Chapter 4 of the Environmental Impact Assessment Report (EIAR).

1.1 Purpose of Assessment

The purpose of the assessment is to determine if any specific components or activities associated with the Proposed Development may compromise the attainment of WFD status objectives or cause a deterioration in the status of any surface water or groundwater body, as assigned by the Environmental Protection Agency (EPA) for water bodies that are connected with the Proposed Development. The assessment supplements Chapter 9 of the EIAR (Hydrology and Hydrogeology) submitted as part of the planning application.

1.2 Statement of Authority

This WFD Compliance Assessment was prepared by Henning Moe (registered P. Geo.), a hydrogeologist with over 30 years of practical experience working with CDM Smith. Established in Ireland since 2001, CDM Smith's ISO 9001, ISO 14001 and OHSAS 18001-accredited Dublin office works on a diverse range of water and environmental projects for public and private sector clients, and mainly within the context of WFD implementation in Ireland.

Henning Moe has conducted several WFD-related projects for and with the Environmental Protection Agency, and helped prepare technical guidance on topics such as discharges to surface waters and groundwater, and conducting investigative assessments in both rural and urban catchments. He was the lead hydrogeologist for the 'Eastern River Basin District' project which was part of Ireland's implementation of the first cycle of the WFD, and has subsequently supported Irish public bodies through the second and third cycles of WFD implementation. As such, he is experienced with the WFD implementation process, including the details of EPA's water body status requirements and classification tests.

1.3 Water Framework Directive

The EU Water Framework Directive (2000/60/EC) is a holistic approach towards water resources management across the EU. The WFD was transposed into Irish law by the European Communities (Water Policy) Regulations 2003 (S.I. No. 722 of 2003).

The WFD requires that EU Member States achieve WFD 'Good' status objectives for all water bodies by year 2027 at the latest. Where a Member State assigns 'High' status objectives to water bodies, 'High' status must be achieved and/or maintained in 2027.

In Ireland, water body status objectives and water body status are assigned by the EPA in successive 6-year river basin management planning cycles. Status objectives define what must be achieved. Status assignment defines what was achieved. For each successive river basin management plan, EPA determines where objectives have been met and where they have not.

In all water bodies, Programmes of Measures are implemented to protect and/or improve their biological quality elements and environmental supporting conditions. There are two types of measures: Basic Measures, which are

statutory and enforceable (e.g., the Sustainable Use of Pesticides regulations); and Supplementary Measures, which are non-statutory and voluntary (e.g., pilot schemes, awareness campaigns).

As part of its WFD implementation, EPA also completes a risk assessment every 6 years, with outcomes that are published in successive river basin management plans. Water bodies are either 'At Risk' or 'Not At Risk' of failing to achieve WFD environmental objectives. Where a water body is 'At Risk', EPA determines the 'significant pressures' that places the water body 'At Risk' and which may prevent the water body from meeting status objectives. This determination focuses a 'Programmes of Measures' in the subcatchment of that water body.

Ireland is currently in the third cycle of WFD implementation, which covers the period 2022-2027. Ireland's latest river basin management plan, which was published in 2021, sets out the status objectives to be achieved by year 2027 (DHLGH, 2021). The latest available status classification for all water bodies covers the period 2016-2021.

It is noted that WFD status classification is assessed by EPA and reported formally by Ireland to the European Commission in 6 year river basin management plan cycles. The duration of the construction period for the Proposed Development is approximately 2 years (maximum). Hence, the likelihood of affecting status has a longer-term perspective and is more relevant to the operational phase of the Proposed Development.

The WFD also requires that 'designated sites' (protected areas) meet their environmental requirements and conservation objectives. Designated sites are: Natura 2000 sites (Special Areas of Conservation, SACs, with water-dependent habitats, and Special Protection Areas for species listed in the EU Habitats Directive); drinking water protected areas; bathing waters; shellfish waters; salmonid waters; and nutrient sensitive waters. Environmental requirements and conservation objectives for designated sites are stipulated in existing regulations or are being developed by the relevant public bodies (e.g., National Parks and Wildlife Service for SACs).

2. Water Body Identification

This section identifies the surface water and groundwater bodies that can potentially be affected by the Proposed Development. This is based on a review of hydrological and hydrogeological linkages, whether direct or indirect.

2.1 Surface Water Bodies

The Proposed Development, which includes the grid connection route, resides within WFD Catchment 33, Blacksod-Broadhaven, and WFD Catchment 34, Moy & Killala Bay. The specific, relevant river water bodies which are linked to the Proposed Development are listed in **Table 1** and shown in **Figure 1**. The river water bodies are part of three main river flow systems: Owenmore River, Ballinglen River, and Cloonaghmore River.

- The Owenmore River system drains to Tullaghan Bay, more than 30 km downstream of Glenora Forest. The EPA code for the associated transitional water body is IE_WE_390_0100.
- The Ballinglen River system drains to Bunatrahir Bay, approximately 8 km northeast of Glenora Forest. The EPA code for the associated transitional water body is IE_WE_410_0100.
- The Cloonaghmore River system drains to Cloonaghmore estuary, approximately 4 km northwest of Killala. The EPA code for the associated transitional water body is IE_WE_420_0100.

There are no WFD reportable lake water bodies linked to the Proposed Development (*i.e.,* no water bodies greater than 50 hectares in size). One small lough with the Proposed Development Site, Altderg Lough, is not part of EPA's WFD status classification schema.

Table 1: WFD River Water Bodies and Subbasins Linked to the Proposed Development

Water Course	WFD River Water Body	WFD River Subbasins	Comment
Wind Farm Site			
Fiddaunfrankagh R.	Owenmore(Mayo)_010 (IE_WE_33O040050)	Owenmore[Mayo]_SC_010	Headwater
Glenora R.			Headwater
Altderg R.			From confluence of Fiddaunfrankagh R. and Glenora R.
Oweninny R.			From confluence of Altderg R. and Inagh R.
Owenmore R.	Owenmore(Mayo)_020 (IE_WE_33O040200)		Continuation of Oweninny R. downstream of the confluence between Oweninny R. and Sheskin R. Owenmore(Mayo)_060 river waterbody ultimately discharges to Tullaghan Bay
Unnamed streams	Keerglen_010 (IE_WE_33K010200)	Glencullin[NorthMayo]_SC_010	Headwater streams flowing south from eastern part of Glenora Forest to Keerglen R.
Keerglen R.			Flows into Ballinglen R.
Ballinglen R.	Ballinglen_010 (IE_WE_33B010100		Downstream of Keerglen R. Ballinglen_020 river waterbody ultimately flows into Bunatrahir Bay
Grid Connection Route			
Sralagagh R.	Glencullin (North Mayo)_010 (IE_WE_33G020200)	Glencullin[NorthMayo]_SC_010	Merges with Glencullin R. downstream
Glencullin R.			Flows into Bunatrahir Bay
Ballinglen R.	Ballinglen_020 (IE_WE_33B010200)		Flows into Bunatrahir Bay
	Ballinglen_010 (IE_WE_33B010100)		
Rathroe R.	Breaghwy_010 (IE_WE_34B060600)	Cloonaghmore_SC_010	Merges with Cloonaghmore R. downstream
Cloonaghmore R.	Cloonaghmore_040 (IE_WE_34C030200)		Flows into Cloonaghmore Estuary which is part of the larger Killala Bay
	Cloonaghmore_050 (IE_WE_34C030270)		
Moyne R.	Moyne_010 (IE_WE_34M190890)	Abbeytown_SC_010	Flows into Killala Bay

