Shannon Technology and Energy Park (STEP) Power Plant

Environmental Impact Assessment Report - Volume 2

Chapter 06 Water

Shannon LNG Limited

April 2024

Delivering a better world

Prepared for:

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6.1 Introduction

This chapter of the Environmental Impact Assessment Report (EIAR) assesses the likely significant effects upon the water environment and hydrogeology as a result of constructing and operating the Proposed Development.

The Site is located in the townlands of Kilcolgan Lower and Ralappane, between Tarbert and Ballylongford, Co. Kerry. The application Site boundary ('red line') encloses an area of approximately 41 hectares (ha) and is entirely owned by the Applicant.

The assessment aims to satisfy the requirements of the EU EIA Directive 2011/92/EU, as amended by EIA Directive 2014/52/EU (assessment of the effects of certain public and private projects on the environment) (the "EIA Directive"). The assessment aims to ensure that:

- The need for the avoidance and reduction of impacts on the water environment is taken fully into account in the environmental evaluation.
- The selection of appropriate means of preventing any significant predicted impact is made through modification of the drainage design, choice of discharge location(s) and/ or adoption of runoff treatment methods, with the objective of designing-out potential adverse environmental impacts.

This chapter describes water, hydrology and flooding risk issues associated with the Proposed Development and should be read in conjunction with **Chapter 05** (Land, Soils and Geology) and **Chapter 07A** (Marine Ecology), which pay particular attention to the potential for impacts upon the geological and aquatic / riparian environments respectively.

In order to describe the baseline conditions, AECOM utilised the geotechnical and environmental investigations data acquired during 2006 / 2007 for a previous planning application on the Site, as the geological and hydraulic information from those geology and hydrogeology studies remains relevant, and supplemented this with additional groundwater and surface water measurement and samples collected on the Site in February 2020. The geological and hydraulic information from those geology and hydrogeology studies remains relevant.

In assessing potential significant effects associated with construction and operational phases of the Proposed Development on surface waters and hydrogeology, AECOM has considered both the importance of the attributes and the predicted scale and duration of likely impacts.

Full details on the background, Site history and the Proposed Development is provided in **Chapter 02** (Description of the Proposed Development) and the Planning Statement submitted with this planning application.

6.2 Competent Expert

This assessment has been undertaken by Kevin Forde, Associate Hydrogeologist in the AECOM Ground, Energy and Transaction Services team, who has more than 30 years' post-graduate experience. He graduated with an honour's degree in Geology (1991) and has since earned a post

graduate diploma in Computing (UCC, 1992) and a Masters in Hydrogeology (UCL, 1993). He has extensive experience of ground contamination assessment and remediation for both public and private sector clients involving environmental due diligence, pre-construction site investigation, EIAR, contaminated land remediation and construction phase soil waste management.

6.3 Legislation, Policy, and Guidance

6.3.1 Legislation

The following European legislation and transposing Irish regulations are of relevance to this water environment assessment and the Proposed Development:

- European Union Water Framework Directive (WFD) (2000/60/EC).
- European Communities (Water Policy) Regulations, 2003 (S.I. No. 722 of 2003).
- European Union (Water Policy) Regulations, 2014 (S.I. No. 350 of 2014).
- European Union (Water Policy) (Abstractions Registration) Regulations, 2018 (S.I. No. 261 of 2018).
- European Communities (Drinking Water) Regulations 2014 (S.I. 122 of 2014).
- European Communities Environmental Objectives (Surface Water) Regulations, 2009 ('S.I. No. 272 of 2009 as amended'), as amended in 2012 (by S.I. No. 327/2012), 2015 (by S.I. No. 386/2015) and 2019 (by S.I. No. 77/2019).
- European Communities Environmental Objectives (Groundwater) Regulations, 2010 (S.I. No. 9 of 2010 as amended), as amended in 2016 (S.I. No. 366 of 2016).
- European Union Environmental Impact Assessment (EIA) Directive 2011/92/EU as amended by 2014/52/EU.
- European Union (Planning and Development) (Environmental Impact Assessment) Regulations S.I. No. 419 of 2012, as amended by S.I. No. 543 of 2014, 2018 (S.I. No. 296 of 2018), as amended by S.I. No. 404 of 2018 and S.I. No. 646 of 2018.
- The EU Floods Directive 2007/60/EC.
- European Communities (Assessment and Management of Flood Risks) Regulations, 2010 (S.I. No. 122 of 2010).
- European Union (Environmental Impact Assessment) (Flood Risk) Regulations 2012 (S.I. No. 470 of 2012).

6.3.2 Policy

The Kerry County Development Plan (CDP) 2022-2028, prepared in accordance with the provisions of the Planning and Development Act 2000 (as amended), sets out a range of proposed policy objectives for development up to 2028 (Kerry County Council, 2022). The Kerry CDP incorporates the mandatory objectives listed in the Act, including conservation and protection of the environment and promotion of compliance with environmental standard, including but not limited to the following:

- **KCDP 11-15**: Facilitate and support the protection and enhancement of wetlands as nature-based solutions to flood management, climate change, and the biodiversity crisis.

- **KCDP 13-1**: Ensure compliance with the Water Framework Directive.
- **KCDP 13-2**: Achieve water quality targets by implementing the national River Basin Management Plan (and associated programmes of measures).
- **KCDP 13-5**: Ensure that planning applications are assessed with regard to the Groundwater Protection Scheme and the potential impacts the development may have on groundwater quality.
- **KCDP 13-6**: Protect all sources and potential sources of public water supply, including their zones of contribution within the County from pollution resulting from any development and/or land use.
- **KCDP 13-7**: Protect existing and potential water resources for the county, in accordance with the EU Water Framework Directive (2000/60/EC), the current National River Basin Management Plan and any amending or replacement version, the Pollution Reduction Programmes for designated shellfish waters, the provisions of the Groundwater Protection Scheme for the county and any other protection plans for water supply sources, with an aim to improving all water quality.
- **KCDP 13-18:** Ensure that development proposals comply with the standards and requirements of the Irish Water: Code of Practice for Wastewater Infrastructure, (December 2016), and any updated version of this document during the lifetime of the Plan.
- **KCDP 13-24**: Support the incorporation of Sustainable Urban Drainage Systems (SUDs) in all public and private development in urban areas.

6.3.3 Guidance

The following guidance documents are of relevance to the Proposed Development and were adhered to in the preparation of this water environment assessment:

- Department of Housing, Local Government and Heritage (DHLGH) (2018). *River Basin Management Plan 2018-2021*.
- Environmental Protection Agency (EPA) (2022). *Guidelines on the Information to be contained in Environmental Impact Assessment Reports*.
- EPA (2003). *Advice Notes on Current Practice in the Preparation of Environmental Impact Statements*.
- EPA (2013). *Management of Contaminated Land and Groundwater at EPA Licensed Sites*.
- National Roads Authority (NRA) (2009). *Guidelines on Procedures for Assessment Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes*.
- Institute of Geologists of Ireland (IGI) (2013). *Guidelines for Preparation of Soils, Geology, Hydrogeology Chapters of Environmental Impact Statements*.
- Department of Housing, Local Government and Heritage (DHLGH) (2009). *The Planning System and Flood Risk Management – Guidelines for Planning Authorities.*
- EC (2017). *Environmental Impact Assessment of Projects – Guidance on Scoping (Directive 2011/92/EU as amended by 2014/52/EU).*

6.4 Methodology

6.4.1 Introduction

The following sources of information that define the Proposed Development form the basis of this assessment:

- **Chapter 01** (Introduction).
- **Chapter 02** (Description of the Proposed Development).
- **Figures F6.1** to **F6.6** (Volume 3).
- **Appendix A6.3**: Flood Risk Assessment (Volume 4).

6.4.2 Study Area

The study area for water receptors encompasses the entire area within the Site, and water features within a 2 km radius. The study area is considered appropriate to identify water environment receptors that could reasonably be affected and to take account of potentially significant impacts which could arise a greater distance away, *i.e.*, groundwater dependent designated sites, which could be hydraulically connected over an extended distance to groundwater beneath the Site (NRA, 2009).

6.4.3 Determination of the Baseline Environment

The baseline water environment within the study area for water receptors has been determined from desktop review and site studies / investigations, as follows:

- Ordnance Survey Ireland (OSI) website for historical maps of 1:2,500 scale and 1:10,560 scale and aerial photographs.
- OSI Discovery series of 1:50,000 scale.
- Geological Survey of Ireland (GSI) online map viewer: www.gsi.ie/mapping [accessed February 2024].
- EPA Maps online map viewer: https://gis.epa.ie/EPAMaps/ [accessed February 2024].
- EPA Catchments online map viewer: www.catchments.ie [accessed February 2024].
- EPA Hydronet online map viewer: https://epawebapp.epa.ie/hydronet/ [accessed February 2024].
- National Parks and Wildlife Service (NPWS) designated sites and protected areas online map viewer: www.npws.ie/mapping [accessed October 2023].
- Wetland Surveys Ireland wetland inventory online map viewer: www.wetlandsurveys.ie [accessed February 2024].
- GeoHive historic maps online map viewer: https://webapps.geohive.ie/mapviewer/index.html [accessed February 2024].
- Fluvial and Coastal Flood information mapping from the Catchment Flood Risk Assessment and Management Program (CFRAM) (OPW, 2023): https://www.floodinfo.ie [accessed February 2024].

- AECOM (2020). Groundwater and Surface Water Monitoring Report, Shannon LNG site, Tarbert, Co. Kerry, Ireland, report Ref PR-452891_ACM_RP_EN_002B0 Rev 0 dated 03 August 2021.
- Shannon LNG Terminal On shore Ground Investigation Interpretive report C1676.30 Issue 2 Arup. Dated January 2010 (reports 2006 ground investigation data).
- Office of Public Works (OPW) National Flood Hazard Mapping and Management Information (www.floodinfo.ie).
- Shannon LNG Environmental Impact Statement (EIS) (2007) plus appendices, Arup Consulting Engineers for Shannon LNG Limited. September 2007 (particularly Appendix 15.1 'Hydrological and Hydrogeological Impact Assessment of the Proposed Shannon LNG (Liquid Natural Gas) Terminal Development at Ballylongford, Co. Kerry', Minerex Environmental Limited (MEL), 2007).
- Shannon LNG CHP Plant Environmental Impact Statement (EIS) (2012) plus appendices, Arup Consulting Engineers for Shannon LNG Limited. December 2012.

6.4.4 Impact Assessment Methodology

A qualitative assessment of the likely significant effects on the water environment has been undertaken, using the source-pathway-receptor approach. For an impact on the water environment to exist, the following is required:

- An impact source (such as the release of polluting chemicals, particulate matter, or biological materials that cause harm or discomfort to humans or other living organisms, or the loss or damage to all or part of a waterbody).
- A receptor that is sensitive to that impact *(i.e.*, waterbodies and the services they support).
- A pathway by which the two are linked.

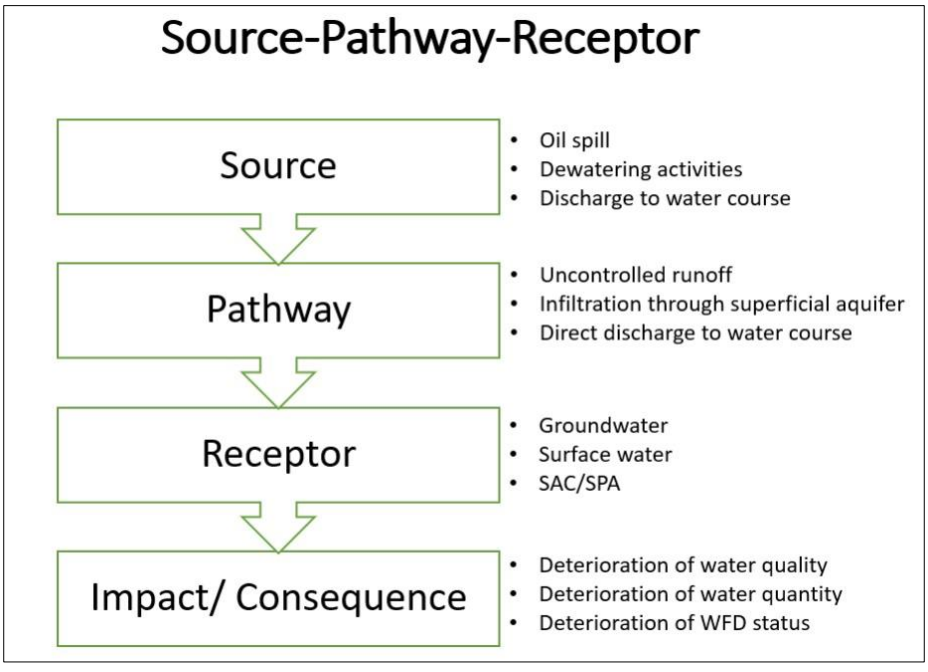

Plate 6.1: Source-Pathway-Receptor Model

The first stage in applying the Source-Pathway-Receptor model is to identify the causes or 'sources' of potential impact from a proposed development. The sources have been identified through a review of the details of the Proposed Development, including the size and nature of the development, proposed construction methodologies and timescales. The next step in the model is to undertake a review of the potential receptors, that is, the water environment receptors that have the potential to be affected.

The last stage of the model is, therefore, to determine if there is a viable exposure pathway or a 'mechanism' linking the source to the receptor. This has been undertaken in the context of local conditions relative to the water receptors within the study area, such as topography, geology, climatic conditions and the nature of the impact (e.g., the mobility of a liquid pollutant or the proximity to works that may physically impact a waterbody).

The assessment of the likely significant effects is qualitative and considers construction, operational and decommissioning phases, as well as cumulative effects with other developments. This assessment has considered the risk of pollution to surface waterbodies and groundwater directly and indirectly from construction activities, particularly in relation to those water features which are within or close to the Site. The risk of pollution from runoff from the built environment has also been considered so that appropriate measures can be incorporated into the design of the Proposed Development.

6.4.5 Flood Risk Assessment (FRA)

A site-specific Flood Risk Assessment (FRA) is provided in **Appendix A6.3**, Volume 4 which assesses flood risk for the Site. Refer to the Flood Risk and Drainage Assessment for a full description of the flood risk baseline, which is also summarised in **Section 6.5.2.7** of this chapter.

6.4.6 Determination of Sensitive Receptors

When undertaking the impact assessment following the source-pathway-receptor process, the following has been considered:

- Considering the existing (baseline) status of the water environment within the Site and relevant surrounds with respect to surface water, groundwater and flood risk.
- Identifying likely impacts of the Proposed Development on the water environment during the operational, construction and decommissioning phases, based on a source-pathway-receptor approach.
- Proposing suitable mitigation measures to be incorporated into the development design, construction and operation to offset any adverse impacts (i.e., embedded mitigation).
- Reviewing any residual impacts and presenting additional mitigation measures to limit their impacts should these be required.

A qualitative assessment has been used to assign a sensitivity rating from negligible to high, based on the EPA's EIAR guidance (EPA, 2022), and considers their likely adaptability, tolerance, and recoverability, as well as their designation. In the absence of specific criteria for rating sensitivity in the 2022 EIAR guidance, the criteria from the NRA's *Guidelines on Procedures for Assessment Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes* (NRA, 2009) have been used and are presented in **Table 6.1**.

Table 6.1: Receptor Sensitivity / Importance

Sensitivity / Importance	Description	Example
Extremely High	Attribute has a high quality or value on international scale or protected by EU legislation.	River, groundwater body, Surface Water Dependent Ecosystem (SWDE) or Groundwater Dependent Terrestrial Ecosystems (GWDTE) of Special Area of Conservation (SAC) or Special Protection Area (SPA) status.
Very High	Attribute has a high quality or value on regional or national scale.	River, groundwater body, SWDE or GWDTE of Natural Heritage Area (NHA) status, regionally important aquifer or public water supply, active continuous hydrometric station, Quality Class A (Biotic Index Q4, Q5).
High	Attribute has a high quality or value on local scale.	SWDE or GWDTE of county importance, locally important aquifer or potable water supply, Quality Class B (Biotic Index Q3-4).
Medium	Attribute has a medium quality or value on local scale.	SWDE or GWDTE of local importance, local potable water supply, Quality Class C (Biotic Index Q3, Q2-3).
Low	Attribute has a low quality or value on a local scale.	Local water supply used for domestic / agricultural purposes, Quality Class D (Biotic Index Q2, Q1).

