Environmental Impact Assessment Report

NISA

North Irish Sea Array

Volume 4: Onshore Chapters

Chapter 22
Water (includes hydrology, surface water quality and flooding)

Statkraft

CIP Copenhagen Infrastructure Partners

GoBe APEMGroup

ARUP

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22. Water

22.1 Introduction

This chapter of the Environmental Impact Assessment Report (EIAR) consists of an assessment of likely significant effects from the North Irish Sea Array (NISA) Offshore Wind Farm (hereafter referred to as the 'proposed development') on surface water quality and the existing onshore hydrological regime under the heading of Water, during the construction, operation and decommissioning phases. The proposed development is an offshore wind farm located off the east coast of Ireland, off counties Dublin, Meath and Louth. The proposed development is comprised of onshore and offshore infrastructure.

This chapter sets out the methodology followed (Section 22.2), describes the baseline environment (Section 22.3) and summarises the main characteristics of the proposed development which are of relevance to surface water (Section 22.4). The evaluation of the potential effects of the proposed development on water is described in Section 22.5. Measures are proposed, where appropriate, to mitigate and monitor these effects (Section 22.6) and residual effects are described in Section 22.7. Transboundary effects are considered in Section 22.8. The cumulative effects are summarised in Section 22.9 and detailed in full in Volume 5, Chapter 38: Cumulative and Inter-Related Effects. A reference section is included in Section 22.10. All figures referenced within this chapter are included in Volume 7.

This chapter of the EIAR assesses all aspects of water that occurs landward of the high-water mark (HWM) regardless of whether the impact arises as a result of the onshore or offshore elements of the proposed development. Effects on water seaward of the HWM are addressed in Volume 3, Chapter 11: Marine Water and Sediment Quality (hereafter referred to as the Marine Water and Sediment Quality chapter).

Effects on hydrogeology landward of the HWM have been considered separately in Volume 4, Chapter 21: Land, Soils, Geology and Hydrogeology (hereafter referred to as the Land and Soils chapter).

The EIAR also includes the following:

- Detail on the competent experts that have prepared this chapter is provided in Appendix 1.1 in Volume 8
- Detail on the extensive consultation has been undertaken with a range of stakeholders during the development of the EIAR is set out in Appendix 1.2; and
- A glossary of terminology, abbreviations and acronyms is provided at the beginning of Volume 2 of the EIAR

Volume 2, Chapter 6: Offshore Description of Development (hereafter referred to as the 'Offshore Description Chapter') and Volume 2, Chapter 7: Onshore Description of Development (hereafter referred to as the 'Onshore Description Chapter') provide a description of the proposed development and Volume 2, Chapter 8: Offshore Construction Strategy (hereafter referred to as the 'Offshore Construction Chapter') and Volume 2, Chapter 9: Onshore Construction Strategy (hereafter referred to as the ' Onshore Construction Chapter') describe the construction strategy for the proposed development.

This chapter includes the following appendices:

- Volume 10, Appendix 22.1: Flood Risk Assessment (FRA)
- Volume 10, Appendix 22.2: Onshore Water Framework Directive (WFD) Compliance Report
- Volume 10, Appendix 22.3: Water quality sampling laboratory analysis

22.2 Methodology

22.2.1 Introduction

The EIAR has been prepared with due regard to the overarching EIA legislation and guidance as detailed in Section 2.2 of Chapter 2: EIA and Methodology for the preparation of an EIAR. The assessment presented in this chapter was also made with reference to the requirements of national and European legislation / guidance as presented in Section 22.2.2.

22.2.2 Legislation and Guidelines

22.2.2.1 Water Framework Directive (WFD)

Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy (hereafter referred to as the Water Framework Directive (WFD)) has been the primary law for water protection in Europe since 2000. The law ensures a reduction and removal of pollution from surface and groundwaters while maintaining enough water to support wildlife and human needs. The WFD provides a vehicle for establishing a system to improve and / or maintain the quality of waterbodies across the European Communities (EC). It requires all waterbodies (river, lakes, groundwater, transitional, coastal) to attain 'Good Water Status' (qualitative and quantitative) by 2015, or by 2027 at the latest.

There are several WFD objectives in respect of which the quality of water is protected. The key objectives at European level are the general protection of aquatic ecology, specific protection of unique and valuable habitats, the protection of drinking water resources, and the protection of bathing water. The objective is to achieve "Good" Status through a system of river basin management planning and extensive monitoring. 'Good Status' means both 'Good Ecological Status' and 'Good Chemical Status'.

The WFD was transposed into Irish law in December 2003 by S.I. No. 722/2003 – European Communities (Water Policy) Regulations 2003, as amended to S.I. No. 93/2010 - European Communities (Water Policy) (Amendment) Regulations, 2010 (hereafter referred to as the WFD Regulations). The WFD Regulations outline the water protection and water management measures required to maintain high status of waters where it exists, prevent any deterioration in existing water status and achieve at least "Good" status for all waters.

The WFD Regulations, S.I. No. 410/2023 - European Communities Environmental Objectives (Surface Waters) (Amendment) Regulations 2023 (hereafter referred to as the Surface Waters Regulations) and S.I. No. 287/2022 - European Communities Environmental Objectives (Groundwater)(Amendment) Regulations 2022 (hereafter referred to as the Groundwater Regulations) govern the shape of the WFD characterisation, monitoring and status assessment programmes. These assign responsibilities for the monitoring of different water categories, determining the quality elements and undertaking the characterisation and classification assessments.

All identified surface waterbodies within the study area as presented within this assessment have been considered as receptors including those classified under the WFD, including riverine and transitional waterbodies, lake and coastal waterbodies and non-WFD classified waterbodies.

A separate Onshore WFD Compliance Report is included in Volume 10, Appendix 22.2 of the EIAR. An offshore WFD Compliance Report is included in Volume 9, Appendix 11.1 . These reports provide an assessment focused on compliance with the WFD objectives.

22.2.2.2 River Basin Management Plans

River Basin Management Plans (RBMPs) provide the mechanism for ensuring an integrated approach to the protection, improvement and sustainable management of the water environment and are published every six years.

The second cycle RBMP 2018 - 2021 was published by the Department of Housing, Planning and Local Government (DHPLG) in April 2018 and covers Ireland as a whole (DHPLG, 2018). For the second cycle, the Eastern, South-Eastern, South-Western, Western and Shannon River Basin Districts were merged to form

one national River Basin District (RBD) which covers the whole island of Ireland. For those waterbodies 'At Risk' of failing to meet the objectives of WFD, the RBMP 2018 - 2021 identified the most significant pressures impacting them as follows: agriculture (53%), hydromorphology (24%), urban wastewater (20%), forestry (16%), domestic wastewater (11%), urban runoff (9%), peat (8%), extractive industry (7%) and mines and quarries (6%).

The RBMP 2018-2021 (2nd cycle), in line with its objective of meeting the objectives of the EU Water Framework Directive (WFD), required that proposed developments are to integrate into their design measures that:

- Ensure full compliance with relevant EU legislation;
- Prevent further deterioration as a minimum or enhance existing high-quality status; and
- Maintain or enhance surface water bodies to achieve good status by 2021 leading up to the 3rd RBMP.

The third cycle RBMP 2022-2027 is published but in draft format and the Public Consultation Report was issued in July 2022. The above bullet point measures are carried forward in the Draft Plan 2022-2027 but with more ambition to reverse the declining water quality and put in place a specific plan for all the 46 river catchments in the country. Therefore, regardless of whether the second or third cycle RBMP plan is in place, the proposed development must not result in a deterioration of the status of the water body.

22.2.2.3 National Planning Framework

Objective 57 of the National Planning Framework (NPF) (Project Ireland 2040) outlines ways to enhance water quality and resource management by:

- Ensuring flood risk management informs plan-making decisions by avoiding inappropriate development in areas at risk of flooding in accordance with The Planning System and Flood Risk Management Guidelines for Planning Authorities (DEHLG and OPW 2009)
- Ensuring that River Basin Management Plan objectives are fully considered throughout the physical planning process; and
- Integrating sustainable water management solutions, such as Sustainable Urban Drainage (SuDS) principles, porous surfacing and green roofs, to create safe places

22.2.2.4 Supplementary Legislation

Additional legislation and policy relevant to this assessment, beyond those referred to previously, which informed the preparation of this chapter are:

- Directive (EU) 2020/2184 of the European Parliament and of the Council of 16 December 2020 on the quality of water intended for human consumption (recast)
- Directive 2007/60/EC of the European Parliament and of the Council of 23 October 2007 on the assessment and management of flood risks (hereafter referred to as the Floods Directive)
- Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014, amending Directive 2011/92/EU of the European Parliament and the Council of 13 December 2011 on the assessment of the impacts of certain public and private projects on the environment (hereafter referred to as the Environmental Impact Assessment (EIA) Directive)
- Number 1 of 1977 - The Local Government (Water Pollution) Act 1997
- S.I. No. 184/1996 - Local Government (Water Pollution) (Amendment) Regulations, 1996
- S.I. No. 259/2003 - European Communities (Quality of Water Intended For Human Consumption) (Amendment) Regulations, 2003
- S.I. No. 293/1988 - European Communities (Quality of Salmonid Waters) Regulations, 1988

- S.I. No. 495/2015 - European Communities (Assessment and Management of Flood Risks) (Amendment) Regulations 2015
- S.I. No. 99/2023 - European Union (Drinking Water) Regulations 2023; and
- S.I. No. 166/2022 - European Union (Water Policy) (Amendment) Regulations 2022

22.2.2.5 Guidelines and Plans

During the preparation of this chapter, the following guidance documents were consulted:

- The Department of the Environment, Heritage, and Local Government (DoEHLG) and the Office of Public Works (OPW) The Planning System and Flood Risk Management Guidelines for Planning Authorities (hereafter referred to as the FRM Guidelines) (DEHLG and OPW 2009)
- NRA (2009) Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes
- Environmental Protection Agency (EPA) Guidelines on the Information to be contained in Environmental Impact Assessment Reports (EIAR), 2022; and
- Inland Fisheries Ireland (IFI) (2016) Guidelines on protection of fisheries during construction works in and adjacent to waters

The relevant county development plans were also consulted and the Strategic Environmental Assessment (SEA) requirements / objectives outlined in these related to water are summarised in Table 22.1. The Strategic Flood Risk assessments associated with the county development plans were also consulted as part of the Flood Risk Assessment (FRA) for the onshore infrastructure of the proposed development included in Appendix 22.1.

Table 22.1 Summary of water requirements from county development plan SEAs.

County Development Plan title	SEA water requirements / objectives
Dublin City Development Plan 2022-2028 Fingal County Development Plan 2023-2029	(W1) Protect and where necessary improve and maintain water quality and the management of watercourses and groundwater and coastal waters in compliance with the requirements of the Water Framework Directive (WFD) and Marine Strategy Framework Directive objectives and measures. (W2) Avoid inappropriate development in areas at risk of flooding and areas that are vulnerable to current and future erosion. (W3) Integrate sustainable water management solutions (such as SuDS, porous surfacing and green roofs) into development proposals.
Louth County Development Plan 2021-2027	Ensure that the status of water bodies is protected, maintained and improved in line with the requirements of the Water Framework Directive and Marine Strategy Framework Directive Ensure that economic growth of the marine resource and its ecosystems are managed sustainably Ensure water resources are sustainably managed to deliver proposed regional and County growth targets in the context of existing and projected water supply and waste water capacity constraints ensuring the protection of receiving environments Avoid inappropriate zoning and development in areas at risk of flooding and areas that are vulnerable to current and future erosion, particularly coastal areas Integrate sustainable water management solutions (such as SuDS, porous surfacing and green roofs) into development proposals
Meath County Development Plan 2021-2027	Protect and where necessary improve and maintain water quality and the management of watercourses and groundwater in compliance with the requirements of the WFD objectives and measures. Avoid inappropriate development in areas at risk of flooding and areas that are vulnerable to current and future erosion.

22.2.3 Study Area and Baseline Data Collection

22.2.3.1 Study Area

The baseline study area for this assessment extends 250m from the onshore development area (that portion of the proposed development boundary landward of the HWM shown on figure 7.1 and on the planning drawings in Appendix 7.1). Any significant effects from the onshore infrastructure on local waterbodies will occur within this range. This includes the landfall site, the grid facility and from the centre line of the onshore cable route (i.e., 500m wide corridor or 250m radius). However, while assessing the potential impacts, due consideration was also given to surface water receptors where there is the potential for a hydrological connection irrespective of the distance from the onshore infrastructure of the proposed development.

The study area is depicted in Figures 22.1 and 22.2(pp1-12), which also show the key existing surface water features. The surface water features in the area are discussed in Section 22.3.

22.2.3.2 Data Sources

Information on the baseline environment including hydrology, hydromorphology[1] and water quality of the receptors within the study area has been collected and collated by undertaking both a desktop study and field surveys. Table 22.2 Data Sources2 lists data sources which were reviewed as part of a desktop assessment of the impacts on water.

Table 22.2 Data Sources

Assessment Attribute	Title
General	Ordnance Survey Ireland (Osi) Aerial photography (i.e., Google Earth, Google Maps)
Surface Water Quality and Hydromorphology	WFD Ireland Database EPA Water Quality Monitoring Database and Reports Teagasc Subsoil Classification Mapping EPA Environmental Data Maps National Parks and Wildlife Service (NPWS)
Hydrology	Catchment Summaries EPA Hydrometric Data System 2017
Water / Flood Risk	OPW National Flood Information Portal (OPW, 2022)

A bridge crossing inspection was undertaken on 24th and 25th of May 2022. The survey scope was to inspect bridge locations and hydrological features on site to provide input for the onshore cable route crossing method assessment. In total, 24 different watercourses for the 25 watercourse crossings were identified.

The EPA provide water quality ratings for water bodies, and these were gathered and are referenced in Section 22.3.3, where available. Water quality surveys were also carried out at six locations where open data was not available and details of this sampling is provided in Section 22.3.3.).

22.2.3.1 Assessment Limitations

This assessment is based on publicly available data and information from the EPA and OPW, and from Fingal County Council's and Dublin City Council's County development plans. Surface water quality data was collected at locations where there was no public data. The water quality analysis was completed by approved methods and accredited laboratories. Overall, the level of confidence in the assessment was moderate to high that none of the limitations would affect the conclusion. The results of the water quality sampling are further discussed in Section 22.3.3.

[1] Hydromorphology generally consists of flow conditions (i.e. quantity of flow and connection to other waterbodies and groundwater bodies) and morphological conditions (i.e. shape, depth, width and substrate of the bed). These quality elements support the biological elements of a waterbody.

22.2.4 Impact Assessment Methodology

The likely significant effects of the onshore infrastructure of the proposed development on water have been assessed by classifying the sensitivity of the relevant attributes (receptors) and quantifying the likely magnitude of any impact on these attributes. The resultant significance of the potential effect is a function of both criteria. Mitigation measures have been detailed where necessary to reduce the significance of these effects and the residual likely significant effects are described.

The criteria to determine the sensitivity of the feature and the magnitude of potential impacts have been based on the guidance outlined in Section 5.6 of the TII Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes (NRA/TII, 2009). It should be noted that the TII Guidelines refer to the sensitivity as 'Importance' and provide ranking criteria accordingly – the terminology of 'Importance' and sensitivity have both been used in this chapter to avoid confusion.

The process is to determine the Importance (or Sensitivity) of the identified constraint (Table 22.3), determine the Magnitude of any potential impacts (Table 22.4) and the resultant Significance of that effect (Table 22.5)

Table 22.3 Criteria for rating site attributes – Estimation of the importance of hydrology attributes (NRA/TII, 2009)

Sensitivity	Criteria	Typical Example
Extremely High	Attribute has a high quality or value on an international scale	River, wetland or surface water body ecosystem protected by EU legislation e.g. 'European sites' designated under the Habitats Regulations or 'Salmonid waters' designated pursuant to the European Communities (Quality of Salmonid Waters) Regulations, 1988.
Very High	Attribute has a high quality or value on a regional or national scale	River, wetland or surface water body ecosystem protected by national legislation – NHA status Regionally important potable water source supplying >2500 homes Quality Class A (Biotic Index Q4, Q5) Flood plain protecting more than 50 residential or commercial properties from flooding Nationally important amenity site for wide range of leisure activities
High	Attribute has a high quality or value on a local scale	Salmon fishery Locally important potable water source supplying >1000 homes Quality Class B (Biotic Index Q3-4) Flood plain protecting between 5 and 50 residential or commercial properties from flooding Locally important amenity site for wide range of leisure activities
Medium	Attribute has a medium quality or value on a local scale	Coarse fishery Local potable water source supplying >50 homes Quality Class C (Biotic Index Q3, Q2- 3) Flood plain protecting between 1 and 5 residential or commercial properties from flooding
Low	Attribute has a low quality or value on a local scale	Locally important amenity site for small range of leisure activities Local potable water source supplying < 50homes. Quality Class D (Biotic Index Q2, Q1). Flood plain protecting 1 residential or commercial property from flooding. Amenity site used by small numbers of local people

Table 22.4 Criteria for rating site attributes impact significance at EIA stage - Estimation of Magnitude of Effects on Hydrology Attributes (NRA/TII, 2009)

Importance	Criteria	Typical Example
Large adverse	Results in loss of attribute and /or quality and integrity of attribute	Loss or extensive change to a waterbody or water dependent habitat

Importance	Criteria	Typical Example
		Increase in predicted peak flood level >100mm[2] Extensive loss of fishery Calculated risk of serious pollution incident >2% annually[3] Extensive reduction in amenity value
Moderate adverse	Results in impact on integrity of attribute or loss of part of attribute	Increase in predicted peak flood level >50mm[2] Partial loss of fishery Calculated risk of serious pollution incident >1% annually[3] Partial reduction in amenity value
Small adverse	Results in minor impact on integrity of attribute or loss of small part of attribute	Increase in predicted peak flood level >10mm[2] Minor loss of fishery Calculated risk of serious pollution incident >0.5% annually[3] Slight reduction in amenity value
Negligible	Results in an impact on attribute but of insufficient magnitude to affect either use or integrity	Negligible change in predicted peak flood level Calculated risk of serious pollution incident <0.5% annually[3]
Minor Beneficial	Results in minor improvement of attribute quality	Reduction in predicted peak flood level >10mm[2] Calculated reduction in pollution risk of 50% or more where existing risk is <1% annually[3]
Moderate Beneficial	Results in moderate improvement of attribute quality	Reduction in predicted peak flood level >50mm[2] Calculated reduction in pollution risk of 50% or more where existing risk is >1% annually[3]
Major Beneficial	Results in major improvement of attribute quality	Reduction in predicted peak flood level >100mm[3]

Table 22.5 Rating of Significant Environmental Effects at EIA Stage (NRA/TII, 2009)

		Magnitude of Impact			
		Negligible	**Small**	**Moderate**	**Large**
Importance of attribute	**Extremely High**	Imperceptible	Significant	Profound	Profound
	Very High	Imperceptible	Significant / Moderate	Profound / Significant	Profound
	High	Imperceptible	Moderate / Slight	Significant / Moderate	Severe / Significant
	Medium	Imperceptible	Slight	Moderate	Significant
	Low	Imperceptible	Imperceptible	Slight	Slight / Moderate

The EPA guidance (Guidelines on the Information to be Contained in EIARs, 2022) uses the same terminology to describe the significance of the effect as the TII guidelines. In line with the EPA guidance, each likely significant effect has been described in terms of its quality, significance, duration, and type.