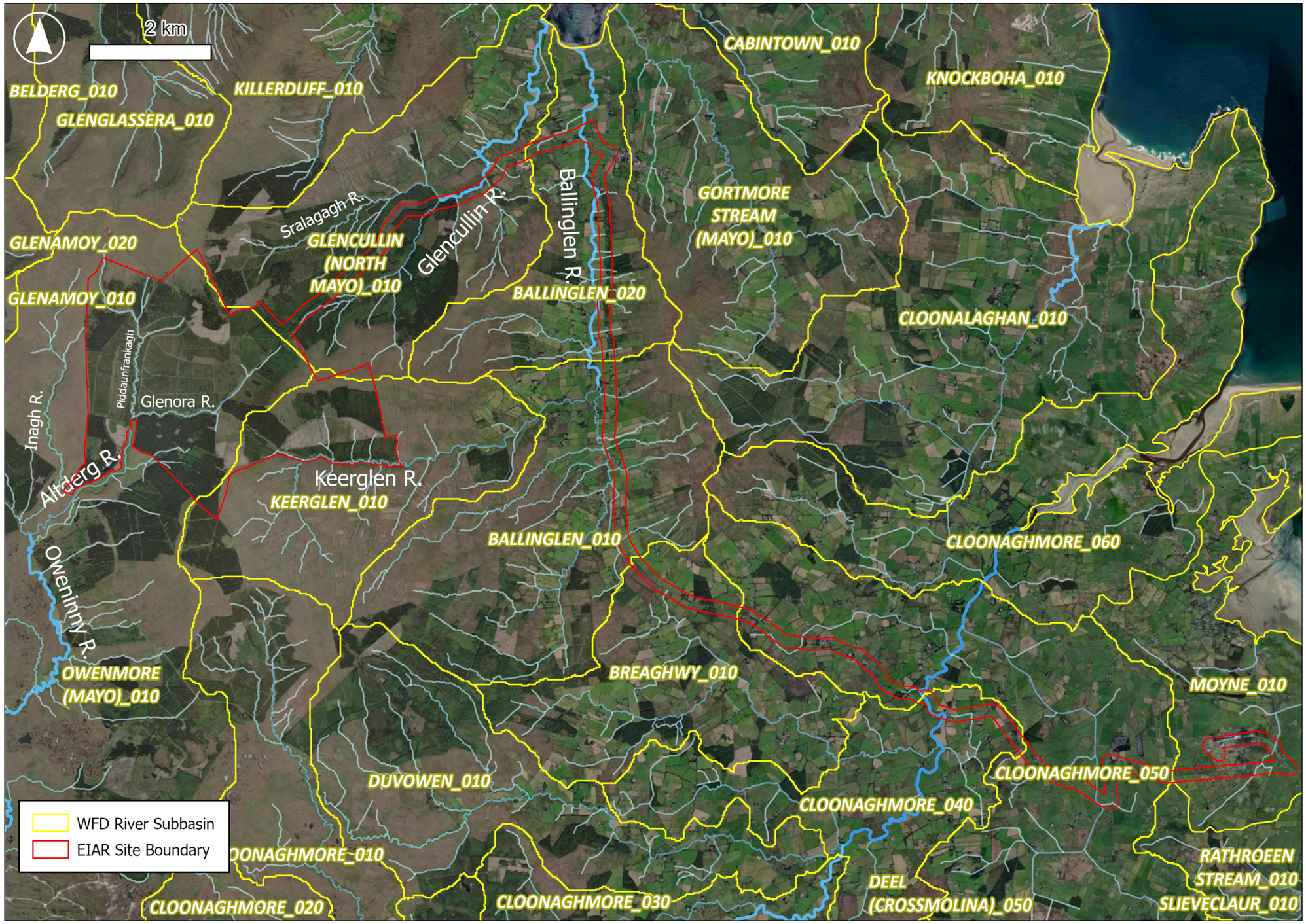


Figure 1: Map of WFD River Subbasins and EAIR Site Boundary

2.2 Surface Water Body Status Objective

Based on EPA's 'Water' web viewer[1], only the Keerglen_010 river water body has been assigned WFD 'High' status objectives. All other river water bodies are assigned the default WFD 'Good' status objective.

'High' status objective river water bodies reflect pristine reference conditions and are used by the EPA to judge ecological status at other locations. Maintaining 'High' status in these river water bodies is a WFD implementation priority (DHLHG, 2021).

2.3 Surface Water Body Status Classification

The latest available WFD status classification of river water bodies for the period 2016-2021[2] are summarised in **Table 2** and shown in **Figure 2**. In short:

- Streams that originate within Glenora Forest and that are part of the Owenmore River system are classified as being at 'High' ecological status. These exceed their WFD 'Good' status objective.
- Streams that are associated with the Keerglen_010 river subbasin are at 'Moderate' ecological status, and thus fail to meet the WFD 'High' status objective.
- The Ballinglen_010 and Ballinglen_020 river subbasins are at 'Poor' and 'Moderate' ecological status, respectively, and thus fail to meet the WFD 'Good' status objectives.
- The Moyne_010 river subbasin (near the grid connection point at Tawnaghmore) is at 'Moderate' ecological status, thus fails to meet the WFD 'Good' status objective.

All other named river subbasins in Table 2 meet their WFD status objectives.