6.4.7 Magnitude of Impact

The magnitude of impact has been assigned based on the EPA 2022 EIAR guidance, taking into account the likelihood of the impact occurring. The likelihood of an impact occurring is based on a scale of certain, likely or unlikely. Likelihood has been considered in the case of the assessment of potential impacts to waterbodies only, as likelihood is inherently included within the FRA. In the absence of specific criteria for description of magnitude of impact in the 2022 EIAR guidance, the criteria from Box 5.2 and Box 5.3 of NRA's *Guidelines on Procedures for Assessment Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes* (NRA, 2009) has been used and are presented in **Table 6.2**. It should be noted the control measures, as outlined in **Chapter 02** (Description of the Proposed Development), have been considered embedded in the project design and their application has been assumed in determining the significance of the impact. Mitigation measures will be devised for each potential complete pollutant linkage (comprising a source, pathway and receptor), no matter how significant the impact. Additional mitigation measures have then been considered prior to determination of residual impacts.

Table 6.2: Magnitude of Impact Rating (NRA, 2009)

Impact Level	Description	Typical example
Large adverse	Results in loss of attribute and / or quality and integrity of attribute.	**Hydrogeology** • Removal of large proportion of aquifer. • Changes to aquifer or unsaturated zone resulting in extensive change to existing water supply springs and wells, river baseflow or ecosystems. • Potential high risk of pollution to groundwater from routine runoff. • Calculated risk of serious pollution incident >2% annually. **Hydrology** • Loss or extensive change to a waterbody or water dependent habitat. • Increase in predicted peak flood level >100 mm. • Extensive loss of fishery. • Calculated risk of serious pollution incident >2% annually. • Extensive reduction in amenity value.

Impact Level	Description	Typical example
Moderate adverse	Results in impact on integrity of attribute or loss of part of attribute.	**Hydrogeology** • Removal of moderate proportion of aquifer. • Changes to aquifer or unsaturated zone resulting in moderate change to existing water supply springs and wells, river baseflow or ecosystems. • Potential medium risk of pollution to groundwater from routine runoff. • Calculated risk of serious pollution incident >1% annually. **Hydrology** • Increase in predicted peak flood level >50 mm. • Partial loss of fishery. • Calculated risk of serious pollution incident >1% annually. • Partial reduction in amenity value.
Small adverse	Results in minor impact on integrity of attribute or loss of small part of attribute.	**Hydrogeology** • Removal of small proportion of aquifer. • Changes to aquifer or unsaturated zone resulting in minor change to water supply springs and wells, river baseflow or ecosystems. • Potential low risk of pollution to groundwater from routine runoff. • Calculated risk of serious pollution incident >0.5% annually. **Hydrology** • Increase in predicted peak flood level >10 mm. • Minor loss of fishery. • Calculated risk of serious pollution incident >0.5% annually. • Slight reduction in amenity value.
Imperceptible	Results in an impact on attribute but of insufficient magnitude to affect either use or integrity.	**Hydrogeology** • Calculated risk of serious pollution incident <0.5% annually. **Hydrology** • Negligible change in predicted peak flood level. • Calculated risk of serious pollution incident <0.5% annually.

6.4.8 Describing Potential Impacts

The methodology used for describing the potential impacts considers the "quality" of the impacts (*i.e.,* whether it is adverse or beneficial), the "probability" of the event occurring and the "duration" of the impacts (*i.e.,* whether it is short or long-term) and a rating of negligible to high, as per the EPA Guidelines[1]. The description or magnitude of impact (**Table 6.2**) is then combined with the sensitivity rating of the receptor (**Table 6.1**) to determine the significance of the potential effect (**Table 6.3**).

Table 6.3: Effect Significance Ratings (NRA, 2009)

		Magnitude of Impact			
		Negligible	**Small**	**Moderate**	**Large**
Sensitivity / Importance of Attribute	**Extremely High**	Imperceptible	Significant	Profound	Profound
	Very High	Imperceptible	Significant / Moderate	Profound / Significant	Profound
	High	Imperceptible	Moderate / Slight	Significant / Moderate	Severe (Very significant) / Significant
	Medium	Imperceptible	Slight	Moderate	Significant
	Low	Imperceptible	Imperceptible	Slight	Slight / Moderate

[1] EPA (2022).

6.4.9 Limitations and General Assumptions

The assessment has been based on the description of the Proposed Development detailed within EIAR **Chapter 02** (Description of the Proposed Development).

Assumptions and limitations relating to flood risk are outlined in the 2024 Flood Risk Assessment, refer to **Appendix A6.3**, Volume 4.

Ground investigations have been undertaken at the Site and immediate surrounding area, and the details are presented in **Chapter 05** (Land, Soils & Geology) and in **Appendices A5.1** and **A5.2** and **Appendix A6.1**, Volume 4. These investigation reports were undertaken by third parties and AECOM takes no responsibility for the conclusions presented in those reports which were used to provide hydrological, hydrogeological and geotechnical recommendations for a previously proposed development on the Site.

While Construction Method Statements will be prepared by the Contractor when appointed, all works will take place using best practice, in accordance with the Construction Environmental Management Plan (CEMP), refer to **Appendix A2.3**, Volume 4.

The WFD Assessment (**Appendix A6.4**, Volume 4) was carried out by AquaFact in March 2024, and any potential changes to identified WFD receptors are considered in **Sections 6.6.1.5** and **6.6.2.5**.

6.5 Baseline Environment

6.5.1 Land Use, Topography and Rainfall

The Proposed Development will be located on the Shannon Estuary, approximately 4.5 km from Tarbert and 3.5 km from Ballylongford, Co. Kerry. The Site of the Proposed Development is 41 ha. The Proposed Development consists of a Combined Cycle Gas Turbine (CCGT) gas-powered Power Plant capable of up to 600 MW of electricity generation, 120 MWh (1-hr) battery energy storage system (BESS), Above Ground Installation (AGI), and associated plant, equipment and infrastructure including a substation. These buildings will principally take place in the north-eastern area of the Site, covering an area of approximately 14 ha. There will be an access road leading south from this area to join the L1010 road.

The Site is located on agricultural land, predominantly as pastureland though there is tillage (barley) reported to the south and west of the Proposed Development. There are no currently occupied buildings onsite, refer to **Figure F2.1** for the Site location and **Figure F2.2** for Site layout, Volume 3.

The Site (excluding the access road) will consist of a constructed platform between Knockfinglas Point and Ardmore Point at elevation of 18m above Ordnance Datum (m OD).

The topography on the north-eastern side of Knockfinglas Point consists of a number of fields sloping towards the north-east from 14 m to <5 m towards the coast, where there is a low cliff, typically 2 m to 5 m in height composed of glacial till subsoils and exposed bedrock, above a tidal rock or shingle coastline. No construction on the foreshore is proposed in this area other than the outfall structure.

The preconstruction topography in the north-eastern area, where it is proposed that the Power Plant will be constructed, consists of a undulating hillside, sloping downward to the north towards the coastline and varying in elevation from 30 m to 35 m OD along its southern boundary to 5 m to 11 m OD at the northern edge, where there is a low cliff, typically 2 m to 5 m in height and composed of glacial till

subsoils and exposed bedrock, above a tidal rock or shingle coastline. This is in line with the topography of the surrounding area, which slopes gently towards the coast.

Ground level contours indicate localised surface gradients at a maximum of approximately 1 in 20, towards the north, in the north-east area of the Site.

The access road in the southern part of the Proposed Development will join the L1010 road.

The surrounding land use is characterised by very sparsely populated farmland with one-off residential properties and farmhouses. Refer to **Chapter 05** (Land, Soils & Geology) for more detail.

The closest Met Éireann weather observing station to the Site with available historical data is located at Tarbert (Kilpadogue) (Station No. 7111), at approximately 4.6 km to the south-east. This station has been operational since 2021. The next closest is Ballyhahill (Glenbawn) (Station No.6311) at Glenbawn located 13 km south-east of the Site and which has been operational since 2000. **Plate 6.2** shows the available long-term average monthly rainfall data for 2000-2020 from Ballyhahill (Glenbawn) and average wet days per month and also the 2022 monthly rainfall for Tarbert weather station. The long-term average (LTA) annual rainfall (2000-2020) is 1,498.7 mm. According to Met Éireann, most of the eastern half of the country gets between 750 and 1,000 mm of rainfall in a year, while rainfall in the west generally averages between 1,000 and 1,400 mm. The LTA annual rainfall for Ballyhahill is therefore just above the range for the west. The datasets show that monthly rainfall is generally lower in the spring months and wetter in the summer / autumn months.

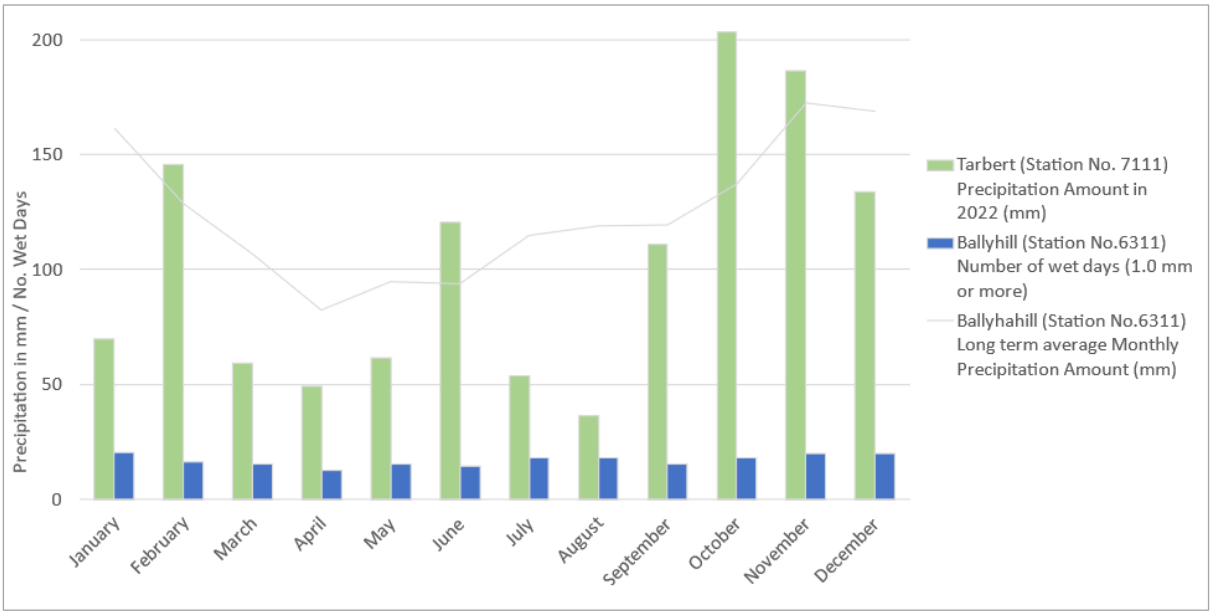

Plate 6.2: Rainfall data for Tarbert area

Source: Met Éireann, 2024.

6.5.2 Hydrology

The description of the baseline condition of the surface water environment and the identification of hydrological receptors with the potential to be impacted by the Proposed Development, focuses on the following constraint types:

- Surface waterbodies, and associated water quality and hydromorphology.

- WFD river sub basins.
- Surface water abstraction / monitoring / discharge points.
- Designated sites with surface water dependent habitats or species.
- Surface water flood risk areas.

6.5.2.1 Surface Waterbodies

Regionally, the Site lies at the western end of the Shannon Estuary South hydrometric area. The Site lies within the Astee_West sub catchment of the Shannon Estuary South (WFD sub catchment name Astee_West_SC_010) and is bordered by the Lower Shannon Estuary WFD transitional waterbody (IE_SH_060_0300) to the north.

There is one EPA mapped river waterbody within the red line boundary of the Site and is named Ralappane_010. Approximately 1 km west of the Site, the short (<1 km) Reenturk stream (IE_SH_24R300270, EPA name Ralappane_010) rises at a spring and flows generally west to enter the Lower Shannon Estuary.

The Ballyline River (IE_SH_24B030700, EPA name Ballylongford_020) is the principal surface waterbody to the west of the Site. The Ballyline River rises on higher ground approximately 6 km south of Ballylongford and flows in a northerly direction, joined by tributaries from east and west, and enters the Shannon Estuary north of Ballylongford (IE_SH_24B030860, EPA name Ballylongford_030).

To the east of the Site, the Doonard Lower watercourse (IE_SH_24T010100, EPA name Tarbert_010) flows towards the north-east and enters the Shannon Estuary at Tarbert. At its closest point it is approximately 1.8 km from the south of the Site and 380 m south of the source of the Ralappane River to the south-east of the Site.

Between Ardmore Point and Tarbert the short (<1km) Farranwana stream (IE_SH_24R300270, EPA name Ralappane_010) flows north to the Lower Shannon Estuary.

The major river in this catchment is the Deel (IE_SH_24D021400. The overall Shannon Estuary South catchment encompasses an area of approximately 2,033 km^2.

Local and regional surface water features within the study area are shown on **Figure F6.1** and **F6.4** respectively. **Table 6.4** summarises the WFD status of each of the identified surface waterbodies.

Table 6.4: WFD Surface Waterbodies

WFD Waterbody	Waterbody name	WFD ID	WFD STATUS (2016-2021)	WFD AT RISK STATUS (3RD CYCLE) [2]
Ralappane_010	Ralappane, Farranawana & Reenturk	IE_SH_24R300270	Moderate	Review
Ballylongford_030	Ballyline River	IE_SH_24B030860	Good	Review
Tarbert_010	Doonard Lower associated tributaries	IE_SH_24T010100	Moderate	At risk

[2] For waterbodies that are 'At Risk' of not meeting their WFD objectives, a significant pressure will have been identified. For waterbodies that are categorised as 'Review', additional information is needed to determine their status before resources and more targeted measures are initiated or the measures have been undertaken, e.g. a wastewater treatment plant upgrade, but the outcome hasn't yet been measured / monitored. For waterbodies that are 'Not at Risk' and therefore are meeting their WFD objectives (EPA, 2023).

WFD Waterbody	Waterbody name	WFD ID	WFD STATUS (2016-2021)	WFD AT RISK STATUS (3RD CYCLE) [2]
Lower Shannon Estuary	Shannon Estuary	IE_SH_060_0300	Good	Not at risk

Source: EPA, 2024

6.5.2.2 Regional Surface Water Quality

The EPA Quality Rating (Q-value) System has been used to indicate the ecological quality of streams and rivers based on biotic index in Ireland since 1971. River water quality has been provided by the EPA for the Ballyline River (IE_SH_24B030700, EPA name Ballylongford_020), south-west of the Site and Doonard Lower, to the east (IE_SH_24T010100, EPA name Tarbert_010). The EPA[3] has classified the river water quality for the Ballyline River in 2023, at the Gortanacooka Br station (RS24B030700) as Q 3-4 (Moderate). River water quality for the Doonard Lower has been classified as Q 3 (Poor), based on 2023 data for the West Br in Tarbert station (RS24T010100).

There is no EPA surface water quality data available for the Ralappane Stream (D1 stream) (IE_SH_24R300270) adjacent to the Site. A biological assessment of the Ralappane Stream was undertaken as part of the 2021 EIAR and determined that the stream was Q3 (Poor), refer to **Appendix A7B.4**, Volume 4.