[2] Refer to Annex 1, Methods E and F, Annex 1 of HA216/06

[3] Refer to Appendix B3 / Annex 1, Method D, Annex 1 of HA216/06

Where the significance of the effect on a receptor is determined, based on Table 22.5, to be 'Imperceptible', 'Slight' or 'Moderate', the effect is determined to be Not Significant. Where the significance of the effect on a receptor is determined, based on Table 22.5, to be 'Significant' or 'Profound' the effect is determined to be 'Significant'.

This chapter includes an assessment of the likely significant effects on water quality and local hydrology. The results of the FRA are summarised here while the full assessment is included in Appendix 22.1. Due to the interconnected nature of water, there are linkages to ecological receptors and groundwater and the risks to these features are dealt with in Volume 4 Chapter 23: Biodiversity (hereafter referred to as the Biodiversity Chapter) and the Land and Soils chapter respectively.

22.3 Baseline Environment

22.3.1 Regional Overview of Hydrology

The study area (as shown on Figures 22.1 and 22.2(pp1-12) lies within the Eastern River Basin District regional catchment, and the Nanny-Delvin (HA 08) and Liffey and Dublin Bay (HA 09) WFD Catchments, as shown on Figure 22.1.

The Nanny-Delvin Catchment Summary (Nanny Delvin Catchment Report HA 08, EPA 2021) describes this catchment as including the area drained by the Rivers Nanny and Delvin and by all streams entering tidal water between Mornington Point and Sea Mount, Co. Dublin, draining a total area of 711km^2. The largest urban centre in the catchment is Swords, and the other main urban centres relevant to the study area are Lusk and Balbriggan. The total population of the catchment area is approximately 159,230 with a population density of 224 people per km^2 (CSO, 2022). The main sub-catchments that the study area interacts with within this WFD catchment are the Palmerstown_SC_010 and Balough [Stream]_SC_010 sub-catchments, however in some areas the study area also touches on the Devlin_SC_010 and Broadmeadow_SC_010 sub-catchments.

The Liffey and Dublin Bay Catchment Summary (Liffey and Dublin Bay Catchment Report HA 09,,EPA 2021) describes this catchment as including the area drained by the river Liffey and by all streams entering tidal water between Sea Mount and Sorrento Point in County Dublin, draining a total area of 1,616km^2. The largest urban centre in the catchment is Dublin city. The Liffey and Dublin Bay catchment contains the largest population (approximately 1,255,000) of any catchment in Ireland and is characterised by a sparsely populated, upland south-eastern area underlain by granites and a densely populated flat, low lying limestone area over the remainder of the catchment basin (CSO, 2022). The catchment area is heavily urbanised and industrialised. The main sub-catchments that the study area interacts with within this WFD catchment is the Mayne_SC_010 sub-catchment.

The EPA water quality monitoring dataset is designed as a geometric river network for monitoring, management, and reporting purposes. The EPA has split up rivers and streams into smaller sections to allow areas to be easily distinguished. These segments are assignment segment codes (estuaries and canals are not assigned segment codes). The EPA's segmented coding and naming system has been applied throughout this chapter.

22.3.2 Local Hydrological Drainage Features

The EPA catchment and sub-catchment details for each watercourse crossing are presented on Figure 22.2 and are summarised in Table 22.6.

Section 22.4 provides a detailed overview of the characteristics of the proposed development that are relevant to water, however, to provide context for the local hydrology the watercourse crossings are introduced in this section.

The onshore cable route crosses 24 watercourses at 25 locations, from the grid facility to the grid connection point at Belcamp. These crossings are listed below in Table 22.6 with approximate Irish Transverse Mercator (ITM) reference coordinates and presented on Figure 22.2 (pp1-12). It should be noted that there are no catchment area data for Wx03, Wx05, Wx07, Wx12, Wx18, Wx19, Wx21, Wx23B and Wx23C, due to no station being present for those coordinate locations.

Table 22.6 Catchment and Sub-catchment Details for each Water Crossing (Source EPA Maps)

Water Crossing Ref. No.	EPA Waterbody Name	Contributing Catchment Approx. Area (km^2)	WFD Catchment	WFD Catchment Approx. Area (km^2)	WFD Sub-Catchment	WFD Waterbody name	Crossing ITM X Coordinate	Crossing ITM Y Coordinate
Landfall Site	North Irish Sea	NA	NA	NA	NA	North Irish Sea (HA08)	719811	765320
Wx01	Bremore Stream	1.8	Nanny-Delvin	708.22	Palmerstown_SC_010	Matt_010	719677	764326
Wx02	Bracken (Matt) River	27.7	Nanny-Delvin	708.22	Delvin_SC_010	Matt_010	720017	763052
Wx03	Knock Stream	N/A	Nanny-Delvin	708.22	Palmerstown_SC_010	Matt_010	719494	760779
Wx04	Balrothery Stream	2.7	Nanny-Delvin	708.22	Palmerstown_SC_010	Matt_010	719105	760137
Wx05	Balrickard Stream	N/A	Nanny-Delvin	708.22	Palmerstown_SC_010	Matt_010	718601	758553
Wx06	Rowans Little Stream	1.3	Nanny-Delvin	708.22	Palmerstown_SC_010	Matt_010	718596	758440
Wx07	Rowans Big Stream	N/A	Nanny-Delvin	708.22	Palmerstown_SC_010	Matt_010	718581	758301
Wx08	Courtlough Stream	1.2	Nanny-Delvin	708.22	Ballough[Stream]_SC_010	Ballough Stream_010	718833	756777
Wx09	Oberstown Stream	1.4	Nanny-Delvin	708.22	Ballough[Stream]_SC_010	Ballough Stream_010	719280	755878
Wx10	Aldrumman Stream	<0.5	Nanny-Delvin	708.22	Ballough[Stream]_SC_010	Ballough Stream_010	719426	755619
Wx11	Ballough Stream	32.2	Nanny-Delvin	708.22	Ballough[Stream]_SC_010	Ballough Stream_020	719594	752665
Wx12	Ballyboghil Stream	N/A	Nanny-Delvin	708.22	Ballough[Stream]_SC_010	Ballyboghill_010	719808	751445
Wx13	Deanestown Stream	44.3	Nanny-Delvin	708.22	Ballough[Stream]_SC_010	Ballyboghill_010	719802	751378
Wx14	Turvey Stream	7.0	Nanny-Delvin	708.22	Ballough[Stream]_SC_010	Turvey_010	719770	750896
Wx15	Staffordstown Stream	3.0	Nanny-Delvin	708.22	Ballough[Stream]_SC_010	Turvey_010	718979	748793

Water Crossing Ref. No.	EPA Waterbody Name	Contributing Catchment Approx. Area (km^2)	WFD Catchment	WFD Catchment Approx. Area (km^2)	WFD Sub-Catchment	WFD Waterbody name	Crossing ITM X Coordinate	Crossing ITM Y Coordinate
Wx16	Broadmeadow River	109.6	Nanny-Delvin	708.22	Broadmeadow_SC_010	Broadmeadow_040	718732	748251
Wx17	Ward River	61.6	Nanny-Delvin	708.22	Broadmeadow_SC_010	Ward_040	718700	748169
Wx18	Seapoint Stream	N/A	Liffey and Dublin Bay	1,624.42	Mayne_SC_010	Gaybrook_010	719350	747479
Wx19	Greenfields Stream	N/A	Liffey and Dublin Bay	1,624.42	Mayne_SC_010	Gaybrook_010	719482	747414
Wx20	Gaybrook Stream	4.6	Liffey and Dublin Bay	1,624.42	Mayne_SC_010	Gaybrook_010	720900	745787
Wx21	Hazelbrook Stream	N/A	Liffey and Dublin Bay	1,624.42	Mayne_SC_010	Sluice_010	721135	744870
Wx22	Sluice Stream	8.4	Liffey and Dublin Bay	1,624.42	Mayne_SC_010	Sluice_010	721159	743383
Wx23A	Cuckoo Stream	4.9	Liffey and Dublin Bay	1,624.42	Mayne_SC_010	Mayne_010	721024	741737
Wx23B	Cuckoo Stream	N/A	Liffey and Dublin Bay	1,624.42	Mayne_SC_010	Mayne_010	722164	741652
Wx23C	Cuckoo Stream	N/A	Liffey and Dublin Bay	1,624.42	Mayne_SC_010	Mayne_010	722262	741513
Wx24A	Mayne Stream	8.6	Liffey and Dublin Bay	1,624.42	Mayne_SC_010	Mayne_010	721162	741196
Wx24B	Mayne Stream	14.9	Liffey and Dublin Bay	1,624.42	Mayne_SC_010	Mayne_010	722096	741460
Wx24C	Mayne Stream	14.9	Liffey and Dublin Bay	1,624.42	Mayne_SC_010	Mayne_010	722233	741430
Wx25	Mayne Stream	5.9	Liffey and Dublin Bay	1,624.42	Mayne_SC_010	Mayne_010	719245	741336

22.3.3 Water Quality

22.3.3.1 WFD Status

The 2016-2021 WFD Status of the rivers and streams within the study area of the onshore development area of the proposed development are detailed in Table 22.7.

In summary, the WFD status of the water bodies show that the watercourses along the cable route and at the grid facility have “Poor” to “Moderate” WFD status. The key pressures associated with these bodies have also been noted. However, all waterbodies have 2027 set as the date to meet their environmental objectives in line with the WFD Regulations.

Table 22.7 Surface Water WFD Status

WFD Sub Catchment	WFD Waterbody name	Type	Status (2016-2021)	Key Pressures	Risk Category
Broadmeadow Estuary (inner)	Broadmeadow_040	River	Poor	Agriculture, Hydromorphology	At Risk
Palmertown_SC_010	Matt_010	River	Poor	Hydromorphology, Urban Runoff	At Risk
08_6 Ballough[Stream]_SC_010	Ballough Stream_020	River	Moderate	Agriculture, Urban Wastewater	At Risk
08_6 Ballough[Stream]_SC_010	Ballough Stream_010	River	Poor	Agriculture	At Risk
08_6 Ballough[Stream]_SC_010	Ballyboughill_010	River	Poor	Agriculture	At Risk
08_6 Ballough[Stream]_SC_010	Turvey_010	River	Poor	Urban Runoff, Urban Wastewater	At Risk
08_3 Broadmeadow_SC_010	Broadmeadow_040	River	Poor	Urban Runoff, Hydromorphology, Urban Wastewater	At Risk
08_3 Broadmeadow_SC_010	Ward_040	River	Poor	Urban Runoff, Hydromorphology, Urban Wastewater	At Risk
09_17 Mayne_SC_010	Gaybrook_010	River	Poor (2013-2018)	Anthropogenic Pressures	Review
09_17 Mayne_SC_010	Sluice_010	River	Poor	Anthropogenic Pressures	Review
09_17 Mayne_SC_010	Mayne_010	River	Poor	Urban Runoff	At Risk

22.3.3.2 EPA Surface Water Monitoring

The EPA assesses the water quality of rivers and streams across Ireland through a biological assessment method known as the Quality Rating System (Q-value) (EPA 2018). The EPA assigns biological river quality (biotic index) ratings from Q5 to Q1 to watercourse sections (refer to Table 22.8). Q5 denotes a watercourse with high water quality and high macroinvertebrate community diversity, whereas Q1 denotes very low macroinvertebrate community diversity and bad water quality. This data will be used to inform baseline receptor importance.

The WFD also considers highly modified waterbodies (HMWB) and artificial surface waterbodies (AWB). The WFD requires HMWB and AWB to achieve good ecological potential rather than Good Status.

Table 22.8 EPA Scheme of Biotic Indices or Quality (Q) Values (EPA 2018)

Biotic Index Q Value	WFD Status	Pollution Status	Condition
Q5, Q4-Q5	High	Unpolluted	Satisfactory
Q4	Good	Unpolluted	Satisfactory
Q3-Q4	Moderate	Slightly Polluted	Unsatisfactory
Q3, Q2-Q3	Poor	Moderately Polluted	Unsatisfactory
Q2, Q1-Q2, Q1	Bad	Seriously Polluted	Unsatisfactory

Within the study area only the following watercourses have been assigned these classifications. The majority of these are moderately to slightly polluted which indicates that the overall water quality is unsatisfactory:

- Mayne River (Q3),
- Sluice Stream (Q3-Q4),
- Turvey Stream (Q3), and
- Ballough Stream (Q3-Q4).

22.3.3.3 Site Specific Water Quality Survey

Site specific water quality monitoring was conducted from early September to mid October 2022 at six water crossing locations where EPA data was not available at all or inadequate / obsolete, as detailed in Table 22.9.

Table 22.9 Water Quality Sampling Locations

Crossing Point	Water Body Name	WFD Water Body Name	Crossing ITM:X	Crossing ITM: Y
Wx05	Balrickard Stream	Matt_010	718600	758554
Wx09	Oberstown Stream	Ballough Stream_010	719280	755878
Wx10	Aldrumman Stream	Ballough Stream_010	719422	755619
Wx15	Staffordstown Stream	Turvey_010	718986	748788
Wx18	Seapoint Stream	Gaybrook_010	719335	747507
Wx20	Gaybrook Stream	Gaybrook_010	720899	745784

Three samples were taken with approximately three weeks interval between September 5th, 2022, and October 17th, 2022. The sampling was completed during low flow periods to ensure highest concentration of parameters tested were captured, due to low dilution in the watercourses during that period. The results are presented in Table 22.10 and the lab analysis sheets are included in Appendix 22.3.

Table 22.10 Water Quality Analysis Results 05/09/22-17/10/22, with thresholds as per the Surface Water Regulations.