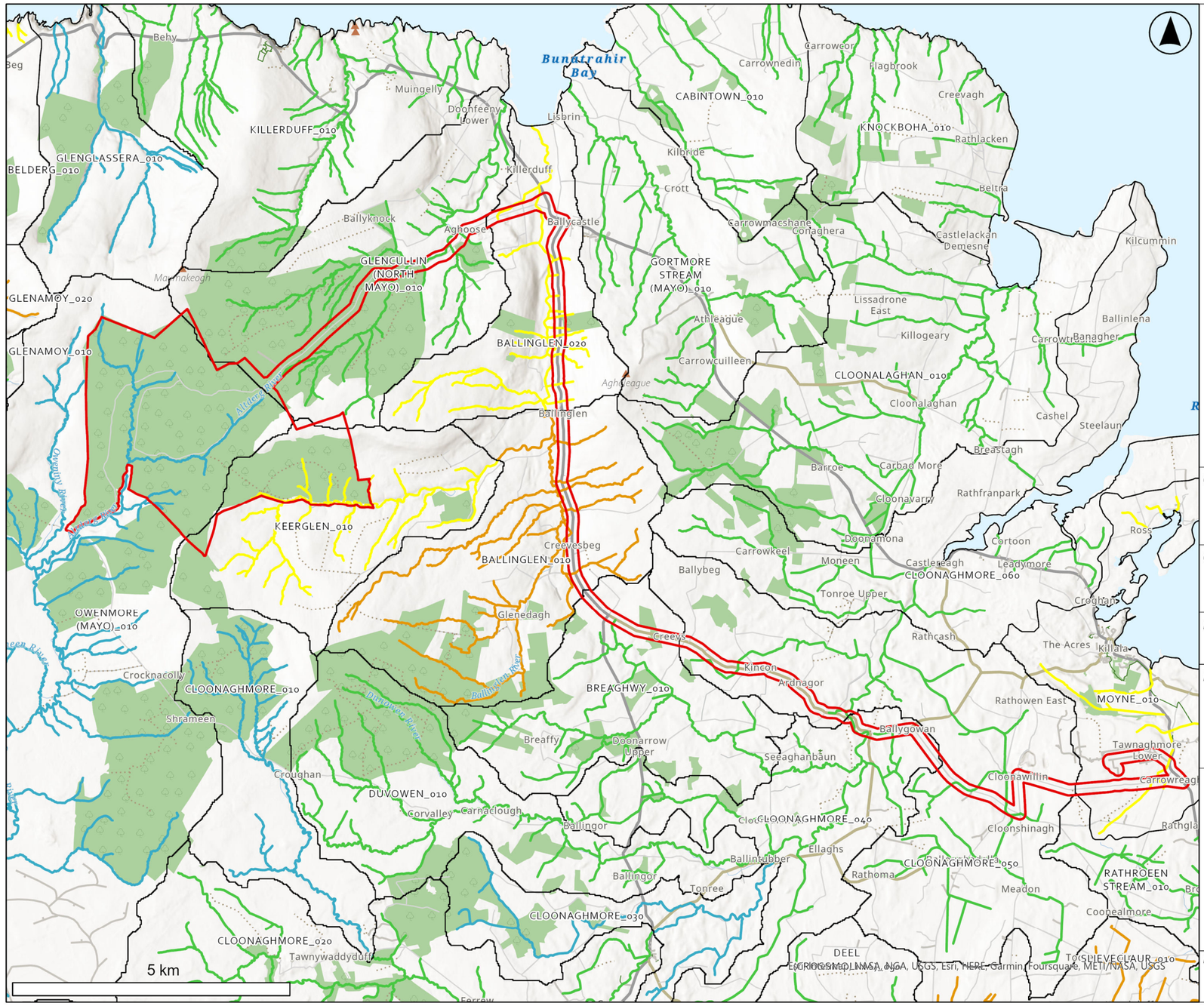
The precise causes for the 'Moderate' or 'Poor' ecological status of the Keerglen_010, Ballinglen_010, Ballinglen_020 and Moyne_010 subbasins are not known, but information that is publicly available from EPA through the www.catchments.ie website provides indicative information, as follows:

- Keerglen_010 is of 'Moderate' biological status which is related to 'Moderate' fish status. Water chemistry supporting conditions passed all of EPA's tests and invertebrate status is 'High'. It is noted that Inland Fisheries Ireland assigned a 'Moderate' fish status for the Keerglen River in 2021.[3]
- Ballinglen_010 is of 'Poor' biological status related to 'Poor' fish status. Water chemistry status is 'Moderate' on account of a 'specific pollutant' (chromium). All other water chemistry supporting conditions passed EPA's tests, and invertebrate status is 'High'. It is noted that Inland Fisheries Ireland assigned a 'Poor' fish status for a tributary in the upper sections of Ballinglen River in 2021, "*due to absence of an indicator species (i.e., brown trout) and lower than expected abundance of salmon at the site*."[4]
- Ballinglen_020 is of 'Moderate' biological status related to 'Moderate' invertebrate status. All water chemistry supporting conditions passed EPA's tests. The latest (2020) Q-index scores were 3 and 3-4 at invertebrate monitoring stations near Ballycastle.
- Moyne_010 does not have specific information available, but the river subbasin is part of an 'area for action' related to the protection of Killala Bay.

[1] https://gis-stg.epa.ie/EPAMaps/Water (last accessed 25 July 2023)
[2] https://gis-stg.epa.ie/EPAMaps/Water (last accessed 25 July 2023)
[3] https://www.fisheriesireland.ie/sites/default/files/2023-03/ballinglen_2021.pdf
[4] https://www.fisheriesireland.ie/sites/default/files/2023-03/ballinglen_2021.pdf

Table 2: WFD River Water Bodies Status Classification (2016-2021)

Water Course	WFD River Water Body	WFD Status Objective	WFD Ecological Status (2016-2021)
Wind Farm Site in Glenora Forest			
Fiddaunfrankagh R.	Owenmore(Mayo)_010	Good	High
Glenora R.			
Altderg R.			
Oweninny R.			
Owenmore R.	Owenmore(Mayo)_020	Good	High
Unnamed streams flowing south from Glenora Forest	Keerglen_010	High	Moderate
Keerglen R.			
Ballinglen R.	Ballinglen_010	Good	Poor (Assigned high confidence by EPA)
Grid Connection Route			
Sralagagh R.	Glencullin (North Mayo)_010	Good	Good
Glencullin R.			
Ballinglen R.	Ballinglen_020	Good	Moderate (Assigned high confidence by EPA)
	Ballinglen_010	Good	Poor (Assigned high confidence by EPA)
Rathroe R.	Breaghwy_010	Good	Good
Cloonaghmore R.	Cloonaghmore_040	Good	Good
	Cloonaghmore_050	Good	Good
Moyne R.	Moyne_010	Good	Moderate (Assigned 'low confidence' by EPA; based on modelling)



Legend

2016-2021 WFD River Status

- High
- Good
- Moderate
- Poor
- WFD River Subbasin
- Forest
- EIAR Site Boundary

Client: MKO

Consultant: CDM Smith
cdmsmith.com

Project Code: 260761

Project: Glenora Wind Farm

Drawing Title: 2016-2021 WFD status of river water bodies

Drawn by:	*Approved by:*	*Date:*
HOA	BCP	11/12/2023

Figure 2: River Water Body Status, 2016-2021 (Source: EPA)

The Ballinglen River catchment is an 'area for action' by the Local Authorities Water Programme (LAWPRO), whereby causes of environmental pressures are investigated and measures are defined which aim to improve water body status[5,6]. Agriculture, peat cutting, urban wastewater discharges and hydromorphological changes (in the form of channelisation and siltation) are all being investigated as possible influences on the biological quality elements of the river system.