Transitional Water Quality data for the Lower Shannon Estuary (IE_SH_060_0300) for the period 2018 - 2020 indicated the estuary to be classified as Unpolluted.

Table 6.5: EPA Latest River Q Values

WFD Waterbody	Waterbody name	WFD ID	Latest river Q value (status)	Year
Ballylongford_020	Ballyline River	IE_SH_24B030700	3-4 (Moderate)	2023
Tarbert_010	Lower Doonard	IE_SH_24T010100	3 (Poor)	2023

Source: EPA, 2024

6.5.2.3 WFD River Basins

The WFD was transposed into Irish Legislation by the European Communities (Water Policy) Regulations 2003, (S.I. No. 722 of 2003) on 22nd December 2003. This legislation established the River Basin Districts (RBDs) and provides support for the protection of the status of all waters. River sub basins are a management and reporting unit for the WFD. The Site falls within the Shannon Estuary South catchment 24, WFD Sub catchment ASTEE_WEST_SC_010 and River Sub Basin Ralappane_010.

6.5.2.4 Surface Water Flows

There are no river flow estimates for rivers within the immediate vicinity of the Proposed Development, however there are river flow estimates generated by the EPA's Hydrotool[4] available for the nearby Tarbert_010 river waterbody, and Ballylongford_030 river waterbody, located 4.6 km south-east, and

[3] Available at: RiverQValue (epa.ie) [Date accessed: 14/02/2024]
[4] The EPA's Hydrotool is a dataset of naturalised river flow duration percentiles for Irish rivers that will enable assessment of quantitative impacts relating to hydrological alterations. The flow estimates represent flows that could be expected in rivers under naturalised conditions and do not take account of artificial influences of any kind such as water supply abstractions or wastewater discharges.

3.6 km south-west of the Proposed Development, respectively. The following table summarises this data.

Table 6.6: EPA Hydrotool River Flow Estimates

WFD Waterbody	River Segment ID	Naturalised Flow Estimates (m^3/s)		
		Q10	Q50	Q95
Tarbert_010	24_1610	0.376	0.107	0.024
Ballylongford_030	24_1612	2.938	0.529	0.067

***No data available for the Ralappane_010 watercourse.*

Source: EPA, 2024

6.5.2.5 Surface Water Abstraction / Monitoring / Discharge Points

The Ralappane_010 and Tarbert_010 surface waterbodies are not designated as drinking water rivers and therefore there are no known surface water abstraction locations within the area.

There are two national surface water monitoring points RALAPPANE - Interstitial, Br East of Carhoonakilla (RS24R300270) and Lower Shannon Estuary ambient d/s TPEFF1300D0459SW001 (TW36004123SN3001), located 1.5 km south-east and 2.5 km south-west, respectively.

It is also understood that ESB Moneypoint, located approximately 2.4 km to the north, discharges cooling water to the Shannon Estuary under an IE licence.

There are no Section 4 (of the Local Government (Water Pollution) Act 1977, as amended) discharges recorded onsite, based on EPA Maps online map viewer [accessed February 2024]. The nearest Section 4 Discharge is located at 4.8 km north-west, across the estuary at Killimer Dock Local Authority (LA) Reference No WP085.

6.5.2.6 Designated Sites with Surface Water Dependent Habitats or Species

There are a number of designated marine conservation areas located in the vicinity of the Proposed Development. These include:

- Lower River Shannon Special Area of Conservation (SAC), Site Code 002165.
- Ballylongford Bay proposed Natural Heritage Area (pNHA), Site Code 1332.
- River Shannon and River Fergus Estuaries Special Protection Area (SPA), Site Code 004077.

The Site is bordered by the Lower River Shannon Special Area of Conservation (SAC) (site code 002165) and the River Shannon and River Fergus Estuaries Special Protection Area (SPA) (site code 004077), refer to **Chapter 07A** (Marine Ecology). The SAC includes numerous Annex I protected habitats and species, including surface water dependent ecosystems (SWDE) such as intertidal flats and supports a diverse macro-invertebrate community. The SPA is designated for wintering birds, and therefore the qualifying interests are not considered relevant to this study and the SPA site has been scoped out of this assessment.

The Site is located approximately 1 km east of Ballylongford Bay, a proposed Natural Heritage Area (pNHA). Ballylongford Bay consists of a brackish lagoon and areas of reed beds, where large concentrations of waterfowl feed on the mudflats. They are likely to be considered an SWDE and has been included in this assessment.

6.5.2.7 Flood Risk Assessment (FRA)

A site-specific FRA has been prepared for the Site, refer to **Appendix A6.3**, Volume 4. A brief summary of the baseline flood risk assessment from the site-specific FRA is provided in this section.

The FRA for the Site was undertaken in accordance with the requirements of "*The Planning System and Flood Risk Management – Guidelines for Planning Authorities"* (DHLGH, 2009) to demonstrate that the Proposed Development will:

- Not increase flood risk elsewhere and, if practical, will reduce overall flood risk.
- Include measures to minimise flood risk to people, property, the economy, and the environment as far as reasonably possible.
- Include measures to ensure that residual risks to the area and / or development can be managed to an acceptable level.

The information collated during Stage 1 – Flood Risk Identification and the subsequent Stage 2 – Initial Flood Risk Assessment was insufficient to assess the potential flood risk to the proposed Site. The proposals have been classified as 'Highly Vulnerable Development' and therefore their construction within either Flood Zone 'A' or Flood Zone 'B' require the justification test to be passed.

The Stage 3 – Detailed Flood Risk Assessment involved the construction of a linked 1D-2D hydraulic model using Infoworks ICM modelling software based on hydrographic and topographic survey information. Fluvial flow estimation was undertaken for the 50%, 1% and 0.1% AEP events along with tidal level estimation for the 50%, 0.5% and 0.1% AEP events. Climate Change flows and levels were also derived for the MRFS and HEFS in line with current OPW guidance. These flows and levels were subsequently applied to the model to obtain flood extents and levels. Both a baseline and proposed model were developed.

The model results showed that circa 400 m at the downstream end of the model is tidally influenced with a sizeable area liable to tidal flooding. A limited degree of fluvial flooding is present and limited to an area near and beyond the upstream Site boundary. The extents of Flood Zone 'A' and Flood Zone 'B' have been determined based on the baseline model outputs.

With the exception of crossings of the watercourses for access there is no development proposed within either Flood Zone 'A' or Flood Zone 'B' and therefore the Proposed Development has a **Negligible** impact on the existing flood regime in the area. Given no development within either flood zone the proposals are therefore seen to pass the justification test.

The proposed crossings of the watercourses have been adequately sized to have a minimal impact on the current hydraulic regime in the area. They also provide an adequate freeboard in accordance with current OPW guidelines for the 1% MRFS AEP fluvial event which would be seen as an acceptable design flow event for culverts.

6.5.2.8 Existing Drainage, Discharges, and Monitoring

The Site is currently drained by a number of shallow drainage channels which are not clearly visible on satellite imagery. These drainage features are found across the southern portion of the Site, generally flowing in a west or north-west direction, refer to **Appendices A6.1** and **A6.2**, Volume 4. The drainage features along the access road all ultimately drain to a single surface water course, the Ralappane_010

Stream (River Waterbody Code IE_SH_24R300270 EPA code 24R30, WFD status reported by EPA as 'Moderate' (EPA, 2021), see also **Section 6.5.2.3**, details for this can be seen in **Table 6.7**.

Table 6.7: Nomenclature for Ditches in the Proposed Development

Name	ID	Description
Ralappane_010	D1	Ralappane_010 WFD watercourse, rising in the south-east flowing north-west before discharging into the Lower Shannon Estuary
Unnamed ditch	D2	Approximately 750m in length, extending west through the proposed development before draining into the Ralappane_010 WFD watercourse.
Unnamed ditch	D3	Approximately 500m in length extending through the southern reach of the proposed development before discharging into the Ralappane_010 WFD watercourse.
Unnamed ditch	D4	Approximately 250m in length extending through the west region of the proposed development before discharging into D2.
Unnamed ditch	D5	Approximately 100m in length extending through the west region of the proposed development before discharging into D2.

The Ralappane_010 Stream flows in a north-west direction towards the coast close to, but beyond, the western boundary of the Site and through a key coastal wetland area, which is part of both the Lower River Shannon SAC and the Ballylongford pNHA, before discharging to the Shannon Estuary on the southwest side of Knockfinglas Point via a modified channel, refer to Photograph 1 in **Appendix A6.1**, Volume 4.

The north-eastern and north-western areas of the Site are composed of poorly-drained soils and showed development of waterlogged areas and reed growth at several locations under winter 2020 conditions, refer to **Figure F6.1** and Photographs 2 and 18 in **Appendix A6.2**, Volume 4.

Along the access road in the south of the Proposed Development, soils appear better drained (Photograph 1 in **Appendix A6.2**), except where the proposed road crosses existing drainage features, near surface water sampling locations found along watercourses D1, D2 and D3, as named in **Table 6.7**.

6.5.3 Hydrogeology

The description of the baseline condition of the groundwater environment and identification of hydrogeological receptors with the potential to be impacted by the Proposed Development, focuses on the following constraint types:

- Aquifers, and associated water quality, levels, and flows.
- WFD groundwater bodies.
- Groundwater abstraction / monitoring points / discharges.
- Karst landforms and traced underground connections.
- Groundwater dependent terrestrial ecosystems (GWDTEs).
- Areas of groundwater flood risk.

6.5.3.1 Aquifers and Groundwater Conditions

The baseline superficial deposits and bedrock geology are detailed in **Chapter 05** (Land, Soils & Geology). A summary of the mapped geology, aquifer classifications, groundwater vulnerability and subsoil permeability beneath the Site is provided (GSI, 2024) (refer to **Figures F6.5** and F**6.6**, Volume 3):

- The Site is underlain by superficial deposits mapped as tills derived from Namurian sandstones and shales (TNSSs). Alluvium deposits are also mapped to the west associated with the Ralappane Stream. These deposits are not mapped as being an aquifer but are considered likely to act as a pathway to the underlying bedrock aquifer.
- No evidence of excavation, filling or waste disposal at the Site was observed by AECOM during the December 2020 Site walkover or the site assessment works completed during the groundwater and surface water sampling in February 2020. It is understood that there has been no change to the Site since this walkover.
- The Site is underlain by bedrock mapped as the Shannon Formation. This consists of a sequence of Namurian mudstone, siltstone, and sandstone. This formation is mapped as being a locally important aquifer, bedrock which is moderately productive only in local zones (Ll).
- The National Draft Gravel Aquifer Map does not indicate a gravel aquifer under the Site or in the study area. No extensive clean sands or gravels with resource potential were encountered during the 2006-2007 intrusive Site investigation.
- The inferred groundwater flow direction within both the overburden / subsoil and the bedrock unit beneath the Site is to the north or north-west in line with the regional gradient, while that beneath the access road is towards the west or southwest towards the wetland areas and the Ralappane Stream (D1 stream).
- The subsoil permeability on the Site is mapped to be low.
- The groundwater vulnerability onsite is mapped as being Moderate, High and Extreme (E & I).
- Well yields in the Tarbert area are generally classified as Poor to Moderate (<100 m^3/d) by GSI [5], but with one ‘Good’ well yield recorded at the former Tarbert Creamery site.

There have been historic ground investigations (GI) undertaken on the Site during 2006 and 2007 (refer to **Chapter 05** (Land, Soils & Geology) and **Appendices A5.1** and **A5.2** and **Appendix A6.1**, Volume 4). These investigations are considered relevant to contribute to baseline assessment data. It is noted that the site has remained in agricultural use since these investigations were undertaken. There was no evidence of likely contamination reported following the 2020 site walkover and groundwater sampling by AECOM staff. There have not been any significant activities such as major construction works, major excavation works or the creation of a quarry post-2007, therefore the soil and geology data collected as part of these investigations are considered to be representative of current geological conditions.

A summary of the information from these investigations is provided below:

- The cored bores drilled in 2006 (Arup, 2010) in the north-eastern area logged the Shannon Group bedrock as fine-grained sandstones interbedded with argillaceous (siltstone and mudstone) bands, with unweathered bedrock showing variable fracture spacing depending on borehole location and with the rock being interpreted as strong and as medium to occasionally thickly bedded (0.1 m to 0.3 m thick sandstone / siltstone beds).

[5] GSI well yields are classified as Excellent = >400m^3/ day, Good = 100-400m^3/day, Moderate = 40-100m^3/day and Poor = <40m^3/day (GSI Groundwater Well and Spring Data - Datasets - data.gov.ie)

- Depth to bedrock at the Site varies from 0.5 m below ground level (bgl) (BH20) to 8 m bgl (BR-6). Bedrock underlying the main construction area in the north-west of the Proposed Development is generally between 1 m and 5 m bgl.
- Bedrock at the Site is generally unweathered below approximately 10 m - 14 m bgl (MEL, 2007). Below this depth, the bedrock is generally dark grey, very dense and with few, tight fractures. Borehole BR-1 is an exception to this and is reported to show deeper weathering and more extensive fracturing. The drilling logs for boreholes RC/ BR03, RC04, RC/ BR05, RC07, RC08, RC/ BR12, RC/ BR13, RC/ BR14, RC16, RC/ BR19 and RC/ BR20 show iron-staining on bedrock fracture surfaces, suggesting some groundwater movement within this unit.
- The upper few metres of bedrock are noted to be more weathered, typically 2 m - 3 m thick, where present (Arup, 2007), having a brownish grey colour and being more extensively fractured along bedding planes and joints. Groundwater strikes were generally encountered within this more open and permeable weathered rock horizon and were artesian in places, particularly in the lower-lying, poorly-drained area between the proposed Power Plant and Knockfinglas Point, due to the overlying low permeability tills acting as a confining layer.
- Borehole BR-1, adjacent to Ralappane Stream and a low lying waterlogged area in the very south of the Proposed Development, showed a high degree of weathered bedrock and both this weathering and the high water table may indicate faulting and groundwater discharge along the east-west alignment of the Ralappane Stream (D1 stream) in this area, which is not in the same orientation as both the main north-west to southeast Ralappane Stream (D1 stream) alignment downstream and the coincident mapped F1 bedrock Fault (MEL, 2007).

AECOM acquired measurements and / or samples at the pre-existing groundwater wells and surface water monitoring locations within the Site in February 2020 to confirm and supplement the earlier datasets, map piezometric contours and hydraulic gradients and assess hydrochemistry, refer to **Figures F6.2** and **F6.3**, Volume 3.

Not all monitoring locations were found in February 2020 - no trace remains of well RC/ BH10, no staff gauges remain at MEL surface water locations D3-FG-SW2 or D1-SW-FG-SG1 and several wells show damage to the well headworks and / or standpipes, likely due to livestock presence (notably BH14, BH19, BR-01 and BR-11 – **Appendix A6.2**, Volume 4), however the new data acquired in 2020 support the findings of the previous MEL study.

A WFD assessment referred to in this chapter was completed by AquaFact in March 2024 and is described in **Appendix A6.4**, Volume 4.

A 150 mm diameter 10 m deep bedrock well, PW01, installed in 2006, was located in an inferred bedrock fracture zone as a potential groundwater supply well for the then-proposed development, however a 28.6 hour pumping test from the 5.4m bedrock section of the bore indicated a low bedrock permeability (reported as 1.05×10^{-5} m/s) and the well was estimated to have a long term yield of <1 L/s (litre per second), which was insufficient for the requirements of the proposed 2007 development (Arup, 2007). A 3 m drawdown was noted in well RC/ BH23, approximately 75 m to the north-east of PW01, during

the PW01 pumping test, indicating good connectivity but poor storativity within the bedrock fracture network at the Site.

Packer testing of site investigation boreholes at a site just west of the Proposed Development also reported low bedrock permeabilities (1 x10^{-6} m/s to 2.1 x10^{-6} m/s) (Arup, 2012).