Crossing Location	Water Crossing Ref. No.	Parameter	Threshold Limits	unit	05th Sept 2022	26th Sept 2022	17th Oct 2022
Gaybrook Stream	Wx20	Conductivity	N/A	mscm - 1@25ºC	630	750	470
		Dissolved Oxygen	95%ile <120% saturation	mg/L	7.20mg/l = 78.9 DO% saturation	6.40 mg/l = 62.9 DO% saturation	7.04 mg/l = 66.2 DO% saturation
		pH	Hard Water 6.0< pH < 9.0; Soft Water 4.5< pH < 9.0	pH units	8.80	7.42	8.00
		Temperature	Not greater than a 1.5°C rise in ambient temperature outside the mixing zone	ºC	19.80	14.60	12.60
		Turbidity	N/A*	NTU	0.30	1.70	2.80
		Water Level	N/A*	m	0.19	0.19	0.25
Seapoint Stream	Wx18	Conductivity	N/A	mscm - 1@25ºC	530	1470	500
		Dissolved Oxygen	95%ile <120% saturation	mg/L	7.20 mg/l = 77.9 DO% saturation	5.20 mg/l = 51.21 DO% saturation	6.57 mg/l = 63.16 DO% saturation
		pH	Hard Water 6.0< pH < 9.0; Soft Water 4.5< pH < 9.0	pH units	8.60	7.78	7.78
		Temperature	Not greater than a 1.5°C rise in ambient temperature outside the mixing zone	ºC	19.20	14.70	13.60
		Turbidity	N/A*	NTU	0.90	0.50	4.80
		Water Level	N/A*	m	0.20	0.21	0.13

Crossing Location	Water Crossing Ref. No.	Parameter	Threshold Limits	unit	05th Sept 2022	26th Sept 2022	17th Oct 2022
Staffordstown Stream	Wx15	Conductivity	N/A	mscm - 1@25ºC	540	860	420
		Dissolved Oxygen	95%ile <120% saturation	mg/L	6.70 mg/l = 70.2 DO% saturation	5.30 mg/l = 49.3 DO% saturation	5.59 mg/l = 50.9 DO% saturation
		pH	Hard Water 6.0< pH < 9.0; Soft Water 4.5< pH < 9.0	pH units	8.40	7.45	7.54
		Temperature	Not greater than a 1.5°C rise in ambient temperature outside the mixing zone	ºC	17.60	12.10	11.20
		Turbidity	N/A*	NTU	2.80	0.60	1.30
		Water Level	N/A*	m	0.18	0.16	0.21
Aldrumman Stream*	Wx10	Conductivity	N/A	mscm - 1@25ºC	Not Available	710	450
		Dissolved Oxygen	95%ile <120% saturation	mg/L	Not Available**	5.00 mg/l = 46.5 DO% saturation	4.97 mg/l = 44.6 DO% saturation
		pH	Hard Water 6.0< pH < 9.0; Soft Water 4.5< pH < 9.0	pH units	Not Available**	7.50	7.62
		Temperature	Not greater than a 1.5°C rise in ambient temperature outside the mixing zone	ºC	Not Available**	12.10	10.60
		Turbidity	N/A*	NTU	Not Available**	1.90	24.10
		Water Level	N/A*	m	Not Available**	0.17	0.24
Oberstown Stream	Wx9	Conductivity	N/A	mscm - 1@25ºC	710	690	510

Crossing Location	Water Crossing Ref. No.	Parameter	Threshold Limits	unit	05th Sept 2022	26th Sept 2022	17th Oct 2022
		Dissolved Oxygen	95%ile <120% saturation	mg/L	7.1 mg/l = 74.4 DO% saturation	7.10 mg/l = 67.4 DO% saturation	8.39 mg/l = 74.8 DO% saturation
		pH	Hard Water 6.0< pH < 9.0; Soft Water 4.5< pH < 9.0	pH units	8.30	7.57	7.52
		Temperature	Not greater than a 1.5°C rise in ambient temperature outside the mixing zone	°C	17.60	11.00	10.3
		Turbidity	N/A*	NTU	3.90	1.60	47.50
		Water Level	N/A*	m	0.22	0.23	0.20
Balrickard Stream	Wx05	Conductivity	N/A	mscm - 1@25°C	710	670	450
		Dissolved Oxygen	95%ile <120% saturation	mg/L	4.3 mg/l = 45.2 DO% saturation	5.2 mg/l = 48.2 DO% saturation	5.76 mg/l = 51.6 DO% saturation
		pH	Hard Water 6.0< pH < 9.0; Soft Water 4.5< pH < 9.0	pH units	7.80	7.15	6.79
		Temperature	Not greater than a 1.5°C rise in ambient temperature outside the mixing zone	°C	17.80	12.00	10.50
		Turbidity	N/A*	NTU	2.90	1.20	8.90
		Water Level	N/A*	m	0.25	0.22	0.22

* Turbidity and water level are site specific parameters therefore will not have upper or lower limits.

**Water quality information for Aldrumman Stream was not available on 5th September 2022. However, the results for consecutive dates do not show significant variation in water quality and thus can be relied upon as representative water quality for this stream.

The results are as expected for the type of background environment in the area. Samples from Oberstown Stream and Aldrumman Stream taken on 17 October 2022 had turbidity spikes which can be assumed to have been generated from storm events the days prior to the sampling. The slightly elevated electrical conductivity at Seapoint Stream on 26 September 2022 indicates influence of sea water at the sampling point. The dissolved oxygen (DO) level is generally good (above 6.5-8mg/l) and below the threshold of 120% saturation. However, the Balrickard Stream has consistently showed DO levels less than 6mg/l, once dropping to just 4.3mg/l which is below the generally accepted level for healthy water.

22.3.4 Known Pressures

The presence / absence of Urban Wastewater Treatment Plants (UWWTP) discharge points and associated storm water overflows (SWOs) and Industrial Emissions Licence (IEL) / Integrated Pollution Control (IPC) licensed sites was examined in the EPA online database to understand existing discharges to determine the potential for environmental pressures on the water bodies within the study area. The following UWWTP, IE / IPC licensed sites were identified in the wider area:

- IE Licensed Facility Padraig Thornton Waste Disposal Limited, Stephenstown Business Park, Balbriggan, Dublin, Reg. No. P1014-01
- IE Licenced Facility Fingal Landfill, Nevitt, Lusk, Dublin, Reg No.: W0231-01
- IE Licenced Facility Bord na Móna Recycling Limited, Coldwinters, Blakescross, Lusk, Dublin, Reg No.: W0222-01
- IE Licenced Facility Balleally Landfill, Lusk, Dublin, Reg No.: W0009-03
- IE Licenced Facility Sk Biotek Ireland Limited, Watery Lane, Swords, Dublin, Reg. No.: P0014-04
- IE Licenced Facility Arch Chemicals BV, Watery Lane, Swords, Dublin, Reg. No.: P0060-01
- IE Licenced Facility MSD International GmbH t/a MSD Ireland (Biotech Dublin), Drynam Road, Swords, Dublin, Reg. No.: P1106-01
- IE Licenced Facility Amazon Data Services Ireland Limited, Clonshaugh Business & Technology Park, Dublin, Reg. No. P1171-01
- IPC Licenced Facility Brooks Group Limited, Business Park, Courtlough, Balbriggan, Fingal, Dublin, Reg No.: P0780-01
- IPC Licenced Facility Evode Industries Limited, Newtown, Swords, Dublin, Reg. No.: P0083-01
- IPC Licenced Facility Forest Laboratories Ireland Limited, Clonshaugh Industrial Estate, Coolock, Dublin, Reg. No.: P0306-03
- UWWTP Balbriggan, Reg. No.: D0023-01
- UWWTP Swords, Reg No.: D0024-01; and
- UWWTP Malahide, Reg. No. D0021-01

22.3.5 Protected features

This section of the report summarises those protected features which are within the study area or are hydraulically connected (i.e. a site may be far from the onshore development area of the proposed development but activities at the onshore infrastructure may effect the designated feature if it is hydrologically connected). These features comprise ecological sites or drinking water supplies.

22.3.5.1 Ecological Designated Sites

There are a number of designated sites that have been summarised in this section which are located landward of the high water mark (HWM) within the study area. The designated sites which have been summarised in this section are located within the Nanny-Delvin and the Liffey and Dublin Bay catchments.

The sites described comprise nutrient sensitive areas, shellfish areas, Special Area of Conservation (SAC), Special Protection Areas (SPA), proposed Natural Heritage Area (pNHA), salmonid rivers, shellfish areas and marine bathing waters.

This chapter only assesses if there is a potential for water quality, levels or flow to change at the protected feature as a result of the proposed development. The Biodiversity Chapter assesses in full whether these changes in the water related characteristics will have a potential effect on the protected ecological features themselves.

It should be noted that for several of these sites, most of the site lies seaward of the HWM and as such an assessment of potential effects has been undertaken in the Marine and Sediment Quality chapter. This chapter only includes those protected features where the boundary of the protected site extends landward of the HWM and that area landward of the HWM contains qualifying features which contribute towards the site's protection status.

A review of the protected features was conducted to determine those sites which were within the study area and / or hydrologically connected to the waterbodies. Table 22.11 summarises the sites which were identified to be relevant to this assessment. A full list of the protected ecological features is included in Table 23.10 and 23.11 of the Biodiversity Chapter and are shown on Figures 23.11 to 23.14 of that chapter.

Table 22.11 List of Designated sites with a potential hydraulic connection

Protected Feature	Site Code	Protection Reason	Description
Baldoyle Bay	000199	SPA, SAC & pNHA	The protected feature is 90% seaward of the HWM* with 10% of the protected feature landward of the HWM. Several of the qualifying features relate to items landward and seaward of the HWM so this feature will be included in the assessment. Proposed cable route is connected via upstream watercourse crossings
Malahide Estuary	000205	SPA, SAC & pNHA	80% of the protected feature seaward of the HWM with 20% of the protected feature landward of the HWM. Several of the qualifying features relate to items landward and seaward of the HWM so this feature will be included in the assessment. Proposed cable route is connected via upstream watercourse crossings
Rogerstown Estuary	000208	SPA, SAC & pNHA	80% of the protected feature seaward of the HWM with 20% of the protected feature landward of the HWM. Several of the qualifying features relate to items landward and seaward of the HWM so this feature will be included in the assessment. Proposed cable route is connected via upstream watercourse crossings
Sluice River Marsh	001763	pNHA	This site is of importance as a relatively intact freshwater marsh, a habitat that is now rare in County Dublin. Proposed cable route is connected via upstream Sluice crossing
Knock Lake	001203	pNHA	This lake, although artificial in origin, is of importance for botanical and zoological interests. Similar such water bodies are scarce Co Dublin. The lake is located upstream of Knock stream crossing
Bog of the Ring	001204	pNHA	Marshes are few in County Dublin and therefore the site is of interest. Located c0.3km west of proposed cable route.

*Note that the distinction between the area landward and seaward of the HWM is an approximation.

There is one nutrient sensitive area in the study area. This is the Broadmeadow Estuary (Inner) designated under the Urban Wastewater Treatment (UWWT) Directive (91/271/EEC). The majority of this site is seaward of the HWM; however, some localised areas extend landward of the HWM. These follow the same boundary of the Malahide Estuary SAC and potential effects will be assessed with that feature.

There are two designated shellfish areas hydrologically connected to the WFD waterbodies within the study area:

- Balbriggan / Skerries (IEPA2_0063)
- Malahide (IEPA2_0057)

The shellfish areas are compliant with the relevant standards and there are no water quality issues of concern (as per the Sea Fisheries Protection Authority (SFPA) and Marine Institute Monitoring Programme).

No designated salmonid rivers were identified within the study area.

22.3.5.2 Drinking Water Supply

There is one public water supply source located in the north of the study area, south-west of Balbriggan, as shown on Figure 21.9. The Geological Survey Ireland (GSI) has designated the land which contributes to this public water supply in the form of a Source Protection Area, as inner (SI) and outer (SO) zones. This supply is groundwater, rather than surface water fed, however is noted in this chapter due to the potential interaction between groundwater and local surface water bodies. The likely significant effects of the onshore infrastructure of the proposed development on this source protection area has been assessed in the Land and Soils Chapter and will not be considered further here.

There are no National Federation of Group Water Schemes (NFGWS) Source Protection Areas (NFGWS, 2023) within the study area. None of the river segments within the study area are providing drinking water.

22.3.6 Summary of the receptors to be assessed

This section of the chapter summarises those potential receptors identified in the preceding sections where there is the potential for activities related to the onshore infrastructure of the proposed development to have a likely significant effect, either directly or via hydraulic connection.

Table 22.12 provides a summary of the receptors to be assessed. As outlined in Section 22.2.4, the Importance / Sensitivity of the receptor was defined in line with the criteria presented in Table 22.3. Note that a conservative approach was taken to rank the importance (sensitivity) of each receptor listed based on both the characteristics of the receptor itself and also the potential downstream connection to European Sites or protected ecosystems.

Table 22.12 Summary of the Receptors to be Assessed

Feature	ID	Description	Importance (Sensitivity) ranking
Bremore Stream	Matt_010	Attribute has a low quality or value on a local scale. Poor WFD Status. Watercourse at Risk. >5km from SAC/SPA	Low
Bracken (Matt) River	Matt_010	Attribute has a low quality or value on a local scale. Poor WFD Status. Watercourse at Risk. >5km from SAC/SPA	Low
Knock Stream	Matt_010	Attribute has a low quality or value on a local scale. Poor WFD Status. Watercourse at Risk. >5km from SAC/SPA	Low
Balrothery Stream	Matt_010	Poor WFD Status. Watercourse at Risk. >5km from SAC/SPA	Low
Balrickard Stream	Matt_010	Poor WFD Status. Watercourse at Risk. >5km from SAC/SPA	Low
Rowans Big Stream	Matt_010	Poor WFD Status. Watercourse at Risk. >5km from SAC/SPA	Low
Rowans Little Stream	Matt_010	Poor WFD Status. Watercourse at Risk. >5km from SAC/SPA	Low
Courtlough Stream	Ballough_Stream_010	Attribute has a high quality or value on a local scale. Quality class B (Q3-Q4 Biotic index) Poor WFD Status. Watercourse at Risk. Direct Hydrological Connection to Rogerstown SAC/SPA	High
Oberstown Stream	Ballough_Stream_010	Attribute has a high quality or value on a local scale. Quality class B (Q3-Q4 Biotic index) Poor WFD Status. Watercourse at Risk. Direct Hydrological Connection to Rogerstown SAC/SPA	High
Aldrumman Stream	Ballough_Stream_010	Attribute has a high quality or value on a local scale. Quality class B (Q3-Q4 Biotic index) Poor WFD Status. Watercourse at Risk. Direct Hydrological Connection to Rogerstown SAC/SPA	High
Ballough Stream	Ballough_Stream_020	Attribute has a high quality or value on a local scale. Quality class B (Q3-Q4 Biotic index). Moderate WFD Status. Watercourse at Risk. Direct Hydrological Connection to Rogerstown SAC/SPA	High
Deanestown Stream	Ballyboghill_010	Poor WFD Status. Watercourse at Risk. Direct Hydrological Connection to Rogerstown SAC/SPA	Low

Feature	ID	Description	Importance (Sensitivity) ranking
Ballyboghill Stream	Ballyboghill_010	Poor WFD Status. Watercourse at Risk. Direct Hydrological Connection to Rogerstown SAC/SPA	Low
Turvey Stream	Turvey_010	Attribute has a medium quality or value on a local scale. Quality class C (Q3 Biotic index). Poor WFD Status. Watercourse at Risk. Direct Hydrological Connection to Malahide Estuary SAC/SPA	Medium
Staffordstown Stream	Turvey_010	Attribute has a medium quality or value on a local scale. Quality class C (Q3 Biotic index). Poor WFD Status. Watercourse at Risk. Direct Hydrological Connection to Malahide Estuary SAC/SPA	Medium
Broadmeadow River	Broadmeadow_040	Poor WFD Status. Watercourse at Risk. Direct Hydrological Connection to Malahide Estuary SAC/SPA	Low
Ward River	Ward_040	Poor WFD Status. Watercourse at Risk. Direct Hydrological Connection to Malahide Estuary SAC/SPA	Low
Seapoint Stream	Gaybrook_010	Poor WFD Status. Watercourse at Risk. Direct Hydrological Connection to Malahide Estuary SAC/SPA	Low
Greenfields Stream	Gaybrook_010	Poor WFD Status. Watercourse at Risk. Direct Hydrological Connection to Malahide Estuary SAC/SPA	Low
Gaybrook Stream	Gaybrook_010	Poor WFD Status. Watercourse at Risk. Direct Hydrological Connection to Malahide Estuary SAC/SPA	Low
Hazelbrook Stream	Sluice_010	Attribute has a high quality or value on a local scale. Quality class B (Q3-Q4 Biotic index). Poor WFD Status. Watercourse at Risk. Direct Hydrological Connection to Baldoyle SAC/SPA	High
Sluice Stream	Sluice_010	Attribute has a high quality or value on a local scale. Quality class B (Q3-Q4 Biotic index). Poor WFD Status. Watercourse at Risk. Direct Hydrological Connection to Baldoyle SAC/SPA	High
Cuckoo Stream	Mayne_010	Attribute has a medium quality or value on a local scale. Quality class C (Q3 Biotic index). Poor WFD Status. Watercourse at Risk. Direct Hydrological Connection to Baldoyle SAC/SPA	Medium
Mayne Stream	Mayne_010	Attribute has a medium quality or value on a local scale. Quality class C (Q3 Biotic index). Poor WFD Status. Watercourse at Risk. Baldoyle Direct Hydrological Connection to SAC/SPA	Medium
Baldoyle Bay pNHA & SAC	000199	pNHA and SAC site. Connection via Hazelbrook Stream, Sluice Stream, Cuckoo Stream and Mayne Stream listed above	Extremely High
Sluice River Marsh pNHA	001763	pNHA site. Connection via Sluice River	Very High
Malahide Estuary pNHA & SAC	000205	pNHA and SAC site – also overlaps with Broadmeadow Estuary UWWTD site. Connection via Turvey Stream, Staffordshire Stream, Broadmeadow Stream, Ward River, Seapoint Stream, Greenfields Stream and Gaybrook Stream listed above	Extremely High
Rogerstown Estuary pNHA & SAC	000208	pNHA and SAC site – also includes 2 shellfish areas in Balbriggan / Skerries & Malahide. Connection via watercourses above	Extremely High
Knock Lake pNHA	001203	pNHA site. Located upstream of crossing at Wx03 Knock stream	Very High
Bog of the Ring pNHA	001204	pNHA site. Located upstream of crossing at Wx04 Balrothery Stream	Very High

22.3.7 Flood Risk

A standalone Flood Risk Assessment (FRA) was completed for the onshore development area of the proposed development which is presented in Volume 10: Appendix 22.1. A summary of the baseline flood risk findings are provided here, with specific construction and operational effects and mitigation measures, if required under the relevant sections of this Chapter.

The FRA follows the Planning System and Flood Risk Management Guidelines for Planning Authorities (Office of Public Works, OPW 2009), hereafter referred to as the Flood Risk Guidelines.

The Flood Risk Guidelines aim to integrate flood risk management into the planning process to assist the delivery of sustainable development. They aim to encourage a transparent and consistent consideration of flood risk in the planning process and ensure that flood risk is neither created nor increased by inappropriate development.

They require the adoption of a sequential approach (to flood risk management) of:

- Avoidance: avoid inappropriate development in areas at risk of flooding, prefer lower flood risk zones
- Substitute: ensure the type of development proposed is not especially vulnerable to the adverse impacts of flooding
- Justify: ensure that the development is being considered for strategic reasons
- Mitigate: ensure flood risk is reduced to acceptable levels

Fundamental to the guidelines is the introduction of flood risk zoning and the classification of different types of development having regard to their vulnerability to flood risk.