The Bunatrahir Bay transitional water body, which receives inputs from the Glencullin and Ballinglen Rivers, was classified as being at ' 'Good' ecological status in the period 2016-2021. The status of the Cloonaghnmore Estuary transitional water body, which receives inputs from the Cloonaghmore River, was unassigned.

2.4 Surface Water Body Risk Assessment

Based on the latest available WFD risk assessment (period 2022-2027)[7], most of the river subbasins are classified as 'Not At Risk' of failing to achieve WFD status objectives in 2027 (indicted by the blue coloured river segments in **Figure 3**). Ballinglen_010, however, is "At Risk" for reasons outlined in Section 2.3. Keerglen_010, Ballinglen_020 and Moyne_010 are under "review' (pending further assessments by EPA and LAWPRO).

2.5 Groundwater Bodies

As presented in Chapter 9 of the EIAR, the groundwater bodies that underlie the Proposed Development are:

- Bangor (code IE_WE_G_0052)
- Belmullet (code IE_WE_G_0057)
- Bellacorick-Killala (code (code IE_WE_G_0041)

2.6 Groundwater Body Status Objectives

The default WFD status objective for all groundwater bodies in Ireland is 'Good'.

2.6 Groundwater Body Status Classification

There are only two categories of WFD status classification for groundwater bodies in Ireland – 'Good' and 'Poor'. For the latest status classification period (2016-2021), each of the groundwater bodies listed above were assigned 'Good' status by EPA, which means that their WFD status objectives were met in the reporting period.

2.7 Groundwater Body Risk Assessment

Each of the named groundwater bodies were also classified as being 'Not At Risk' of failing to achieve WFD status objectives in in year 2027.

[5] https://lawaters.ie/app/uploads/2022/03/AFA0014_Ballinglen_Desktop_Assessment.pdf
[6] https://www.catchments.ie/wp-content/files/areaforactionreports/AFA0014%20Ballinglen%20AFA%20Report.pdf?_gl=1*1220j0p*_ga*OTgxMjA4MTk3LjE2MjA5MTU3Njc.*_ga_TPK2CK9KEX*MTY5MDQ0ODkzOS4xMzguMC4xNjkwNDQ4OTM5LjAuMC4w
[7] https://gis-stg.epa.ie/EPAMaps/Water (last accessed 25 July 2023)

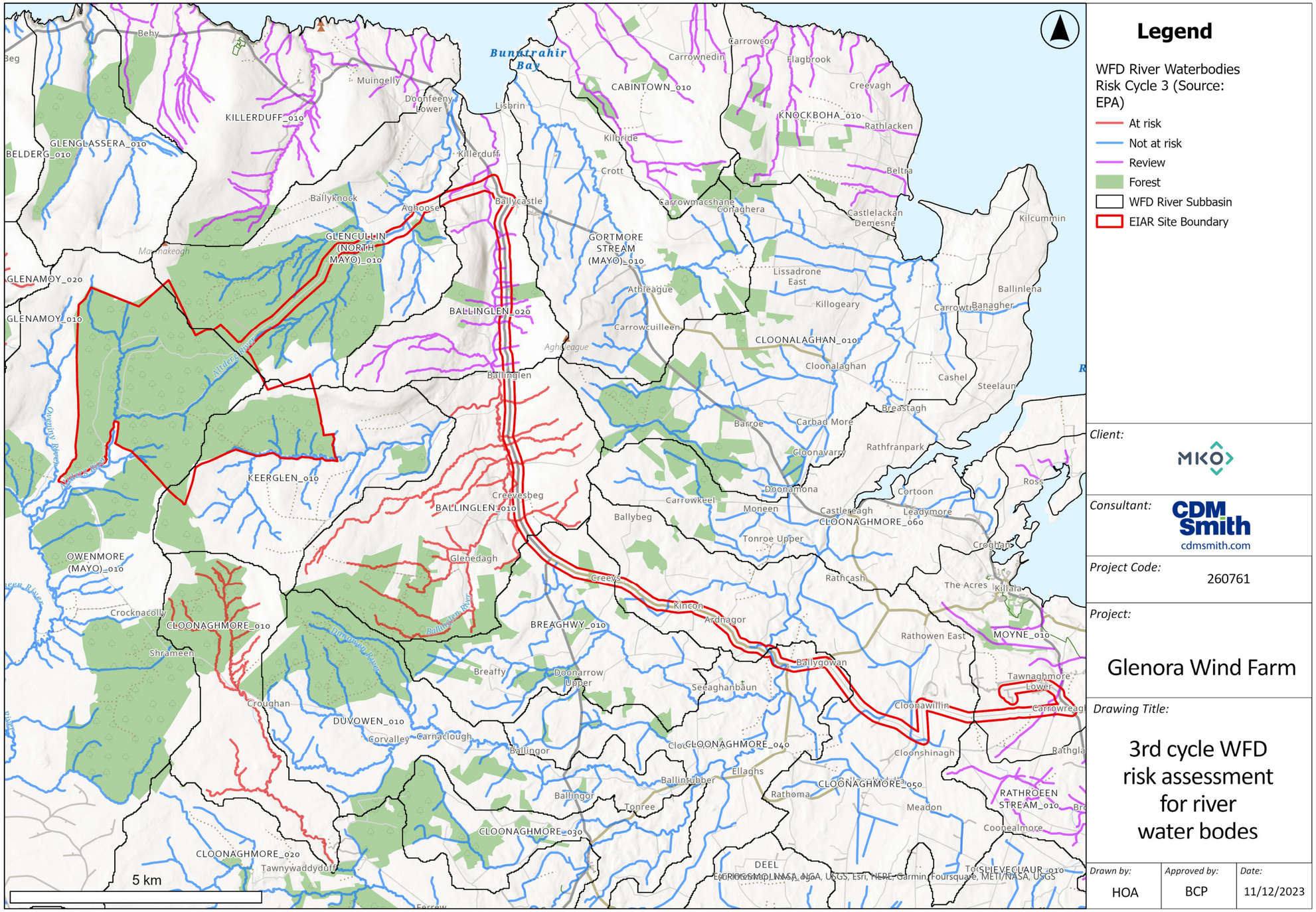


Figure 3: River Water Risk Assessment, 2022-2027 (Source: EPA)