6.5.3.2 Groundwater Quality

Groundwater field readings of the unstable parameters pH, electrical conductivity (EC), temperature and redox potential were taken during the February 2020 sampling event. These parameters were all within the applicable statutory GTV ranges for groundwaters and are consistent with groundwater in a non-carbonate, non-saline aquifer (pH ranged from 6.27 to 8.75 pH units, EC ranged 201 to 553 microSiemens per centimetre, temperature 10.2 to 11.31 ^{o}C and redox ranged 142 to 369 milliVolts).

Groundwater analytical data was screened against generic assessment criteria (GAC) for a future commercial end use of the Site and within the context of the site environmental setting. Constituent concentrations were deemed ‘potentially significant’ if they exceeded the ‘generic’ values, which is an approach consistent with the principles of human health protection in Irish EPA, UK DEFRA and UK Environment Agency guidance.

None of the groundwater parameters analysed exceeded surface water EQSs (European Union Environmental Objectives Regulations 2015, S.I. No. 386 of 2015), however there were exceedances of the other applicable environmental standards or guidance for certain parameters.

The analytical results indicated that background groundwater conditions at the Site are locally impacted by some minor water quality issues:

Petroleum-range hydrocarbons were detected in 2020, between 10 to 100 times the IGV and / or GTV guidance in wells BH05, BH19 and BH20 in the north of the Site and in well BR-11 in the west of the Site. No evidence of fuel hydrocarbon use or storage was observed on the Site, therefore hydrocarbons in groundwater may either originate offsite (potentially related to fuel storage, road runoff or machinery maintenance) and migrate onto site via groundwater flow or be derived from breakdown and decay of organic material in vegetated, waterlogged areas of the Site and surroundings.

Dissolved iron and manganese exceed the DWS and IGV at numerous locations in groundwater; however, water at these locations is not used for potable purposes and the IGV is non-statutory guidance in relation to groundwaters. The most elevated dissolved iron and manganese results are associated with wells BH20 and BR-11, which also show the most elevated hydrocarbon results, suggesting that these most elevated dissolved iron and manganese results in groundwater are related to dissolution of iron and manganese from aquifer materials under anaerobic groundwater conditions resulting from biodegradation of the hydrocarbons in the environment.

Sodium concentrations in groundwater and surface water are all less than 60 mg/l and generally less than 30 mg/l, so do not indicate that salinity is a significant impact on groundwater quality at the Site, despite the site’s proximity to the estuary.

Other inorganic parameters (nitrate, phosphate, chloride, sulphate, alkalinity and total organic carbon) in groundwater were generally typical of surface waters in rural, coastal settings. Groundwater samples generally showed elevated phosphate concentrations (which exceeded the GTV by a factor of up to 4) and chloride concentrations (which exceeded either the GTV or IGV by a factor of up to 7 and reflect

the site's marine coastal setting), but none of these inorganic parameters analysed in groundwater exceeded the DWS.

More information on the geology and contamination encountered during the historic GI is included in **Chapter 05** (Land, Soils & Geology).

6.5.3.3 WFD groundwater Bodies

The Site is located within the Ballylongford WFD groundwater body (GWB) (IE_SH_G_030). The most recent WFD status (2016-2021) was reported as 'Good' overall, with 'Good' for both chemical and quantitative categories. In the WFD 3rd Cycle of risk classification, the Ballylongford groundwater body was classified as 'Not at Risk' with respect to meeting 2028 WFD targets (EPA website, 2024).

A WFD undertaken in March 2024 by Aquafact concluded that the activities associated with the construction and operation of the Proposed Development will have no permanent impacts on the condition of the Ralappane river waterbody or indirectly affect measures put in place to achieve the environmental objectives of the WFD for this waterbody (see **Appendix A6.4**, Volume 4).

6.5.3.4 Groundwater Abstractions / Monitoring Points / Discharges

There are no groundwater abstractions within the red line boundary or within a 1 km radius. According to the GSI's National Well Database, the nearest mapped groundwater abstractions to the Site are as follows - it is unknown if any of these are active boreholes or are installed in the superficial deposits or bedrock, refer to **Figure F6.5**, Volume 3.

Table 6.8: Summary of Groundwater Abstractions within 2 km

Borehole ID	Owner	Proximity to site	Drilled Date and Depth	Yield (GSI yield class)	Use / other comments
0813NEW010	Unknown	Approx. 1 – 2 km	Drilled in 1970 to depth of 33.5m	26m^3/d (Poor)	Agri & domestic use
0813NEW019	Unknown	Approx. 1 – 2 km	Drilled in 1971 to depth of 33.5m	26m^3/d (Poor)	Agri & domestic use
0813NEW029	Unknown	Approx. 1 – 2 km	Drilled in 1959 to depth of 8.2m	8.7m^3/d (Good)	Agri & domestic use
0813NEW031	Unknown	Approx. 1 – 2 km	Drilled in 1962 to depth of 31.7m	15m^3/d (Poor)	Agri & domestic use

The MEL (2007) study identified two groundwater springs within the redline boundary of the Proposed Development. Two springs (named SP-SW4 and SP-SW5 in the 2007 study) are both located just west of the proposed construction phase car parking/ laydown area and both flow westward towards the D2 Stream, a minor stream / field drain on the Site which flows north-west and then turns south-west and joins the larger Ralappane Stream (D1 stream) outside the Site boundary, refer to **Figure F6.1,** Volume 3. These minor springs are not recorded on the GSI Wells and Springs database.

The nearest Source Protection Zone (SPZ) - delineated for the protection of drinking water supplies – is Glin PWS, mapped at over 11km to the south-east from the Site.

There is an EPA groundwater monitoring station, Glin (GWIE_SH_G_03036000011), located at approximately 11.3 km to the south-east of the Site (EPA Maps online web viewer, accessed February 2024). This station is not listed on the EPA's Hydronet viewer.

There are no discharges to groundwater permitted on-site.

6.5.3.5 Karst Landforms

There are no karst features mapped within the Site or within 2km of the Site (GSI, 2024).

6.5.3.6 Groundwater Dependent Terrestrial Ecosystems (GWDTE)

The Ballylongford GWB IE_SH_G_030 is classified as a groundwater body important for SAC species and habitats and SPA habitats (EPA Maps online web viewer, accessed February 2024).

The qualifying interests listed for the Lower Shannon Estuary SAC include several habitats which have the potential to be groundwater dependent (Working Group on Groundwater, 2004). These are Atlantic salt meadows [EU Code 1330], Mediterranean salt meadows [1410], Water courses of plain to montane levels, with the Ranunculion fluitantis and Callitricho-Batrachion vegetation [3260], Molinia Meadows [6410] and Alluvial forests [91E0] (NPWS, 2013).

The qualifying interests listed for the River Shannon and River Fergus Estuaries SPA do not include groundwater dependent habitats; and therefore, the SPA site is not considered to be a GWDTE and has been scoped out of this assessment.

The Site is directly adjacent to the Ballylongford Bay proposed Natural Heritage Area (pNHA) - Site Code 001332. The site includes the wetland area along the Ralappane Stream to the west of the Site, the adjacent heathland and the salt marsh further west of the site. This area is considered likely to be a GWDTE and has been included in this assessment.

6.5.3.7 Groundwater Flood Risk

According to the GSI's Groundwater Flooding Data Viewer, there are no areas of historic groundwater flooding within the study area. In addition, the soil permeability is low, therefore the Site is deemed to be at low risk.

6.5.4 Summary of Baseline Conditions

Table 6.9 provides a summary of the baseline conditions of the water environment and the sensitivity of each surface water and groundwater receptor identified.

Table 6.9: Summary of Water Environment Receptors and Baseline Condition

Attribute Type	Attribute Name	Location	Baseline Condition	Data Source	Attribute Importance / Sensitivity
Surface Water / Hydrology					
Transitional water bodies (and quality)	Lower Shannon Estuary (IE_SH_060_0300)	Surrounding the Site to the north, west, east and south-west.	Classified as unpolluted, with Good WFD status and Not at Risk (2021, most recent). Designated as SAC (of EU and international importance).	EPA Maps Viewer [Accessed February 2024]	**Extremely high**
Surface watercourses (and quality)	Tarbert_010 IE_SH_24T010100	Rises 2 km south-east of the Proposed Development.	Classified as Moderate WFD status and At Risk (2021, most recent). Hydromorphology status listed as unknown.	EPA Maps Viewer [Accessed February 2024]	**High**
	Ralappane_010 IE_SH_24R300270	Rises approximately 2 km south-east of the Site, flowing through the southern region of the Proposed Development and enters the Shannon Estuary 0.5 km west of the Site.	Classified as Moderate WFD status and Review (2021, most recent). Hydromorphology status listed as unknown.	EPA Maps Viewer [Accessed February 2024]	**High**
SWDEs / Designated sites	Lower River Shannon SAC	Surrounding the Site to the north, west, east and south-east.	Designated (or proposed) status. Contains wetland habitats as a qualifying interest and in a favourable conservation condition	NPWS Map Viewer [Accessed February 2024]	**Extremely high**
	Ballylongford Bay pNHA	Within approximately 1 km west of the Site.			**Very high**
Flood Risk	Site classified as a not Vulnerable	Within Site boundary	Assessment concluded that with the exception of crossings of the watercourses for the access road, there is no development proposed within either Flood Zone 'A' or Flood Zone 'B' and therefore the Proposed Development, including the excavations required for the power station platform, has a negligible impact on the existing flood regime in the area. The proposed crossings of the watercourses within the Site have been adequately sized to have a minimal impact on the existing hydraulic regime in the area to the Ralappane Stream.	FRA: **Appendix A6.3**	-
Groundwater / Hydrogeology					

Attribute Type	Attribute Name	Location	Baseline Condition	Data Source	Attribute Importance / Sensitivity
Superficial deposits	Till derived from Namurian sandstones and shales	Surrounding area.	Not designated as an aquifer by the GSI, considered likely to act as pathway to bedrock aquifer.	GSI Map Viewer [Accessed February 2024]	**Low** (Likely direct hydrogeological connection between site and nearby protected sites)
	Alluvium	Surrounding area.	Not designated as an aquifer by the GSI, considered likely to act as pathway to bedrock aquifer.	GSI Map Viewer [Accessed February 2024]	**Low** (Likely direct hydrogeological connection between site and nearby protected sites)
Bedrock	Shannon Group, undifferentiated	Underlying Site and surrounding area.	Locally important aquifer (Ll).	GSI Map Viewer [Accessed February 2024]	**Medium** (Likely direct hydrogeological connection between site and nearby protected sites)
Groundwater abstractions / supplies	Groundwater abstraction wells	Nearest at approx. 1 – 2 km m from Site.	Historical boreholes with reported Poor and Good well yields and used for agriculture and domestic / industrial purposes.	GSI Map Viewer [Accessed February 2024]	**Low**
WFD groundwater bodies (GWBs)	Ballylongford GWB	Underlying site and surrounding area.	Good WFD status and Not at Risk of not achieving good status.	GSI Map Viewer [Accessed February 2024]	**Extremely high**
GWDTEs	Lower Shannon Estuary SAC	Along northern boundary of the Site.	Designated status of EU and international importance. Contains wetland habitats as a qualifying interest and in a favourable conservation condition.	NPWS Map Viewer [Accessed February 2024]	**Extremely high**
	Proposed NHA Ballylongford	Located approximately 1 km west of the Site.	Proposed designated site of national importance. Likely to contain wetland habitats.	NPWS Map Viewer [Accessed February 2024]	**Very high**

6.6 Assessment of Impact and Effect

Several activities during construction, operation, and decommissioning phases are likely to generate impacts, which have the potential to cause significant effects to the water environment, if unmitigated. The impacts and effects (both beneficial and adverse) are outlined in the following sections. It should be noted that the proposed activities have been assessed following consideration of the embedded mitigation measures (see **Chapter 02** (Description of the Proposed Development)).

These include:

- Separation of drainage from paved and other impermeable areas from other stormwater drainage.
- The provision of an attenuation system for stormwater runoff from paved / impermeable areas, including silt traps and a class 1 interceptor fitted with control valves.
- A firewater retention basin and associated stormwater diversion infrastructure.
- Dedicated process effluent and sanitary drainage and treatment systems.
- Provision of designated bunded storage facilities for potentially-contaminating chemicals and fuels.

The Proposed Development can give rise to potential impacts on the drainage regime and hydrology of the Site both during the construction and operational phases as outlined below.

Due to the inter-relationship between land, soils and water (hydrology), the following impacts are considered applicable to **Chapter 05** (Land, Soils & Geology). **Chapter 16** (Waste Management) is also considered to comprise an interaction.

6.6.1 Construction Phase

Excavation and infilling of soil and subsoil will be required for levelling of the Site to render it suitable for building the Power Plant platform and to construct the access roadway and associated swale draining road runoff to the platform area.

Beneath the proposed Power Plant platform, a process of ‘cut and fill’ will be employed in order to level the footprint of the proposed process infrastructure and buildings and achieve the desired platform level of 18 m OD from which to commence construction works. Outside of the Power Plant footprint ‘cut and fill’ will also be undertaken in order to construct roadways, facilitate firewater retention pond construction and achieve desired ground levels across the Proposed Development.

The civil works which may impinge upon the water environment will comprise the following activities:

- Preliminary works, including clearance, levelling, site roads / pedestrian access, establishment of lay-down and fabrication area and firewater retention pond.
- Laying of foundations for plant and buildings.
- Landscaping and reinstatement.

The risk of potential significant effects occurring during the construction phase (in the absence of adequate management and mitigation measures) can arise from a range of activities, principally:

- Discharge of vehicle wash-down water.
- Discharge of construction materials, e.g. uncured concrete.

- Uncontained spillage of wastewater effluent.
- Uncontrolled sediment erosion and contaminated silty runoff.
- Construction vehicle refuelling areas and chemical and waste storage or handling areas.
- Polluted drainage and discharges from site.
- Changes to the existing drainage network including interception and redirection of natural and artificial watercourses (e.g. drainage channels).
- Discharge of groundwater to surface water at platform level due to natural springs or man-made spring lines due to topographical changes (cuttings).
- Increased runoff from cleared areas.
- Watercourse crossings.
- Outfall points.

Groundwater vulnerability beneath the Site is classified as 'Low'. However, removal of the relatively thin soil cover will slightly increase the vulnerability to underlying bedrock aquifer.

During construction, pollution from elevated alkalinity (relating to use of concrete / cement) and mobilised suspended solids from excavation and piling will generally be the prime concerns, but spillage of fuels, lubricants, hydraulic fluids and cement from construction plant may lead to incidents, especially where there is the absence of any or inadequate pollution mitigation measures.

6.6.1.1 Dewatering Due to Cuttings

The construction of cut faces into bedrock due to excavation for the 18 m platform will lead to seepage of groundwater into the excavation / platform area from upgradient areas. The rate of seepage is anticipated to be low, due to the presence of clay-dominated soils and the relatively low permeability sandstone bedrock, as indicated by the unproductive pumping test at well PW1. Localised dewatering of the bedrock within 10 m - 50 m of the cut faces of the excavation is anticipated; however, as all groundwater in the bedrock aquifer in this area is flowing towards the Shannon Estuary under baseline conditions, the interception and discharge of groundwater discharging to the platform area of the Proposed Development will not lead to a net change to the quantities of groundwater ultimately discharging to the Shannon Estuary from this portion of the Site.

Localised dewatering and altered drainage regimes due to cuttings will result in a **Permanent Direct** effect on water levels and runoff volumes of **Neutral** quality which will have an **Imperceptible** effect on the character of the environment but is certain to occur and **Irreversible**. However, the excavated platform area of the Proposed Development will not lead to a net change to the quantities of groundwater ultimately discharging to the Shannon Estuary from this portion of the Site. Groundwater seepage from cut faces will be managed via the Site. As such, this is considered to be a **Negligible** impact on the water environment (on the Lower River Shannon SAC, the Ballylongford WFD GWB and bedrock aquifer receptors) and the significance of the effect is considered **Imperceptible.**

6.6.1.2 Sedimentation (Suspended Solids)

Pollution of surface waters by mobilised suspended solids can have significant adverse ecological effects. Various construction activities have the potential to release sediment and cause unacceptable suspended solids levels in the catchment area.