Flood zones are geographical areas within which the likelihood of flooding is in a particular range. There are three types of flood zones defined in the Flood Risk Guidelines as shown in Table 22.13.

Table 22.13 Definition of Flood Zones

Zone category	Description
Flood Zone A	Probability of flooding from rivers and the sea is **highest** (greater than 1% Annual Exceedance Probability (AEP) or 1 in 100 for river flooding or 0.5% or 1 in 200 for coastal flooding).
Flood Zone B	Probability of flooding from rivers and the sea is **moderate** (between 0.1% AEP or 1 in 1000 year and 1% AEP or 1 in 100 for river flooding and between 0.1% or 1 in 1000 year and 0.5% or 1 in 200 for coastal flooding).
Flood Zone C	Probability of flooding from rivers and the sea is **low** (less than 0.1% AEP or 1 in 1000 for both river and coastal flooding). Flood Zone C covers all areas of the plan which are not in zones A or B.

Table 22.14 summarises the Vulnerability Classes defined in the Flood Risk Guidelines and provides a sample of the most common type of development applicable to each.

Table 22.14 Vulnerability classes

Vulnerability Class	Land Uses and Types of Development which include;
Highly Vulnerable Development	Includes Garda, ambulance and fire stations, hospitals, schools, residential dwellings, residential institutions. Essential infrastructure, such as primary transport and utilities distribution, including electricity generating power stations and sub-stations, water and sewage treatment, and potential significant sources of pollution (SEVESO sites, IPPC sites, etc.) in the event of flooding.
Less Vulnerable Development	Includes retail, leisure, warehousing, commercial, industrial, and non-residential institutions, etc.
Water Compatible Development	Includes Flood Control Infrastructure, docks, marinas, wharves, navigation facilities, water-based recreation facilities, amenity open spaces and outdoor sport and recreation facilities.

The Flood Risk Guidelines allow consideration of uses not listed in the table above on their own merits. As explained in the Flood Risk Guidelines, "*the classification of different land uses and types of development as highly vulnerable, less vulnerable and water-compatible is influenced primarily by the ability to manage the safety of people in flood events and the long-term implications for recovery of the function and structure of buildings"*. The vulnerability classification of the onshore infrastructure is not explicitly covered by the above table and has therefore been considered by the authors with respect to its ability to operate or not during a flood event and whether flooding can cause damage to the infrastructure.

The infrastructure at the landfall site includes the TJB and onshore export cables, which will be installed underground. If flooding was to occur, these would not be damaged, and operation would not be impacted. There will be no long-term implications for recovery following a flood event. The infrastructure is therefore considered *water compatible* development. Access tracks to the site are only used for maintenance and not for regular traffic. These are also considered a *water compatible development*. As these are considered to be water compatible development, a justification test is therefore not required.

The grid facility contains critical above ground electrical assets that, if inundated during a flood event, could be damaged as well as disrupt operation of the facility. The grid facility is therefore considered essential infrastructure *highly vulnerable* to flooding.

The onshore cable route will be installed within underground ducts and once installed, it can operate during flooding conditions. The permanent access tracks will only be used for maintenance and not for regular traffic. As such, the onshore cable route and access tracks are considered compatible with flooding (*water compatible development)*.

The sequential approach to flood risk management assigns appropriate types of development based on their vulnerability to flood risk, to flood zones and aims to guide highly vulnerable development to areas at lower risk. If the development type is proposed in a flood zone that is not considered appropriate, the Justification I is required. The Justification Matrix is presented in Table 22.15.

Table 22.15 Justification Test Matrix (The Planning System and Flood Risk Management - Guidelines for Planning Authorities)

Vulnerability	Flood Zone A	Flood Zone B	Flood Zone C
Highly Vulnerable	Justification Test	Justification Test	Appropriate
Less Vulnerable	Justification Test	Appropriate	Appropriate
Water Compatible	Appropriate	Appropriate	Appropriate

The FRA assessed the risk of flooding at the landfall site, grid facility and onshore cable route from fluvial, tidal, pluvial and groundwater flooding.

22.3.7.1 Fluvial flooding (river or stream)

Fluvial flooding can occur when excessive rainfall creates a situation where the flow capacity of the river is exceeded and bank overtopping occurs, flooding nearby areas. The Catchment Flood Risk Assessment and Management Studies (CFRAMS) undertaken by OPW were used to assess risk of fluvial flooding.

There are no watercourses near the landfall and grid facility sites. The two sites at are low risk of fluvial flooding.

The onshore cable route crosses several watercourses at 25 locations. In some areas within the onshore development area boundary along the onshore cable route, the watercourses overtop their banks during either the 1% AEP or the 0.1% AEP events, and flood nearby roads where the onshore cable route is proposed. These include parts of the R132 in Glebe south, Turvey, Lissenhall, near the Fingallians GAA club, parts of the Estuary Road in Malahide, parts of Chapel Road, parts of the Hole in the Wall road, Balgriffin Park and small areas on the R139 in Belcamp. These areas and the associated probability of flooding can be viewed in Figure 22.3(1-12).

22.3.7.2 Coastal/ Tidal flooding

Tidal/coastal flooding can occur when tides are high and/or during a storm surge, where an abnormal rise in water generated by high winds and low atmospheric pressure due to a storm increases sea level above the astronomical tide. The Irish Coastal Wave and Water Level (ICWWS) modelling study and associated National Coastal Extreme Water Level Estimation extents and points are available on floodinfo.ie and provide extreme water levels around the Irish coast. These were used to assess risk of coastal flooding to the development.

The landfall and grid facility are at higher elevation than the predicted extreme water levels and therefore at low risk of coastal flooding.

The majority of the onshore cable route and the onshore infrastructure is located outside coastal and tidal flood risk, in areas with less than 0.1% AEP, with the exception of two locations as follows. This can be viewed in Appendix 22.1 – Flood Risk Assessment.

- Approximately 2,250m (in three sections of 210m + 260m + 1,780m) of the onshore cable route lies within the 0.5%AEP (1 in 200 year event) coastal extents originating from the Malahide Estuary
- Approximately 310m of the route along Chapel Road (Approx ITM location: 722407, 743037) lies within the 0.5%AEP (1 in 200 year event) coastal extents originating from the tidally influenced section of the Sluice river (discharging to Mayne Estuary)

22.3.7.3 Pluvial flooding/urban drainage

Pluvial flooding can occur when the capacity of the local surface water drainage network is exceeded during periods of intense rainfall and results in surface water ponding in low spots in the ground surface topography.

The local topography at the landfall site was reviewed to determine risk of pluvial flooding. A small depression within the landfall site was identified which could cause water ponding during a high intensity rainfall event. Refer to Figure 2.4 of the Flood Risk Assessment in Appendix 22.1 for the site topography and location of depression. The landfall site is generally higher than surrounding land, indicating low likelihood of overland flows entering the site from surrounding lands.

The grid facility is also located on higher grounds than the surrounding agricultural land, with low likelihood of overland flows entering from surrounding lands.

Surface water runoff on the onshore cable route is not considered to have a likely significant effect, due to the existing road drainage as well as the nature of development (underground cables in ducts).

22.3.7.4 Groundwater flooding

Groundwater flooding can occur during lengthy periods of heavy rainfall, typically during late winter/early spring when the groundwater table is already high. If the groundwater level rises above ground level, it can pond at local low points and cause periods of flooding.

GSI Groundwater flooding maps do not show any extent of groundwater flooding within the onshore development area.

22.3.7.5 Summary of baseline flood risk

A summary of the risks to the three areas under each type of flooding is shown in Table 22.16.

Table 22.16 Summary table of flood risk assessment findings

Area / Flood Source	Landfall site	Grid facility	Onshore cable route
Fluvial	Low (<0.1% AEP)	Low (<0.1% AEP)	Areas at high, medium and low
Tidal	Low (<0.1% AEP)	Low (<0.1% AEP)	Areas at high, medium and low
Flood Zone	Flood Zone C	Flood Zone C	Flood Zones A, B and C
Pluvial	Low, with localised moderate risk (depression)	Low	Low
Groundwater	Low	Low	Low

22.4 Characteristics of the Proposed Development

The focus of the water assessment is on the likely significant effects of the onshore infrastructure of the proposed development on hydrology and flood risk, water quality and hydromorphology. The onshore infrastructure which is relevant to this assessment comprises of the landfall site, the grid facility and the onshore cable route. Specific elements of the proposed development relevant to the water assessment are described in appropriate detail in the sections of this chapter addressing likely significant effects of the construction phase (Section 22.5.2) the operational phase (Section 22.5.3) and decommissioning phase.

The landfall site is shown in Figure 7.2 and includes an underground crossing of the offshore export cables from offshore to onshore underneath the beach via a Horizontal Direct Drilling (HDD) technique and to the Transition Joint Bays (TJBs). From the TJBs, the onshore export cables then pass through the agricultural fields and under the Dublin-Belfast railway line (via HDD) to the R132 and onwards to connect to the grid facility.

The grid facility site is shown on Figure 7.3 and will be the site of two new substations (the compensation substation and Bremore substation) with associated permanent above ground infrastructure (buildings, electrical equipment) covering approximately 3.5 ha (35,000 m^2). Between the R132 and the grid facility there will be access tracks and a temporary contractor compound. There will be no sewer connection from the grid facility to the network. The construction of the grid facility will last approximately 24 months.

The onshore cable route will run 33-35km from the grid facility to the grid connection point at Belcamp and is shown on Figure 7.3. The cable route will either connect into the existing substation at Belcamp or it will connect into both the existing substation and the proposed Belcamp extension (refer to the Onshore Description chapter for further details). Both underground connections will be located within the onshore development area and this assessment has considered both. The onshore cable route will feature either all cables contained in one trench or with the cables contained in two narrower trenches. The construction of the onshore cable route from the grid facility and onto the grid connection at Belcamp substation will last approximately 24 months, with some activities, at different locations, taking place in parallel.

As outlined above, the onshore cable route crosses 24 watercourses at 25 locations, from the grid facility to the grid connection point at Belcamp. These crossings are listed above in Table 22.6 with approximate Irish Transverse Mercator (ITM) reference coordinates and presented on Figure 22.2 (pp1-12). For the purposes of the EIAR, it is assumed that the offline watercourse crossings will be located anywhere along the section of watercourse within the onshore development area boundary. There are a number of crossing location options for water crossings WX23 (Cuckoo) and WX24 (Mayne) depending on which cable route option is chosen at the southern end of the onshore cable route. (Refer to the Onshore Construction chapter for further information). The locations of water crossings Wx12, Wx13 and Wx22 will also vary depending on whether an inline (within the road) crossing or an offline route for the onshore cable route is selected at these locations.

The Onshore Construction chapter provides details on the locations of the crossings and proposed construction methodologies for crossing these watercourses and these are also summarised in Table 22.17 of this chapter.

The following construction activities are considered in relation to potential effects on water:

- Construction activities at the landfall site including installation of onshore export cables TJB and HDD operations.
- Temporary contractor compounds at the landfall site, the grid facility and at various crossings along the onshore cable route
- Construction activities at the grid facility site
- Open cut trenching through watercourses along the onshore cable route
- HDD operations (underneath watercourses) that may discharge drilling mud/fluids to the surrounding environment.
- Underground structures forming the onshore cable route.
- Construction of access and haul roads
- Transportation of concrete, fuel, and other chemicals with a potential to effect water quality; and
- Removal of topsoil/vegetation throughout the onshore development area during construction

For the watercourse crossings, as described below and further described in the Onshore Construction Chapter, four different crossing methods have been considered for each watercourse crossing. In some instances, multiple crossing methods have been included and their effects assessed in this EIAR for completeness to ensure robustness of the assessment. However, at the detailed design/construction stage just one of these methods at each watercourse crossing will be chosen.

The Onshore Construction Chapter provides details on the proposed construction methodologies for crossing these watercourses, which are summarised below and in Table 22.17 of this chapter. The four construction methods proposed are:

Within the road:

- Inline open cut trench, i.e., the trench will be located within the road above the existing bridge/culvert (in some cases it may be installed beneath the culvert structure via open cut)
- Inline HDD, i.e., HDD under the road and under the watercourse as above but the HDD compounds will be located within the road.

Offline of the road:

- Offline open cut trench, i.e., damming of the watercourse, over pumping and excavating a trench across the watercourse.
- Offline Horizontal Directional Drilling (HDD), i.e., HDD under the watercourse. This will require a HDD compound either side of the watercourse in third party lands

The majority of the crossings will be within the road itself (inline) and will not directly interact with the watercourses. At eight crossing locations, offline construction methods are considered. These crossings are as follows: Wx10, Wx11, Wx12, Wx13, Wx20, Wx22 and Wx25.

The operational phase aspects relevant to the water assessment are limited to permanent above ground structures which includes the compensation substation and Bremore substation at the grid facility site and permanent access tracks. The onshore export cables, onshore cable route and joint bays will be underground and designed to be floodable without affecting operations as per Eirgrid specifications. The underground infrastructure will not affect flood flows.

22.5 Potential Effects

As per the relevant guidelines, likely significant effects have been assessed for all the potential water receptors listed in Table 22.12. All effects are described in the absence of mitigation.

22.5.1 Do-Nothing Scenario

In this chapter, the 'evolution of the baseline environment without the proposed development' is described as the "Do Nothing" scenario, i.e., the proposed development does not proceed.

In terms of water quality - the baseline environment describes the existing waterbodies within the study area as identified and categorised under the RBMP 2018-2021 and reported by the EPA. The RBMP categorises significant pressures impacting waterbodies in Ireland into 14 categories, and identifies measures and actions aimed at addressing each pressure. This supports the analysis of future trends expected in the water environment to determine the 'evolution of the baseline without the development'. Future trends will be more noticeable, predictable, and measurable in the short to medium-term in relation to water quality, whereas hydrological and hydro-morphological changes are subject to more long-term trends.

In the RBMP 2018-2021 the most significant pressures to the waterbodies "at risk" of not achieving "Good" status within the study area are urban runoff from diffuse urban sources, hydromorphology from channelisation and urban wastewater from combined sewer overflows. Agriculture and domestic wastewater from wastewater discharges are also identified at Ballough Stream_010 and Broadmeadow, respectively. Anthropogenic pressures are also present at Sluice_010 and Gaybrook_010 waterbodies.

The current trend on pressures will continue for the foreseeable future unless a planned intervention as proposed in the RBMP is implemented. In the absence of the proposed development, the baseline surface water environment will not be impacted or will continue to improve albeit at low pace. Therefore, the effect under the do-nothing scenario is imperceptible.

In terms of flood risk, climate change imposes the main risks in the area. According to Dublin City Council's Climate Action Plan 2019-2024, Fingal County Council's Climate Change Action Plan 2019-2024, Fingal County Council's Draft Climate Change Action Plan 2024-2029, Meath County Council's Climate Action Strategy 2019-2024 and Louth County Council's Climate Change Adaptation Strategy 2019 -2024, the main risks of climate change around the area of the onshore infrastructure are likely to include sea level rise, which will directly affect the extreme coastal water levels at Malahide Bay and the Irish Sea. Furthermore, it is expected that climate change will cause increase in the frequency and intensity of extreme weather events, resulting in increased flows within the watercourses and potential increase in flood risk. These changes are expected to happen in both a do-nothing scenario and with the proposed development in place, and as such the effect under the do-nothing scenario will be imperceptible.

22.5.2 Construction Phase

The Onshore Construction chapter outlines the strategy to construct the onshore infrastructure of the proposed development and includes details of duration and phasing during construction and methodologies to undertake construction activities. In addition, the Onshore Construction chapter details the location of contractor compounds, the traffic management plan, hours of working and numbers of personnel involved.

22.5.2.1 Potential Construction Phase Impacts

There are several potential hydrological impacts related to the construction phase of the onshore infrastructure of the proposed development. The nature of the likely significant effects of these varies for the various construction stages and activities for each waterbody within the study area. However, these are grouped under hydrology and flood risk, water quality and hydromorphology for ease of refence:

- Hydrology and Flood Risk
  - Potential for disrupting local drainage systems due to construction works at watercourse crossings, in particular for the offline open-cut crossings where over-pumping or culvert / flume will be required.
  - Potential risk of flooding to the open trenches during excavations, which can expose construction staff to health risks.
  - Potential for increased flood risk to upstream receptors during in-stream works, during offline open cut trench operations.
  - Effect on the hydraulic characteristics of water features through modifications to the channel dimensions during construction of outfalls and culverts, where required.

- Change in the natural hydrological regime due to an increase in discharge because of dewatering activities during construction; potential for temporary increase in hard standing areas and / or soil compaction during construction works which could result in increased runoff rates to waterbodies.
- Accumulated excess backfill material, resulting in an increase of flood risk
- In-road open cut methodology will have no impacts to the watercourses and surroundings in terms of flood risk
- HDD/Construction compounds can cause increased risk of flooding to other sites and expose staff to health risks if positioned within a floodplain.

No streams or rivers traverse within the boundary of the grid facility. Therefore, the grid facility is at low risk of flooding from fluvial sources.

During construction of the onshore cable route, excavations on-road and offline will be undertaken to lay the onshore cable ducts, some of which will be in areas at risk of fluvial flooding from the 1% AEP or 0.1% AEP. These includes parts of the R132 in Glebe south, Turvey, Lissenhall, near the Fingallians GAA club, parts of the Estuary Road in Malahide, parts of Chapel Road, parts of the Hole in the Wall road, Balgriffin Park and small areas on the R139 in Belcamp. Open trenches along the onshore cable route at areas prone to flooding could become flow paths during a flood event and or could potentially change the flood mechanism and increase risk of flooding to adjoining areas if not appropriately mitigated.