3. WFD Compliance Assessment

3.1 Risk Factors - Surface Water

Without mitigation actions, the Proposed Development has the potential to affect the water quality and hydromorphology of local streams and downgradient rivers. The principal items that can affect water quality and associated aquatic habitats are:

- Sediment load to surface water courses and sedimentation of streambeds.
- Physical damage to streambanks and streambeds (with further mobilisation of sediments).
- Chemical load from drainage of peat, mainly nutrients (nitrogen and phosphorus) and organic constituents (e.g., fine suspended organic matter and dissolved organic carbon).
- Contamination events associated with accidental leaks and spills of fuel or other chemicals.
- Changes to natural flow conditions and water quality (e.g., pH) in streams as a result of modifications to the drainage network (NPWS, 2015).

The principal activities that may contribute to effects are:

- During construction - tree-felling, earthworks, drainage/dewatering, and construction and upgrade of access roads (especially near streams).
- During operations – maintenance works.
- During decommissioning – same as during construction, but on a smaller scale.

3.2 Risk Factors - Groundwater

Without mitigation measures, the Proposed Development can affect groundwater conditions locally, notably groundwater quality. Items that can results in effects are:

- Contamination events associated with accidental leaks and spills of fuel or other chemicals.
- Changes to shallow groundwater flow patterns in peat and subsoils from the proposed drainage and excavations of borrow pits.

The proposed work that may contribute to effects are:

- During construction – use of machinery, poor handling of fuels and chemicals, and drainage.
- During operations – maintenance activity.
- During decommissioning – same as during construction, but on a smaller scale.

3.3 Risk of Affecting Surface Water Body Status

EPA's status classification scheme for surface water bodies involves the consideration of:

- Data and information related to biological quality elements of surface water conditions. These are stipulated in the European Union Environmental Objectives (Surface Waters) (Amendment) Regulations 2019. S.I. 77 of 2019. They include, for example, the 'Q-rating' surveys for macroinvertebrates.
- Data on the physico-chemical (water quality) conditions that support the biological quality elements. Specifically, EPA reviews water quality data in context of environmental quality standards (EQS) for 'Good' or 'High' status conditions, as well as trends and patterns.
- Measurable changes to biological quality elements against established reference conditions that apply for 'Good' and 'High' status.
- Flows and levels of surface waters.
- Visual indicators of impact, such as hydromorphological alterations to streams.
- Research publications and review of other 'best available information'.

In the context of the Proposed Development, WFD status is mainly at risk from being affected by longer-term changes to hydrology, water quality and river morphology, specifically:

- Increased runoff and flows, and changes to runoff patterns and hydrology.
- Enhanced chemical and sediment loading.
- Changes in pH of streams.
- Physical damage to streambanks and streambeds.
- Sedimentation of streambeds in the downgradient direction.

Without mitigation, longer-term effects can result in the deterioration of WFD status. With mitigation (see Section 4 below), the potential for significant effects is much reduced, especially during the operational phase, as the major earthworks will be completed and permanent drainage controls will be in place. Maintenance works are still needed, but this is on a much smaller scale.

Individual, accidental pollution events are unlikely to affect water body status, although serious contamination events (e.g., of hazardous substances) can have longer-term ramifications on aquatic biota (hence, the biological quality elements of WFD status classification).

Sediment mobilisation, transport and sedimentation remains the principal issue of concern. With regard to nutrients, ammonia is the principal constituent of concern. The draining of peat can result in leaching and export of ammonia (e.g., Daniels *et al.,* 2012), and the unionized form of ammonia, NH_3, can be toxic to fish.

As documented in Chapter 9 of the EIAR, and since EPA began its national WFD monitoring programme in 2007, water quality data from EPA monitoring stations downstream of the Proposed Development Site do not exceed any environmental quality standards that are stipulated in the European Communities Environmental Objectives (Surface Waters) (Amendment) Regulations 2022, S.I. No. 288/2022).

The 'metrics' which can be tracked with monitoring for assessment of potential effects are:

- Monitoring of indicator parameters – notably true colour, turbidity and suspended solids.
- Observations of river morphological conditions.
- Rapid assessment and small stream impact score surveys, based on established procedures (LAWPRO/EPA, 2022).

Developing and tracking these items requires that routine monitoring and periodic survey work is carried out prior to, during and after construction and operations. Proposed mitigation measures are presented in Section 4 below.

3.4 Risk of Affecting Groundwater Body Status

When assigning status to groundwater bodies, EPA considers:

- Quantitative status', which is determined by comparing (known) total abstractions and estimated total recharge volumes across GWBs, as well as trends in groundwater levels using data from EPA's national monitoring well network.
- 'Qualitative status', whereby groundwater quality data from a network of wells and/or springs are compared with 'chemical test' threshold values which are stipulated in the European Union Environmental Objectives (Groundwater) (Amendment) Regulations 2019. S.I. 366 of 2016. EPA also reviews data trends and patterns to inform technical judgement.

A GWB can be assigned 'Poor' quantitative status but 'Good' qualitative status, or vice versa, and the EPA uses the least favourable outcome to assign final status. A GWB can only be at 'Poor' or 'Good' status overall, and there are no groundwater bodies with 'High' status objectives. 'Good' status is the default status objective in all cases.

The Wind Farm Site will require temporary sump pumping during excavation of the Borrow Pits. The volumes are small, the pumping duration is brief, and the temporary effect will be imperceptible in context of the overall water balance of Belmullet groundwater body.

The Wind Farm Site may also include the drilling of a well in bedrock to support the operational phase by providing water to workers. Such a well would pump less than 5 m^3 per day, and will be imperceptible in context of the overall water balance of both the Bangor or Belmullet groundwater bodies.

Accordingly, the Proposed Development will not affect the WFD quantitative status classification in either groundwater body.

Groundwater quality in the bedrock aquifers is relevant because groundwater provides limited baseflow to the streams within the Proposed Development Site, especially during prolonged dry weather, low-flow conditions (see Chapter 9 of the EAIR). Groundwater is also part of the environmental supporting conditions of habitats within the peat (e.g., fens).