Site stripping and bulk earthworks as part of landscaping and building and infrastructure construction will leave substrates exposed to erosion by wind or rain and this can potentially lead to increases in sediment loading of the drainage network or direct runoff to the estuary or to the Ralappane Stream and its tributaries. Contamination from suspended sediments may also be caused by runoff from material stockpiles.

Runoff containing large amounts of suspended solids can adversely impact on surface water. The impact of runoff is considered a temporary effect, as it is only associated with certain phases of the 32-month construction programme.

Control of runoff and release of suspended sediment from construction activities will be managed under the Construction Environmental Management Plan (CEMP); therefore, uncontrolled runoff containing large amounts of suspended solids is considered unlikely to occur and, should it occur, is likely to be infrequent and short-term.

Considering the implementation of the CEMP, runoff containing large amounts of suspended solids leaving the construction areas and entering the estuary is considered unlikely to occur. The importance of the Lower River Shannon SAC and the Ballylongford WFD GWB is considered to be extremely high, and of the bedrock aquifer to be medium; however the impact magnitude is considered to be **Negligible**; which combined would result in an **Imperceptible** effect on these receptors.

Construction operations in the near-offshore area for the outfall pipe have the potential to generate suspended sediment, which can travel with marine currents, be deposited elsewhere and can adversely impact aquatic habitat quality. Hydrodynamic modelling of marine sediment transport is reported in **Chapter 07A** (Marine Ecology) and **Appendix A7A.5**, Volume 4 and indicates that suspended sediments will be dispersed laterally along the coastline by tidal currents, extending to the east of Tarbert at high tide and extending over 10 km downstream in the estuary under low water conditions. The model predicts sediment deposition rates in this area would be low, less than 0.01 mm per square metre across the majority of the suspended sediment deposition area, other than a localised area up to 0.2 mm per square metre on the east side of Ballylongford Bay, which is regarded as insignificant in relation to OSPAR guidance on sediment deposition, refer to **Chapter 07A** (Marine Ecology).

Considering the implementation of the CEMP, runoff containing large amounts of suspended solids leaving the construction areas in the near-offshore area for the outfall and entering the estuary is considered unlikely to occur. The importance of the Lower River Shannon SAC and the Ballylongford WFD GWB is considered to be extremely high, and of the bedrock aquifer to be medium; the impact magnitude is considered to be **Negligible**; which combined would result in an **Imperceptible** effect on these receptors.

6.6.1.3 Accidental Spillage and Leaks

Any construction activities carried out close to surface waters involve a risk of pollution due to accidental spillage and leaks. While liquids such as oils, lubricants, paints, bituminous coatings, preservatives and weed killers present the greatest risk, fuel spillages from machinery operating close to watercourses or the estuary also present a risk. The refuelling of general construction plant also poses a significant risk of pollution, depending on how and where it is carried out. Pollution as a result of accidental spillage can potentially affect fish, aquatic flora and can also have an effect on invertebrate communities.

As main site works are generally located within the area of moderate to high vulnerability due to its proximity to the estuary, fuels or chemicals, if inappropriately handled or stored, during construction can potentially impact on surface water quality in the estuary adjacent to the Site.

Accidental spillage may result in the indirect impact to surface water at the Site shall contaminants enter surface waters directly or migrate through the subsoils / bedrock and underlying groundwater to surface waters. The impact is considered a direct effect of a negative nature and temporary duration, given it is only associated with one-off events during the construction programme.

Measures to prevent accidental spillages and leaks will be implemented in accordance with the CEMP and are considered unlikely to occur and, shall they occur, are likely to be a temporary direct small adverse effect.

Considering the implementation of the CEMP, accidental spillages and leaks are considered unlikely to occur and should they occur are likely to be temporary. The impact magnitude is considered to be **Negligible**, which combined would result in an **Imperceptible** effect on the Lower River Shannon SAC, the Ballylongford WFD GWB and bedrock aquifer receptors.

6.6.1.4 Use of Concrete and Lime

Lime and concrete (specifically, the cement component) are highly alkaline and any spillage can enter surface water directly or migrates though subsoils and groundwater impacting surface water quality. The activities most likely to result in contamination include piling and pouring of concrete foundations during building construction, roadway construction and construction of concrete culverts and watercourse crossings.

Considering the implementation of the CEMP, the impact is considered a direct effect of a negative nature and of a temporary duration given it is only associated with the construction programme. Impacts associated with the use of concrete and lime are considered unlikely to occur and, should they occur, are likely to be rare events of short duration. The impact magnitude is considered to be **Negligible**, which combined would result in an **Imperceptible** effect on the Lower River Shannon SAC, the Ballylongford WFD GWB and bedrock aquifer receptors.

6.6.1.5 Changes to WFD Status of Waterbodies

The potential impacts on the WFD status of the adjacent Lower Shannon Estuary transitional waterbody, and underling Ballylongford WFD GWB were assessed in the WFD Screening Assessment (Aquafact 2024) refer to **Appendix A6.4** (Volume 4). Based on the WFD Assessment undertaken by Aquafact the activities associated with the construction and operation of the Proposed Development will have no permanent impacts on the condition of the Ralappane river waterbody or indirectly affect measures put in place to achieve the environmental objectives of the WFD for this waterbody.

6.6.1.6 Changes to Groundwater Levels, Flows and Contributions to GWDTEs by Dewatering

The potential impacts on groundwater level, flow and availability during construction are likely to arise from dewatering activities required to facilitate excavations for the underground electrical connections, drainage infrastructure, as well as any foundations required for the development and creation of the platform area from upgradient areas.

Temporary dewatering or altered drainage regimes may divert water away from GWDTEs, such as the SAC, or create flow barriers, leading to groundwater level and flow alteration. The magnitude of any

change will depend on the depth and nature of the structures. Impacts associated with altered groundwater flow regimes are likely to be localised to the superficial deposits and bedrock close to the edge cuttings forming the east and south sides of the cut platform. The impact magnitude is considered to be negligible, which combined would result in an **Imperceptible** effect on the identified receptors.

6.6.1.7 Changes to Flood Risk

Vegetation removal, site stripping, stockpiling, vehicle movements and bulk earthworks as part of the construction could leave topsoil and superficial deposits exposed to erosion by wind or rain. This could potentially lead to an increase in site-runoff leaving the Site during construction and to an increase in flood risk from pluvial sources. Considering the CEMP, uncontrolled site-runoff leading to an increased flood risk from pluvial sources is considered unlikely to occur, and should it occur would be temporary. The impact magnitude is considered to be **Negligible**, which combined would result in an **Imperceptible** effect on the Lower River Shannon SAC, the Ballylongford WFD GWB and bedrock aquifer receptors.

Table 6.10: Potential Construction Impacts and Effects (where impact pathways exist)

Potential Impact	Impact Pathway	Magnitude of impact with Embedded Mitigation	Identified receptor (and Sensitivity / Importance)	Effect Significance with Embedded Mitigation
Dewatering Due to Cuttings	Potential indirect linkage via superficial deposits	Negligible (and temporary)	Lower River Shannon SAC (extremely high)	**Slight**
	Potential indirect linkage via superficial deposits or direct if excavations extend into bedrock		Bedrock aquifer (medium)	**Slight**
	Potential indirect linkage via superficial deposits or direct if excavations extend into bedrock	Negligible (temporary, very localised impact and unlikely to change WFD status)	Ballylongford WFD GWB (extremely high)	**Slight**
Sedimentation (Suspended Solids)	Potential direct linkage as surface runoff	Negligible (and temporary)	Lower River Shannon SAC (extremely high)	**Imperceptible**
	Potential indirect linkage as recharge via overlying superficial deposits		Bedrock aquifer (medium)	**Imperceptible**
	Potential indirect linkage as recharge via overlying superficial deposits	Negligible (temporary, very localised impact and unlikely to change WFD status)	Ballylongford WFD GWB (extremely high)	**Imperceptible**
Accidental Spillage and Leaks	Potential direct linkage as surface runoff	Negligible (and temporary)	Lower River Shannon SAC (extremely high)	**Imperceptible**
	Potential indirect linkage as recharge via overlying superficial deposits		Bedrock aquifer (medium)	**Imperceptible**
	Potential indirect linkage as recharge via overlying superficial deposits	Negligible (temporary, very localised impact and unlikely to change WFD status)	Ballylongford WFD GWB (extremely high)	**Imperceptible**
Use of Concrete and Lime	Potential direct linkage as surface runoff	Negligible (and temporary)	Lower River Shannon SAC (extremely high)	**Imperceptible**
	Potential indirect linkage as recharge via overlying superficial deposits		Bedrock aquifer (medium)	**Imperceptible**
	Potential indirect linkage as recharge via overlying superficial deposits	Negligible (temporary, very localised impact and unlikely to change WFD status)	Ballylongford WFD GWB (extremely high)	**Imperceptible**
Changes to groundwater levels, flows and contributions to GWDTEs by dewatering	Potential indirect linkage via superficial deposits	Negligible (and temporary)	Lower River Shannon SAC (extremely high)	**Imperceptible**
	Potential indirect linkage via superficial deposits or direct if excavations extend into bedrock		Bedrock aquifer (medium)	**Imperceptible**
	Potential indirect linkage via superficial deposits or direct if excavations extend into bedrock	Negligible (temporary, very localised impact and unlikely to change WFD status)	Ballylongford WFD GWB (extremely high)	**Imperceptible**
Changes to flood risk	Potential direct linkage as surface runoff	Negligible (and temporary)	Proposed Development	**Imperceptible**

6.6.2 Operational Phase

Potential adverse impacts which can occur due to unplanned events during the operational phase, in the absence of adequate management and mitigation measures, are as follows:

- Uncontained spillage of wastewater effluent.
- Uncontained spillage of polluting materials stored onsite, e.g. diesel fuel, glycol heat transfer fluid or oil, cleaning chemicals and lubricants for maintenance.
- Excessive demand on the water main / water network resulting in reduced supply or loss of pressure in the surrounding area.
- Potential flooding of the Site resulting in contaminated floodwaters.
- Siltation of storm water drainage system and attenuation ponds.
- Changes to WFD status of waterbodies.
- Changes to groundwater levels, flows and contributions to GWDTES by underground structures.
- Emergency overflow discharge from the foul sewage networks.

Direct discharges to the water environment during the operational phase will consist of the following:

- Surface water runoff from paved / impermeable areas from the Proposed Development and access road will be collected via a dedicated, sealed storm drainage network, which will pass through a silt trap and Class 1 hydrocarbon interceptor, and discharge to the shared constructed outfall to the Shannon Estuary. There will be a stormwater discharge point at the Ralappane D1 stream crossing located 50 m from the Site entrance (Drawing Ref: 198291-1STF-S3001, submitted with this planning application), and a second stormwater discharge point will be located at the D2 stream crossing located 20 m from the construction laydown area (Drawing Ref: 198291-1STF-S3002, submitted with this planning application). Both will be fitted with Class 1 hydrocarbon interceptors. The resulting discharge will be similar in composition and will have similar flow rates to existing drainage, which discharges directly from the agricultural lands to the Ralappane Stream and the Shannon Estuary. On this basis, it is not envisaged that the surface water discharge will have an adverse impact on receiving waterbodies.
- Groundwater discharging to the excavated area of the Proposed Development will be intercepted at the toe of the cut faces by drains and will be discharged to the Shannon Estuary via the storm water outfall but will not lead to a net change to the quantities of groundwater ultimately discharging to the Shannon Estuary from this portion of the Site.
- A minor portion of surface water from the immediate vicinity of the streams will enter directly through overland flow.
- Surface water from undeveloped areas in the west and south of the Site will continue to discharge to the existing drainage ditch network, other than the access road runoff, which will be routed to the storm water drains serving the paved / impermeable area of the developed area.

- Drainage from unpaved / permeable areas of the developed area will be collected via a separate storm drainage network consisting of swales and catch basins and discharge directly to the shared constructed outfall to the Shannon Estuary.
- All foul water generated at the onshore part of the Proposed Development will be pumped or fall by gravity to a single WWTP onsite. The WWTP will be a package treatment system which will treat the effluent to required discharge standards. The WWTP will be sized to cater for a population of approximately 67 No. people. The treated effluent will be discharged to the estuary via the same discharge outfall pipe as the surface water.
- Process effluent streams principally comprising process water treatment effluent, steam cycle blowdown / drains and auxiliary boiler blowdown/ drains will be collected separately, monitored and, if necessary, treated before being discharged to the effluent sump prior to discharge to the shared constructed outfall to the Shannon Estuary.
- Other process effluent streams comprising Turbine Building Floor Drains and other liquid wastes not suitable for discharge to surface water will be collected and removed from site to an appropriate licenced waste facility.

6.6.2.1 Hazardous Materials Storage

The storage or use of materials hazardous to the aquatic environment during the operational phase of the Proposed Development will be limited to:

- Diesel – The firewater pumps, black start generator and emergency generators will be fuelled by diesel which will be stored in tertiary-contained bunded facilities. Tertiary containment, bunding and associated pipework will be designed in accordance with EPA Guidance Note on Storage and Transfer of Materials for Scheduled Activities.
- Minor quantities of maintenance oils, greases, lubricants, cleaning chemicals, etc. A designated chemical cage is included within the design of the proposed warehouse / workshop building.

The storage of materials hazardous to the aquatic environment during the operational phase will be in secondary and tertiary contained areas, such as fixed or mobile bunds, and will be controlled in accordance with any IE licence conditions.

Considering the Environmental Management Plan (EMP), accidental spillages and leaks are considered unlikely to occur and should they occur are likely to be temporary. The impact magnitude is considered to be **Negligible**, which combined would result in an **Imperceptible** effect on the Lower River Shannon SAC, the Ballylongford WFD GWB and bedrock aquifer receptors.

6.6.2.2 Accidental Spillage and Leaks

Accidental spills and leaks are considered to be direct impacts of a negative nature and of a temporary duration given that they will be confined to one-off releases.

Natural gas leaks are not considered to be a potential source of contamination to groundwater or surface waters, because in view of its extremely low vaporisation temperature (approximately -160°C) it will never be present as a liquid or solid under ambient conditions.

Considering the EMP, accidental spillages and leaks are considered unlikely to occur and should they occur are likely to be temporary. The impact magnitude is considered to be **Negligible**, which combined

would result in an **Imperceptible** effect on the Lower River Shannon SAC, the Ballylongford WFD GWB and bedrock aquifer receptors.

6.6.2.3 Flooding and Drainage

The Stage 3 – Flood Risk Assessment (FRA) (**Appendix A6.3** Volume 4) concluded that with the exception of crossings of the watercourses for the access road, there is no development proposed within either Flood Zone 'A' or Flood Zone 'B' and therefore the Proposed Development has a **Negligible** impact on the existing flood regime in the area.

The proposed crossings of the watercourses within the Proposed Development will be adequately sized at detailed design stage to have a minimal impact on the existing hydraulic regime in the area draining to the Ralappane Stream.

The Power Plant site will have a constructed stormwater drainage system capable of handling anticipated stormwater volumes (up to be 162 L/s/ha (3,125 L/s) for a 100-year, 24-hour rain event) and which will incorporate monitoring equipment and firewater retention facilities.

Considering the EMP, impacts from flooding and drainage are considered unlikely to occur, and should it occur would be temporary. The impact magnitude is considered to be **Negligible**, which combined would result in an **Imperceptible** effect on the identified receptors.