Inline open cut trench and inline/offline HDD methodology are the preferred options for the majority of watercourse crossings, ensuring no interaction with the watercourses and hence no impact in terms of flood risk. HDD compounds are required at either side of the HDD bore and while they are set back from the flood extents at most locations, this might not be possible in some locations. In such locations, the compounds could impact flow routes.

Offline open cut trench methodology is an option for Wx10, Wx20 Wx22, and Wx25. The construction methodology for these crossings will either consist of damming the watercourse and pumping, or diverting the watercourse. As such, there is a risk of increasing upstream or downstream flooding along these streams and impacting nearby properties, if not appropriately mitigated.

- Water Quality
  - Silty water runoff containing high loads of suspended solids from construction activities such as stockpiles.
  - Contamination of waterbodies with anthropogenic substances (e.g., oil spills, grease).
  - Potential frac-out risk of non-toxic bentonite drilling fluid during HDD, smothering benthic flora and affecting feeding and breeding sites
  - Re-exposure of historic contaminants within or near to waterbodies because of working within or in proximity to the waterbody. Historic contaminants have been identified in Table 21.21 of the Land and Soils Chapter
  - Offline open cut trench methodology is an option for Wx10, Wx20, Wx22 and Wx25. The construction methodology for these crossings will either consist of damming the watercourse and pumping or diverting the watercourse. As such, there is an increased risk of adverse water quality effects at these locations.
- Hydromorphology
  - Increased sediment loading because of silty water runoff or dewatering activities, introducing a sediment plume, potentially leading to the smothering of bed substrate and changes to existing morphological features (i.e. changing the riverbed profile during construction can have knock on impacts downstream). This will be particularly of risk at the offline open cut trench locations.

A detailed assessment of the likely significant effects on receptors is summarised in Table 22.17 and Table 22.18.

It should be noted that this assessment characterises the significance of the effect on the receptor in terms of the potential for impacts to the integrity of the water feature e.g. water levels, quality or flows. It does not assess the significance of those effects on other receptors e.g. water-dependent ecological features, which are assessed using different criteria in the relevant chapter e.g. the Biodiversity Chapter. It should be noted that as different assessment criteria are used to understand the potential for impact on those receptors, the significance of the potential effects on a feature can differ between chapters.

As outlined in section 22.2.3.1, the Onshore Construction Chapter describes the crossing methodology proposed for each water crossing. Where more than one crossing methodology exists, they are presented in order of preference and these have been presented in the same order in Table 22.17 and Table 22.18.

Table 22.17 Construction Impact Risk Assessment for Surface Waters

Receptor	Construction activities with potential impacts		Predicted Effects		
	Primary Activity type (inc Water Crossing Ref. No.)	Crossing Technique	Receptor Importance / Sensitivity	Magnitude of Impacts	Significance of Effects
Bremore Stream	Construction of watercourse crossings (Wx01) Stockpiling, removal of topsoil, accidental spillages	In-road Open Cut Trench	Low Importance / Sensitivity watercourse. Poor WFD Status, At Risk.	Moderate adverse Results in impact on integrity of attribute or loss of part of attribute	Slight: The proposed crossing is an in-road open cut which will not involve in-stream works. Any potential risks arise from near-stream construction works, however these will be temporary in duration. The effect is not significant.
Bracken River	Construction of watercourse crossings (Wx02) Stockpiling, removal of topsoil, accidental spillages	In-road Open Cut Trench	Low Importance / Sensitivity watercourse. Poor WFD Status, At Risk.	Moderate adverse Results in impact on integrity of attribute or loss of part of attribute	Slight: The proposed crossing is an in-road open cut which will not involve in-stream works. Any potential risks arise from near-stream construction works, however these will be temporary in duration. The effect is not significant.
		Inline HDD	Low Importance / Sensitivity watercourse. Poor WFD Status, At Risk.	Moderate adverse Results in impact on integrity of attribute or loss of part of attribute	Slight: The proposed crossing is an in-road inline HDD which will not involve in-stream works. Any potential risks arise from near-stream construction works, however these will be temporary in duration There is a potential frac-out risk of non-toxic bentonite drilling fluid smothering benthic flora and affecting feeding and breeding sites. The effect is not significant.
Knock Stream	Construction of watercourse crossings (Wx03) Stockpiling, removal of topsoil, accidental spillages	In-road Open Cut Trench	Low Importance / Sensitivity watercourse. Poor WFD Status, At Risk.	Moderate adverse Results in impact on integrity of attribute or loss of part of attribute	Slight: The proposed crossing is an in-road open cut which will not involve in-stream works. Any potential risks arise from near-stream construction works, however these will be temporary in duration. The effect is not significant.
		Inline HDD	Low Sensitivity watercourse. Poor WFD Status, At Risk.	Moderate adverse Results in impact on integrity of attribute or loss of part of attribute	Slight: The proposed crossing is an in-road inline HDD which will not involve in-stream works. Any potential risks arise from near-stream construction works, however these will be temporary in duration There is a potential frac-out risk of non-toxic bentonite drilling fluid smothering benthic flora and affecting feeding and breeding sites. The effect is not significant.
Balrothery Stream	Construction of watercourse crossings	In-road Open Cut Trench	Low Sensitivity watercourse. Poor WFD Status, At Risk.	Moderate adverse Results in impact on integrity of attribute or loss of part of attribute	Slight: The proposed crossing is an in-road open cut which will not involve in-stream works. Any potential risks arise from near-stream construction works, however these will be temporary in duration. The effect is not significant.

Receptor	Construction activities with potential impacts		Predicted Effects		
	Primary Activity type (inc Water Crossing Ref. No.)	Crossing Technique	Receptor Importance / Sensitivity	Magnitude of Impacts	Significance of Effects
	(Wx04) Stockpiling, removal of topsoil, accidental spillages	Inline HDD	Low Sensitivity watercourse. Poor WFD Status, At Risk.	Moderate adverse Results in impact on integrity of attribute or loss of part of attribute	Slight: The proposed crossing is an in-road inline HDD which will not involve in-stream works. Any potential risks arise from near-stream construction works, however these will be temporary in duration There is a potential frac-out risk of non-toxic bentonite drilling fluid smothering benthic flora and affecting feeding and breeding sites. The effect is not significant.
Balrickard Stream	Construction of watercourse crossings (Wx05) Stockpiling, removal of topsoil, accidental spillages	In-road Open Cut Trench	Low Sensitivity watercourse. Poor WFD Status, At Risk.	Moderate adverse Results in impact on integrity of attribute or loss of part of attribute	Slight: The proposed crossing is an in-road open cut which will not involve in-stream works. Any potential risks arise from near-stream construction works, however these will be temporary in duration. The effect is not significant.
		Inline HDD	Low Sensitivity watercourse. Poor WFD Status, At Risk.	Moderate adverse Results in impact on integrity of attribute or loss of part of attribute	Slight: The proposed crossing is an in-road inline HDD which will not involve in-stream works. Any potential risks arise from near-stream construction works, however these will be temporary in duration. There is a potential frac-out risk of non-toxic bentonite drilling fluid smothering benthic flora and affecting feeding and breeding sites. The effect is not significant.
Rowans Big Stream	Construction of watercourse crossings (Wx06) Stockpiling, removal of topsoil, accidental spillages	In-road Open Cut Trench	Low Sensitivity watercourse. Poor WFD Status, At Risk.	Moderate adverse Results in impact on integrity of attribute or loss of part of attribute	Slight: The proposed crossing is an in-road open cut which will not involve in-stream works. Any potential risks arise from near-stream construction works, however these will be temporary in duration. The effect is not significant.
		Inline HDD	Low Sensitivity watercourse. Poor WFD Status, At Risk.	Moderate adverse Results in impact on integrity of attribute or loss of part of attribute	Slight: The proposed crossing is an in-road inline HDD which will not involve in-stream works. Any potential risks arise from near-stream construction works, however these will be temporary in duration. There is a potential frac-out risk of non-toxic bentonite drilling fluid smothering benthic flora and affecting feeding and breeding sites. The effect is not significant.
Rowans Little Stream	Construction of watercourse crossings	In-road Open Cut Trench	Low Sensitivity watercourse. Poor WFD Status, At Risk.	Moderate adverse Results in impact on integrity of attribute or loss of part of attribute	Slight: The proposed crossing is an in-road open cut which will not involve in-stream works. Any potential risks arise from near-stream construction works, however these will be temporary in duration. The effect is not significant.

Receptor	Construction activities with potential impacts		Predicted Effects		
	Primary Activity type (inc Water Crossing Ref. No.)	Crossing Technique	Receptor Importance / Sensitivity	Magnitude of Impacts	Significance of Effects
	(Wx07) Stockpiling, removal of topsoil, accidental spillages	Inline HDD	Low Sensitivity watercourse. Poor WFD Status, At Risk.	Moderate adverse Results in impact on integrity of attribute or loss of part of attribute	Slight: The proposed crossing is an in-road inline HDD which will not involve in-stream works. Any potential risks arise from near-stream construction works, however these will be temporary in duration. There is a potential frac-out risk of non-toxic bentonite drilling fluid smothering benthic flora and affecting feeding and breeding sites. The effect is not significant.
Courtlough Stream	Construction of watercourse crossings (Wx08) Stockpiling, removal of topsoil, accidental spillages	In-road Open Cut Trench	High Sensitivity watercourse. Quality Class B. Poor WFD Status, At Risk.	Moderate adverse Results in impact on integrity of attribute or loss of part of attribute	Significant / Moderate: The proposed crossing is an in-road open cut which will not involve in-stream works. Any potential risks arise from near-stream construction works, and will be temporary in duration. The effect is significant.
		Inline HDD	High Sensitivity watercourse. Quality Class B. Poor WFD Status, At Risk.	Moderate adverse Results in impact on integrity of attribute or loss of part of attribute	Significant / Moderate: The proposed crossing is an in-road inline HDD which will not involve in-stream works. Any potential risks arise from near-stream construction works and these will be temporary in duration There is a potential frac-out risk of non-toxic bentonite drilling fluid smothering benthic flora and affecting feeding and breeding sites. The effect is significant.
Oberstown Stream	Construction of watercourse crossings (Wx09) Stockpiling, removal of topsoil, accidental spillages	Inline HDD	High Sensitivity watercourse. Quality Class B. Poor WFD Status, At Risk.	Moderate adverse Results in impact on integrity of attribute or loss of part of attribute	Significant / Moderate: The proposed crossing is an in-road inline HDD which will not involve in-stream works. Any potential risks arise from near-stream construction works and these will be temporary in duration There is a potential frac-out risk of non-toxic bentonite drilling fluid smothering benthic flora and affecting feeding and breeding sites. The effect is significant.
		In-road Open Cut Trench	High Sensitivity watercourse. Quality Class B. Poor WFD Status, At Risk.	Moderate adverse Results in impact on integrity of attribute or loss of part of attribute	Significant / Moderate: The proposed crossing is an in-road open cut which will not involve in-stream works. Any potential risks arise from near-stream construction works, and will be temporary in duration. The effect is significant.
Aldrumman Stream	Construction of watercourse crossings (Wx10)	Inline HDD	High Sensitivity watercourse. Quality Class B. Poor WFD Status, At Risk.	Moderate adverse Results in impact on integrity of attribute or loss of part of attribute	Significant / Moderate: The proposed crossing is an in-road inline HDD which will not involve in-stream works. Any potential risks arise from near-stream construction works and these will be temporary in duration There is a potential frac-out risk of non-toxic bentonite drilling fluid smothering benthic flora and affecting feeding and breeding sites. The effect is significant.

Receptor	Construction activities with potential impacts		Predicted Effects		
	Primary Activity type (inc Water Crossing Ref. No.)	Crossing Technique	Receptor Importance / Sensitivity	Magnitude of Impacts	Significance of Effects
	Stockpiling, removal of topsoil, accidental spillages				
		In-road Open Cut Trench	High Sensitivity watercourse. Quality Class B. Poor WFD Status, At Risk.	Moderate adverse Results in impact on integrity of attribute or loss of part of attribute	Significant / Moderate: The proposed crossing is an in-road open cut which will not involve in-stream works. Any potential risks arise from near-stream construction works, and will be temporary in duration. The effect is significant.
		Offline Open Cut Trench	High Sensitivity watercourse. Quality Class B. Poor WFD Status, At Risk.	Large adverse: Results in loss of attribute and /or quality and integrity of attribute	Severe / Significant: In-stream works are proposed during construction which have a greater potential for impacts than out of stream works. Potential impacts also arise from near stream construction works. Effects will be short term in duration. The effect is significant.
Ballough Stream	Construction of watercourse crossings (Wx11) Stockpiling, removal of topsoil, accidental spillages	Offline HDD	High Sensitivity watercourse. Quality Class B. Poor WFD Status, At Risk.	Moderate adverse Results in impact on integrity of attribute or loss of part of attribute	Significant / Moderate: The proposed crossing is an in-road offline HDD which will not involve in-stream works. Any potential risks arise from near-stream construction works and these will be temporary in duration There is a potential frac-out risk of non-toxic bentonite drilling fluid smothering benthic flora and affecting feeding and breeding sites. The effect is significant.
Deanstown stream	Construction of watercourse crossings (Wx12 – includes Wx12A & W12B) Stockpiling, removal of topsoil, accidental spillages	Inline HDD (Combined with Wx13)	Low Sensitivity watercourse. Poor WFD Status, At Risk.	Moderate adverse Results in impact on integrity of attribute or loss of part of attribute	Slight: The proposed crossing is an in-road inline HDD which will not involve in-stream works. Any potential risks arise from near-stream construction works, however these will be temporary in duration There is a potential frac-out risk of non-toxic bentonite drilling fluid smothering benthic flora and affecting feeding and breeding sites. The effect is not significant.
		Offline HDD (Combined with Wx13)	Low Sensitivity watercourse. Poor WFD Status, At Risk.	Moderate adverse Results in impact on integrity of attribute or loss of part of attribute	Slight: The proposed crossing is an in-road offline HDD which will not involve in-stream works. Any potential risks arise from near-stream construction works, however these will be temporary in duration There is a potential frac-out risk of non-toxic bentonite drilling fluid smothering benthic flora and affecting feeding and breeding sites. The effect is not significant.

Receptor	Construction activities with potential impacts		Predicted Effects		
	Primary Activity type (inc Water Crossing Ref. No.)	Crossing Technique	Receptor Importance / Sensitivity	Magnitude of Impacts	Significance of Effects
Ballyboughill Stream	Construction of watercourse crossings (Wx13 – includes Wx13A & W13B) Stockpiling, removal of topsoil, accidental spillages	Inline HDD (Combined with Wx12)	Low Sensitivity watercourse. Poor WFD Status, At Risk.	Moderate adverse Results in impact on integrity of attribute or loss of part of attribute	Slight: The proposed crossing is an in-road inline HDD which will not involve in-stream works. Any potential risks arise from near-stream construction works, however these will be temporary in duration There is a potential frac-out risk of non-toxic bentonite drilling fluid smothering benthic flora and affecting feeding and breeding sites. The effect is not significant.
		Offline HDD (Combined with Wx12)	Low Sensitivity watercourse. Poor WFD Status, At Risk.	Moderate adverse Results in impact on integrity of attribute or loss of part of attribute	Slight: The proposed crossing is an in-road offline HDD which will not involve in-stream works. Any potential risks arise from near-stream construction works, however these will be temporary in duration There is a potential frac-out risk of non-toxic bentonite drilling fluid smothering benthic flora and affecting feeding and breeding sites. The effect is not significant.
		Offline Open Cut Trench	Low Sensitivity watercourse. Poor WFD Status, At Risk	Large adverse: Results in loss of attribute and /or quality and integrity of attribute	Slight/Moderate: In-stream works are proposed during construction which have a greater potential for impacts than out of stream works. Potential impacts also arise from near stream construction works. Effects will be short term in duration. The effect is not significant.
Turvey Stream	Construction of watercourse crossings (Wx14) Stockpiling, removal of topsoil, accidental spillages	In-road Open Cut Trench	Medium Sensitivity watercourse. Quality class C. Poor WFD Status, At Risk.	Moderate adverse Results in impact on integrity of attribute or loss of part of attribute	Moderate: The proposed crossing is an in-road open cut which will not involve in-stream works. Any potential risks arise from near-stream construction works, however these will be temporary in duration. The effect is not significant.
		Inline HDD	Medium Sensitivity watercourse. Quality class C. Poor WFD Status, At Risk.	Moderate adverse Results in impact on integrity of attribute or loss of part of attribute	Moderate: The proposed crossing is an in-road inline HDD which will not involve in-stream works. Any potential risks arise from near-stream construction works, however these will be temporary in duration There is a potential frac-out risk of non-toxic bentonite drilling fluid smothering benthic flora and affecting feeding and breeding sites. The effect is not significant.
Staffordstown Stream	Construction of watercourse crossings (Wx15)	In-road Open Cut Trench	Medium Sensitivity watercourse. Quality class C. Poor WFD Status, At Risk.	Moderate adverse Results in impact on integrity of attribute or loss of part of attribute	Moderate: The proposed crossing is an in-road open cut which will not involve in-stream works. Any potential risks arise from near-stream construction works, however these will be temporary in duration. The effect is not significant.
		Inline HDD	Medium Sensitivity watercourse. Quality	Moderate adverse Results in impact on integrity of	Moderate: The proposed crossing is an in-road inline HDD which will not involve in-stream works. Any potential risks arise from near-stream