There are no activities planned with the Proposed Development that will influence the groundwater quality in the bedrock aquifers in the long-term. Accidental spills and leaks can occur, which can affect groundwater quality locally, but these would likely be brief/episodic. Individual spill and short-term pollution events during are unlikely to affect groundwater body status.

Moreover, at the groundwater body scale, there is no risk of affecting the current 'Good' status objective or classification of each named groundwater body. Works areas and potential local effects are negligible compared to the spatial extents (i.e., areas) of each groundwater body. Thus, any localised groundwater quality issues will not influence the determination of status for the whole groundwater body.

For these reasons, the Proposed Development will not affect the WFD qualitative status of either of the named groundwater bodies that underlie the Proposed Development.

4. Mitigation to Prevent Status Deterioration

The objective of mitigation measures is to maintain current water quality characteristics (see Section 9 of the EIAR) and avoid deterioration of WFD status. In order to mitigate against potential negative effects on water quality and water body status, including flow volumes and patterns, mitigation measures will be implemented during all phases of the Proposed Development as summarised below (information derived from Chapter 9 of the EIAR).

4.1 Construction Phase

Proposed measures during the construction phase are summarised in **Table 3**, recognising that several of the measures will be permanent, and thus also function during the operational and decommissioning phases.

Interceptor drains will be installed up-gradient of all proposed infrastructure to collect greenfield runoff, in order to minimise the amount of runoff reaching areas where suspended sediment could become entrained. It will then be directed to locations where it can be re-distributed over the ground by means of a level spreader, before flowing into local streams.

Swales/road-side drains will be used to collect runoff from access roads and turbine hardstanding areas in the Win Farm Site. These will trap and transmit suspended sediment in water to settlement ponds for subsequent settling of sediments. On steep sections of access roads, transverse drains ('grips') will be constructed in the surface layer of the road to divert runoff off the road into swales/roadside drains. Check dams constructed from crushed rock will be used along sections of access road drains to intercept sediments at source. Settlement ponds, emplaced downstream of road swale sections and at turbine locations, will serve to buffer volumes of runoff discharging from the drainage system during periods of intense rainfall, by retaining water until the storm hydrograph has receded, thus reducing the hydraulic loading to watercourses. Settlement ponds have been designed in

consideration of greenfield runoff rates, taking into account 1 in 10 year storm events and climate change projections (20% increased rainfall).

As further detailed in **Table 1**, water quality protection incorporates many sequential barriers of protection within the broader proposed drainage management system.

Table 1: Summary of Proposed Mitigation Measures During Construction Phase

Mitigation Type	Description	Applicable Works Area
Avoidance Controls	• Application of 50m buffer zones to natural watercourses. • Minimising work areas. • Working in appropriate weather and suspending certain work activities in advance of or when periods of heavy rainfall occur.	Construction work areas
Source Controls	Upslope interceptor drains and downslope swales, diversion drains, flumes and culvert pipes	Construction work areas; access roads
	• Set designated working areas and limiting size of working areas; • Covering stockpiles; • Promoting vegetation growth.	Work and stockpiles areas
In-line Controls	• Upslope interceptor drains and downslope swales, diversion drains, flumes and culvert pipes. • Erosion and velocity control measures such as: sandbags; silt fences; check dams, oyster bags filled with gravel; filter fabrics; straw bales; flow limiters; weirs or baffles; and/or other similar/equivalent or appropriate systems. • Collection sumps, temporary sumps, pumping systems. • Sediment traps, stilling /settlement ponds.	Interceptor and collection drainage systems
Treatment Controls	• Silt fences, filter fabrics, silt bags; • Sediment traps, settlement lagoons; • Sumps.	Surface water treatment locations prior to controlled discharges/outfalls
Discharge/Outfall Controls	• Level-spreaders to generate diffuse low-energy discharges. • Buffered outfalls to break energy of discharges and reduce soil erosion. • Vegetation filters. • Flow limiters and weirs to help control discharges.	Drainage outfalls and overland discharge points

4.2 Operational Phase

Mitigation measures relevant to the operational phase are:

- Interceptor drains installed upslope of all proposed infrastructure. These collect greenfield runoff which is directed around construction areas to discharge diffusely via level spreaders downslope of construction areas.

- Swales/roadside drains. These will collect runoff from access roads and other hardstand areas (e.g., by turbines) to capture suspended sediment and lead this to settlement/stilling ponds prior to controlled discharge.
- Transverse drains ('grips'). These will be constructed in the surface layer of steep sections of access roads, to divert runoff from the road surface into downslope swales/roadside drains.
- Check dams. These will be installed in drains and swales along access road to intercept and settle out coarser sediments at source. Check dams will be constructed using non-friable crushed rock.
- Settlement/stilling ponds. These will be emplaced downslope of road swales and at infrastructure elements. They serve to buffer volumes of runoff discharging from the drainage system during periods of high rainfall, by retaining water until the storm has receded, thus reducing the hydraulic loading to watercourses. They also serve to settle out suspended sediments prior to discharge. Settlement/stilling ponds have been designed in consideration of greenfield runoff rates and 6-hour duration, 1 in 10 year storm events.

4.3 Decommissioning Phase

Potential effects during decommissioning are similar to those associated with construction, but the magnitude of activity is reduced. It will also be possible to reverse or at least reduce any potential effects caused during construction, and to a lesser extent operation, by rehabilitating constructed areas such as turbine bases and hard standing areas. This will be done by covering with vegetation to encourage vegetation growth, which will reduce runoff and sediment transport.

The Proposed Development Site roadways will be kept and maintained following decommissioning of the wind farm infrastructure, as these will be utilised by forestry works and other participating landowners.

The underground cables connecting the proposed turbines to the onsite substation will be removed, while the ducting itself will remain in-situ, as this is considered to have less of a potential environmental impact in terms of earthworks and, therefore, the possibility of mobilizing suspended sediments to/in watercourses.

The proposed turbines will be removed and transported offsite along their original delivery route. The disassembly and removal of the turbines will not have an impact on the hydrological/hydrogeological environment at the Proposed Development Site.

Other impacts such as possible contamination by fuel leaks will remain, but will be of reduced magnitude. The same mitigation measures as those outlined in Sections 4.11 and 4.2 will be implemented to ensure that no effects to receiving waters occur.

4.4 General – All Phases

Other aspects of potential surface water and groundwater quality impacts will be mitigated by best practice methods as set out below, with an emphasis on mitigation by avoidance. These apply to all phases of the Proposed Development.