6.6.2.4 Combined Operational Stormwater, Sanitary and Process Effluent Discharges to Surface Water

The combined stormwater flows and treated sanitary effluent and process effluent from the Proposed Development will be discharged via a common outfall to the estuary below low tide level. The potential impact of this discharge on the marine environment is discussed under **Chapter 07A** (Marine Ecology). The Surface Water Outfall pipeline outflow will be monitored prior to the discharge point for a range of parameters at frequencies specified under the site's IE licence and will allow for retention of the combined effluent stream in the Fire Water Retention Pond in the event of exceedances of the allowed Emission Limit Values under the IE licence. An average flow of 0.4 L/s (34.5 m^3/day) is expected to be discharged from the WWTP via the outfall pipe.

3-D hydrodynamic modelling of the wastewater discharge plume in the estuary using Telemache software has indicated negligible impact on the estuary, because of significant dilution and dispersion will occur due to the high-water volume and tidal flux in the estuary. Modelling of water flow and direction for a flooding tide and mid-ebb tide indicates predominantly east-west water flow beyond a distance of approximately 250 m offshore.

Suspended sediment (see discussion in **Section 6.6.1.2**) and treated effluent (modelled as E. Coli bacteria) are predicted by the hydrodynamic modelling to undergo extremely high levels of dilution and dispersion within a short distance (approximately 1 km) of the Site. Also, the predicted current directions on the ebb tide indicate little or no interaction of the outfall from the site with intertidal or subtidal habitats or species in the estuary, including the SCA, SPA, pNHA and the oyster production sites in inner Ballylongford Bay (see **Chapter 07A** (Marine Ecology). Maximum predicted E. coli concentrations from the site wastewater discharge are predicted to decline to below 1 per 100 ml before reaching either Tarbert Island or inner Ballylongford Bay.

Operational discharges to the estuary will be controlled under the site's IE licence and the operational phase Environmental Management Plan. Considering the EMP, impacts from site drainage are considered to be unlikely, arising from rare events. The impact magnitude is considered to be **Negligible**, which combined would result in an **Imperceptible** effect on the Lower River Shannon SAC, the Ballylongford WFD GWB and bedrock aquifer receptors.

6.6.2.5 Changes to WFD Status of Waterbodies

The potential impacts on the WFD status of the adjacent Lower Shannon Estuary transitional waterbody, and underling Ballylongford WFD GWB were assessed in WFD Screening Assessment (Aquafact 2024) refer to **Appendix A6.4** (Volume 4). Based on the WFD Assessment undertaken by Aquafact the activities associated with the construction and operation of the Proposed Development will have no permanent impacts on the condition of the Ralappane River waterbody or indirectly affect measures put in place to achieve the environmental objectives of the WFD for this waterbody.

6.6.2.6 Changes to Groundwater Levels, Flows and Contributions to GWDTEs

The potential impacts on groundwater level, flow and availability during operation that could arise relate to the presence passive dewatering in place as a result of the creation of the platform area in upgradient. Areas. Additionally, the presence of underground structures, such as foundations or permanent piling required for the Proposed Development. The depths and nature of the proposed underground structures are unknown. However, shallow groundwater is present in the superficial deposits between 0.062 meters (well BR23) m and 5.608 m Bgl at an unmarked well (referred to as well BR-X P1 in the 2021 groundwater monitoring report) and therefore the water table is likely to be intercepted by underground structures and by the cutting to form the 18 m OD Power Plant platform.

The rate of seepage is anticipated to be low, due to the presence of clay-dominated soils and the relatively low permeability sandstone bedrock, as indicated by the unproductive pumping test at well PW1.

Altered groundwater flow regimes in the superficial deposits may divert water away from GWDTEs, such as the SAC, or create flow barriers, leading to groundwater level and flow alteration. The magnitude of any change will depend on the depth and nature of the structures. However, as all groundwater in the bedrock aquifer in this area is flowing towards the Shannon Estuary under baseline conditions, the interception and discharge of groundwater discharging to the platform area of the Proposed Development will not lead to a net change to the quantities of groundwater ultimately discharging to the Shannon Estuary from this portion of the Site. Impacts associated with altered groundwater flow regimes are likely to be localised but permanent. However, the excavation of the platform area of the Proposed Development will not lead to a net change to the quantities of groundwater ultimately discharging to the Shannon Estuary from this portion of the Site. Groundwater seepage from cut faces will be managed via the Site drainage systems in such a way as to prevent Potential Negative impact on the receiving environment.

The impact magnitude is therefore considered to be **Negligible**, which combined would result in an **Imperceptible** effect on the identified receptors.

6.6.2.7 Changes to Flood Risk

Drainage networks have the potential to be blocked and lose capacity, which can ultimately lead to surface water flooding.

Considering the EMP, which includes flood defence infrastructure monitoring and maintenance, surface water flooding is considered unlikely to occur, and should it occur would be temporary. The impact magnitude is considered to be **Negligible**, which combined would result in an **Imperceptible** effect on the identified receptors.

Table 6.11: Potential Operation Impacts and Effects (where impact pathways exist)

Potential impact	Impact pathway	Magnitude of impact with embedded mitigation	Identified receptor (and sensitivity / importance)	Effect significance with embedded mitigation
Hazardous Materials Storage	Potential direct linkage as surface runoff	Negligible	Lower River Shannon SAC (extremely high)	**Imperceptible**
	Potential indirect linkage as recharge via overlying superficial deposits		Bedrock aquifer (medium)	**Imperceptible**
	Potential indirect linkage as recharge via overlying superficial deposits	Negligible (very localised impact and unlikely to change WFD status)	Ballylongford WFD GWB (extremely high)	**Imperceptible**
Accidental Spillage and Leaks	Potential direct linkage as surface runoff	Negligible	Lower River Shannon SAC (extremely high)	**Imperceptible**
	Potential indirect linkage as recharge via overlying superficial deposits		Bedrock aquifer (medium)	
	Potential indirect linkage as recharge via overlying superficial deposits	Negligible (very localised impact and unlikely to change WFD status)	Ballylongford WFD GWB (extremely high)	
Flooding and Drainage	Potential direct linkage as surface runoff	Negligible	Proposed Development	Imperceptible
Combined Operational Stormwater, Sanitary and Process Effluent Discharges to Surface Water	Potential direct linkage as surface runoff	Negligible	Lower River Shannon SAC (extremely high)	**Imperceptible**
Pollution of waterbodies by surface water and process water discharges	Potential direct linkage as surface runoff	Negligible	Lower River Shannon SAC (extremely high)	**Imperceptible**
Changes to groundwater levels, flows and contributions to GWDTEs by underground structures	Potential indirect linkage via superficial deposits	Negligible	Lower River Shannon SAC (extremely high)	**Imperceptible**
	Potential indirect linkage via superficial deposits or direct if structures extend into bedrock		Bedrock aquifer (medium)	
	Potential indirect linkage via superficial deposits or direct if structures extend into bedrock		Ballylongford WFD GWB (extremely high)	
Changes to flood risk	Potential direct linkage as surface runoff	Negligible	Proposed Development	**Imperceptible**

6.6.3 Decommissioning Phase

As outlined in **Chapter 02** (Description of the Proposed Development), in the event of decommissioning, mitigation measures will be undertaken by the Applicant to ensure that there will be no significant, negative environmental effects during the decommissioning phase. Examples of the measures that will be implemented are outlined in Section 2.9, **Chapter 02** and will include removal of subsurface utilities such as the site drainage and surface water management systems.

Additionally, the site will be licenced by the EPA under the Industrials Emission Licencing regime during its operational phase and a Closure Restoration Aftercare Management Plan will need to be agreed, costed and provided for financially in advance of site closure under the requirements of the IE Licencing regime. As a result of the IE licence and EPA regulatory oversight, additional potential impacts and associated effects arising during the decommissioning phase are not anticipated above and beyond those already assessed during the construction phase.

A monitoring programme of all potential emissions including surface water and dust would be conducted after the decommissioning process in order to ensure that emissions from the facility have ceased.

6.7 Mitigation and Monitoring Measures

A range of measures that are standard good practice for development of this type, and which are required to comply with environmental protection legislation, will be implemented. These are well-developed and have been successfully implemented on infrastructure projects across the country and there is a high degree of confidence in their success. They can therefore be treated as embedded mitigation and will include the following measures.

6.7.1 Embedded Measures

6.7.1.1 Construction Environmental Management Plan

A CEMP has been prepared as part of this application, refer to **Appendix A2.3**, Volume 4). The contractor will prepare and implement a CEMP for the Proposed Development during the construction phase. This will incorporate relevant environmental avoidance or mitigation measures to minimise potential environmental impact of the construction works. It will cover all potentially polluting activities and include an emergency response procedure. All personnel working on the Site will be trained in the implementation of the procedures. The CEMP will be reviewed and updated on a regular basis and modified and extended by any relevant construction related requirements imposed as conditions of any planning permission granted.

A Resource and Waste Management Plan (RWMP) (see **Appendix A16.1,** Volume 4) was prepared in accordance with Department of Environment, Community & Local Government guidelines (DEHLG, 2006) and an Oil and Hazardous and Noxious Substances Spill Plan (**Appendix A2.5**, Volume 4).

The CEMP will also include details of environmental monitoring to be implemented for the duration of the construction works.

6.7.2 Construction Phase Measures

6.7.2.1 Soil Removal and Compaction

During the construction phase, the mitigation measures will ensure that no sediment contamination, as a result of soil removal or compaction will enter watercourses on or near the Site. These measures are defined in the CEMP as embedded mitigation. The CEMP will be further refined, and expanded by the Contractor, into a Contractor's CEMP. The mitigation measures are outlined below.

Temporary storage of soil and stone will be carefully managed in such a way as to prevent potential negative impact on the receiving environment. Spoil and temporary stockpiles including stone stockpile areas will be positioned in locations which are distant from the shoreline, drainage systems and retained drainage channels and away from areas subject to flooding, so as not to cause potential silt runoff to surface waters. Stockpiles will be managed to prevent dust generation during dry weather. The CEMP will outline proposals for the excavation and management of excavated material. Movement of material will be minimised in order to reduce degradation of soil structure and generation of dust. Further detail on mitigation measures in relation to soil management is given in **Chapter 05** (Land, Soils & Geology).

6.7.2.2 Bedrock Excavation

Where bedrock is to be removed as part of the cut / fill exercise onsite, it is anticipated that rock breaking and blasting may be required to achieve the 18 m OD formation level. Mitigation measures relating to the associated noise impacts are set out in **Chapter 09** (Airborne Noise & Groundborne Vibration). Excavation of bedrock to 18 m OD will be below the pre-construction groundwater level in some areas of the Site and will result in discharges of groundwater from the cut faces. This will be routed via the stormwater drainage system at platform level, as described below.

6.7.2.3 Construction Dewatering

Shallow groundwater is present in the superficial deposits and bedrock at the Proposed Development, such that the water table is likely to be intercepted during excavation works and dewatering activities required to facilitate excavations for the creation of the platform area, the underground electrical connections, drainage infrastructure, as well as any foundations required for the development. The Contractor's CEMP will include a programme of groundwater level and quality monitoring at existing groundwater monitoring boreholes at the site and controlled discharge of water abstracted during dewatering. Any discharge of and any consenting requirements for the discharge of such water, following treatment, will be discussed, and agreed with the Kerry Co. Co. prior to the commencement of work. Dewatering fluids will be pumped via settlement tanks or collection basins where any solids in the water will settle out.

6.7.2.4 Surface Water / Storm Water

During the construction phase the mitigation measures will ensure that no sediment contamination, contaminated runoff or untreated wastewater will enter watercourses on or near the Site. Drainage channels and water streams will be clearly identified onsite and shown on method statements and site plans.

Groundwater from the upgradient area to the south discharging onto the main construction site at the cut faces to the south, east and west of the 18 m platform will be intercepted by drainage at the toe of the slopes and diverted away from the active construction areas to the extent possible. In case of impact

by construction activity and machinery, this groundwater will pass through a sediment trap and oil: water separator prior to discharge under licence to the estuary via the outfall.

Temporary surface water drainage and silt ponds will be constructed to control runoff from the earthwork stages. Drains carrying high sediment load will be diverted through silt ponds, located between the construction area and the surface water outfall. Surface water runoff from working areas will not be allowed to discharge directly to the local watercourses or to the estuary. To achieve this, the drainage system and silt ponds will be constructed prior to the commencement of major site works. All design and construction will be carried out in accordance with the Construction Industry Research and Information Association (CIRIA) C532 Control of Water Pollution from Construction Sites Guidance for Consultants and Contractors (CIRIA, 2001). During the construction activities there will be a requirement for diverting rainwater runoff away from the construction areas, into the nearby estuary. Rainwater runoff will be treated to prevent sediment from entering the estuary. Discharge water quality targets will be agreed with Kerry Co. Co. and included in the CEMP. Regular water inspection and sampling regimes will be put in place via the CEMP on the foreshore during construction activity onsite to monitoring compliance with the discharge conditions.

Where possible, excavations will only remain open for limited time periods to reduce groundwater ingress and water containing silt will be passed through a settlement tank/ silt pond or adequate filtration system prior to discharge. Discharge consent under the CEMP will be obtained for disposal of ground water arising from pumping or such water may be disposed of as construction site runoff, having first passed through a settlement tank or filtration system, where appropriate. A discharge licence will be required for temporary construction phase storm water discharges to the estuary; operational phase discharges will be regulated under the site's IE licence.

To minimise impact from material spillages, all oils, chemicals and waste materials will be stored within temporary bunded areas with a volume of 110% of the capacity of the largest tank/ container within it. Fuel, oil and chemical filling and draw-off points will be located entirely within the bunded area(s). Drainage from the bunded area(s) will be diverted for collection and disposal.

Vehicle / equipment refuelling and maintenance with hydraulic oil or lubricants will take place in bunded areas where possible. If it is not possible to bring the machine to the refuelling point, fuel will be delivered in a double-skinned mobile fuel bowser. Drip trays will be used to contain spillages with spill kits and hydrocarbon absorbent packs stored in vehicle cabs with operators fully trained in their use. Vehicles and equipment will not be left unattended during refuelling operations. Regular inspection and maintenance measures for site machinery will be included in the CEMP to minimise the likelihood of losses of hydraulic fluids or fuels to ground during the construction works.

Spoil and temporary stockpiles including stone stockpile areas will be positioned in locations which are distant from drainage systems and retained drainage channels, away from areas subject to flooding. Runoff from spoil heaps will be prevented from entering watercourses by diverting it through onsite settlement ponds and removing material as soon as possible to designated storage areas.

Culverts beneath the access road will be located at or close to the locations of existing natural flow paths to allow existing flows to continue. Lateral drainage will be within shallow geotextile and rock lined drainage channels to avoid the drainage of surrounding soils. The outer perimeter fence line will be set back from the L1010 road to avoid crossing watercourses as far as possible. The outer perimeter

fencing is not expected to impact surface water flow where two minor watercourses are crossed, as there will not be a requirement for this fencing to be extended below the water's surface. The inner security fence surrounding the Power Plant will not cross any existing watercourse.

All watercourse crossings will be planned in accordance with applicable guidelines and in consultation with Inland Fisheries. No permanent watercourse diversions are proposed as part of the Proposed Development.

The access road will be designed to conduct road runoff to an engineered swale adjacent to the west side of the road. This swale will be profiled to grade continuously northward and to transfer the runoff from the access road to the sealed stormwater drainage system at the Power Plant area in the north of the Proposed Development.

Silt traps will be placed at crossing points to avoid siltation of watercourses. These will be maintained and cleaned regularly throughout the construction phase. Attention will also be paid to preventing the build-up of dirt on road surfaces, caused by lorries and other plant entering and exiting Site, via wheel washes and road sweepers as required.