Receptor	Construction activities with potential impacts		Predicted Effects		
	Primary Activity type (inc Water Crossing Ref. No.)	Crossing Technique	Receptor Importance / Sensitivity	Magnitude of Impacts	Significance of Effects
	Stockpiling, removal of topsoil, accidental spillages		class C. Poor WFD Status, At Risk.	attribute or loss of part of attribute	construction works, however these will be temporary in duration There is a potential frac-out risk of non-toxic bentonite drilling fluid smothering benthic flora and affecting feeding and breeding sites. The effect is not significant.
Broadmeadow Stream	Construction of watercourse crossings (Wx16) Stockpiling, removal of topsoil, accidental spillages	In-road Open Cut Trench	Low Sensitivity watercourse. Poor WFD Status, At Risk	Moderate adverse Results in impact on integrity of attribute or loss of part of attribute	Slight: The proposed crossing is an in-road open cut which will not involve in-stream works. Any potential risks arise from near-stream construction works, however these will be temporary in duration. The effect is not significant.
		Inline HDD combined with Wx17	Low Sensitivity watercourse. Poor WFD Status, At Risk	Moderate adverse Results in impact on integrity of attribute or loss of part of attribute	Slight: The proposed crossing is an in-road inline HDD which will not involve in-stream works. Any potential risks arise from near-stream construction works, however these will be temporary in duration There is a potential frac-out risk of non-toxic bentonite drilling fluid smothering benthic flora and affecting feeding and breeding sites. The effect is not significant.
Ward River	Construction of watercourse crossings (Wx17) Stockpiling, removal of topsoil, accidental spillages	In-road Open Cut Trench	Low Sensitivity watercourse. Poor WFD Status, At Risk	Moderate adverse Results in impact on integrity of attribute or loss of part of attribute	Slight: The proposed crossing is an in-road open cut which will not involve in-stream works. Any potential risks arise from near-stream construction works, however these will be temporary in duration. The effect is not significant.
		Inline HDD combined with Wx16	Low Sensitivity watercourse. Poor WFD Status, At Risk	Moderate adverse Results in impact on integrity of attribute or loss of part of attribute	Slight: The proposed crossing is an in-road inline HDD which will not involve in-stream works. Any potential risks arise from near-stream construction works, however these will be temporary in duration There is a potential frac-out risk of non-toxic bentonite drilling fluid smothering benthic flora and affecting feeding and breeding sites. The effect is not significant.
Seapoint Stream	Construction of watercourse crossings (Wx18) Stockpiling, removal of topsoil, accidental spillages	In-road Open Cut Trench	Low Sensitivity watercourse. Poor WFD Status, At Risk	Moderate adverse Results in impact on integrity of attribute or loss of part of attribute	Slight: The proposed crossing is an in-road open cut which will not involve in-stream works. Any potential risks arise from near-stream construction works, however these will be temporary in duration. The effect is not significant.
		Inline HDD	Low Sensitivity watercourse. Poor WFD Status, At Risk	Moderate adverse Results in impact on integrity of attribute or loss of part of attribute	Slight: The proposed crossing is an in-road inline HDD which will not involve in-stream works. Any potential risks arise from near-stream construction works, however these will be temporary in duration There is a potential frac-out risk of non-toxic bentonite drilling fluid smothering

Receptor	Construction activities with potential impacts		Predicted Effects		
	Primary Activity type (inc Water Crossing Ref. No.)	Crossing Technique	Receptor Importance / Sensitivity	Magnitude of Impacts	Significance of Effects
					benthic flora and affecting feeding and breeding sites. The effect is not significant.
Greenfields Stream	Construction of watercourse crossings (Wx19) Stockpiling, removal of topsoil, accidental spillages	In-road Open Cut Trench	Low Sensitivity watercourse. Poor WFD Status, At Risk	Moderate adverse Results in impact on integrity of attribute or loss of part of attribute	Slight: The proposed crossing is an in-road open cut which will not involve in-stream works. Any potential risks arise from near-stream construction works, however these will be temporary in duration. The effect is not significant.
		Inline HDD	Low Sensitivity watercourse. Poor WFD Status, At Risk	Moderate adverse Results in impact on integrity of attribute or loss of part of attribute	Slight: The proposed crossing is an in-road inline HDD which will not involve in-stream works. Any potential risks arise from near-stream construction works, however these will be temporary in duration There is a potential frac-out risk of non-toxic bentonite drilling fluid smothering benthic flora and affecting feeding and breeding sites. The effect is not significant.
Gaybrook Stream	Construction of watercourse crossings (Wx20) Stockpiling, removal of topsoil, accidental spillages	Inline Open Cut Trench	Low Sensitivity watercourse. Poor WFD Status, At Risk	Moderate adverse Results in impact on integrity of attribute or loss of part of attribute	Slight: The proposed crossing is an in-road open cut which will not involve in-stream works. Any potential risks arise from near-stream construction works, however these will be temporary in duration. The effect is not significant.
		Inline HDD	Low Sensitivity watercourse. Poor WFD Status, At Risk	Moderate adverse Results in impact on integrity of attribute or loss of part of attribute	Slight: The proposed crossing is an in-road inline HDD which will not involve in-stream works. Any potential risks arise from near-stream construction works, however these will be temporary in duration There is a potential frac-out risk of non-toxic bentonite drilling fluid smothering benthic flora and affecting feeding and breeding sites. The effect is not significant.
		Offline Open Cut Trench	Low Sensitivity watercourse. Poor WFD Status, At Risk	Large adverse Results in impact on integrity of attribute or loss of part of attribute	Slight / Moderate: In-stream works are proposed during construction which have a greater potential for impacts than out of stream works. Potential impacts also arise from near stream construction works. Effects will be short term in duration. The effect is not significant.
Hazelbrook stream	Construction of watercourse crossings (Wx21)	In-road Open Cut Trench	High Sensitivity watercourse. Quality Class B. Poor WFD Status, At Risk.	Moderate adverse Results in impact on integrity of attribute or loss of part of attribute	Significant / Moderate: The proposed crossing is an in-road open cut which will not involve in-stream works. Any potential risks arise from near-stream construction works, and will be temporary in duration. The effect is significant.
		Inline HDD	High Sensitivity watercourse. Quality	Moderate adverse Results in impact on integrity of	Significant / Moderate: The proposed crossing is an in-road inline HDD which will not involve in-stream works. Any potential risks arise from

Receptor	Construction activities with potential impacts		Predicted Effects		
	Primary Activity type (inc Water Crossing Ref. No.)	Crossing Technique	Receptor Importance / Sensitivity	Magnitude of Impacts	Significance of Effects
	Stockpiling, removal of topsoil, accidental spillages		Class B. Poor WFD Status, At Risk.	attribute or loss of part of attribute	near-stream construction works and these will be temporary in duration There is a potential frac-out risk of non-toxic bentonite drilling fluid smothering benthic flora and affecting feeding and breeding sites. The effect is significant.
Sluice stream	Construction of watercourse crossings (Wx22 – includes Wx22A & W22B) Stockpiling, removal of topsoil, accidental spillages	Inline Open Cut Trench	High Sensitivity watercourse. Quality Class B. Poor WFD Status, At Risk.	Moderate adverse Results in impact on integrity of attribute or loss of part of attribute	Significant / Moderate: The proposed crossing is an in-road open cut which will not involve in-stream works. Any potential risks arise from near-stream construction works, and will be temporary in duration. The effect is significant.
		Offline Open Cut Trench	High Sensitivity watercourse. Quality Class B. Poor WFD Status, At Risk.	Large adverse Results in impact on integrity of attribute or loss of part of attribute	Severe / Significant: In-stream works are proposed during construction which have a greater potential for impacts than out of stream works. Potential impacts also arise from near stream construction works. Effects will be short term in duration. The effect is significant.
		Offline HDD	High Sensitivity watercourse. Quality Class B. Poor WFD Status, At Risk.	Moderate adverse Results in impact on integrity of attribute or loss of part of attribute	Significant / Moderate: The proposed crossing is an in-road offline HDD which will not involve in-stream works. Any potential risks arise from near-stream construction works and these will be temporary in duration There is a potential frac-out risk of non-toxic bentonite drilling fluid smothering benthic flora and affecting feeding and breeding sites. The effect is significant.
Cuckoo Stream	Construction of watercourse crossings (Wx23A) Stockpiling, removal of topsoil, accidental spillages	In-road Open Cut Trench	Medium Sensitivity watercourse. Quality class C. Poor WFD Status, At Risk	Moderate adverse Results in impact on integrity of attribute or loss of part of attribute	Moderate: The proposed crossing is an in-road open cut which will not involve in-stream works. Any potential risks arise from near-stream construction works, however these will be temporary in duration. The effect is not significant.
		Inline HDD	Medium Sensitivity watercourse. Quality class C. Poor WFD Status, At Risk	Moderate adverse Results in impact on integrity of attribute or loss of part of attribute	Moderate: The proposed crossing is an in-road inline HDD which will not involve in-stream works. Any potential risks arise from near-stream construction works, however these will be temporary in duration There is a potential frac-out risk of non-toxic bentonite drilling fluid smothering benthic flora and affecting feeding and breeding sites. The effect is not significant.
		In-road Open Cut Trench	Medium Sensitivity watercourse. Quality	Moderate adverse Results in impact on integrity of	Moderate: The proposed crossing is an in-road open cut which will not involve in-stream works. Any potential risks arise from near-stream

Receptor	Construction activities with potential impacts		Predicted Effects		
	Primary Activity type (inc Water Crossing Ref. No.)	Crossing Technique	Receptor Importance / Sensitivity	Magnitude of Impacts	Significance of Effects
	Construction of watercourse crossings (Wx23B) Stockpiling, removal of topsoil, accidental spillages		class C. Poor WFD Status, At Risk	attribute or loss of part of attribute	construction works, however these will be temporary in duration. The effect is not significant.
		Inline HDD	Medium Sensitivity watercourse. Quality class C. Poor WFD Status, At Risk	Moderate adverse Results in impact on integrity of attribute or loss of part of attribute	Moderate: The proposed crossing is an in-road inline HDD which will not involve in-stream works. Any potential risks arise from near-stream construction works, however these will be temporary in duration There is a potential frac-out risk of non-toxic bentonite drilling fluid smothering benthic flora and affecting feeding and breeding sites. The effect is not significant.
	Construction of watercourse crossings (Wx23C) Stockpiling, removal of topsoil, accidental spillages	In-road Open Cut Trench	Medium Sensitivity watercourse. Quality class C. Poor WFD Status, At Risk	Moderate adverse Results in impact on integrity of attribute or loss of part of attribute	Moderate: The proposed crossing is an in-road open cut which will not involve in-stream works. Any potential risks arise from near-stream construction works, however these will be temporary in duration. The effect is not significant.
		Inline HDD (combined with Wx24C)	Medium Sensitivity watercourse. Quality class C. Poor WFD Status, At Risk	Moderate adverse Results in impact on integrity of attribute or loss of part of attribute	Moderate: The proposed crossing is an in-road inline HDD which will not involve in-stream works. Any potential risks arise from near-stream construction works, however these will be temporary in duration There is a potential frac-out risk of non-toxic bentonite drilling fluid smothering benthic flora and affecting feeding and breeding sites. The effect is not significant.
Mayne river	Construction of watercourse crossings (Wx24A) Stockpiling, removal of topsoil, accidental spillages	In-road Open Cut Trench	Medium Sensitivity watercourse. Quality class C. Poor WFD Status, At Risk	Moderate adverse Results in impact on integrity of attribute or loss of part of attribute	Moderate: The proposed crossing is an in-road open cut which will not involve in-stream works. Any potential risks arise from near-stream construction works, however these will be temporary in duration. The effect is not significant.
		Inline HDD	Medium Sensitivity watercourse. Quality class C. Poor WFD Status, At Risk	Moderate adverse Results in impact on integrity of attribute or loss of part of attribute	Moderate: The proposed crossing is an in-road inline HDD which will not involve in-stream works. Any potential risks arise from near-stream construction works, however these will be temporary in duration There is a potential frac-out risk of non-toxic bentonite drilling fluid smothering benthic flora and affecting feeding and breeding sites. The effect is not significant.
	Construction of watercourse crossings	In-road Open Cut Trench	Medium Sensitivity watercourse. Quality class C. Poor WFD Status, At Risk	Moderate adverse Results in impact on integrity of attribute or loss of part of attribute	Moderate: The proposed crossing is an in-road open cut which will not involve in-stream works. Any potential risks arise from near-stream construction works, however these will be temporary in duration. The effect is not significant.

Receptor	Construction activities with potential impacts		Predicted Effects		
	Primary Activity type (inc Water Crossing Ref. No.)	Crossing Technique	Receptor Importance / Sensitivity	Magnitude of Impacts	Significance of Effects
	(Wx24B) Stockpiling, removal of topsoil, accidental spillages	Inline HDD	Medium Sensitivity watercourse. Quality class C. Poor WFD Status, At Risk	Moderate adverse Results in impact on integrity of attribute or loss of part of attribute	Moderate: The proposed crossing is an in-road inline HDD which will not involve in-stream works. Any potential risks arise from near-stream construction works, however these will be temporary in duration There is a potential frac-out risk of non-toxic bentonite drilling fluid smothering benthic flora and affecting feeding and breeding sites. The effect is not significant.
	Construction of watercourse crossings (Wx24C) Stockpiling, removal of topsoil, accidental spillages	Inline HDD	Medium Sensitivity watercourse. Quality class C. Poor WFD Status, At Risk	Moderate adverse Results in impact on integrity of attribute or loss of part of attribute	Moderate: The proposed crossing is an in-road open cut which will not involve in-stream works. Any potential risks arise from near-stream construction works, however these will be temporary in duration There is a potential frac-out risk of non-toxic bentonite drilling fluid smothering benthic flora and affecting feeding and breeding sites. The effect is not significant.
		In-road Open Cut Trench	Medium Sensitivity watercourse. Quality class C. Poor WFD Status, At Risk	Moderate adverse Results in impact on integrity of attribute or loss of part of attribute	Moderate: The proposed crossing is an in-road open cut which will not involve in-stream works. Any potential risks arise from near-stream construction works, however these will be temporary in duration. The effect is not significant.
	Construction of watercourse crossings (Wx25) Stockpiling, removal of topsoil, accidental spillages	Offline Open-Cut	Medium Sensitivity watercourse. Quality class C. Poor WFD Status, At Risk	Large adverse Results in impact on integrity of attribute or loss of part of attribute	Significant: In-stream works are proposed during construction which have a greater potential for impacts than out of stream works. Potential impacts also arise from near stream construction works. Effects will be short term in duration. The effect is significant.
		In-Road Open Cut trench	Medium Sensitivity watercourse. Quality class C. Poor WFD Status, At Risk	Moderate adverse Results in impact on integrity of attribute or loss of part of attribute	Moderate: The proposed crossing is an in-road open cut which will not involve in-stream works. Any potential risks arise from near-stream construction works, however these will be temporary in duration. The effect is not significant.
Baldoyle Bay SAC, SPA & pNHA	Downstream pathway via watercourses	N/A	Extremely High	Negligible: Results in an impact on attribute but of insufficient magnitude to affect either use or integrity	Imperceptible: Due to dilution potential in the watercourses and the distance to the protected features, any changes in water quality, levels or flows would have an imperceptible effect on the feature. The effect is not significant.

Receptor	Construction activities with potential impacts		Predicted Effects		
	Primary Activity type (inc Water Crossing Ref. No.)	Crossing Technique	Receptor Importance / Sensitivity	Magnitude of Impacts	Significance of Effects
Sluice River Marsh pNHA	Downstream pathway via watercourses	N/A.	Very High	Negligible: Results in an impact on attribute but of insufficient magnitude to affect either use or integrity	Imperceptible: Due to dilution potential in the watercourses and the distance to the protected features, any changes in water quality, levels or flows would have an imperceptible effect on the feature. The effect is not significant.
Malahide Estuary SAC, SPA & pNHA	Downstream pathway via watercourses	N/A	Extremely High	Negligible: Results in an impact on attribute but of insufficient magnitude to affect either use or integrity	Imperceptible: Due to dilution potential in the watercourses and the distance to the protected features, any changes in water quality, levels or flows would have an imperceptible effect on the feature. The effect is not significant.
Rogerstown Estuary SAC, SPA & pNHA	Downstream pathway via watercourses	N/A	Extremely High	Small adverse Results in minor impact on integrity of attribute or loss of small part of attribute	Significant: Due to the proximity of the Rogerstown Estuary, the dilution potential will be less than for other sites resulting in a higher potential risk from construction activities. The effect is significant.
Knock Lake pNHA	Upstream of crossing	N/A	Very High	Negligible: Results in an impact on attribute but of insufficient magnitude to affect either use or integrity	Imperceptible: the location of the pNHA upstream of the proposed development means it will not be vulnerable to changes in water quality. Changes in water levels are unlikely to occur as these would be the result of a blockage in the flow path – however the design of the cable route will allow water to flow unimpeded. The effect is not significant.
Bog of the Ring pNHA	Upstream of crossing	N/A	Very High	Negligible: Results in an impact on attribute but of insufficient magnitude to affect either use or integrity	Imperceptible: the location of the pNHA upstream of the proposed development means it will not be vulnerable to changes in water quality. Changes in water levels are unlikely to occur as these would be the result of a blockage in the flow path – however the design of the cable route will allow water to flow unimpeded. The effect is not significant.