<u>Accidental Spills and Leaks of Fuel and Chemicals</u>

- Onsite refueling of machinery will be carried out using a mobile double skinned fuel bowser.
- Onsite refueling will be carried out by trained personnel only.
- The fuel bowser, a double-axel, custom-built, refueling trailer will be refilled offsite, and will be towed around the site by a 4x4 vehicle to where machinery is located.
- The 4x4 towing vehicle will carry fuel absorbent material and pads in the event of any accidental spillages.
- The fuel bowser will be parked on a level area in the construction compound when not in use and only designated trained and competent operatives will be authorised to refuel plant on site.
- Mobile measures such as drip trays and fuel absorbent mats will be used during all refueling operations.

- A permit to fuel system will be put in place.
- Taps, nozzles or valves associated with refueling equipment will be fitted with locks.
- Refueling will not be permitted within the 50 m buffer zone of streams.
- All fuel storage areas will be bunded appropriately for the duration of the construction phase.
- All bunded areas will be fitted with a storm drainage system and an appropriate oil interceptor. Ancillary equipment such as hoses, pipes will be contained within the bunded area.
- Fuel and oil stores including tanks and drums will be regularly inspected for leaks and signs of damage.
- The electrical control building (at the substation) will be bunded appropriately to the volume of oils likely to be stored and to prevent leakage of any associated chemicals to groundwater (or surface water). The bunded area will be fitted with a storm drainage system and an appropriate oil interceptor.
- The plant used during construction will be regularly inspected for leaks and fitness for purpose.
- An emergency plan for the construction phase to deal with accidental spillages is included within the Construction and Environmental Management Plan.

Wastewater:

During the construction phase, self-contained port-a-loos with integrated waste holding tanks will be used at each of the Site construction compounds, maintained by the providing contractor, and removed from the Site on completion of the construction works. No wastewater will be discharged onsite.

During the operational phase, wastewater from staff welfare facilities in the control buildings will be managed by means of a sealed storage tank. Wastewater generated will be removed by permitted waste collectors for offsite disposal at wastewater treatment plants. No wastewater will be discharged onsite.

Cement-based compounds:

- No batching of wet-concrete products will occur onsite. Ready-mixed supply of wet concrete products and emplacement of pre-cast elements will be relied on, also for culverts.
- Where concrete is delivered onsite, only the chute will be cleaned, using the smallest volume of water practicable. No discharge of concrete contaminated waters to the construction phase drainage system or directly to any artificial drain or watercourse will be allowed. Chute cleaning water will be undertaken at lined concrete washout ponds.
- Weather forecasting will be used to avoid pouring concrete on days of heavy rainfall.
- Pour sites will be kept free of standing water and plastic covers will be ready in case of sudden rainfall events.

4.4 Residual Effects After Implementing Mitigation Measures

With the implementation of the mitigation measures outlined above, no likely significant effects on surface water or groundwater environments will occur. As a result, risks are managed and the current WFD status objectives and status assignments of each referenced water body will be maintained.

5. Designated Sites and Protected Areas

As presented in Chapter 9 of the EIAR the Proposed Development is linked, directly or indirectly, with the following designated sites and protected areas listed in **Table 2**.

Table 2: Summary of Designated Sites and Potential to be Impacted by the Proposed Development

Designated Site/Protected Area	Nearest Distance From Proposed Development	Assessment of Likely Zone of Influence
Special Areas of Conservation (SAC)		
Glenamoy Bog Complex SAC [000500]	0.2 km from Wind Farm Site (upslope)	The SAC boundary is approximately 200 m from the EIAR redline boundary, but 750 m away from the nearest proposed works, in the upslope direction. Hence, there will be no direct effects as the development footprint is outside the designated site and there are no pathways or surface water linkages in a downstream direction. From a hydrogeological perspectives, indirect effects of peat drainage could translate to the SAC. However, the 750 m distance to the SAC boundary the likelihood of effects occurring is low to negligible.
Bellacorick Bog Complex SAC [001922]	c. 2.5 km from Wind farm Site (downslope)	The SAC boundary, which is marked by the Oweninny River, is approximately 2.5 km from the EIAR redline boundary in the downslope direction. There will be no direct effects as the development footprint is located entirely outside the SAC. Although there is potential for water pollution of the Oweninny River, there are no pathways or connectivity to the habitats of this site. Hence, there will be no effects of the Proposed Development on the SAC.
Broadhaven Bay SAC [000472]	>30 km flow distance from Wind Farm Site (downslope)	The SAC is more than 30 km downstream of the Wind Farm Site. There is only indirect and remote hydrological connectivity via the Owenmore River and Tullaghan Bay (an estuary), thus potential effects are considered negligible.
Killala Bay/Moy Estuary SAC [000458]	1.1 km from grid connection	There will be no direct effects as the grid connection footprint is located outside the designated site. Downstream hydrological connectivity with the SAC is identified via the watercourses that cross the proposed grid connection route. Hence, there is (remote) potential for deterioration of water quality during the construction phase of the grid connection.
Owenduff/Nephin Complex SAC [000534]	13.3 km from Wind Farm Site (downslope)	The SAC boundary is approximately 13.3 km from the EIAR redline boundary in the downslope direction, and the SAC boundary runs along the bank of the Owenmore River. There will be no direct effects as the development footprint is located entirely outside the SAC. Although there is potential for water pollution of the Owenmore River, there are no pathways or connectivity to the habitats of this site. Hence, there will be no effects of the Proposed Development on the SAC.
Special Protection Area (SPA)		
Blacksod Bay/ Broadhaven SPA [004037]	>30 km flow distance from Wind Farm Site (downslope)	There will be no direct effects as the footprint of the Proposed Development is outside the designated site. The designated site is indirectly hydrologically linked in the downstream direction, but because of the distance involved (more than 30 km), there is an unlikely potential for effects to occur. Any pollutants will be diluted to such an extent that impact will not be perceptible.
Killala Bay/Moy Estuary SPA [004036]	1.9 km from grid connection (downslope)	There will be no direct effects as the grid connection footprint is located outside the designated site. Downstream hydrological connectivity with the SAC is identified via the watercourses that cross the proposed grid connection route. Hence, there is (remote) potential for deterioration of water quality during the construction phase of the grid connection.
Owenduff/Nephin Complex SPA [004098]	13.3km from Wind Farm Site (downslope)	There will be no direct effects as the development footprint is located entirely outside the designated site. The SPA boundary is approximately 20 km flow distance from the EIAR redline boundary in the downslope direction, and the SPA boundary runs along the bank of the Owenmore River. Although there is potential for water pollution of the Owenmore River, there are no pathways or connectivity to the habitats of this site. Hence, there will be no effects of the Proposed Development on the SPA.
National Heritage Area (NHA)		
Inagh Bog NHA [002391	0 km. Adjacent Wind Farm Site	Works will be conducted close to the boundary of this NHA, which borders the Wind Farm Site. There will be no direct effects but there can be indirect effects, e.g. dust transmission, hydrological changes from peat/subsoil drainage.