6.7.2.5 Fuel and Chemical Handling

Construction phase mitigation will be implemented to prevent spillages to ground of fuels, and to prevent any consequent soil, groundwater or surface water quality impacts. These include but are not limited to the following:

- Designating a bunded storage area at the contractor's compound for all oils, solvents and paints used during construction. Oil and fuel storage tanks will be bunded to a volume of 110% of the capacity of the largest tank / container within the bunded area. Drainage from the bunded area will be diverted for collection and safe disposal. All containers within the storage area will be clearly labelled, so that appropriate remedial action can be taken in the event of a spillage. When moving drums from the bunded storage area to locations within the Proposed Development, a suitably-sized spill pallet will be used for containing any potential spillages during transit.
- Refuelling of construction vehicles and the addition of hydraulic oils or lubricants to vehicles, will take place in a designated area, which will be away from surface water gullies or drains. Spill kit facilities will be provided at the fuelling area in order to provide for accidental releases or spillages in and around the area. Any used spill kit materials will be appropriately disposed of using a hazardous waste contractor.
- Where mobile fuel bowsers are used on the Proposed Development in the event of a machine requiring refuelling outside of the designated area, fuel will be transported in a mobile double skinned tank. Any flexible pipe, tap or valve will be fitted with a lock where it leaves the tank and locked shut when not in use. The pump or valve will also have a lock and be locked shut when not in use. Each bowser will carry a spill kit and each bowser operator will have spill response training.
- All equipment and machinery will be checked for leaks and other potential sources of contaminants before arriving on-site and on a daily basis. Any equipment or machinery likely to introduce to contaminants will not be brought on-site or will be removed from the Site

immediately if any leak is discovered. Spill kits will be available to machine operators, and they will be trained in their use.

- The storage of hazardous substances will be necessary during construction. Fuel will be stored at least 50 m from a waterbody and refuelling will only take place in designated areas, on hardstanding by appropriately trained personnel.

6.7.2.6 Control of Concrete and Lime

Measures for protection of watercourses from wet concrete will be implemented and the following measures will be implemented to prevent discharge of alkaline wastewaters or contaminated storm water to the underlying subsoil / groundwater or nearby surface water, as follows:

- Ready-mixed concrete will be either produced onsite in a batching plant or brought to the Proposed Development by truck.
- A suitable risk assessment for wet concreting will be completed prior to works being carried out which will include measures to prevent discharge of alkaline wastewaters or contaminated storm water to the underlying subsoil or to the marine environment.
- The pouring of concrete will take place within designated areas as required, using a geosynthetic material to prevent concrete runoff into the soil.
- Washout of concrete-transporting vehicles will take place at an appropriate facility, offsite where possible, alternatively, where washout takes place onsite, it will be carried out in carefully-managed onsite wash out areas as detailed in the Concrete Washout Management Plan.
- Rainwater will be diverted away from the construction areas into the estuary or nearby ditches and streams. Water from construction areas will be filtered and treated to prevent sediment from entering surface waters. A regular water sampling regime will be put in place for the D1, D2 and D3 streams and the Surface Water Outfall on the Site and other potentially-impacted runoff points to the shoreline during construction activity onsite. Water samples will be taken at specified locations to be agreed with the local authority.
- Works requiring discharge of water from excavations or areas of water which may have come in contact with concrete or cementitious material will require a site Permit to Pump under procedures outlined in the CEMP. All such water will be tested for pH by contractors, and discharging water must go through a series of filtration systems before final discharge.

6.7.2.7 Sources of Aggregates and Clean Fill for the Proposed Development

While it is anticipated the Proposed Development will have a net zero cut / fill balance, there is potential for small quantities of clean fill materials to be required to facilitate construction works, for example where site-won soils or crushed rock are not of sufficient geotechnical or chemical quality for re-use. The source of this fill material will be vetted in order to ensure that it is of a reputable origin and that it is ‘clean’ (i.e. will not introduce contamination to the groundwater or surface water environment). All potential suppliers will be vetted for the following criteria:

- Environmental management status.
- Regulatory and legal compliance status of the company.

Clean fill material will be sourced from local suppliers which comply with the above requirements. If recycled aggregate is used as imported fill, rigorous chemical testing will be undertaken to confirm that it is 'clean' (*i.e.* will not introduce contamination to the environment).

6.7.2.8 Water Supply

The details of the water supply for the construction phase of the Proposed Development will be agreed with the water services section of Uisce Éireann prior to commencement. It is anticipated that a water supply of up to 98 m^3/day during construction of the Power Plant, which will be supplied from the upgraded water main along the L1010 road south of the Site.

6.7.2.9 Foul Sewer

Foul sewage arising from kitchen facilities and temporary toilets and sanitary facilities during the Construction Phase on the Site will initially be discharged to an onsite receptacle which will be appropriately managed by the service contractor with relevant licences and emptied by tanker on a regular basis for disposal at a licensed waste facility.

It is anticipated that, due to the scale of the Proposed Development, a canteen will be provided onsite during construction. Provisions will be made for a grease trap at the canteen drain outlet and this drain will connect to the onsite receptacle and later to the WWTP. Drumming of waste cooking oil within the canteen will also be provided.

6.7.2.10 Flood Risk

Measures for protection of watercourses from flooding will be implemented as follows:

- During the construction phase, the Contractor will monitor weather forecasts on a monthly, weekly, and daily basis, and plan works accordingly. The Contractor will describe in the Site ERP the actions it will take in the event of a possible flood event. These actions will be hierarchal meaning that as the risk increases the Contractor will implement more stringent protection measures. This is important to ensure all workers, the construction site and third-party land, property and people are adequately protected from flooding during the construction phase.
- Weekly checks will be carried out to ensure surface water drains are not blocked by silt, or other items, and that all storage is located at least 50m from the edge of the SAC. A regular log of inspections will be maintained, and any significant blockage or spill incidents will be recorded for root cause investigation purposes and updating procedures to ensure incidents do not reoccur.
- Construction material(s), demolition materials and plant / welfare will not to be stored in the flood extents or elevated to minimise the impacts of flooding.
- All temporary works within the flood extents will be designed taking into account a flood impact loading and where possible, the Contractor will choose materials and / or equipment that are flood compatible to minimise the risk if a flood were to occur during any construction works.
- Continuous monitoring of weather conditions and tidal levels including surges will be completed throughout the works period.

6.7.3 Operational Phase Measures

6.7.3.1 Surface Water

All hazardous or water polluting materials will be handled or stored in a manner to prevent / minimise potential impact to surface water.

With regard to the emergency back-up generators associated with the Proposed Development, the diesel will be stored in fuel tanks located in bunded areas.

Secondary Fuel will be stored in two (2 No.) storage tanks (~5,000 m^3 each) and three-day tanks (~2,000 m^3 each) which will be site fabricated steel storage tanks. Tertiary containment, bunding and associated pipework will be designed in accordance with EPA Guidance Note on Storage and Transfer of Materials for Scheduled Activities. The secondary containment (primary bund) design will allow the greater of 110% of the largest tank within the bund or 25% of the total volume of substance within the bund, whichever is the larger. A second bund will be built and will contain any spillage should the primary bund fail. Refer to Drawing 198291-SS-A411 for details of the bunding.

If a leak from one of the tanks were to occur this will be identified by the leak detection system that will be present on each tank. The generator will be disabled in this event and the fuel will be allowed to collect within the second skin of the tank, which will have a 110% capacity. All bunded areas will have valved discharge points.

Emissions from chemical spills / leaks or runoff from rainwater that has passed over impermeable surfaces will be prevented from polluting local surface water, as all surface water runoff from Power Plant and parking areas will be directed to hydrocarbon interceptors prior to discharge to the Shannon Estuary or Ralappane Stream. The use of hydrocarbon interceptors will significantly reduce the likelihood of water contamination from vehicle fuel or chemical spills.

Spill kits will be located at strategic points around the Proposed Development in order to ensure a quick response to any spillages should they occur. Any used spill kits will be disposed of using a hazardous waste disposal contractor and in accordance with all relevant EU and Irish waste management legislation (*i.e.* the Waste Management Acts 1996-2011 and any regulations made thereunder, and the Waste Framework Directive). The EPA Guidance Note 'Storage and Transfer of Materials for Scheduled Activities' (EPA 2004) shall be taken into account when designing material storage and containment at the Proposed Development.

The transformers will be installed in bunds designed to retain a minimum of 110% of the total quantity of oil present in the transformer, below the fire trap. These bunds will be tested after construction and during maintenance to ensure the water depth loss is no more than 1 mm/hour over a continuous 6-hour period. Automatic emptying of rainwater from the bund will be achieved with a BundGuard© system or similar.

In the event of a fire, the fire water will drain through the storm sewerage system and hydrocarbon interceptors (where present) and be diverted to the firewater impoundment basin, sized and designed in accordance with the Irish EPA Guidance on Retention of Firewater, prior to inspection and discharge to the estuary. The retention pond will be rendered impermeable by use of an appropriate liner, and periodically integrity-tested in line with the requirements of the site's IE licence. All process area site storm drainage will pass through the retention pond. An automatic shut-off valve linked to the site's fire detection system would be installed on the drainage outlet point.

6.7.3.2 Foul Sewer

All foul water from the Proposed Development will be pumped or fall by gravity to a WWTP. The WWTP will be a pre-engineered biological treatment system which will treat the effluent to required discharge standards set out by the IE licence.

Table 6.12: Anticipated Characteristic of WWTP Discharge

Parameter	Emission Limit Value	Proposed Monitoring Frequency
Volume	35 m^3/day	Continuous
pH	6-10	Continuous
Biochemical Oxygen Demand	25 mg/L	Bi-annual
Suspended Solids	35 mg/L	Bi-annual
Ammonia	5 mg/L as N	Bi-annual
Total Phosphorous	2 Mg/L as P	Bi-annual

The WWTP will be sized to cater for a population of approximately 67 people. The treated effluent will be monitored in accordance with the site's IE licence requirements prior to discharge to the estuary via the same discharge outfall pipe as the surface water.

Effluent leaving the WWTP will be continuously monitored for flow rate and pH before discharging to the estuary. The automatic control system associated with the WWTP will sound an alarm if pH falls outside of the expected range. This will alert the operator to take corrective action to remedy the problem. If the problem continues to go outside the pre-set range, this will automatically close the discharge valve.

6.7.3.3 Water Supply

The water supply system will be metered to determine water consumption and facilitate leakage detection and will be in accordance with Irish Water requirements.

6.7.3.4 Storm Water Drainage

To minimise sediment, build up within the storm water drainage network, trapped inlets will be used at all points of entry and key manholes will have sumps to collect material. A regular maintenance regime, including monitoring, will be put in place to remove any excess build-up of material.

6.7.3.5 Flood Risk

The site-specific Flood Risk Assessment (FRA) (**Appendix A6.3,** Volume 4) concluded that the Proposed Development has a **Negligible** impact on the existing flood regime in the area, with the exception of crossings of the watercourses for the access road. These will be culverted at an adequate size to have a minimal impact on the existing hydraulic regime in the area to the Ralappane Stream.

The Site will have a constructed stormwater drainage system capable of handling anticipated peak stormwater volumes for a 100-year, 24-hour rainfall event (162 L/s/ha, which equates to a total discharge rate of approximately 3,125 L/s peak flow) and which will incorporate a firewater retention pond and discharge monitoring and flow control devices.

6.7.3.6 Environmental Management Plan

An environmental management plan for the Proposed Development will be implemented during the operational phase under the IE Licence, incorporating all mitigation measures and emergency response measures, as described in this chapter.

6.7.4 Decommissioning Phase

As outlined in **Chapter 02** (Description of the Proposed Development) in the event of decommissioning, measures will be undertaken to ensure that there will be no significant, negative environmental effects from the development and in accordance with the IE licence CRAMP.

6.8 Residual Impacts

6.8.1 Construction Phase

The implementation of mitigation measures highlighted above will significantly reduce the likelihood and magnitude of the potential impacts on the groundwater and surface water environment occurring during the construction phase.

Residual impacts may be negative but are unlikely to occur if mitigation measures are properly implemented. Residual impacts will be of localised effect, in that they will only impact locally and impacts will be of temporary duration.

The magnitude of the potential residual impact during construction phase is therefore considered to be **Negligible** on a surface water environment of **Extremely High** sensitivity, and the potential impact of the Proposed Development on the water environment is considered to be **Imperceptible**.

6.8.2 Operational Phase

The implementation of measures inherent to the Proposed Development design and mitigation measures highlighted above and in **Chapter 02** (Description of the Proposed Development) will significantly reduce the likelihood and magnitude of effects on the groundwater and surface water environment occurring during the operational phase.

In relation to the operational phase, the magnitude of the potential residual impact is considered to be **Negligible** on a surface water environment of **Extremely High** sensitivity, and the potential effect of the Proposed Development on the water environment is considered to be **Imperceptible**.

6.8.3 Decommissioning Phase

As outlined in **Chapter 02** (Description of the Proposed Development), in the event of decommissioning, measures will be undertaken by the Applicant to ensure that there will be no significant, negative environmental effects during the decommissioning phase. Examples of the measures that will be implemented are outlined in Section 2.9, **Chapter 02** and will include removal of subsurface utilities such as the site drainage and surface water management systems. As a result, additional potential impacts and associated effects arising during the decommissioning phase are not anticipated above and beyond those already assessed during the construction phase.

A monitoring programme of all potential emissions including surface water and dust would be conducted after the decommissioning process in order to ensure that emissions from the facility have ceased.

6.9 Cumulative Impacts and Effects

The cumulative impacts of the Proposed Development and nearby consented projects in the vicinity of the Proposed Development are discussed below.

Most of the projects listed in **Appendix A1.2** Volume 4 are sufficiently distant and of a nature and scale that there are no pathways for these to act in-combination with the Proposed Development in relation to impacts to the Water environment.

Significant developments which are relatively close to the Proposed Development, *i.e.,* within c. 2 km of the Site are addressed below.

6.9.1 Summary of Schemes Considered in Cumulative Impact Assessment

6.9.1.1 SLNG Strategic Gas Reserve Facility

The location of the Proposed Development is the subject of a SID pre-application for a Proposed Shannon Technology and Energy Park (STEP) Strategic Gas Reserve Facility (APB-319245-24) comprising of a floating storage and regasification unit (FSRU), jetty and access trestle, onshore receiving facilities, and all ancillary works. A pre-application was submitted to An Bord Pleanála (ABP) on 8th March 2024, and a request for a pre-application consultation meeting is pending from the Board.

6.9.1.2 SLNG Gas Pipeline

Planning permission exists for the development of a 26 km natural gas pipeline which will facilitate connection from the Site to the GNI transmission network at Leahy's, located to the west of Foynes, Co. Limerick. The application was accompanied by an Environmental Impact Statement (EIS).

No significant residual effects were identified to hydrogeology and surface water in the EIS for the SLNG Gas pipeline.

6.9.1.3 Data Centre Campus

As part of the Masterplan, a Data Centre Campus is proposed to the west of the Proposed Development. This will be subject to its own EIAR and planning application.

6.9.1.4 High Voltage 220 kV and Medium Voltage (10 / 20 kV) Power Transmission Networks

Shannon LNG executed a 600 MW 220 kV grid connection agreement with EirGrid for the Power Plant on 14th April 2023. It is expected that the high voltage connection will run 5 km east under the L1010 road to the ESBN / EirGrid Kilpaddoge 220 kV substation.

The Power Plant may also require an onsite substation and a separate medium voltage (10 / 20 kV) connection, from the existing Electricity Supply Board Networks (ESBN) / EirGrid Kilpaddoge substation. This will be used as a back-up electricity system when the Power Plant is undergoing maintenance.

The medium voltage (10 / 20 kV) and 220 kV power connections will be constructed in parallel with the Proposed Development but will be subject to separate planning design and planning applications.

6.9.2 Construction Impact

The Proposed Development and nearby consented projects are located in an environment of **Extremely High** sensitivity (surface water). It is noted that:

- The SLNG pipeline was subject to an EIS. No significant residual impacts (taking into account the control measures), in relation to the water environment, were identified.
- The potential future Strategic Gas Reserve Facility will be constructed on the platform created as part of this Proposed Development, therefore additional significant impacts that will act in combination with the Proposed Development are not anticipated.
- The Proposed Development and nearby consented projects, including the potential future data centre and the consented SLNG pipeline and electricity transmission will not result in an impact to the water environment, as there are no extensive works below ground level or any uncontrolled discharges to the water environment anticipated / assumed.