Table 22.18 Construction Impact Risk Assessment relating to flood risk

Receptor	Construction activities with potential impacts		Predicted Effects		
	Primary Activity type (inc Water Crossing Ref. No.)	Construction Technique *	Receptor Importance / Sensitivity	Magnitude of Impacts	Significance of Effects
Residential property 220m upstream Wx10 (along Aldrumman stream)	Construction of watercourse crossings (Wx10) Accidental increase in levels upstream	Inline HDD Offline Open Cut Trench	Low Importance/ Sensitivity 1 residential property 220m upstream	Moderate adverse Increase in predicted peak flood level >50mm	Slight: In-stream works are proposed during construction which have a greater potential for impacts than out of stream works. Potential impacts could cause flooding to upstream property. The effect is not significant.
Property 2.5km upstream Wx13 (along Bollyboghil river)	Construction of watercourse crossings (Wx13) Accidental increase in levels upstream	Inline HDD (Combined with Wx12) Offline HDD (Combined with Wx12) Offline Open Cut Trench	Low Importance/ Sensitivity 1 residential property 2.5km upstream	Negligible change in peak flood level at the nearest property, due to distance from watercourse crossing	Imperceptible: Increase in water levels during construction not expected to impact receptor. The effect is not significant.
Malahide residential community adjacent to Wx20 (along Gaybrook stream)	Construction of watercourse crossings (Wx20) Accidental increase in levels upstream	In-road Open Cut Trench Inline HDD Offline Open Cut Trench	Very high more than 50 residential properties adjacent to the crossing and watercourse	Large adverse change in peak flood levels of >100mm	Profound: In-stream works are proposed during construction which have a greater potential for impacts than out-of-stream works. Potential impacts could cause flooding to upstream properties. Refer to section 6.4.1 of Appendix 22.1 for more details. The effect is significant.
Abbeville House 500m upstream Wx22 (along Sluice stream)	Construction of watercourse crossings (Wx22) Accidental increase in levels upstream	In-road Open Cut Trench Offline Open Cut Trench Offline HDD	Low Importance/ Sensitivity 1 property 500m upstream	Moderate adverse change in peak flood levels of >50mm	Slight: In-stream works are proposed during construction which have a greater potential for impacts than out of stream works. Potential impacts could cause flooding to upstream property. The effect is not significant.
Property 500m upstream Wx25 (along Mayne river)	Construction of watercourse crossings (Wx25) Accidental increase in levels upstream	Offline Open-Cut In-Road Open Cut trench	Medium Importance/ Sensitivity 4 residential properties 500m upstream	Moderate adverse change in peak flood levels of >50mm	Moderate: In-stream works are proposed during construction which have a greater potential for impacts than out of stream works. Potential impacts could cause flooding to upstream property. The effect is not significant.

* The above table includes impacts in relation to the construction methodology

Most of the potential risks related to the construction activities outlined in Table 22.17 are lower where in-road open cut or HDD technology is used.

Where the cable route traverses through agricultural land, there may be risks associated with blocking or contaminating local land drainage. While these may not pose a risk to the receptors identified, they may cause minor local effects of slight to imperceptible significance and will not be significant.

22.5.3 Operational Phase

Given the nature of the proposals, the potential for impacts on the surface water environment are for the most part associated with the construction phase. For completeness of assessment, operational phase effects considered include:

- Impacts to surface water quality from sediment runoff, spillages, discharges or physical modification
- Impacts on hydromorphology from changed riverbed profiles at off-line open cut locations
- Impacts on drainage patterns from working in or near watercourses
- Impacts on water supply and drainage infrastructure; and
- Impacts on flood risk

The grid facility will consist of permanent above ground infrastructure including the compensation substation and Bremore substation facilities. Welfare facilities will be provided to facilitate maintenance activities at the grid facility. The grid facility will have no sewer connection as it will have foul holding tanks with high level alarms, which will be emptied regularly and disposed of to a licensed wastewater treatment facility. As such, there will be an imperceptible effect which will not be significant on the water environment from the welfare facilities.

The surface water drainage systems of the grid facility has been designed in accordance with Sustainable Urban Drainage (SuDs) principles and includes an attenuation basin. Surface water runoff from the drainage systems will be limited to greenfield runoff rates and thus the impact on flood risk is imperceptible and not be significant. Refer to the Flood Risk Assessment (Appendix 22.1) for further information.

Water quality will be managed by applying a treatment train approach in line with (SuDS principles. Filter drains will provide an at source treatment stage for runoff from areas of hard standing. A hydrocarbon interceptor will be provided upstream of the attenuation basin as a secondary treatment stage. Fuel tanks will be located in concrete bunds to ensure any spillages do not inadvertently enter the surface water network. Suitable oil separation systems will be in place on the bund outlet to satisfy the EirGrid functional specifications. Consequently, the impact on water quality of the operational phase of the grid facility is expected to be imperceptible and not significant.

An imperceptible effect which will not be significant on surface water drainage routes along the onshore cables route is expected as the land will continue to drain as per the existing situation. No water supplies will be affected by the onshore infrastructure of the proposed development.

The landfall site, onshore cable route, temporary access tracks, and temporary contractor compounds will be reinstated once construction is complete. As such there will be no significant increase in surface water discharge during the operational phase. As the cables will be of a solid insulation type, there will be no sources of pollution and as they will be buried, they will not offer a pathway to any surface water receptors. Given the nature of the proposals, it is expected that effects on surface water quality during operation will be imperceptible and therefore not significant .

The onshore cable route crosses several watercourses at 25 locations along its length. Similar to other locations, once the cable is buried, there will be no changes to the ground levels or surfacing and no permanent impact to the watercourses. River-bed profiles will be reinstated to the existing condition following construction. The effect is therefore imperceptible and therefore not significant at the operational stage.

Access will be required at joint bays, link boxes and communications chambers along the cable route to facilitate maintenance. Any adverse water quality impacts arising from maintenance will be unlikely.

Permanent access tracks, which will increase the area of hard standing will be installed at the following locations where joint bays are offline from the public road.

- Landfall site – permanent access tracks to potential joint bay locations and TJB site
- Wx11, 12, 13 – permanent access tracks to potential joint bay locations
- M1– permanent access off R132 to potential joint bay locations, and
- Wx22 – permanent access off R107 to potential joint bay locations

The limited number of permanent access tracks proposed at offline crossings could potentially alter the flood mechanism at the watercourses if located within the floodplain resulting in a slight effect which would not be significant.

22.5.3.1 Justification test (Flooding)

As defined in section 22.3.7, the infrastructure at the landfall site is considered *water compatible* development. The grid facility contains critical above ground electrical assets and as such is considered essential infrastructure, which is *highly vulnerable* to flooding. Both the landfall and grid facility sites are located within Flood Zone C, at low risk of flooding and as such any type of development is permitted in terms of flood risk. The Justification Test is not required.

The onshore cable route crosses Flood Zones A, B and C, areas at high, moderate and low risk of flooding, respectively. The onshore cable is considered *water compatible* to flooding, as defined in section 22.3.7. As such, the proposed development is considered appropriate within these zones and a Justification Test is not required.

22.5.4 Decommissioning

The operational life of these assets will be approximately 35 years. Once the proposed development has reached the end of its operational life, it is anticipated parts of it will be decommissioned. The compensation substation at the grid facility will be decommissioned and above ground structures will be removed. As the removal of the underground structures may have more of an environmental impact than their retention, these features will remain in-situ. The Bremore substation will not be decommissioned, as it will form part of the wider transmission network owned by EirGrid. The onshore cable route from the Bremore substation at the grid facility to the Belcamp Substation will form part of the wider transmission system and will not be decommissioned.

When it becomes appropriate to decommission the proposed development, all above ground structures, such as the access track and marker posts between the TJB and the grid facility, will be removed, and the sites will be returned to their previous state. It is not proposed to remove any planting. The onshore export cables between the TJBs and the grid facility will be removed but below ground ducting will remain in place. Items / equipment which are decommissioned will be removed for appropriate management, based on the waste regulations at the time of decommissioning. Whilst decommissioning between the compensation station and the TJBs may lead to localised water pollution during removal due to ground disturbance, the potential impacts on water (in the absence of mitigation measures) will be imperceptible given the absence of watercourses in this area.

It is anticipated that the decommissioning process will involve similar activities to the construction process, but these will be undertaken in reverse with the removal of above ground structures between the landfall site and grid facility.

As all below ground cables of the onshore cable route will remain in place there will be no effects associated with flooding from the decommissioning.

A summary of the decommissioning effects is outlined in Table 22.19 which demonstrates that there are no likely significant effects arising from the decommissioning phase of the proposed development.

22.5.5 Summary of Impact Assessment

Table 22.19 summarises potential effects on receptors for the construction, operational and decommissioning stages. Where different significance were identified for a receptor during the construction stage due to the different construction methods proposed, the highest level of Significance has been presented in Table 22.19.

Table 22.19 Summary of Receptors and Significance of Effects

Receptor	Significance		
	Construction	Operation	Decommissioning
Bremore Stream (Wx01)	Slight	Imperceptible	Imperceptible
Bracken (Matt) River	Slight	Imperceptible	Imperceptible
Knock Stream (Wx03)	Slight	Imperceptible	Imperceptible
Balrothery Stream (Wx04)	Slight	Imperceptible	Imperceptible
Balrickard Stream (Wx05)	Slight	Imperceptible	Imperceptible
Rowans Big Stream (Wx06)	Slight	Imperceptible	Imperceptible
Rowans Little Stream (Wx07)	Slight	Imperceptible	Imperceptible
Courtlough Stream (Wx08)	Significant / Moderate	Imperceptible	Imperceptible
Oberstown Stream (Wx09)	Significant / Moderate	Imperceptible	Imperceptible
Aldrumman Stream (Wx10)	Severe / Significant	Imperceptible	Imperceptible
Ballough Stream (Wx11)	Significant / Moderate	Imperceptible	Imperceptible
Deanestown Stream (Wx12)	Slight	Imperceptible	Imperceptible
Ballyboghill Stream (Wx13)	Slight / Moderate	Imperceptible	Imperceptible
Turvey Stream (Wx14)	Moderate	Imperceptible	Imperceptible
Staffordstown Stream (Wx15)	Moderate	Imperceptible	Imperceptible
Broadmeadow River (Wx16)	Slight	Imperceptible	Imperceptible
Ward River (Wx17)	Slight	Imperceptible	Imperceptible
Seapoint Stream (Wx18)	Slight	Imperceptible	Imperceptible
Greenfields Stream (Wx19)	Slight	Imperceptible	Imperceptible
Gaybrook Stream (Wx20)	Slight / Moderate	Imperceptible	Imperceptible
Hazelbrook Stream (Wx21)	Significant / Moderate	Imperceptible	Imperceptible
Sluice Stream (Wx22 A and B)	Severe / Significant	Imperceptible	Imperceptible
Cuckoo Stream (Wx23 A, B and C)	Moderate	Imperceptible	Imperceptible
Mayne River (Wx24A, B and C & W25)	Significant	Imperceptible	Imperceptible
Baldoyle Bay SAC & pNHA	Imperceptible	Imperceptible	Imperceptible
Sluice River Marsh pNHA	Imperceptible	Imperceptible	Imperceptible
Malahide Estuary SAC & pNHA	Imperceptible	Imperceptible	Imperceptible
Rogerstown Estuary SAC & pNHA	Significant	Imperceptible	Imperceptible
Knock Lake pNHA	Imperceptible	Imperceptible	Imperceptible
Bog of the Ring pNHA	Imperceptible	Imperceptible	Imperceptible
Residential property 220m upstream Wx10	Moderate adverse	Imperceptible	Imperceptible
Property 2.5km upstream Wx13	Negligible	Imperceptible	Imperceptible
Malahide residential community adjacent to Wx13	Large adverse	Imperceptible	Imperceptible
Abbeville House 500m upstream Wx22	Moderate adverse	Imperceptible	Imperceptible
Property 500m upstream Wx25	Moderate adverse	Imperceptible	Imperceptible

22.6 Mitigation and Monitoring Measures

As part of the proposed development, best practice construction methods will be implemented that will ensure the construction related effects are avoided or reduced to a minimum as much as practicable. This section outlines this best practice and or mitigation measures that will be implemented to mitigate the potential effects identified in Section 22.5 of this chapter.

22.6.1 Construction Phase

22.6.1.1 Project Wide Mitigation Measures

Industry good practice guidance will be followed by the Contractor during constructed including, where relevant, those listed in the guidance below:

- Construction Industry Research and Information Association (CIRIA), (2001). C532 Control of Water Pollution from Construction Sites, Guidance for Consultants and Contractors
- CIRIA, (2005). C650 Construction Industry Research and Information Association (CIRIA) Environmental Good Practice on Site
- BPGCS005, Oil Storage Guidelines
- Best Practice Guidelines for the Preparation of Resource and Waste Management Plans for Construction and Demolition projects, EPA (2021)
- Control of Water Pollution from Linear Construction Projects, CIRIA (C649)
- The SuDS Manual, CIRIA (C753)
- Guidelines on Protection of Fisheries during Construction Works in and Adjacent to Waters, IFI (2016)
- The Management of Waste from National Road Construction Projects, GE-ENV-01101, TII (2017).

The Contractor will be required to put in place a Surface Water Management Plan (SWMP) to protect the water environment during construction. This will include all mitigation measures listed in this chapter and any other water related mitigation measures listed in other chapters including but not limited to the Biodiversity chapter, Land and Soils chapter etc.

22.6.1.2 Specific Mitigation and Monitoring Measures

Once the project-wide mitigation measures are implemented, other specific water pollution and flooding mitigation and / or monitoring measures include, but are not limited to those listed below:

Monitoring

- A suitably qualified Environmental Clerk of Works (EnCoW) and Ecological Clerk of Works (ECoW) will be appointed prior to commencement of works. The duties of these will be to monitor the efficacy of mitigation measures implemented by the contractors and to report on the application and success of these measures
- Water quality monitoring will be undertaken in advance of construction to establish baseline levels of potential contaminants in all watercourses across the proposed development
- At the watercourse crossing locations background samples (i.e. baseline) shall be collected in the same season as the construction will occur at that location to ensure the results are representative. This may mean that sampling is undertaken in the various watercourses at different times

- Upstream and downstream samples will be collected at each watercourse crossing location and will be tested for a range of parameters that occur naturally and for pollutants[4] including temperature, Electrical Conductivity (EC), pH, Dissolved Oxygen (DO), Turbidity, Total Petroleum Hydrocarbon (TPH) and Diesel Range Organics (DRO)
- Water pollution trigger levels will be determined against baseline monitoring results. The baseline monitoring results will present naturally occurring parameters. Any abnormally high concentrations monitored during construction will flag for construction to be stopped
- During construction of the watercourse crossings, field parameters (temperature, pH, turbidity, DO and EC) shall be monitored upstream and downstream of the construction works twice a day. Visual inspections of the watercourses at these locations will be conducted hourly during construction to identify any plumes of sediment or sheens of oil which may indicate spillages. If these are identified, works will stop until the source has been identified and remediated
- When there is construction on the same day at multiple watercourse crossing locations the ECoW is required to be present at instream works and designated person chosen by the contractor to do visual checks at the other watercourse crossings. Should the designated person observe a plume then they shall advise the ECoW and follow the mitigation measure above
- In the event of pollution occurring or the potential to occur, the EnCoW and ECoW have a 'Stop Works' authority to ensure measures to stop a pollution event are implemented immediately
- Post construction monitoring will be conducted for three months subsequent to construction

Prevention of release of hydrocarbons and contaminates

During construction the contractor will be required to implement the following specific mitigation measures to prevent the release of hydrocarbons, polluting chemicals, sediment/silt:

- Storage of sand/gravel/soil will be as far as practicable from watercourses or hydrological pathways to designated sites and grading adjacent to these stockpiles kept to a minimum
- Surface water run-off from temporary works area to be collected in silt/gravel traps prior to discharge to the surface water drainage network
- Silt fences (to Hy-Tex Premium specification or similar) and silt traps will be installed prior to commencement of works and will be inspected daily to inform adaptive management as required. The locations of same will be determined by the EnCoW
- All refuelling to take place in bunded enclosures and a minimum of 50m from any watercourse, or coastline. The only exception to this would be plant of limited mobility such as HDD rigs: for refuelling of these items, a small mobile fuel bowser will be used for refuelling, drip trays and plant nappies would be utilised to mitigate any potential spill of fuel during refuelling, and additional supervision employed
- Visual checks of the working areas and all silt/gravel traps will be carried out during weekly audits and maintenance works undertaken, if required
- All chemical/fuel etc. will be stored in bunded containers and all storage will have sufficient bunding for all liquids stored (110% of the capacity of the largest drum)
- Spill Kits will be maintained on sites and works areas
- The contractor will prepare a spill response procedure and implement it, if required
- Spill incidents will be reported to the EnCoW

[4] According to CIRIA (2001) pollutants are defined as substances that occur either in a location where it is not naturally occurring or in an abnormally high concentration.