Designated Site/Protected Area	Nearest Distance From Proposed Development	Assessment of Likely Zone of Influence
		The Proposed Development Site adjoins the NHA in sidegradient and downgradient directions. As stated in the site synopsis report for the NHA (NPWS, 2004), the site is of "*considerable conservation value*" and "*The main threats are from grazing, burning, drainage, further afforestation and potentially renewable energy development, in particular wind power installations and associated infrastructure*".
Ummerantarry Bog NHA [00157]	<0.1 km, opposite (south of) Keerglen River	There will be no direct effects as the NHA is south of, and on the opposite side of, Keerglen River from the Wind Farm Site. Although there is potential for water pollution of the Keerglen River, there are no pathways or connectivity to the habitats of this site. The Keerglen River is considered a hydrological barrier. Hence, there will be no effects of the Proposed Development on the NHA.
Proposed National Heritage Area (pNHA)		
Glenamoy Bog Complex [000500]	0.2 km from Site (upslope)	See SAC description above.
Bellacorick Bog Complex [001922]	c. 2.5 km from Site (downslope)	See SAC description above.
Killala Bay/Moy Estuary [000458]	1.1 km from grid connection	See SAC description above.
Owenduff/Nephin Complex [000534]	13.3 km from Site (downslope)	See SAC description above.

Each of the designated sites and protected areas have qualifying interests which are, in part, water dependent. Direct effects cannot occur as the Proposed Development is not directly within any of the named sites. However, indirect effects can occur, from:

- Construction dust.
- Drainage of peat, in the upslope direction, if the hydraulic influence of interceptor drains extend sufficiently far.
- Water quality impairment in the downstream direction if the streams that leave or cross the Wind Farm Site or grid connection route become affected by the Proposed Development.

5.1 Construction Dust

Airborne construction dust can be transported to surrounding designated sites and protected areas. However, dust suppression measures are proposed which will preclude any effects from occurring.

5.2 Drainage of Peat

The peat within the Wind Farm Site is already extensively drained by the forestry operations. The peat is contiguous with the blanket bog of the Inagh Bog NHA. As such, the hydraulic influence of further drainage of peat areas has the potential to affect the hydrological conditions of the blanket bog in the NHA, by lowering water levels in the bog.

The nearest distance between the proposed infrastructure within the Proposed Development Site and the NHA boundary is, however, greater than the 100 m threshold that was proposed in Chapter 9 of the EIAR. As such, the risks of effects are considered low. The nearest proposed infrastructure is, nevertheless, wind turbines T2, T3, and T4, and these are at distances of 110, 157, and 116 m from the NHA boundary, respectively. Everywhere else, the distances to infrastructure are much greater.

Assuming that peat drainage effects translate 100 m into the NHA as a worst case scenario, the area within the NHA that would be hydraulically influenced (further assuming that effects translate across the topographic divide) becomes:

> 100 m × 100 m (width of turbine interceptor drains, perpendicular to drainage direction) × 3 turbines = 30,000 m^2, or 3 ha.

This equates to 0.5 % of the approximate total NHA area of 600 ha (6 km^2).

The likelihood or probability of hydraulic effects extending into the NHA is low. This is because the blanket bogs are significantly 'wet' (high and frequent rainfall in an upland setting), the planned drains are shallow, the named turbine locations are marginally sidegradient of the NHA boundary, and the weight of evidence from the literature review presented in Chapter 9 of the EIAR indicates that hydraulic effects will not be significant. It is, therefore, considered unlikely that the proposed drainage system within the Proposed Development Site will affect the Inagh Bog NHA.

5.3 Water Quality Impairment

Effects on designated site and protected areas from potential water quality impairment associated with the Proposed Development is only applicable to:

- The Bellacorick Bog Complex SAC and pNHA.
- The Killala Bay/Moy Estuary SAC, SPA, and pNHA.

The qualifying interests of the Bellacorick Bog Complex SAC relate to habitats within the SAC/pNHA. The Altderg River flows south from the Proposed Development Site, becoming the Oweninny River downstream. The SAC/pNHA borders the Oweninny River and related habitats in the SAC/pNHA are not dependent on the water quality of the Oweninny River directly, rather the water quality of the water that flows internally within the SAC/pNHA. There are no pathways between the Proposed Development Site and the habitats within the SAC/pNHA. Hence, any water quality impairment of the Altderg River (and Oweninny River downstream) will not affect the WFD status of water courses or aquatic biota within the Bellacorick Bog Complex SAC/pNHA.

With regard to the grid connection route, this follows existing roads to Tawnaghmore near Killala. The grid connection route crosses several tributaries of the Cloonaghmore River, and the latter discharges to the Killaly Bay/Moy Complex SAC, SPA and pNHA. The grid connection involves temporary earthworks (trenching and filling) and will thus not influence the WFD status of river water bodies that are crossed.

6. Summary

For the latest available WFD status classification period (2016-2021), all related water bodies (surface water and groundwater) that are connected hydrologically or hydrogeologically with the Proposed Development either met or exceeded their WFD status objectives, with the exception of Keerglen River. As outlined in Section 2.3 of this Appendix 9.4, the Keerglen River was assigned 'Moderate' status by EPA, due to 'Moderate biological conditions', specifically 'Moderate fish status or potential'.

Deterioration of WFD status is not permitted by the WFD and Irish Law. The Proposed Development has the potential to cause deterioration of water quality and WFD status of surface water bodies. For this reason, mitigation measures are necessary and proposed to break potential source-pathway-receptor linkages and allow for attenuation of suspended sediments. The means and methods of achieving the necessary levels of protection are established based on existing guidance documents which are listed in Chapter 9 of the EIAR. The proposed mitigation measures will be strictly enforced.

All measures are incorporated into the CEMP, which the Contractor will be legally required to adhere to. Extensive monitoring will be implemented as outlined in Chapter 9 of the EIAR.

With the proposed mitigation measures, including drainage management, the Proposed Development will not cause a deterioration of the status of surface or groundwater bodies, and will not jeopardise the attainment of WFD status objectives.

7. References

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