If works associated with these schemes (described above) in close proximity to the Proposed Development are concurrent with works at the Proposed Development, there is potential for cumulative impacts and effects on surface water and groundwater features, notably the Ralappane Stream and associated protected habitats. Should this situation arise, construction activities will be planned and phased, in consultation with the construction management team for the Proposed Development as outlined in **Section 6.7,** mitigation measures proposed to manage and control potential impacts during the Proposed Development will reduce the magnitude and significance of effects to a minimum.

Additionally, the potential future data centre, and potential future Strategic Gas Reserve Facility will be subject to their own EIAR and planning permission submissions. Similar construction mitigation measures, including the preparation of a CEMP, will be required for these developments.

Taking account of mitigation measures proposed, the cumulative effect of all schemes proceeding simultaneously is considered to be a **Negligible** impact to an **Extremely High** sensitivity environment and the significance of the effect has been assessed as **Imperceptible**.

6.9.3 Operational Impacts

The Proposed Development and nearby consented projects are located in an environment of **Extremely High** sensitivity (surface water). It is noted that:

- The SLNG Gas Pipeline was subject to an EIS. **No Significant** residual operational impacts (taking into account the control measures), in relation to the water environment, were identified.
- **No Significant** operational impacts, in relation to water environment are anticipated from the proposed Strategic Gas Reserve (located on the same site as the Power Plant), electricity transmission (High Voltage 220 kV and Medium Voltage (10 / 20 kV) Power Transmission Networks) or Data Centre Campus development.

As outlined in **Section 6.7**, mitigation measures proposed to manage and control potential impacts during the Proposed Development will reduce the potential magnitude and significance of effects from the Proposed Development.

If works associated with these schemes (described above) in close proximity to the Proposed Development are operated concurrently with the Proposed Development, there is potential for cumulative impacts and effects on surface water and groundwater features, notably the Ralappane Stream and associated protected habitats.

However, the potential future Data Centre Campus, and potential future Strategic Gas Reserve Facility will be subject to their own EIAR and planning permission submissions. Similar construction mitigation measures, including the preparation of an EMP, will be required for these developments.

Potential effects to surface water and groundwater from the Proposed Development range from **Small** to **Moderate** and mitigation measures proposed to manage and control potential impacts during operation will further reduce the magnitude and significance of effects. Potential impacts primarily relate to accidental releases, which on independent sites cannot be considered to be cumulative. Therefore, the cumulative operational effect of the Proposed Development and other consented or potential developments in the vicinity surface water and groundwater is considered to be **Imperceptible**.

6.9.4 Do Nothing Scenario

Under a 'Do Nothing' scenario it is expected that the Site will continue to be utilised for agricultural purposes. As is, the Site potentially represents a source of contamination to the water environment, as diffuse agricultural sources continue to be the main threat to the quality of water in Ireland.

6.10 Summary

Construction stage spill and leaks, including concrete and lime products and fuels, may give rise to a small adverse effect on an **Extremely High** sensitivity environment (Lower River Shannon SAC) with the significance of the effect being significant, but such activities will be set back from the coast, and managed in accordance with the CEMP resulting in a negligible impact after mitigation.

Other construction phase risks arise from excavation, localised dewatering near rock cuttings and silt runoff to surface waters from material stockpiles on the Site. Dewatering of bedrock will be a permanent but localised direct impact and will not lead to a net volume change in groundwater discharge to the estuary, resulting in an imperceptible effect. Excavated materials storage areas and stormwater runoff will be carefully managed in accordance with the CEMP to prevent potential negative effect on the receiving environment. Stormwater discharge from the Proposed Development to the estuary will be carried out in compliance with a discharge licence. Offshore construction will be managed to minimise use of wet concrete in contact with marine waters.

Overall, the residual impact on the water environment during construction is considered **Imperceptible.**

Operational Phase risks to groundwater and surface water will arise principally from discharges of stormwater, process effluent and sanitary water via a Surface Water Outfall to the estuary. These effluent streams will be collected via separate constructed drainage networks and will be treated and monitored prior to discharge as required by the Site's IE licence from the EPA, resulting in a negligible adverse effect on an extremely high sensitivity environment and the significance of any residual effect is **Imperceptible**.

Other operational phase risks to groundwater and surface water will arise from losses of diesel fuel, transformer oils, and other chemicals used onsite. These risks will be managed by siting sensitive chemical storage and equipment within bunded areas, resulting in a low adverse effect to an extremely high sensitivity environment and the residual significance will be **Imperceptible.**

Mitigation measures associated with both the construction and operational phases of the Proposed Development have been proposed, which may also interact with waste management and land and soils aspects of the development.

Overall, the residual impact on the water environment during operation is considered **Imperceptible.**

The potential impacts on the WFD status of the adjacent Lower Shannon Estuary transitional waterbody, and underling Ballylongford WFD GWB were assessed in WFD Screening Assessment (Aquafact 2024) refer to **Appendix A6.4** (Volume 4) and it was concluded that no permanent impacts on the condition of the Ralappane river waterbody or indirectly affect measures put in place to achieve the environmental objectives of the WFD for this waterbody.

A CEMP will be prepared for the construction phase of the Proposed Development which will incorporate relevant environmental avoidance or mitigation measures to reduce potential environmental impact of temporary storage of soil or rock fill, road runoff, runoff of contaminated waters from constructions areas, storage and use of oils, chemicals, fuels and waste material onsite, concreting operations and vehicles onsite. Site waste management, including control of sewage and other key effluents, will be managed under the CEMP.

Operational phase mitigations include:

- Handling all hazardous or water-polluting materials in a manner to prevent/ minimise potential impact on groundwater and surface water.
- Secondary containment (bunding) and spill kits will be provided for other hazardous materials to be stored onsite, such as fuels, maintenance oils, odorant and cleaning chemicals. Tertiary containment, bunding and associated pipework will be designed in accordance with EPA Guidance Note on Storage and Transfer of Materials for Scheduled Activities.
- An Environmental Management Plan (EMP) will be prepared for the operational phase.
- The environmental aspects of the operational phase will be licensed and controlled by the EPA via an IE Licence.

Hydrodynamic modelling of constructions stage sediment deposition from operational phase outfall from the Site indicated **No Significant** impacts to the intertidal or subtidal habitats or species in the estuary, which includes the SAC, SPA, pNHA and the commercial oyster production sites in inner Ballylongford Bay (see **Chapter 07A** (Marine Ecology)).

Cumulative impacts arising from the proposed SLNG Strategic Gas Reserve Facility, SLNG Gas Pipeline, High Voltage 220 kV and Medium Voltage (10 / 20 kV) Power Transmission Networks and Data Centre Campus developments envisaged under the Master Plan were considered, **No Significant** residual impacts were identified to groundwater and surface water and the cumulative operational impact is considered to be **Imperceptible**. The proposed Strategic Gas Reserve Facility, 20 kV and Medium Voltage (10 / 20 kV) Power Transmission Networks and Data Centre Campus developments will be subject to separate EIARs.

Should the Proposed Development not take place, the groundwater and surface water will remain in their current state and there will be no change.

The residual effect of the Proposed Development on the surrounding groundwater and surface water environments is considered to be **Imperceptible** at both the construction and operational phases.

Table 6.13: Summary

Proposed Development Phase	Aspect / Impact Assessed	Existing Environment / Receptor Sensitivity	Effect / Magnitude	Significance (Prior to Mitigation)	Mitigation and Monitoring Measures (the Proposed Development design embedded environmental controls and all mitigation and monitoring measures detailed herein are included in the CEMP and Chapter 02 of the EIAR)	Residual Effect Significance
Construction	Dewatering due to cuttings	Low	Cut faces into bedrock will lead to seepage of groundwater into platform localised dewatering of the bedrock within 10m - 50m of the cut faces. Permanent, direct, irreversible moderate effect	Neutral	Localised dewatering of the bedrock within 10m - 50 m of the cut faces of the excavation is anticipated, however, as all groundwater in the bedrock aquifer in this area is flowing towards the Shannon Estuary under baseline conditions, the interception and discharge of groundwater discharging to the excavated platform area of the Proposed Development will not lead to a net change to the quantities of groundwater ultimately discharging to the Shannon Estuary from this portion of the Site. Groundwater seepage from cut faces will be managed via the Site drainage systems in such a way as to prevent potential negative impact on the receiving environment. The CEMP will outline proposals for the control and monitoring of groundwater seepages from the cut faces of the platform area.	**Imperceptible**
Construction	Sedimentation (Suspended Solids)	Extremely high	Runoff containing large amounts of suspended solids from site stripping, earthworks and material stockpiles can potentially adversely impact on surface water and marine environments. Installation of bored piles in the offshore area may generate low suspended sediment loads which will be transported by tidal currents. Temporary small adverse effect to an medium extremely high sensitivity surface water environment.	Significant	Surface water runoff from working areas will not be allowed to discharge directly to the local watercourses. To achieve this, the drainage system, settlement ponds and surface water outfall will be constructed prior to the commencement of major site works. Spoil and temporary stockpiles will be positioned in locations which are distant from drainage systems and retained drainage channels, away from areas subject to flooding. Runoff from spoil heaps will be prevented from entering watercourses by diverting it through onsite settlement ponds and removing material as soon as possible to designated storage areas. Pile installation will use reverse circulation drilling to minimise loss of drilling spoil and generation of suspended sediment in the marine environment. Control of runoff from construction activities will be managed under the CEMP therefore runoff containing large amounts of suspended solids is considered unlikely to occur and, shall it occur, is likely to be rare and short-term.	**Imperceptible**

Proposed Development Phase	Aspect / Impact Assessed	Existing Environment / Receptor Sensitivity	Effect / Magnitude	Significance (Prior to Mitigation)	Mitigation and Monitoring Measures (the Proposed Development design embedded environmental controls and all mitigation and monitoring measures detailed herein are included in the CEMP and Chapter 02 of the EIAR)	Residual Effect Significance
Construction	Accidental Spills and Leaks • Use and Storage of liquid chemicals. • Spillage or leakage of oils and fuels from construction machinery or site vehicles. • Spillage of oil or fuel from refuelling machinery onsite.	Extremely high	Adverse effect on fish, aquatic flora and invertebrate communities. the Proposed Development. Direct negative small effect of temporary duration.	Significant	In order to prevent spillages to ground of fuels or other chemicals, and to prevent any consequent soil or groundwater quality impacts, it will be necessary to adopt mitigation measures during the construction phase, which include: • Designating a bunded storage areas and handling procedures for all oils, solvents and paints used during construction. • Refuelling of construction vehicles and the addition of hydraulic oils or lubricants to vehicles, will take place in a designated area with appropriate facilities. • Refuelling outside of the designated area will be via a mobile double skinned tank with lockable fittings and an onboard spill kit. Accidental spillages and leaks will be managed under the CEMP and are considered unlikely to occur and, shall they occur, are likely to be a temporary.	**Imperceptible**
Construction	Use of Concrete and Lime	Extremely high	Lime and concrete (specifically, the cement component) is highly alkaline and can impact surface water quality during construction. Direct negative small effect of temporary duration	Significant	Hazardous materials will be controlled via the CEMP and stored in bunded areas. A suitable risk assessment for wet concreting will be completed prior to works being carried out, which will include measures to prevent discharge of alkaline wastewaters or contaminated storm water to the underlying subsoil or to the marine environment. Use of pre-cast concrete structures for the jetty and outfall in the marine environment will be maximised to limit the use of wet concrete. Washout of concrete-transporting vehicles will take place at an appropriate facility offsite where possible, alternatively, where washout takes place onsite, it will be carried out in carefully-managed onsite wash out areas.	Imperceptible
Operational	Hazardous Materials Storage • Diesel	Extremely high	Storage of materials that are potentially hazardous to the aquatic environment. Temporary	Significant	The storage of materials hazardous to the aquatic environment during the operational phase will be in secondary contained area and will be controlled in accordance with any IE licence conditions.	Imperceptible

Proposed Development Phase	Aspect / Impact Assessed	Existing Environment / Receptor Sensitivity	Effect / Magnitude	Significance (Prior to Mitigation)	Mitigation and Monitoring Measures (the Proposed Development design embedded environmental controls and all mitigation and monitoring measures detailed herein are included in the CEMP and Chapter 02 of the EIAR)	Residual Effect Significance
	• Chemical odorant • Minor quantities of maintenance oils, greases, lubricants, cleaning chemicals, etc.		small adverse effect to an extremely high sensitivity surface water environment.		All hazardous or water-polluting materials will be handled or stored in a manner to prevent / minimise potential impact on soil. Secondary containment and spill kits will be provided for other hazardous materials to be stored onsite. Potentially hazardous materials will be stored and handled in compliance with the site's IE licence requirements during the operational phase.	
Operational	Accidental Spills and Leaks	Extremely high	Spills during handling of fuels and other liquid chemicals can result in discharge to groundwater or the surface water environment. Direct negative small adverse effect of temporary duration.	Significant	All hazardous or water-polluting materials will be handled or stored in a manner to prevent/ minimise potential impact on soil. Secondary containment and spill kits will be provided for other hazardous materials to be stored onsite, such as maintenance oils and cleaning chemicals. Diesel fuel tanks for the fire water pumps and generators will be stored within bunded areas. Fuel will be prevented from entering the soil around the generators, as drainage will be directed to an oil/ water interceptor prior to discharge to the storm water drainage system. In addition, there will be a shut off valve from the generator yard to the external surface water drainage network. Potentially hazardous materials will be stored and handled in compliance with the site's IE licence requirements during the operational phase.	**Imperceptible**
Operational	Flooding and Drainage	Extremely high	Direct discharges to the water environment during the operational phase will consist of • Stormwater water runoff from the developed and undeveloped areas of the Site.	Significant	The proposed crossings of the watercourses within the Proposed Development along the access road have been adequately sized to have a minimal impact on the existing hydraulic regime in the area draining to the Ralappane Stream, and therefore the Proposed Development has a negligible impact on the existing flood regime in the area. The Site will have a constructed stormwater, effluent and sanitary drainage systems capable of handling anticipated effluent volumes and which will incorporate treatment facilities and monitoring equipment appropriate to each effluent stream (including silt trap, Class 1 hydrocarbon	**Imperceptible**

Proposed Development Phase	Aspect / Impact Assessed	Existing Environment / Receptor Sensitivity	Effect / Magnitude	Significance (Prior to Mitigation)	Mitigation and Monitoring Measures (the Proposed Development design embedded environmental controls and all mitigation and monitoring measures detailed herein are included in the CEMP and Chapter 02 of the EIAR)	Residual Effect Significance
			• Groundwater discharges from cut faces. • Foul water from welfare facilities on the Site. • Process effluent streams. Small adverse impact effect on an extremely high sensitivity environment.		interceptor, a firewater retention facility, package waste water treatment plant and pH adjustment). Outfall discharges to the estuary were modelled and indicated that the treated effluent will be rapidly diluted and dispersed within a short distance of the outfall and does not compromise the water quality at the aquaculture sites in Ballylongford Bay. The Site's drainage systems will be operated and monitored in compliance with the site's IE licence requirements during the operational phase.	
Operational	Combined Operational Stormwater, Sanitary and Process Effluent Discharges to Surface Water.	Extremely high	Direct discharges to the marine environment during the operational combined Surface Water Outfall. Small adverse impact effect on a medium extremely high sensitivity environment.	Significant	The Site will have a constructed stormwater, effluent and sanitary drainage systems capable of handling anticipated effluent volumes and which will incorporate treatment facilities and monitoring equipment appropriate to each effluent stream (including silt trap, Class 1 hydrocarbon interceptor, a firewater retention facility, package waste water treatment plant and pH adjustment). The Site's drainage systems will be operated and monitored in compliance with the site's IE licence requirements during the operational phase.	**Imperceptible**

6.11 References

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