- Oil interceptors will be installed on surface water drainage network at the grid facility works areas for the construction phase
- No foul sewer discharge will be allowed to enter the surface water drainage network; and
- Toolbox talks for all staff will be carried out by the contractor before work commences to identify environmental issues

Protection of watercourses

- For works occurring within 50m of an open watercourse, weather forecasts will be monitored prior to and during works to avoid working in adverse weather conditions such as heavy rains. No excavations for watercourse crossings will take place during a yellow, or higher, issued rain warning by Met Eireann
- All instream works will only take place during the permitted annual instream working window which runs from July to September (IFI, 2016), unless otherwise agreed with IFI.
- At the offline open cut trench crossings, the riverbed levels will be surveyed to allow them to be reprofiled back to their original condition at the completion of construction of the crossing
- Instream dewatered working zones, once construction is completed, will be reinstated with clean rounded river gravels of various sizes (30-100mm) and not the excavated material removed as this material will have become unstable and will release suspended solids if used for reinstatement of the watercourse bed. Alternatively, the excavated material will be cleaned and reinstated
- Excavated material will be placed in such a way as to avoid any disturbance of areas near to the banks of watercourses and any spillage into the watercourses
- An ECoW will be present for the entire duration of any instream works and monitoring will be conducted in line with the monitoring requirements above
- Settlement tanks, silt traps / bags and bunds will be used where required to remove silt from surface water runoff. Sizing of the tanks will be based on best available guidelines. Any construction work within a 10m buffer zone of the watercourse edge will be provided with these measures to minimise sediment discharge to a watercourse
- Where over pumping of water is required, flow will be discharged back to the same stream at a downstream location to maintain continuity and avoid flooding and water quality impacts to adjacent streams
- Dewatering, if required during excavation works, will be designed such that water will be adequately treated prior to discharge
- The existing drainage infrastructure will be surveyed where possible prior to construction. Land drains, open drains, drainage pipework or watercourses, affected by the works, will be maintained until completion of the works, and restored to their original condition. Where required, drainage will be temporarily diverted or over pumped, with appropriate water treatment as required. Further details are provided in Section 9.5.5 of the Onshore Construction chapter. Crossings will be undertaken following the methodology proposed in the Onshore Construction chapter and the drain or watercourse reinstated following to their original condition following construction
- All machinery will have been suitably serviced and inspected prior site delivery. A hydrocarbon/oil boom will be available at working areas for immediate deployment within any watercourse in the event of any hydrocarbon spillage at the site. A fuel spillage will be considered to be any loss of fuel, oil or lubricant, including hydraulic oil and spot leakage
- Deposition areas for spoil will be enclosed with silt fencing to prevent mobilisation of solids during adverse weather conditions and no drainage from these areas will be directed into the temporary drainage systems. A SuDS will be implemented to allow controls to be designed for the retention of large volumes of water that may arise from spoil deposition areas

- Silt traps and fencing to be placed in working areas that have the potential to carry silt laden material from the working area to aquatic environments. Silt traps and fences will not be erected within flowing watercourses as these can act as a barrier for movement of species
- Re-seeding of all areas of bare ground or the placement of jute matting will take place as soon as practicable to prevent run-off; and
- All onsite welfare facilities will be installed and managed as per regulations to prevent nutrient overloading of aquatic environments
- Mitigation measures in relation to soil stripping, earth removal, stockpiling are detailed in Section 21.6.1 of the Land and Soils chapter
- Where an open-cut watercourse crossing method is proposed at Wx13 (Ballyboghill Stream), which flows directly into the Rogerstown Estuary SAC and SPA, no in-stream works will occur within 150m of the SAC boundary.

Works to manage flooding

The contractor will be required to put in place a Flood Risk Management Plan (FRMP) to ensure staff are not exposed to the risk of flooding, to minimise damage to the construction works in case of flooding and to reduce risk of flooding to nearby properties. As part of the FRMP, the following will be included:

- The work near watercourses will be planned to be undertaken at appropriate periods when low flow is expected
- Weather warning notifications will be issued and the weather forecast checked regularly when working near areas at risk of flooding
- Where offline open cut trench method is proposed, water levels upstream of the watercourse crossings will be monitored
- A flood warning system and management plan will be implemented

Further mitigation measures specific to each construction methodology are outlined below:

- Inline open cut trenches: Trenches will be excavated in short lengths and will be backfilled following installation of the ducts. Excavated material will be stockpiled outside areas at risk of flooding to prevent impoundment of water or changes to flow paths
- Inline HDD compounds: HDD compounds will be located where practicable outside the 0.1% AEP flood extents
- Offline open cut crossing:
  - *With Over-pump Methodology:* If expected flows in the watercourse are within the capacity of available pumps, temporary bunding and over-pumping methodology can be adopted. In that case, soil filled sandbags will be used to create a seal and bund both the upstream and downstream sides of the watercourse crossing. Then appropriately sized pumps will be located adjacent to the watercourse crossing, the intake pipe will be positioned upstream of the upstream bund and the discharge pipe downstream of the downstream bund, with appropriate water treatment provided in between, as required. The bunds, pump and treatment will be inspected daily.

    Water levels in the watercourse will be monitored to prevent flooding upstream of the bunds, back up pumps may be required. It is recommended that works are undertaken during low flows and avoided if a storm is expected
  - *With Culvert/Flume Pipe Methodology:* In this method, the water flow will be diverted into a culvert or flume pipe to the side of the watercourse. The culvert/flume pipe watercourse crossing will be prepared by stripping the topsoil from the banks and areas adjacent to the river at the crossing point and storing it separately within the working area, away from the watercourse

- The excavated bank material and a selection of vegetation will be stored for replacement or reinstatement of the watercourse, after the cable ducts have been laid. A flume pipe bridge will be installed to one side of the watercourse channel. The culvert/flume pipe will be long enough to extend below the haul road to allow safe passage of plant and materials along the cable route. A suitably sized culvert/flume pipe will be installed at the crossing point. The invert of the culvert/flume pipe will typically be 100mm below the existing watercourse invert, to replicate natural free flow through the channel. The culvert/flume pipe will extend on the upstream and downstream sides of the crossing point for a suitable distance. The culvert/flume pipe will then be bedded and packed or surrounded with soil filled sandbags to create a seal or dam across the watercourse, to prevent scouring and to divert the water flow into the flume pipe. The flume pipe will take all the flow to the downstream side of the crossing point and the ducts will be installed beneath the dry watercourse channel

- Once the flume pipe or dam bund and over-pump method has been installed and sandbags are securely in place, the construction of the cable trench can proceed by excavating through the bed of the watercourse. Trench supports may be used to facilitate safe excavation and dewatering of the excavation area will be carried out if required. Final reinstatement will use the stored river-bed materials with reinforcement mesh included along with yellow marker warning tape.

- The banks of the temporary watercourse crossings will be reformed to their original profile. The excavated bed materials which had been removed for construction, and stored separately, will be reinstated to the original profile. The temporary flume pipe, packing and sand-bags will be removed once the watercourse profile-has been reinstated, ensuring the correct sequencing of substrate reinstatement.

- Final bank reinstatement may require further measures to stabilise the banks and prevent erosion. Bank stabilisation works will be discussed with the NPWS/IFI to ensure that suitable materials and methodologies are being used. Any bank protection, where it is required, will be adequately keyed into both the bed and banks. The materials and methods employed will be in keeping with the surrounding environment and will comply with any conditions attached to the planning approval.

- The limited number of permanent access tracks proposed at offline crossings could potentially alter the flood mechanism at the watercourses if located within the floodplain. As also outlined in Section 22.6.2, where reasonably possible, the tracks will be positioned outside the flood extents and designed to minimise changes to the existing ground. If encroaching within the floodplain, they will be constructed at-grade to prevent changes to flow paths or impoundment and will be made of semi-impermeable material (crushed stone) to mimic the natural infiltration potential of the existing land.

Protection from HDD Operations and Frac-Out

The contractor will implement a number of specific measures with respect to HDD operations at the landfall and the relevant crossings along the cable route, as detailed below.

- Any groundwater or rainwater that collects in the HDD drilling pit will be pumped away. Then it will be discharged onto the adjacent land, not directly into a waterway, and through a filter medium. This will avoid the build-up of silt, as some granular material will, inevitably, be pumped out with the water from the trench

- The contractor and the ECoW will monitor weather conditions and will carry out daily inspections of the mud pit to ensure the volume of the mud pit does not ‘overtop’ to the surrounding land. Where required, measures such as pumping will be used to prevent overtopping

- Any bentonite (or similar HDD drilling head lubrication material) will be handled and removed by the drilling contractor. The volume of bentonite (or similar material) will be determined by the ground conditions encountered and length of HDD

In order to eliminate the migration of drilling fluids through the subsurface to waterbodies the following measures will be employed

- Drilling pressures will be closely monitored and will not exceed those needed to penetrate the formation

- Exit and entry points for the HDD on land (exit point for landfall HDD is in the seabed) will be enclosed by silt barriers (e.g. straw or silt fence) to prevent any runoff into surface water bodies
- If pressure drops during drilling or if there is a lack of returns, the drilling will be stopped immediately to allow an assessment of a potential leakage of drilling fluid into the surrounding formation. A leak stopping compound, such as mica, may be used to prevent the leak from migrating further into the formation. If the leak stopping compound is not successful, the drilling direction may need to change to avoid the area where the leak occurred

While the bentonite drilling fluid is non-toxic and can be commonly used in farming practices, if sufficient quantity enters a watercourse, it can potentially settle on the bottom, smothering benthic flora and affecting faunal feeding and breeding sites. The drilling contractor will develop a location specific HDD frac-out contingency plan, detailing measures to be taken to reduce the risk of bentonite breakout and measures to be taken for the protection of sensitive ecological receptors, should a breakout occur.

In event of managing a breakout or frac-out, the following measures will be adopted:

- Drilling will be stopped immediately
- The bentonite will be contained by constructing a bund e.g. using sandbags
- The bentonite will be recovered from the bund by pumping to a suitable container or back to the entry pit for recycling
- If necessary, inert and non-toxic lost circulation material (mica) will be pumped into the bore profile, which will swell and plug any fissures
- The area will be monitored closely to determine if the breakout has been sealed; and
- Mud volumes and pressures will be checked and monitored as the works recommence

In event of managing a breakout or frac-out under water, the following measures will be adopted

- The drilling will be stopped immediately
- Lost circulation material (mica), which will swell and plug any fissures, will be pumped into the bore
- Mud volumes and pressures will be checked and monitored as the works recommence
- The process will be repeated as necessary until the breakout has been sealed

Any bentonite will be managed and removed by the specialist drilling contractor on completion of the operation. Water will be brought to site in tankers (to make up the drilling fluid) for lubrication of the bore and to provide the requisite volumes of water to the compound. The water used will be non-saline and non-potable water.

On completion of the operation the drill fluid will be disposed of to an appropriately licensed facility.

22.6.2 Operational Phase

An attenuation basin will be provided at the grid facility and this will ensure that the instantaneous surface water runoff rate from the site will not exceed the greenfield runoff rate. Water quality will be managed by controlling the volume, and treating the discharge in line with SuDS principles.

Emergency procedures detailing the measures to be undertaken should any accidental spill happen during operation will be developed as part of the operations manual for the proposed development. These will be based on the same emergency procedures detailed in the Onshore CEMP.

The limited number of permanent access tracks proposed at offline crossings could potentially alter the flood mechanism at the watercourses if located within the floodplain. Where reasonably possible, the tracks will be positioned outside the flood extents and designed to minimise changes to the existing ground.

If encroaching within the floodplain, they will be constructed at-grade to prevent changes to flow paths or impoundment and will be made of semi-impermeable material (crushed stone) to mimic the natural

infiltration potential of the existing land. With the above design restrictions in place, the effect of the permanent tracks on flood risk is imperceptible at the operational stage.

With the implementation of the proposed design, no additional mitigation measures for water are considered necessary for the operation of the proposed development.

22.6.3 Decommissioning

The mitigation measures, described above for the construction phase which are relevant to decommissioning, updated to reflect good practice at the time, will be implemented for the decommissioning phase.

22.7 Residual Effects

22.7.1 Construction Phase

Following implementation of the mitigation measures outlined in the preceding sections, the residual effects to the proposed development are expected to be temporary and imperceptible. These are summarised in Table 22.20. Where differing levels of significance were identified for a receptor during the construction stage due to there being multiple construction method options proposed, the highest level of significance has been presented in Table 22.20 for comparison. In conclusion, there will be no likely significant residual effects on water or flooding as a result of the construction of the proposed development.

Table 22.20 Summary of Residual Effects on Receptors during construction

Receptor	Receptor Importance/ Sensitivity	Pre-mitigation Magnitude	Significance of effects pre-mitigation	Post-mitigation Magnitude	Residual effects (post mitigation
Bremore Stream (Wx01)	Low	Moderate adverse	Slight	Negligible	Imperceptible – Not significant
Bracken (Matt) River	Low	Moderate adverse	Slight	Negligible	Imperceptible – Not significant
Knock Stream (Wx03)	Low	Moderate adverse	Slight	Negligible	Imperceptible – Not significant
Balrothery Stream (Wx04)	Low	Moderate adverse	Slight	Negligible	Imperceptible – Not significant
Balrickard Stream (Wx05)	Low	Moderate adverse	Slight	Negligible	Imperceptible – Not significant
Rowans Big Stream (Wx06)	Low	Moderate adverse	Slight	Negligible	Imperceptible – Not significant
Rowans Little Stream (Wx07)	Low	Moderate adverse	Slight	Negligible	Imperceptible – Not significant
Courtlough Stream (Wx08)	High	Moderate adverse	Significant / Moderate	Negligible	Imperceptible – Not significant
Oberstown Stream (Wx09)	High	Moderate adverse	Significant / Moderate	Negligible	Imperceptible – Not significant
Aldrumman Stream (Wx10)	High	Large adverse	Severe / Significant	Negligible	Imperceptible – Not significant
Ballough Stream (Wx11)	High	Moderate adverse	Significant / Moderate	Negligible	Imperceptible – Not significant

Receptor	Receptor Importance/ Sensitivity	Pre-mitigation Magnitude	Significance of effects pre-mitigation	Post-mitigation Magnitude	Residual effects (post mitigation
Deanestown Stream (Wx12)	Low	Moderate adverse	Slight	Negligible	Imperceptible – Not significant
Ballyboghill Stream (Wx13)	Low	Large adverse	Slight / Moderate	Negligible	Imperceptible – Not significant
Turvey Stream (Wx14)	Medium	Moderate adverse	Moderate	Negligible	Imperceptible – Not significant
Staffordstown Stream (Wx15)	Medium	Moderate adverse	Moderate	Negligible	Imperceptible – Not significant
Broadmeadow River (Wx16)	Low	Moderate adverse	Slight	Negligible	Imperceptible – Not significant
Ward River (Wx17)	Low	Moderate adverse	Slight	Negligible	Imperceptible – Not significant
Seapoint Stream (Wx18)	Low	Moderate adverse	Slight	Negligible	Imperceptible – Not significant
Greenfields Stream (Wx19)	Low	Moderate adverse	Slight	Negligible	Imperceptible – Not significant
Gaybrook Stream (Wx20)	Low	Large adverse*	Slight / Moderate	Negligible	Imperceptible – Not significant
Hazelbrook Stream (Wx21)	High	Moderate adverse	Significant / Moderate	Negligible	Imperceptible – Not significant
Sluice Stream (Wx22 A and B)	High	Large adverse*	Severe / Significant	Negligible	Imperceptible – Not significant
Cuckoo Stream (Wx23 A, B and C)	Medium	Moderate adverse	Moderate	Negligible	Imperceptible – Not significant
Mayne River (Wx24A, B and C & W25)	Medium	Large adverse*	Significant	Negligible	Imperceptible – Not significant
Baldoyle Bay SAC & pNHA	Extremely high	Negligible	Imperceptible	Negligible	Imperceptible – Not significant
Northwest Irish SPA	Very high	Negligible	Imperceptible	Negligible	Imperceptible – Not significant
Sluice River Marsh pNHA	Very high	Negligible	Imperceptible	Negligible	Imperceptible – Not significant
Malahide Estuary SAC & pNHA	Extremely high	Negligible	Imperceptible	Negligible	Imperceptible – Not significant
Rogerstown Estuary SAC & pNHA	Extremely high	Negligible	Significant	Negligible	Imperceptible – Not significant

Receptor	Receptor Importance/ Sensitivity	Pre-mitigation Magnitude	Significance of effects pre-mitigation	Post-mitigation Magnitude	Residual effects (post mitigation
Knock Lake pNHA	Very High	Negligible	Imperceptible	Negligible	Imperceptible – Not significant
Bog of the Ring pNHA	Very High	Negligible	Imperceptible	Negligible	Imperceptible – Not significant
Residential property 220m upstream Wx10	High	Moderate adverse	Moderate	Negligible	Imperceptible – Not significant
Property 2.5km upstream Wx13	Low	Negligible	Imperceptible	Negligible	Imperceptible – Not significant
Malahide residential community adjacent to Wx13	Low	Large adverse*	Moderate	Negligible	Imperceptible – Not significant
Abbeville House 500m upstream Wx22	High	Moderate adverse	Moderate	Negligible	Imperceptible – Not significant
Property 500m upstream Wx25	Medium	Moderate adverse	Moderate	Negligible	Imperceptible – Not significant

* Considers the watercourse crossing with highest magnitude impact

22.7.2 Operational Phase

Given water quality will be managed by controlling and treating the discharge in line with SuDS principles, no significant residual effects are anticipated during the operational phase of the proposed development. In conclusion, there will be no likely significant residual effects on water as a result of the operation of the proposed development.

There will be no residual flooding effects during the operation.

22.7.3 Decommissioning

With the employment of the above mitigation measures, it is considered that there will be no likely significant residual effects on water or flooding as a result of the decommissioning phase of the proposed development.

22.8 Transboundary Effects

Given the proposed development extents are entirely within the Republic of Ireland and considering the nature and location of the proposed development in relation to water on the landward of the HWM, no transboundary effects are anticipated.

22.9 Cumulative Effects

The cumulative effects assessment is presented in Volume 6, Chapter 38: Cumulative and Inter – related Effects.

A long list of "other projects" which were deemed to be potentially relevant to be included in the cumulative impact assessment was compiled (see Volume 6, Chapter 38: Cumulative and Inter-related Effects (hereafter referred to as the 'Cumulative and Interrelated Effects Chapter')). A screening exercise of the "long list" was carried out to determine whether each of project has the potential to give rise to likely significant cumulative

effects from a water perspective with the proposed development. Many of the other projects were screened out for a number of reasons including the location, scale and nature of the project. Those projects which were "screened in" were carried forward for assessment. The results of the assessment are presented in the Cumulative and Interrelated Effects chapter.

The assessment concluded that no likely significant direct or indirect cumulative effects on water are predicted during the construction, operation or decommissioning phases of the proposed development.

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